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**Four empirical essays on the role of
institutional quality, political instability and
entrepreneurship for economic growth and
jobs in Sub-Saharan Africa**

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Abstract

Most Sub-Saharan African (SSA) countries experienced sound economic growth and a declining rate of poverty over the last two decades. Though, by far, the SSA region remains the poorest in the world and faces tremendous political, social, and economic challenges. Moreover, due to the COVID-19 pandemic, SSA entered into a recession with a GDP growth rate of minus 5% in 2020 as ever recorded over 25 years. This has also induced an increase in poverty in the region, which adds up to the structural challenges and further highlight the need of sound policies to address economic growth, governance, jobs, and poverty for the region to meet the Sustainable Development Goals (SDGs) in 2030 and beyond.

This thesis examines the effects of institutional quality, political instability, and a government targeted entrepreneurship program on the accumulation of human, physical, and financial capital by households and firms. In the literature, these factors are identified as the key determinants of economic growth and job creation, yet this thesis contributes to a knowledge gap, especially at the microeconomic level, on how households and firms accumulate these factors in the presence of weak institutional quality, political instability, and government targeted entrepreneurship programs. In particular, this thesis investigates heterogeneity as well as a single country study of the effects of institutional quality and political instability; it also employs a randomized controlled trial (RCT) to assess the impacts of two different targeted entrepreneurship support programs; and finally, it taps on data from this field experiment to assess the performance of two different targeting mechanisms for selecting growth-oriented entrepreneurs. Each paper is self-contained and three among the four papers were written with co-authors.

The first paper assesses the effects of institutional quality and political instability on household assets and human capital accumulation in 19 Sub-Saharan African countries for the period 2003-16. In this paper, the concept of instability is enlarged to include factual instability as measured by the number of political violence and civil unrest events, perceived instability as measured by the perceptions of the quality of institutions by households, and the interplay between factual and perceived instability. Contrary to most previous analyses, this paper takes into account household wealth distribution to show how the effects of political instability differ for poor vs. rich households. For identification, I exploit the variation of factual and perceived instability across 185 administrative regions in the 19 countries. My regressions control for a large range of confounding factors measured at the levels of households, regions, and countries. Overall, factual and perceived instability are associated with higher investments in assets, and factual instability is also associated with more investment in house improvements, yet it is negatively associated with the ownership of financial accounts. With regard to the heterogeneous effects, increased factual or perceived instability is associated with more investments in physical capital but less investments in financial and human capital among rich households, and with less investments in physical, financial and human capital among poor households. These findings suggest that political instability might enhance the accumulation of wealth by rich households and reduce that of poor households, implying that the detrimental effects of political instability have lasting consequences for poor households, especially when poor households are exposed to an actual or even just perceived deteriorating quality of the country's institutions.

The second paper, written with Nicolas Büttner and Michael Grimm, analyzes households' investments in assets and their consumption, and education and health expenditures when exposed to actual instability as measured by the number of political violence and protest events in Burkina Faso. There is a large, rather macroeconomic, literature that shows that political instability and social conflict are associated with poor economic outcomes including lower investment and reduced economic growth. However, there is only very little research on the impact of instability on households' behavior, in particular their saving and investment decisions. This paper merges six rounds of household survey data and a geo-referenced time series of politically motivated events and fatalities from the Armed Conflict Location and Event Data project (ACLED) to analyze households' decisions when exposed to instability in Burkina Faso. For identification, the paper exploits variation in the intensity of political instability across time and space while controlling for time-effects and municipality fixed effects as well as rainfall and nighttime light intensity, and many other potential confounders. The results show a negative effect of political instability on financial savings, the accumulation of durables, investment in house improvements, as well as on investment in education and health. Instability seems, in particular, to lead to a reshuffling from investment expenditures to increased food consumption, implying lower growth prospects in the future. With respect to economic growth, the sizable education and health effects seem to be particularly worrisome.

The third paper, written with Michael Grimm and Michael Weber, employs a randomized controlled trial (RCT) to assess the short-term effects of a government support program targeted at already existing and new firms located in a semi-urban area in Burkina Faso. Most support programs targeted at small firms in low- and middle-income countries fail to generate transformative effects and employment at a larger scale. Bad targeting, too little flexibility and the limited size of the support are some of the factors that are often seen as important constraints. This paper assesses the short-term effects of a randomized targeted government support program to a pool of small and medium-sized firms that have been selected based on a rigorous business plan competition (BPC). One group received large cash grants of up to US\$8,000, flexible in use. A second group received cash grants of an equally important size, but earmarked to business development services (BDSs) and thus less flexible and with a required own contribution of 20%. A third group serves as a control group. All firms operate in agri-business or related activities in a semi-urban area in the Centre-Est and Centre-Sud regions of Burkina Faso. An assessment of the short-term impacts shows that beneficiaries of cash grants engage in better business practices, such as formalization and bookkeeping. They also invest more, though, this does not translate into higher profits and employment yet. Beneficiaries of cash grants and BDSs show a higher ability to innovate. The results also show that cash grants cushioned the adverse effects of the COVID-19 pandemic for the beneficiaries. More generally, this study adds to the thin literature on support programs implemented in a fragile-state context.

The fourth paper, written with Michael Weber, examines the selection of entrepreneurs based on expert judgments for a BPC in Burkina Faso. To support job creation in developing countries, governments allocate significant funds to a typically small number of new or already existing micro, small, and medium-sized enterprises (MSMEs) that are growth oriented. Increasingly, these enterprises are picked through BPCs where thematic experts are asked to make the selection. So far, there exists contrasting and limited evidence on the effectiveness

and efficiency of these expert judgments for screening growth-oriented entrepreneurs among contestants in BPCs. Alternative or complementary approaches such as evaluation and selection algorithms are discussed in the literature but evidence on their performance is thin. This paper uses a principal component analysis (PCA) to build a metric for comparing the performance of these alternative mechanisms for targeting entrepreneurs with high potential to grow. The results show expert subjectivity bias in judging contestant entrepreneurs. The paper finds that the scores from the expert judgment and those from the algorithm perform similarly well for picking the top-ranked or talented entrepreneurs. It also finds that both types of scores have predictive power, i.e. have statistically significantly associated with 17 firm performance outcomes measured 10 or 34 months after the BPC started. Yet, the predictive power, as measured by the magnitude of the regression coefficients, is higher for the algorithm metric, even when it is considered jointly with expert judgment scores. Despite the statistical superiority of the algorithm, expert assessments at least through pitches of entrepreneurs have proved useful in many settings where free-riding or misuse of public funds may occur. Hence, efficiency and precision could be achieved by relying on a reasoned combination of expert judgments and an algorithm for targeting growth-oriented entrepreneurs.

These four papers bring new insights on the relationship between weak institutions, political instability, and targeted government support to entrepreneurship for increasing the accumulation of financial, physical, and human capital, and productivity. And these are the key factors for spurring economic growth and creating jobs in SSA. These findings suggest that efficient institutions building in SSA countries would enhance citizen perceptions of good governance which would reduce political instability and enable households including the poor to accumulate productive assets, increase their productivity and reduce poverty. The findings also suggest that targeted government entrepreneurship support programs, e.g. in the forms of cash grants with monitored disbursements yet flexible in use, can enhance firms' human capital, productive assets, and innovations, even in the short term. Moreover, the targeting mechanism of such programs could be made more effective and efficient by relying on a combination of expert judgments and an algorithm for picking growth-oriented entrepreneurs.

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Contents

List of Figures	iv
List of Tables	vi
List of Abbreviations	ix
1. Introduction.....	2
1.1. Quality institutions for spurring stable and prosperous economies	3
1.2. Human, physical, and financial capital accumulation and entrepreneurship for better jobs... 5	
1.3. Contribution	6
References.....	10
2. Institutional quality, political instability, and household assets and human capital accumulation in Sub-Saharan Africa.....	16
2.1 Introduction.....	16
2.2 Sociopolitical instability and household asset accumulation: theoretical aspects.....	19
2.3 Data.....	22
2.3.1 Outcomes of interest	23
2.3.2 The independent variables	24
2.3.3 Control variables	26
2.4 Empirical specification	27
2.5 Results.....	28
2.5.1 Overall effects	29
2.5.2 Wealth-heterogeneity	31
2.5.3 Spillover effects	34
2.5.4 Robustness checks.....	35
2.6 Conclusion	36
References.....	37
Appendix.....	41
Supplemental Material	46
3. Political instability and households' investment behavior. Evidence from Burkina Faso.....	71
3.1 Introduction.....	71
3.2 The political and socio-economic context of this study.....	72
3.3 Theoretical considerations	75
3.4 Data.....	77
3.5 Empirical specification	81
3.6 Results.....	82
3.6.1 The effect of factual instability on households' asset accumulation.....	82

3.6.2	The effect of factual instability on the performance of farms and non-agricultural firms	87
3.6.3	Robustness checks.....	88
3.7	Conclusion	92
References.....		94
Appendix.....		99
Supplemental Material		103
4.	Short-term impacts of targeted cash grants and Business Development Services. Experimental Evidence from Entrepreneurs in Burkina Faso	154
4.1	Introduction.....	154
4.2	Country context and background of the Bagré Growth Pole Project.....	155
4.3	The intervention and the pathways to impact	157
4.3.1	Selection of beneficiaries and rollout.....	157
4.3.2	Pathways to impact	160
4.4	Randomization, balance tests and attrition	161
4.4.1	Randomization	161
4.4.2	Balance tests.....	163
4.4.3	Attrition.....	163
4.5	Empirical specifications	164
4.6	Results.....	165
4.6.1	Use of grants	165
4.6.2	Effects on investment.....	166
4.6.3	Effects on profits and turnover.....	170
4.6.4	Effects on employment	172
4.6.5	Effects on business skills, business practices, banking and formalization.....	174
4.6.6	Spillovers	178
4.6.7	Did the intervention mitigate the adverse effects of the COVID-19 pandemic?	180
4.6.8	Qualitative evidence.....	183
4.7	Conclusion	184
References.....		186
Appendix.....		188
5.	Expert judgment vs. algorithm: How to best target growth-oriented entrepreneurs?	215
5.1	Introduction.....	215
5.2	Theoretical and empirical background.....	218
5.2.1	The kind of entrepreneur a BPC should pick.....	218
5.2.2	On the optimal design of a selection mechanism.....	219

5.2.3	Empirical evidence on the performance of alternative selection mechanisms.....	221
5.3	Burkina Faso cash and matching grants program	222
5.3.1	The program.....	222
5.3.2	The targeting mechanism.....	222
5.4	Data and methods.....	224
5.4.1	Data.....	224
5.4.2	Method	224
5.5	Results.....	228
5.5.1	Qualitative insights on the experts' judgments on the business plans	228
5.5.2	Identifying the characteristics of the entrepreneurs and their businesses correlated with the experts' judgments on the business plans and pitches	231
5.5.3	Comparing entrepreneurs ranking based on the experts-score vs. the algorithm-score.....	233
5.5.4	Performance of the experts-scores vs. the algorithm-scores in predicting business outcomes.....	235
5.6	Conclusion	239
	References.....	241
	Appendix.....	245
	Supplemental Material	259

List of Figures

Figure A.2.1: Average marginal effects of factual and perceived political instability on household outcomes.....	41
Figure A.2.2: Remittances inflows and outflows between Burkina Faso and Côte d’Ivoire in the 2010-15 period.....	42
Figure A.2.3: Relation between remittances inflows and the number of political violence and protests in 19 countries over the 2000-16 period.....	42
Figure A.3.1: Intensity of factual instability across time and space in Burkina Faso, 1998, 2005, 2014.....	99
Figure A.3.2: Overview – the effects of factual political instability on households’ saving, investment, and consumption behavior.....	100
Figure 4.1: Timeline of the program’s main activities	160
Figure 4.2: Planned investments and purchases (without BDSs).....	166
Figure 4.3: Rollout of cash and matching grants	168
Figure 4.4: Cumulative share of total grants used by months	168
Figure 4.5: Impacts and confidence intervals (adjusted and non-adjusted for multiple hypotheses testing).....	178
Figure 4.6: Percentage of firms which encountered difficulties due to COVID-19 and government response measures.....	180
Figure A.4.1: Post-treatment CDFs of investment by treatment group.....	191
Figure A.4.2: Post-treatment CDFs of turnover (log) by treatment group	194
Figure A.4.3: Post-treatment CDFs of profits by treatment group.....	196
Figure 5.1: Effects of COVID-19 on decline of production, sales, investment, employment, and general performance, detailed regression results	223
Figure 5.2: Misclassifications between rankings based on the experts and PCA scores.....	234
Figure A.5.1: The different steps of the research method and questions addressed.....	252
Figure A.5.2: Comparing the ranking of entrepreneurs based on the experts and PCA scores	253

List of Tables

Table 2.1: Effects of political instability on ownership of financial accounts and assets.....	30
Table 2.2: Effects of political instability on house improvements and school enrollment.....	31
Table 2.3: Heterogeneous effects by wealth status	33
Table 2.4: Between-country spillover effects of factual instability	34
Table A.2.1: Summary statistics on the dependent and independent variables	43
Table A.2.2: Years of used DHS and Afrobarometer surveys.....	43
Table A.2.3: Dependent variable	44
Table 3.1: Assumptions on assets	77
Table 3.2: Summary statistics of outcome variables.....	78
Table 3.3: Effects of factual instability on households' saving and investment decisions (OLS)	83
Table 3.4: Effects of factual instability on households' human capital investments (OLS)...	85
Table 3.5: Effects of factual instability on households' total and consumption expenditures (OLS)	87
Table 3.6: Effects of political instability on households' total turnover and profits from non- agricultural firms (OLS)	88
Table A.3.1: Summary statistics of measures of political instability at municipality level..	101
Table A.3.2: Summary statistics of control variables	102
Table 4.1 : Number of entrepreneurs per stratum and treatment arm	161
Table 4.2: Summary statistics of grants (US\$) across groups	162
Table 4.3: Intention-to-treat effects on total investment in physical capital and land (past 6 months)	169
Table 4.4: Intention-to-treat effects on profits (total profits on products and services) and turnover (total revenues on products and services), past 6 months	171
Table 4.5: Intention-to-treat effects on total and paid wage employments.....	173
Table 4.6: Intention-to-treat effects on formalization, banking, bookkeeping and innovation	176
Table 4.7: Spillover effects on profits stemming from cash beneficiaries.....	179
Table 4.8: Effects of COVID-19 on decline in production, sales, investment, employment, and general performance.....	182
Table A.4.1: Baseline characteristics of the entrepreneur and pairwise balance tests across all three groups.....	188
Table A.4.2: Baseline characteristics of the firm and pairwise balance tests across all three groups.....	189

Table A.4.3: Intention-to-treat effects on total investment in physical capital and land (past 6 months), detailed regression results.....	190
Table A.4.4: Intention-to-treat effects on profits (total profits on products and services), past 6 months.....	192
Table A.4.5: Intention-to-treat effects on turnover (total revenues on products and services), past 6 months	195
Table A.4.6: Intention-to-treat effects on total and paid wage employment, detailed regression results	197
Table A.4.7: Intention-to-treat effects on unpaid employment and the number of days worked, detailed regression results	199
Table A.4.8: Intention-to-treat effects on formalization and banking, detailed regression results	201
Table A.4.9: Intention-to-treat effects on book-keeping and innovation, detailed regression results	204
Table A.4.10: Effects of COVID-19 on decline of production, sales, investment, employment, and general performance, detailed regression results	212
Table 5.1: Pairwise correlations between the scores on the business plans and the pitches.....	230
Table 5.2: Pairwise correlation between expert 1 and expert 2 scores and subscores on the principal criteria	231
Table 5.3: Summary of entrepreneur and business characteristics determining the expert scores	232
Table 5.4: Classification of entrepreneurs based on the experts-scores and PCA-scores.....	235
Table 5.5: Experts and PCA scores performance in predicting firm’s outcomes 34 months after application started	236
Table 5.6: Experts and PCA scores performance in predicting firm’s outcomes 34 months after application started	238
Table A.5.1: Summary statistics on expert and algorithm scores and firm outcomes	245
Table A.5.2: Experts and PCA scores performance in predicting firm’s outcomes 10 months after application started.....	246
Table A.5.3: Experts and PCA scores performance in predicting firm’s outcomes 10 months after application started.....	247
Table A.5.4: Experts and PCA scores performance in predicting firm’s outcomes 34 months after application started.....	248
Table A.5.5: Experts and PCA scores performance in predicting firm’s outcomes 34 months after application started.....	249
Table A.5.6: Experts and PCA scores performance in predicting firm’s outcomes 34 months after application started.....	250

Table A.5.7: Business and entrepreneur characteristics from the business plans and the baseline survey predicting the overall experts score.....254

Table A.5.8: Business and entrepreneur characteristics from the business plans and the baseline survey predicting the average experts score from the experts255

Table A.5.9: Business and entrepreneur characteristics from the business plans and the baseline survey predicting the scores given to the entrepreneurs by each of the expert groups257

List of Abbreviations

ACLED	Armed Conflict Location and Event Data
AEA	American Economic Association
ANCOVA	Analysis of Covariance
BDS	Business Development Services
BEPC	Brevet d'Etudes du Premier Cycle
BPC	Business Plan Competition
CDF	Cumulative Distribution Function
CEP	Certificat d'Etudes Primaires
CEPAL	United Nations Economic Commission for Latin America and the Caribbean
CFA	Communauté Financière Africaine
DHS	Demographic and Health Surveys
DMSP	Defense Meteorological Satellite Program
EDI	Economic Development and Institutions
FSI	Fragile States Index
GDP	Gross Domestic Product
GVC	Governmental venture capitalist
HIS	Inverse Hyperbolic Sine
ICT	Information and Communications Technology
IDA	International Development Association
ILO	International Labor Organization
IMF	International Monetary Fund
INSD	Institut National de la Statistique et de la Démographie
IPA	Innovations for Poverty Action
ITT	Intension To Treat
JTPA	Job Training Partnership Act
LASSO	Least Absolute Shrinkage and Selection Operator

MEBF	Maison de l'Entreprise du Burkina Faso
MSME	Micro, Small and Medium-sized Enterprise
NOAA	National Oceanic and Atmospheric Administration
OECD	Organization for Economic Cooperation and Development
OLS	Ordinary Least Squares
PCA	Principal Component Analysis
PMT	Proxy Means Test
PNDES	Plan National de Développement Economique et Social
PPP	Purchasing Power Parity
PRIO	Peace Research Institute Oslo
RCT	Randomized Controlled Trial
SDG	Sustainable Development Goal
SIPRI	Stockholm International Peace Research Institute
SIYB	Start and Improve Your Business
SME	Small and Medium-sized Enterprise
SSA	Sub-Saharan Africa
UCDP	Uppsala Conflict Data Program
UNDP	United Nations Development Program
UNESCO	United Nations Educational Scientific and Cultural Organization
USD	United States Dollar
WDI	World Development Indicators
XOF	West African CFA franc

1. Introduction

Most Sub-Saharan African (SSA) countries experienced sound economic growth and a declining rate of poverty over the last two decades. Though, by far, the SSA region remains the poorest in the world and faces tremendous political, social, and economic challenges due to an expanding youth bulge, a slow demographic transition, an increased political instability and terrorism, and a low labor productivity (Clionadh et al., 2010; World Bank, 2012; Deon and Fox, 2014; Canning et al., 2015; SIPRI, 2017; Merotto et al., 2018; IMF, 2019; Pettersson et al., 2019). Between 2000 and 2019, data from the World Development Indicators (WDI) database show that relative to the working-age population the age dependency ratio for people younger than 15 dropped by more than 15 percentage points and stood at less than 50% in other developing regions,¹ while it dropped by only 7 percentage points and stood at 76.4% in SSA in 2019.² Over the same period, the total fertility rate dropped to 2.3 births per woman in South Asia, but only to 4.6 in SSA, hence fertility is still high in most parts of SSA. In addition, although the average annual GDP growth rate stood at 4.4% for SSA and 6.6% for South Asia, the GDP per capita grew on average by 4.6% in South Asia, but only by 1.6% in SSA. Consequently, over the period 2002-12, the share of poor people, i.e. those living with less than \$1.90 a day (2011 PPP) dropped by 25 percentage points in South Asia and stood at 19.2% in 2012, but only by 14 percentage points in SSA and stood at 44% in 2012 and 40.4% in 2018. At the same time, these two world poorest regions are plagued with protracted conflict and violence occasioning internal displacement of people, though SSA is the hardest hit. Between 2016 and 2020, again data from the WDI show that, on average, each year conflict and violence induced internal displacements of 3.7 million people in South Asia, but 16.7 million people in SSA. The OECD focused its Perspective on Global Development 2021 on analyzing discontents and protests globally and in developing countries in particular (OECD, 2021). OECD (2021) hence reports a falling trust in public institutions and emerging development traps that result from “low productivity, weak institutions and social vulnerability.” For SSA, governance indicators also show increasing deterioration of institutional quality. For instance, as measured by the Mo Ibrahim Foundation, the public perception of the overall governance in SSA countries decreased from 52.2% in 2010 to 49.7% in 2019.³

Moreover, due to the COVID-19 pandemic, SSA entered into a recession with a GDP growth rate of minus 5% in 2020 as ever recorded over 25 years. This has also induced an increase in poverty in the region (Zeufack et al., 2021), which adds up to the structural challenges and further highlight the need of sound policies to address economic growth, governance, jobs, and poverty for the region to meet the Sustainable Development Goals (SDGs) in 2030 and beyond.

This thesis examines the effects of institutional quality, political instability and government targeted entrepreneurship program on the accumulation of human, physical, and financial capital by households and firms. In the literature, these factors are identified as the key

¹ These regions are: Latin America & Caribbean; Middle East & North Africa; and South Asia.

² <https://datatopics.worldbank.org/world-development-indicators/> (last accessed July 27, 2021).

³ The public perception of overall governance measures “public opinion on governance issues. It contains 13 indicators” compiled using data from Afrobarometer surveys (see <https://mo.ibrahim.foundation/iag/downloads> (last accessed July 27, 2021)).

determinants of economic growth and job creation, yet this thesis contributes to a knowledge gap, especially at the microeconomic level, on how households and firms accumulate these factors in the presence of weak institutional quality, political instability, and government targeted entrepreneurship programs. In particular, this thesis investigates heterogeneity as well as a single country study of the effects of institutional quality and political instability; it also employs a randomized controlled trial (RCT) to assess the impacts of two different targeted entrepreneurship support programs; and, finally, it taps on data from this field experiment to assess the performance of two different targeting mechanisms for selecting growth-oriented entrepreneurs.

1.1. Quality institutions for spurring stable and prosperous economies

The persistence of political instability in the region may unveil a fundamental issue of the quality or efficiency of the institutions in most SSA countries. Yet, the literature suggests that institutional quality primarily determines sustainable and long-run economic and social development of countries (see North, 1990; Rodrik, 2005; Acemoglu and Robinson, 2008; Tan, 2010; Acemoglu et al., 2014; Baland et al., 2018; Durlauf, 2018). Indeed, after a period of debates on whether institutions building or human capital accumulation precedes development (see Lipset, 1959; Easterlin, 1981; North, 1989; Keefer and Knack, 1995; Campos and Nugent, 1998; Caballero and Hammour 2000; Aron, 2000; Acemoglu et al., 2001; Glaeser et al., 2004), many empirical studies have relied on theory and sound econometric methods and shown that efficient institutions enable a rapid and profitable human capital accumulation, which spur economic growth and long-run development (Acemoglu et al., 2002; World Bank, 2002; Acemoglu, 2006; Bhattacharyya, 2009; Dias and Tebaldi, 2012; Acemoglu et al., 2014). This consensus may have led the development community to set among the 17 SDGs, goal 16 for countries to “promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.” However, this literature has so far provided macro-level evidence drawn from cross-country studies using aggregated data at the levels of the country or regions-within-country (see e.g., Udry and Pande, 2005; Tan, 2010). Little micro-level evidence using household data exists on the role of institutions, in particular, on how households’ perceptions of the quality of institutions influence their behavior. Pande and Udry (2005) argue that the policy relevance of the macro-evidence on the fundamental role of institutions hinges on understanding the channels through which institutions assume this role, yet “*the coarseness of cross-country data limits its usefulness*”, which calls for more research based on micro-data. These authors further point that “... *the research agenda identified by the institutions and growth literature is best furthered by the analysis of much more micro-data than has typically been the norm in this literature.*”

At the same time, a separate large macro-level literature has documented that political instability has negative effects on investments and economic growth. This evidence was drawn from cross-country studies using country-level data on growth, investments, and the number of events or fatalities of political violence, assassinations, or coups, or country risk assessments of institutions. Yet, Udry and Pande (2005) argue that expert assessments of country risks are more representative of formal urban sectors, which suggests that the existent macro-literature

on the importance of institutions may miss-out of the effects of institutions on poverty, on rural and informal economy agents. For the same authors, cross-country studies miss important within-country heterogeneity in the characteristics and operation of particular institutions as well as heterogeneity in the effect of institutions across countries. As they put it, heterogeneity is important because *“a given institutional setting can provide a rich variety of incentives to different individuals, depending upon their economic and political standing.”* According to Tan (2010), previous research on the role of institutions ignored *“substantial heterogeneity (e.g. interactions between theories) and nonlinearity across observational units.”* Durlauf (2018) argues that linear aggregate growth models may blur nonlinear relationships and hence poverty traps. In the same vein, Esteban and Ray (2017) observe that perceptions and empirical evidence have long suggested a negative relationship between conflict and per capita income. Yet, economic growth may be positively correlated with social conflict if it increases opportunistic behavior and fights over the distribution of economic gains. Esteban and Ray argue that macro-level *“cross-country studies are too blunt to pick these effects up in any detail.”*

Nonetheless, there exist a recent and growing literature that provides field and laboratory experimental micro and macro-evidence on the role of specific types of institutions for social and economic development. Capra et al. (2009) conduct a macroeconomic simulation and find that democratic institutions, i.e. the ability to make public announcements or to vote on competing and binding policies increase output, welfare, and capital stock. Dal Bó, Foster and Putterman (2010) conduct a lab experiment and find that democratic institutions may affect behavior directly and through the choice of policies. Their finding suggests that transparent and participative policies yield greater impact on behavior and cooperation than autocratic policies do. Finan, Olken and Pande (2017) review field experiments on government bureaucracy. They start from the precept that poor governance may be caused by the interaction between poor institutional structure and poor government performance due to public employees being lazy, corrupt, or both. Their review suggests that three aspects of the state-employee relationships determine the quality of governments, especially in developing countries. These aspects are broadly the selection of civil servants and frontline service providers, the incentive structure and the mechanisms for monitoring these public employees. The burgeoning experimental evidence on the role of institutions is hence promising to yield greater impact on policymaking. However, for Grose (2014) some research questions on political institutions are unsuited to field experimentations. Moreover, findings from these experiments may be hardly extrapolated to other institutional contexts with varying specific environments (see also Udry and Pande, 2005; Durlauf, 2018). Hence, although imperfect, observational studies exploiting the increasing availability of micro-data could contribute to the growing micro-evidence on the role of institutions (see Durlauf, 2018).

Though, there hardly exist country case studies as well as cross-country micro-level evidence based on household and firm level data on the effects of political instability, especially the effects of actual and perceived instability as well as the importance of the interplay between actual and perceived instability (Dercon, 2008; Aaberge, Liu, and Zhu, 2016). Such study may bring new insights given that the existent literature has so far studied separately the effects of institutions and the effects of political instability or has considered institutional quality as a proxy for political instability (Mauro, 1995; Brunetti, 1997; Svensson, 1998; Aron, 2000; Jong-

A-Pin, 2009). Yet, the questions of the heterogeneous effects of institutions and political instability remains of great importance in improving the understanding of the mechanisms through which institutions determine economic growth and development (Udry and Pande, 2005; Tan, 2010; Esteban and Ray, 2017; Durlauf, 2018).

1.2. Human, physical, and financial capital accumulation and entrepreneurship for better jobs

For developing countries, the accumulation of human and physical capital as well as total factor productivity growth, i.e. technological and institutional changes among others are the key determinants of economic growth and poverty reduction (Becker, 1995, Easterly and Levine, 2001; Aghion and Aghion, 2004; Baier et al., 2006; Banerjee and Duflo, 2007; Moav and Neeman, 2012; Takeshi, 2019). Becker (1995) argues that “education, on-the-job or other training, skills, and other knowledge have become crucial determinants of a person’s and a nation’s productivity.” Grootaert, Kanbur, and Oh (1995) analyse survey data from Côte d’Ivoire and find that chronic poverty can be reduced by enhancing human and physical capital endowments. They find that asset endowments especially human and physical capital play an important role in household poverty and welfare dynamics. For the same country, Grimm (2005) conducts a microsimulation and find that the link between investments in education and poverty reduction depends on the returns to education which is also influenced by the stock of physical capital and technological progress. His finding also suggests that secondary and higher education is more linked to poverty reduction than is primary education. Developing countries give now much priority to secondary and tertiary education (see Bold and Svensson, 2016). Hence, given the youth bulge, investment in human capital, especially in children schooling remains a priority for SSA countries (Canning et al., 2015).

Quality education increases entrepreneurship, which in turn drives innovations and productivity growth. Indeed, Aghion and Aghion (2004) argue that entrepreneurship played a key role in the productivity growth in India, following the green revolution, and this reduced poverty in the country. This important role of entrepreneurship for growth and development has long been recognized (Baumol, 1968; Leibenstein, 1968). Moreover, the World Bank (2012) reports that farms and very small firms create most jobs in developing countries. Yet, although most poor households run small businesses, they lack productive assets, but save less, own a small fraction of financial accounts, and invest less in the schooling of their children (Banerjee and Duflo, 2007; Moav and Neeman, 2012; Deon and Fox, 2014). Though, despite the poor being the most vulnerable to financial crises (see e.g. Charlton and Stiglitz, 2004), Takeshi (2019), for example, finds that financial inclusion, as far as public banks are concerned, has a positive impact on poverty reduction in India.

Market failures, behavioral biases, weak institutions and political instability may constrain factor accumulation and productivity growth especially for the non-wealthy (see Banerjee and Duflo, 2007; World Bank, 2015; Grover et al., 2019). Hence, the development community is giving much attention to government entrepreneurship policy, especially targeted programs for increasing productivity and creating better jobs (World Bank, 2012; Deon and Fox, 2014; Canning et al., 2015; Merotto et al., 2018). Yet, for many authors, effective entrepreneurship interventions are tributary to the quality of institutions (World Bank, 2002; Rodrik, 2005;

Lerner 2010; Gennaioli et al., 2013; Urbano et al., 2018). For instance, ineffective targeting mechanisms for anti-poverty or entrepreneurship support programs raises concerns of elite capture and could fuel discontent and ignite social and political instability (Alatas et al., 2012; World Bank, 2012). In the context of Indonesia, Alatas et al. (2020) indeed find the presence of elite capture but that is economically unimportant in targeting poor households for a welfare program. They conclude that the utility gain from investing in improving administrative and management skills of local leaders is larger than focusing on limiting elite capture. This paper also finds that a targeting mechanism based on an algorithm (proxy-means tests (PMT)) is robust and performs better with high quality data. Also for Indonesia, Alatas et al. (2016) find that the targeting of beneficiaries for an anti-poverty program can be substantially improved by adding a small application cost for self-selection. Equally, learning about effective targeting mechanisms to pick growth-oriented entrepreneurs remains of particular interest for private sector support programs (Grover et al., 2019). As data are becoming more available and relatively cheaper to collect, the use of an algorithm for selecting targeted program beneficiaries may be a relevant alternative or a complement to the ubiquitous reliance on targeting based on expert judgments (see McKenzie and Sansone, 2019; Johansson et al., 2021; World Bank, 2021).

1.3. Contribution

In this thesis, I use household and firm level data to conduct four empirical studies to contribute to improving the understanding of how institutional quality, political instability, and entrepreneurship relate to factor accumulation and productivity for spurring economic growth and creating jobs generally in Sub-Saharan Africa, and particularly in Burkina Faso. Each paper is self-contained and three among the four papers were written with co-authors.

The first paper assesses the effects of institutional quality and political instability on household assets and human capital accumulation in 19 Sub-Saharan African countries for the period 2003-16. This work takes advantage of existing data on household perceptions of the quality of policies and institutions. I analyze the effects of the exposure to events of political violence and civil unrests (factual instability) as well as the effects of the perceived quality of policies and institutions, i.e. the perceived risk of a surge of political instability (perceived instability) on ownership of a financial account, investments in assets, house improvements, and post-primary education of children. In particular, given that events and perceptions may reinforce each other, I test whether the interplay between factual and perceived instability play a significant role, and whether taking into account the wealth distribution, i.e. household heterogeneity in terms of wealth, improves our understanding of the effects of instability. In this analysis, I also account for potential confounders at the household, region, and country levels as well as the possible spillover effects of political violence in neighboring countries.

The paper finds that, overall, factual and perceived instability are associated with higher investments in assets, and factual instability is also associated with more investment in house improvements, yet it is negatively associated with the ownership of financial accounts. With regard to the heterogeneous effects, increased factual or perceived instability is associated with more investments in physical capital but less investments in financial and human capital among

rich households, and with less investments in physical, financial and human capital among poor households.

These findings suggest that political instability enhances the wealth accumulation by rich households while it reduces that of poor households. In addition, political instability induces both rich and poor households to reduce their investments in post-primary education, which implies long-term economic consequences. If these trends are confirmed, it would imply that poor households are those who suffer the most of the effects of political instability. In this case, political instability and perceived poor institutional quality would deepen the vulnerability and may lead to a vicious cycle of conflict. More generally, these findings suggest that a micro-level analysis of the effects of political instability, especially when household perceptions are considered, should take into account nonlinearity, and in particular wealth heterogeneity. So far, this aspect had not yet been shown empirically in studies of political instability.

The second paper, written with Nicolas Büttner and Michael Grimm, analyzes households' investments in assets and their consumption, and education and health expenditures when exposed to instability as measured by the number of political violence and protest events in Burkina Faso. This paper contributes to a growing microeconomic literature on single country studies, which show the channels through which political instability affects factor accumulation and economic growth. In line with the macroeconomic literature, this paper finds a negative relationship between instability and the accumulation of human and physical capital and savings by households. This is suggestive that instability lowers the prospects for economic growth. The paper shows a negative effect of political instability on financial savings, the accumulation of durables, investment in house improvements, and investment in education and health. Instability also appears to reduce investments in favor of food consumption. These results may not be causal, though they are robust to alternative specifications, randomization inference tests, as well as to accounting for a host of confounding factors such as local economic development, local rainfall conditions, local mining activities and spatial correlations. With respect to economic growth, the sizable education and health effects seem to be particularly worrisome.

The third paper, written with Michael Grimm and Michael Weber, employs a randomized controlled trial (RCT) to assess the short-term effects of a government support program targeted at already existing and new firms located in a semi-urban area in Burkina Faso. The participant firms were selected based on a rigorous BPC and they were then assigned into three groups each with 400 firms. Firms in the first treatment group received large cash grants of US\$8,000 or less, which was not restricted to a specific use but which disbursement was closely monitored to mitigate misuse and embezzlement. Firms in the second treatment group received matching grants of equally important size, but restricted in use for business development services only and requiring an own contribution of 20% of the services costs. The control group did not receive any grant. The paper finds that, in the short run, cash grants have positive impacts on beneficiary firm's business practices (bookkeeping), formalization, and investments in productive assets (e.g. equipment, machine, and land). Beneficiaries of cash and matching grants increased their innovations. The analysis also shows that, in particular, cash grants shielded firms from the adverse effects of COVID-19. However, neither cash grants nor matching grants have increased profits and employment yet.

This paper contributes to the literature on small firm growth and to that of targeted government support to entrepreneurship in SSA (see e.g. Fafchamps and Woodruff, 2017; McKenzie, 2017; Crépon et al., 2020). The paper is also the first that compares cash grants with matching grants as alternative instruments for supporting firm productivity, growth and job creation. Previous projects rather compared fully fungible cash grants with in-kind grants (e.g. De Mel, 2008) or cash grants with loans (e.g. Fiala, 2018; Crépon et al., 2020). Although matching grants programs are quite common in developing countries, there are hardly any rigorous impact evaluations (Campos et al., 2012; Hristova and Coste, 2016). What makes this study peculiar is that the support programs were implemented by local institutions and the program was focused on agri-business activities such as livestock breeding and other activities related to agriculture such as food processing and manufacturing of agricultural tools and inputs. This is an important sector given the predominance of farms and smallholder businesses in most Sub-Saharan African countries. Noteworthy is also that the study was conducted in a fragile context since Burkina Faso encountered many terrorist attacks starting in 2015. Given that the literature on fragile countries is thin and that fragile countries and conflicts seem to increase worldwide, this paper makes an important contribution also to that literature.

The fourth paper, written with Michael Weber, examines the selection of entrepreneurs based on expert judgments for a BPC in Burkina Faso. The paper first assesses the targeting mechanism based on expert judgment on the business plans and the entrepreneurs. It shows that the resulted screening scores were affected by expert's subjectivity biases. The paper indeed finds inconsistencies between the heuristics on which basis the experts assessed the business plans, the experts own perceptions of the important criteria that must be used to score the plans, and the predefined weights on criteria used to score the plans.

It then calculates an algorithm metric by applying a PCA on relevant factors of the firms and their owners. To do this, the paper relies on different econometric estimators to identify the factors which are statistically significantly associated with the screening scores from the expert judgments, which were also based on criteria defined by the program. This procedure ensures that the screening scores from the expert judgment and the scores from the algorithm are based on the same firm and owner factors. Hence the scores differ only on the ground that one is generated from expert judgment and the other from an algorithm. The paper hence compares the accuracy of the two types of screening scores in picking growth-oriented entrepreneurs and predicting the performance of the selected firms. It finds that both the scores from the expert judgment and those from the algorithm pick relatively the same talented entrepreneurs, but for predicting firm growth the accuracy is higher for the algorithm as compared to the expert judgment. Even when the expert and algorithm scores are used jointly, the prediction power is higher for the algorithm scores.

Despite the statistical superiority of the algorithm, expert judgment e.g. through pitches of applicant entrepreneurs may be useful in some contexts for addressing issues related to risks of misuse of public funds or free-riding behavior. Therefore, our results suggest that the targeting of growth-oriented entrepreneurs could be made more precise and efficient by a reasoned combination of expert judgment and the use of an algorithm. Moreover, the accuracy of such a mixed approach might improve if selected firms are carefully monitored/mentored in the post-selection stage in order to maximize the cost-effectiveness of the public subsidies.

This paper contributes to the literature that contrasts the performance of decision-making mechanisms based on expert judgments to that based on statistical procedures or algorithms. The literature on “Heuristics and Biases” and laboratory experiments show that experts base their judgments on heuristics and a small set of the disposable information, which biases the decision outcomes (Tversky and Kahneman, 1974). In line with this reasoning, for example, two expert judges are likely to give very different scores to the same business plan (see Fafchamps and Quinn, 2017), which can change the ranking of entrepreneurs or business plans if the pool of experts or the way the tasks are assigned to them change (e.g. Mason and Stark, 2004). Similarly, these studies show that when used to take a decision, models often yield more precise and desirable outcomes than expert judgments (Meehl, 1954; Goldberg, 1968; Shanteau and Stewart, 1992; Kahneman and Klein, 2009; Logg et al., 2019). Yet, in parallel, the “Naturalistic Decision-Making” literature tries to show that experts are competent and make accurate decisions in their specialized domains (Libby, 1975; Shanteau, 1992; Shanteau and Stewart, 1992; Devine and Heckman, 1996; Shanteau et al., 2002). In addition, a growing but still small literature examines the performance of targeting mechanisms based on expert’s judgments for picking winners in BPCs. McKenzie (2015) and McKenzie and Sansone (2019) find that expert scoring of entrepreneurs participating in a BPC does not have much predictive power for firm growth as measured by changes in job creation or revenues. McKenzie (2015) finds that the predictive power is even lower for start-ups relative to already existing firms. For a BPC in Ghana, Fafchamps and Woodruff (2017) find that scores on business plans and entrepreneur pitches as well as scores on entrepreneur ability calculated by applying PCA on survey variables, both significantly predict firm growth. The experts-score also adds predictive power over the PCA score on ability. Yet, the PCA score is better to explain the variability in firm growth.

These four papers bring new insights on the relationship between weak institutions, political instability, and targeted government support to entrepreneurship for increasing the accumulation of financial, physical and human capital, and productivity. These are key factors for spurring economic growth and creating jobs in SSA. These findings suggest that efficient institutions building in SSA countries would enhance citizen perceptions of good governance which would reduce political instability and enable households including the poor to accumulate productive assets, increase their productivity, and reduce poverty. The findings also suggest that targeted government entrepreneurship support programs, e.g. in the forms of cash grants with monitored disbursements yet flexible in use, can enhance firms’ human capital, productive assets, and innovations even in the short term. Moreover, the targeting mechanism of such programs could be made more effective and efficient by relying on a combination of expert judgments and an algorithm for picking growth-oriented entrepreneurs.

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2. Institutional quality, political instability, and household assets and human capital accumulation in Sub-Saharan Africa

2.1 Introduction

Military coups are getting rare in Africa (The Economist, 2019), but political instability remains a serious concern. Between the two periods from 1997 to 2007 and that from 2008 to 2018, armed conflicts including terrorism increased by 20% in Sub-Saharan Africa (SSA) (Gleditsch et al., 2001; SIPRI, 2017; IMF, 2019; Petterson et al., 2019).⁴ More broadly, politically motivated violence and civil unrests nearly doubled in the same period (Clionadh et al., 2010).⁵ At the macro-economic level the consequences of such instability have been widely studied (see Campos and Nugent, 2002; Collier and Hoeffler, 2004; Verwimpa et al., 2019), but so far only few studies have examined the consequences at the micro level (Dercon, 2008; Aaberge, Liu, and Zhu, 2016). Furthermore, for studying the effects of political instability researchers have used events data extensively, though many studies (Alesina et al., 1996; Fafchamps, 1999; Dercon, 2008; Attanasio and Kaufmann, 2009) suggest that perceptions and expectations matter more in terms of household's behavior that shapes entrepreneurship, investments, economic growth, and living conditions. But, little is known on how risk or perceived political instability affects household behavior with respect to the accumulation of human, physical, and financial capital in developing countries (Dercon, 2008).

This paper examines the effects of institutional quality and political instability on assets and human capital accumulation by households in Sub-Saharan Africa. The paper contributes to a small but growing literature on the effects of political risks and uncertainties on household behavior in developing countries. Again, although some studies have shown that political instability or aggregate shocks such as financial crises affect household behavior (Deininger, 2003; McKenzie, 2003; González and Lopez, 2019; Justino and Verwimp, 2013; Dupas and Robinson, 2012; León 2012; Giesing and Musić, 2017), little evidence exists on how households change their behavior in response to political violence and perceived weaknesses in institutional quality as well as to a threat of political and social unrest. A recent paper by Büttner et al. (2021) shows that actual events that cause instability have negative effects on household financial savings, the accumulation of durables, investment in house improvements, and investment in education and health in Burkina Faso.

The empirical analysis in this paper relies on repeated cross-sectional data from 43 Demographic and Health Surveys (DHS) and 41 Afrobarometer surveys on household perceptions with respect to governance and the quality of policies and institutions in 19 Sub-Saharan African countries. I combine these data with the Armed Conflict Location and Event Data (ACLED), which offers geo-referenced political violence and protests data collected in the same 19 countries. What is new here is that I use perception data collected from households to analyze political instability. Moreover, so far very few studies (Østby, Nordas and Rød, 2009; Fjelde and Østby, 2014) used household data from the DHS to analyze factors associated with outbreaks of conflict at community levels in Sub-Saharan Africa. Yet, they did not analyze the effects of such risks on household outcomes. The novelty is twofold. First, instead of using

⁴ See the UCDP/PRIO Armed Conflict Dataset.

⁵ See the Armed Conflict Location & Event Data Project (ACLED); <https://www.acleddata.com>.

perception data from experts or policymakers, I use perception data directly from households. Second, I assume that political uncertainty is determined by an interplay between past and contemporaneous events that contribute to instability and household perceptions. In many cases, political instability including civil wars erupts following incremental accruals of grievances accompanied by political violence and protests (see e.g., Yogo and Massil, 2019). There is a lot of evidence that suggests that perceptions of weak institutions and political rights, ethnic or religious hatred, poor social services, and economic inequality are key factors that drive political instability and civil wars (Stewart and Venieris, 1985; Mbaku and Paul, 1989; Hirschleifer, 1995; Schiff, 1998; Aron, 2000; Fearon and Laitin, 2003; Collier and Hoeffler 2004; Miguel et al., 2004; Østby, Nordas and Rød, 2009; Fjelde and Østby, 2014). Although I do not analyze the direction of causality between observed and perceived instability, I test their correlation and then use both as measures of political instability.

Some studies already used perception data to analyze political instability. Keefer and Knack (1995) rely on both expert assessments and events data to study the effects of political instability on growth and private investment, though they did not consider the interplay between perceptions and actual events. Other cross-country studies of economic growth, aggregate investments, or savings relied on expert assessments of policy and institutional quality to measure instability (Mauro, 1995; Brunetti, 1997; Svensson, 1998; Aron, 2000; Jong-A-Pin, 2009). Yet, expert assessments usually rely on business owners and policymakers' perceptions and may not be representative of the perceptions of the entire population in a country (see Pande and Udry, 2005). In most cases, these assessments concentrate on quantifying country risks for foreign direct investments. Such data are also only available at the country level, not at lower disaggregated levels. Representative household surveys may represent a better alternative in the sense that selected respondents come from different sectors of activity. Kahneman and Klein (2009) who in turn refer to the work by Tetlock (2005) also suggest that experienced experts do not make more accurate long-term predictions of political events than untrained well-informed ordinary people do (see also Shanteau and Stewart, 1992).

On the other hand, contrary to most previous cross-country analyses, which relied on representative household models (e.g., Carmignani, 2003), the micro-approach adopted here accounts for household heterogeneity in both perceived instability and outcomes. Among households there exist substantial differences in socio-economic conditions, political preferences, and ideology and community ties which influence their perceptions of the quality of policies and institutions (e.g., Pande and Udry, 2005; Krusell and Smith, 1998). This hence allows taking into account non-linearity in instability and outcomes and getting more insights by looking at the full distribution instead of looking at aggregate outcomes. Another advantage is the relatively large sample size, which increases the statistical power of the analysis. Yet, obvious limitations of these perception data are related to potential ambiguities in survey questions and limited interpersonal comparability (Tversky and Kahneman, 1974; Dominitz 1998; Carmignani, 2003; Manski, 2004).

I exploit the variability of perceived instability and events data across 185 regions in 19 countries over the period 2003-2016. I estimate the relationship between perceived as well as observed instability and household's ownership of a financial account, investments in assets and house improvements, and enrollment of children in post-primary education. The dependent variables are measured at the household level while the proxies for perceived instability and

events are measured at the level of the regions in each country.⁶ The proxies are calculated by combining several dimensions of perceived quality of policies and institutions. Again, these perceptions come from Afrobarometer surveys of randomly selected household members in each country. In most cases, the surveys are representative at the level of the regions (level 1 of administrative unit) in each country.⁷ The literature and the data availability guided my selection of the perceptions' dimensions, which include living conditions, performance of elective institutions, corruption and trust in government and elective institutions, discrimination, criminality, impunity, access to information, political violence, rule of law, extent of democracy, freedom of opinion, fairness in elections, and participation in demonstrations.⁸ The proxy for perceived instability is an index calculated as the first component of a principal component analysis (PCA) on the selected dimensions. As political instability is a multidimensional concept (see e.g., Venieris and Gupta, 1986; Jong-A-Pin, 2009) the PCA approach is generally used to obtain an index corresponding to a non-subjectively weighted linear combination of different dimensions (e.g., Alesina and Perotti, 1996; Perotti, 1996; Annett, 2000; Fosu, 2001; Campos and Nugent, 2002).

Households' income and access to education and health services may co-vary with their capital accumulation, and may in turn influence perceptions of poor quality of institutions and cause civil unrest, and political violence. To dampen a possible bias due to reverse causality, the regressions in this analysis include lagged values of the events and pre-determined values of perceived instability variables (e.g., Svensson 1998; Carmingna, 2003).⁹ As I analyze household behavioral response to anticipated political instability, using such lagged and pre-determined values might be theoretically more appropriate. On the other hand, attempting to reduce omitted variable bias, the estimations include many household level control variables as well as nighttime light intensity, and rainfall levels and variability. The latter controls are used as proxies for community development and agricultural shocks. Regressions account for region fixed-effects as well as country-specific time effects, and a spatial lag variable to take into account between-countries spillover of sociopolitical instability.

I find that taking into account the interplay between factual and perceived instability as well as household wealth heterogeneity in the analysis of the effect of political instability on household outcomes yield new insights. Indeed, when this interplay and this heterogeneity are not accounted for, I find that perceptions of instability or institutional quality do not have any significant effects on the household outcomes. Moreover, when this heterogeneity is not accounted for even instability as measured by the number of events does also not have a significant effect on investments in assets and children post-primary education, the effects being significant only for ownership of financial accounts and house improvements outcomes.

⁶ Regions correspond to the first-level administrative units. Yet, for Nigeria, regions refer to each of the six states of the country; and for other countries such as Burundi, Liberia, Madagascar, Uganda, Tanzania, and Zambia regional borders changed within the study period. I hence used GIS technics and georeferenced information to reconstruct the regions in order to keep their borders consistent over the study period. Along the same line as the discussions by Østby, Nordas and Rød (2009) and Fjelde and Østby (2014) I measure the perceived instability and events explanatory variables at regional level.

⁷ See Section 3 for details on the survey sampling.

⁸ Each dimension is a summary of one to four non-overlapping set of survey variables that together characterize the quality of an institution and a policy. Overall, 41 variables were used.

⁹ Data used to calculate the index of perceived instability is from Afrobarometer surveys, which for those used in this study were conducted one, two or three years before the DHS surveys from which the outcomes of interest are calculated.

However, when both this interplay and this heterogeneity are accounted for, the results indicate that perceptions significantly interact with actual events and determine the overall effects of political instability on household's ownership of financial accounts, and investments in assets, house improvements, and children's education. Moreover, accounting for wealth heterogeneity in the analysis shows that perceptions of increased instability or a deteriorating quality of institutions by poor households has negative effects on their outcomes, but these effects are statistically significant only for two outcomes: house improvements and enrollment of children in post-primary education. For rich households increased perceptions of instability do not change their ownership of financial accounts and enrollment of children in post-primary education, but significantly increases their investments in assets and house improvements.

Overall I find that an increase in perceived instability as well as the number of events of political violence and civil unrests increase investments in house improvements and assets, but they decrease ownership of financial accounts and investments in post-primary education. In particular, for the group of rich households increased political instability increases investments in assets and house improvements, but decreases investment in post-primary education of children. For poor households, increased perceptions or events of political instability decreases ownership of financial accounts and investments in children's post-primary education. However, poor households increase their investments in assets and house improvements with an increase in events of instability while they decrease such investments with an increase in perceived instability. More specifically, perceived instability appears to be negatively associated with all outcomes of poor households. This result is robust to alternative specifications and alternative measurements of perceived and factual instability.

The findings here suggest that political instability increases wealth accumulation by rich households while it reduces that of poor households. If these trends are confirmed, it would imply that poor households are those who suffer the detrimental effects of political instability. In this case, political instability and perceived poor institutional quality would deepen the vulnerability and may lead to a vicious cycle of conflict. More generally, these findings suggest, that a micro-level analysis of the effects of political instability, especially when household perceptions are considered, should take into account non-linearity, and in particular wealth heterogeneity. So far, this aspect had not yet been shown empirically in studies of political instability.

The remainder of the paper is structured as follows. Section 2 discusses the theoretical background of the analyses. Section 3 describes the data sources and variables. Section 4 presents the econometric model. Section 5 discusses the results, and section 6 concludes.

2.2 Sociopolitical instability and household asset accumulation: theoretical aspects

This paper empirically examines the effect of political uncertainty on assets and human capital accumulation at the micro level. It hence takes ground on the theoretical framework of household intertemporal consumption-saving decisions under uncertainty (see e.g., Deaton, 1991). For several reasons, the theoretical background here departs from models based on a representative-household (see, Carmignani, 2003). I rather adopt the new macroeconomic theories that mainstream market incompleteness and household heterogeneity.

I assume that perceived and factual (events-related) political instability cause uncertainty (see Bloom, 2013). Hence, when households experience increased instability, it induces a surge

of uncertainty that can have an aggregate and an idiosyncratic component. The aggregate component relates to the political and socio-economic conditions or the general discontent that motivated this instability. The motives may be related to weak institutional quality,¹⁰ poor or unequal socioeconomic conditions, or civil unrests that affect households countrywide. The idiosyncratic component relates to household heterogeneity in e.g. economic and socio-demographic characteristics, which determines differences in the intensity of perceived instability. Empirical evidence suggests that perceptions of weak institutions and political rights, ethnic or religious hatred, poor social services, and economic inequality are key factors that drive and shape political instability and civil war (Stewart and Venieris, 1985; Mbaku and Paul, 1989; Hirschleifer, 1995; Schiff, 1998; Aron, 2000; Fearon and Laitin, 2003; Collier and Hoeffler 2004; Miguel et al., 2004; Østby, Nordas and Rød, 2009; Fjelde and Østby, 2014). This evidence suggests that household heterogeneity in wealth, community belongings, and political preferences play an important role in analyzing the effects of political uncertainty at the micro level (see Pande and Udry, 2005). To take into account such heterogeneity, the theoretical background of this paper relies on the theory by Krusell and Smith (1998).

Krusell and Smith (1998)'s theory allows analyzing how changes in the income and wealth distributions along with an aggregate productivity shock affect macroeconomic outcomes. They present a model that describes an economy with a large population (measure one) of infinitely lived consumers. Each consumer allocates current output between consumption and asset accumulation by solving a recursively formulated optimization problem based on the consumer's intertemporal expected utility and resources constraint. In each period, there is only one output derived from a Cobb-Douglas technology and given by $y = zk^\alpha l^{1-\alpha}$, with $\alpha \in [0, 1]$ and where k_t is the capital input and l is the labor input. The output can be transformed into future capital, k_{t+1} , and current consumption.

Only one asset or capital good is available, which consumers use as a store of value or an asset of self-insurance against income shocks. The consumer supplies $\varepsilon \tilde{l}$ units of labor, where ε is stochastic and equals 1 if the consumer is employed and 0 if unemployed. The aggregate productivity or technological shock is stochastic and can take two states either good $z = z_g$ or bad $z = z_b$. The individual shocks are assumed to satisfy the law of large numbers, and are correlated with the aggregate shock. Hence, aggregate uncertainty is only exogenously caused by the aggregate productivity shock that may result from political instability.

Krusell and Smith (1998) consider a recursive equilibrium, with a law of motion of the aggregate state of the economy, which is given by (Γ, z) , where Γ is the current distribution of consumers over holdings of capital and employment status. The law of motion is exogenous in z , but movement in Γ is given by $\Gamma' = H(\Gamma, z, z')$. The aggregate shock z follows a first-order Markov chain and movements from z to z' is described by a transition matrix. The most important state variables for each consumer is the capital holdings, employment status, and aggregate state $(k, \varepsilon; \Gamma, z)$. The consumer predicts future prices based on the aggregate state (Γ, z) .

¹⁰ In the last two decades, attempts by incumbent presidents to amend constitutions to change presidential term limits occasioned civil unrests and violence in many Sub-Saharan African countries (Yogo and Massil, 2018).

The decision on future asset holdings is hence implied to be a function of current level of asset, employment status, the aggregate state (the consumer's position in the distribution of wealth and the aggregate shock)

$$k_{t+1} = f(k_t, \varepsilon; \Gamma, z) \quad (1)$$

Equation (1) yields the theoretical base on which I base my econometric model presented below.

In terms of theoretical predictions, through simulations Krusell and Smith (1998) show that household's consumption and asset accumulation depend on their thrift and wealth. The consumption of poor, impatient households strongly correlates with current income, while the consumption of relatively wealthier households strongly correlates with permanent income. Similarly, poor households are found to accumulate only few assets, though they hold assets as a buffer stock to smooth consumption against stochastic income fluctuation, while the wealthier accumulate substantial assets, and strongly engage in precautionary savings following a permanent income behavior (see also Ljungqvist and Sargent, 2004). The literature on precautionary savings (e.g., Deaton, 1991; Carroll and Kimball, 1996) has similar implications. Political instability in particular implies an aggregate shock that adds up with other types of uncertainties related to the stability of institutions and the government and hence uncertainties about the security of property rights, the risk of expropriation, shutdowns of firms, strikes, attacks to personal property and to private entrepreneurs (see Carmignani 2003). Hence, although this increased uncertainty may lead both poor and rich households to hold more financial or liquid assets, the increased risk in assets security (potential loss and lower rates of return) may lead households to purchase less non-liquid or physical assets such as durable goods and housing (see also Gersovizt, 1988).

Regarding household investments in children schooling, since this pays off in the medium or long run, it will depend on their perceived evolution of the return on human capital investments and the level of safety in school frequentation by children. Hence, if households expect a sufficiently high return to human capital and a limited level of violence, then their investments in human capital might increase.

Overall, two main reasons make this theory particularly appealing to the present investigation. First the micro-foundations of the theory fit well key characteristics of Sub-Saharan African economies and the phenomenon of political uncertainty studied. In Krusell and Smith (1998) households are heterogeneous across income and wealth, and individuals draw income from working, which can fluctuate between being employed to being unemployed. Households are subject to an aggregate productivity shock, but also can experience idiosyncratic income shocks. Markets are incomplete so that these shocks are not fully insurable. The model only partially captures possible risk sharing among households. Yet, although informal risk sharing can be substantial in most of the economies studied (Fafchamps, 1999), evidence support that risk sharing does not fully insure households, especially when shocks are aggregate (Zimmerman and Carter, 2003; McKenzie, 2003; Dupas and Robinson, 2010). Households can then engage in precautionary saving and use assets to smooth consumption against income shocks.

Second, in Krusell and Smith (1998), households predict future prices (wages and return on assets) based on their assets, their employment status, the perceived aggregate productivity shock and the distribution of consumers over holdings of capital and employment status. Prices

are assumed to be competitive, i.e., determined by marginal productivities. Again, since political instability affects many sectors of the economy, wages and returns on assets may be affected as well; therefore, it is relevant for this paper that in Krusell and Smith (1998) aggregate shocks render wages and returns on assets stochastic. Yet, in the economies studied, underemployment and low productivity are the norm so that labor and asset prices significantly differ from their competitive levels. On the other hand, since income inequality is often cited as a key motive for political instability, it is interesting that the model yields large income inequality when heterogeneity in preferences (thrift) is accounted for, which further allows distinguishing impatient from patient consumers. One can also interpret households' distribution over holdings of assets and employment as mirroring wealth inequality, and preference heterogeneity as possibly differentiating households along political preferences and community membership within the population. Such differentiation is possible, especially in ethnically diverse economies where the ethnic group in power along with allies may be wealthier or perceive less inequality as well as display lower discount rates than the other ethnic groups (see, Schiff, 1998; Aron, 2000; Franck and Rainer, 2012; Voors et al., 2012; Fjelde and Østby, 2014).

In sum, from the above development, perceived and factual political instability theoretically affects asset and human capital accumulation through three main channels: income, return on assets, and the rule of law (e.g., property rights, asset insecurity). When the level of perceived instability is high or the level of political violence and civil unrest increases, economic performance may deteriorate inducing fears of reduced and uncertain future income. In such a situation, inflation may increase as well as nominal and real interest rates, inducing expectations of reduced return on assets. In addition, instability may threaten the rule of law in general and property rights in particular and as well cause damages of assets.

Through each of the three channels, instability may be positively or negatively associated with the household outcomes, and hence the overall effect will depend on the sign and magnitude of each channel effect. A positive association between instability and capital accumulation would indicate that households hold a positive outlook and perceive the uncertainty similarly as a regular income uncertainty that call for augmenting their buffer stocks or precautionary savings. A negative association would indicate that households hold a negative outlook and perceive the political uncertainty as strongly threatening the quality of institutions and policies as well as reducing return on assets. Yet, the empirical analysis in this paper will not try to identify the effects associated with each of the three channels. I rather estimate the overall effects of instability on the outcomes while using proxy variables for household income and general economic conditions to control for confounders. The empirical investigation that follows is based on the hypothesis that political instability be it perceived or factual has significant effects on assets and human capital accumulation, yet the direction, i.e. whether the effect is positive or negative will be empirically determined.

2.3 Data

I use data from six different sources. The dependent variables are measured at the household level. The independent and most of the control variables are measured at the level of sub-national regions. It is important to note that borders of some or all regions in nine of the 19 countries were modified either by up/downgrading the administrative unit level, or by

extending/reducing the region' surface area.¹¹ Yet, information from various sources¹² suggests that decentralization rather than localized political instability were the main motive for these modifications. Using geo-referenced information for each country, I hence adjusted the regions in order to keep their borders consistent over the years of the study period. I describe below the data sources and the calculation of the variables. Table A.2.1 in the Appendix shows summary statistics for the dependent and independent variables.

2.3.1 Outcomes of interest

The outcomes as well as some control variables are calculated using data from the Demographic and Health Surveys (DHS) program. It surveys households and therein women aged 15-45 and men aged 15-59 in many countries. The sample sizes range from 5,000 to 30,000 randomly selected households. The surveys are representative at national and the countries' first administrative levels, which can be either the region, province or state. The DHS use standardized questionnaires and administrative manuals, which allows comparison across countries and over time. I use data collected between 2003 and 2016 in 19 Sub-Saharan African countries (see Table A.2.2 in the Appendix). The countries retained are only those where there exists at least one Afrobarometer' survey conducted one to three years before a DHS in the same country. The used household data set is obtained by merging four DHS's record files: the households (HR), household members (PR), women (IR), and men (MR) files. From this data set, I calculated the dependent variables as well as some of the control variables (see Table A.2.3 in the Appendix). The following details the calculation of the outcomes:

Ownership of a bank account: It is a dummy variable equals one if any member of the household has a bank or other financial accounts. This variable relates to financial inclusion, and is used to assess the relationship between political instability and the probability that households own a bank account, which in turn shall increase their likelihood of saving in the formal financial system.

Durable goods, i.e. assets: This variable is an index calculated as the first component of a principal component analysis (PCA) applied on a consistent list of durable goods or assets. A consistent list of assets is used to ensure comparability across countries and years. Assets included are: radio, TV, fridge, bicycle, car, truck, fixed and mobile phones, cart and modern cooking stove. Yet, for some countries and years, data are missing on some landline and mobile phones, and modern cooking stove assets, so that the sample size is reduced significantly. I hence removed such assets, and calculated variants of the index that ensure a larger sample size. I use these alternative measures to check the robustness of the results.

House improvements: This variable is an index calculated as the first component of a PCA applied on the standardized measures for the quality of the house's ground, wall, and roof. A consistent list of materials for house parts is used to ensure comparability across countries and

¹¹ Regions' borders were modified in the following countries: Burundi, Kenya, Liberia, Madagascar, Malawi, Senegal, Tanzania, Uganda, Zambia.

¹² For Burundi, see http://www.abelo.bi/download/doc/politique_nationale_de_decentralisation.pdf (last accessed February, 2020); for Madagascar, see http://siteresources.worldbank.org/INTMADAGASCAR/FRENCH/Resources/ecopol_dec.pdf (last accessed February, 2020); for Tanzania, see <https://web.archive.org/web/20091222050849/http://www.policeforce.go.tz/pdf/REPUBLIC.pdf> (last accessed February, 2020); for a case study on Uganda, see Grossman and Lewis (2014).

years. The quality variables are based on different Likert scales, which I standardized through Min-Max transformation to bring all measures into a 0-1 closed interval, with 0 corresponding to the lowest quality and 1 the highest quality. For robustness checks, I calculated variants of these two variables by adding the number of bedrooms and kitchen to the list of house quality variables.

Net enrolment rate in post-primary (secondary and university) education: To get the net enrolment rate, I divide the number of household members who are enrolled in a level (post-primary) and are in that level's legal age group by the number of members in that level's legal age group. This rate is calculated using country-specific legal entry and completion ages for post-primary education.¹³ For the sample countries, the ages of entry range from 12 to 15, and for all countries, I capped the completion age at 24.

2.3.2 The independent variables

Perceived sociopolitical instability: The proxies for perceived instability are measured at the level of the regions in each country, using data from the Afrobarometer survey. This survey records citizens' attitudes and perceptions on democracy, governance, economic reforms, civil society, and the quality of life in 36 African countries. Citizens surveyed are in the age group 18 and older. The sample sizes range from 1,200 to 2,400 randomly selected citizens from randomly selected households. Countries covered are only those where the political environment allows citizens to freely and honestly respond to the questions, i.e., countries not in civil war. The surveys are representative at countries' first administrative level, which can be either the region, province or state.

The survey questionnaire and administrative procedure are standardized, which render possible comparisons across countries and years.¹⁴ I use data collected between 2002 and 2015 in the 19 countries (see Table A.2.2 in the Appendix). For each country, I selected surveys conducted only one to three years before a DHS was conducted in the same country. Several variables in the surveys can be combined into indices of core concepts (Afrobarometer, 2017). Hence, to build the proxy for perceived political instability, I selected variables that can be associated with the concepts or dimensions of perceived quality of policies and institutions. The literature and data availability for the countries guided my selection of in total 41 survey variables, which I then recoded so that higher values proxy higher perceived instability. I then combined the variables into 20 dimensions, such as performance of elective institutions, corruption, and trust in government and elective institutions, impunity, political violence, extent of democracy, and participation in demonstrations. Each dimension is measured as the average of one to four non-overlapping set of survey variables. Yet, the survey variables were elicited based on different ordinal or Likert scales. I hence standardized the scales through Min-Max transformation, bringing all dimensions into a 0-1 closed interval, with 0 corresponding to the lowest and 1 the highest levels of instability perceived by households.

Finally, to get yearly proxies of perceived instability at the level of sub-national regions, I calculated for each region and year the weighted average of each dimension. I used the survey

¹³ I compiled this information from the UNESCO's Institute for Statistics.

¹⁴ In each country, interviews were conducted in the respondent's preferred language. Yet, questions are translated into relevant languages following a standardized procedure.

sampling weights provided in Afrobarometer's datasets. I named these regional proxies "dimensions of perceived instability."

On the other hand, I built one index of perceived instability by applying PCA on eight dimensions. The index is the predicted score of the first principal component (see Table S.2.5 in the Supplemental Material). Pooling all years and countries, I conducted the PCA on the standardized dimensions of perceived instability. Hence, for the index, the weights of the dimensions are the same across countries and regions. To get yearly indices of perceived instability at the level of subnational regions, I calculated the weighted average of the index. The index accounts for 34.3% of the total variation in the data, and the loadings are all positive, which makes the interpretation of the index unambiguous (see Tables S.2.5 in the Supplemental Material).

Data however are missing on some dimensions for some countries and years; therefore, the estimating sample size is significantly reduced using different combination of the dimensions. The calculated index uses the larger sample size. As the index is calculated using qualitative data, there are other limitations. First, the survey variables were verbally elicited using Likert scale questions, which raise a validity issue due to possible ambiguities in understanding such questions (Beyth-Marom, 1982). Other issues such as anchoring, framing, media exposure, and in general access to information can bias the interpretation of these questions and the responses provided by interviewees. Second, issues of interpersonal comparability may compromise the external validity of these data (Tversky and Kahneman, 1974; Dominitz 1998; Carminigani, 2003; Manski, 2004). Nevertheless, Wallsten (1990) suggests that in experiments people respond to uncertainty virtually in a similar manner whether it is measured qualitatively (linguistic) or quantitatively (numerical measure). Field evidence also suggests that people in low income countries can generally understand and answer elicited expectation questions with internal consistency and in line with the laws of probability theory (Delavande, Giné and McKenzie, 2011; Attanasio and Augsburg, 2015). Moreover, these issues are minimized by the random and large samples of the surveys, the Min-Max standardization, the aggregation of the survey variables into dimensions, and the calculation of the proxies at regional levels and using the PCA approach.

Factual sociopolitical instability: The second key independent variable measures actual, or observed sociopolitical political instability at the level of regions in each country. I use data from the Armed Conflict Location & Event Data Project (ACLED). This data set provides geo-referenced time-series of political violence and protest events occurred in nearly 100 countries.¹⁵ Events include battles between armed groups, establishment of bases and strategic development by rebels, militias or governments, riots/protests, violence against civilians, non-violent transfer of territory and remote violence (e.g. bombings, missile attacks). ACLED retrieves the events along with their dates, locations, and actors involved from secondary sources of information. ACLED then uses a unique codebook to build the data set. I select events occurred between 2000 and 2016 in the 19 sample countries. In these countries, 37,104 events occurred in this period, which on average corresponds to 135 events per year. The variable is calculated by counting the number of events occurred every year in each of the 185 regions of these countries.

¹⁵ See ACLED's website: acleddata.com.

To be precise, factual instability is measured as the cumulative number of events in years t , $t-1$, and $t-2$, to which is added the spatial lag variable calculated based on this cumulative number of events i.e.

$$weighted_event_{rct} = \sum_{i=0}^2 (event_{rct-i} + w_{rct-i} * event_{rct-i}),$$

where w_{rct} is the spatial weight for region r in country c in year t , and calculated following Kondo (2017).

2.3.3 Control variables

The socioeconomic and environmental conditions at the level of the regions in each country as well as changes in the countries' governments and political regimes may drive both political instability and household outcomes, which can bias the parameters of interest. In addition, evidence shows that political instability and civil war onset are positively associated with ethnic diversity in a country (Svensson, 1998; Østby, Nordas and Rød, 2009; Fjelde and Østby, 2014), which if omitted may bias the parameters to identify. To minimize these issues, I control for these confounders using proxy variables such as nighttime lights intensity and rainfall in growing seasons measured at the subnational level. I also control for the ethnicity of the household head. The data sources and the calculation of these variables are described as follows.

Nighttime lights intensity: This variable measures the average intensity of light luminosity at night at the level of the regions in each country. I use data from the Operational Linescan System of the Defense Meteorological Satellite Program (DMSP-OLS), which is run by the National Oceanic and Atmospheric Administration (NOAA). Increasingly, researchers use nighttime light measures as proxy indicators for urbanization, population density, energy use, and in general economic and human development (see Addison and Stewart, 2015; Bruederle and Hodler, 2018). Nighttime light image and data are collected by satellites, and then NOAA's National Geophysical Data Center processed and stored them in gridded format. Using tools for spatial data analysis, I extracted average annual nighttime lights intensity for each of the 185 regions of the countries. Yet, the satellite data are available up to 2013. Data for 2014, 2015, and 2016 were hence extrapolated based on regional level time-series of nighttime lights. To extrapolate, I used fractional polynomial regressions and model forecasting.

Rainfall average and variability: I use both the average and the coefficient of variation of rainfall in growing seasons measured at the level of the regions in each country. The data used are gridded monthly terrestrial precipitation for the years 1900-2017, which are provided by the University of Delaware (Matsuura and Willmott, 2018). For each country, rainfall volumes are available for a number of meteorological stations. The coordinates of these stations and of the regions' centroids were used. For each country, the monthly rainfall at the level of a region is calculated as the weighted average of monthly rainfall at the five nearest neighbor stations, weighting by the inverse of the distance between each station and the region's centroid. Then, I calculated the region's annual rainfall as the average of monthly rainfall, using only months in the crop-growing seasons specific to each country.

Ethnic group of household heads: This categorical variable equals 1 up to 5 if a household head is of one of the five largest ethnic groups in the country, and 0 otherwise. For each country, I collected the majority ethnic groups from the World Atlas' website.¹⁶ I used the DHS data sets

¹⁶ www.worldatlas.com

to identify the ethnicity of the household heads. Yet, the DHS does not systematically collect household ethnic groups, but only in some countries and for a subsample of men and women aged 15 or more. Using these subsamples, I identified the ethnic groups of household heads for 32% of the dataset, which represents a substantially reduced sample.

Neighboring country spillovers of political violence and protests: I consider the spillover effects between neighboring countries. The spillover effects are captured by a spatial lag variable calculated using the number of political violence and protest events at the country level. For a given country, the spatial lag variable is calculated as the weighted sum of the events in neighboring countries. Used spatial weights matrix is the power functional type with 2 as the decay parameter,¹⁷ but without considering a distance threshold (see Kondo, 2017).

Wealth index: Poor households are identified by a dummy variable that equals 1 if the household is categorized as poor or poorest according to the wealth index available in the DHS datasets. This wealth index is calculated as the first component of a principal component analysis (PCA) applied on household assets and access to public utilities. As Rutstein and Kiersten (2004) indicate, the variables used in the calculation may vary across countries, though in most cases they include public utilities and assets such as radio, TV, telephone, refrigerator, bicycle, motorcycle, car or truck, cart, electricity, toilet facility, water supply, ownership of dwelling, number of bedrooms, material used in dwell's roof, ground, and wall.

2.4 Empirical specification

To analyze the effects of sociopolitical instability on household's assets and human capital accumulation, I exploit within-country variations in instability measured at the regional level. In this paper, political instability is assumed to manifest itself through the interplay between perceptions and events of political instability. Hence, following previous macro-level studies (see e.g., Keefer and Knack, 1995; Jong-A-Pin, 2009) and drawing from Equation (eq.), I estimate models that include both perceived and factual instability. I then compare results from the basic model (1) to that including the interaction term, i.e. model (2). The models are specified as follows:

$$hhvar_{hrct} = \beta_1 weighted_event_{rct} + \beta_2 perceiv_{rct-c_j} + C'_{rct}\beta_3 + R'_{rct}\beta_4 + H'_{hrct}\beta_5 + \vartheta_{rc} + \beta_6(\theta_c \times \gamma_t) + \varepsilon_{hrct} \quad (1)$$

or

$$hhvar_{hrct} = \beta_1 weighted_event_{rct} + \beta_2 perceiv_{rct-c_j} + \beta_3 perceiv_{rct-c_j} \times (weighted_event_{rct}) + C'_{rct}\beta_4 + R'_{rct}\beta_5 + H'_{hrct}\beta_6 + \vartheta_{rc} + \beta_7(\theta_c \times \gamma_t) + \varepsilon_{hrct}, \quad (2)$$

where $hhvar$ stands for one of the outcomes of interest measured at the level of households h in region r of country c in time t , $weighted_event$ for the number of political violence and protest events, $perceiv$ for perceived instability in region r of country c in time $t-c_j$,¹⁸ the β s for parameter vectors, and ε for the error term. Yet, estimated coefficients associated with $event$

¹⁷ I use the power of 2, but even if 8 is used as in the example by Kondo (2017), the resulted spatial lag variables have the same values up to eight decimal places.

¹⁸ $t - c_j$ stands for Afrobarometer's survey year j in country c . Afrobarometer surveys were conducted either before or in the same year as DHS. Precisely, 37% of country DHS surveys were conducted in the same year as Afrobarometer surveys, 44% of DHS were conducted in one year after Afrobarometer surveys, 14% in two years after, and 5% in three years after.

and *perceiv* might suffer from an omitted variable bias if for example potential confounders such as political, demographic, socioeconomic, and geographical factors varying over time at the household, regional, and country level are not taken into account. To address this issue, I include in the regressions three sets of control variables measured at household, region and country levels, and represented by matrices H , R , and C . The matrix H contains household level variables such as age, gender, ethnic group, marital and occupational status, and education level of the household head as well as the household size, number of members per educational level, number of members under age 16, household location in rural or urban area, and distance to a piped water source. The matrix R contains regions' climatic and economic development characteristics proxied by the nighttime lights intensity, and the average and variability in rainfall in growing seasons. The matrix C contains a spatial lag variable on the number of yearly events at country level, which takes into account the spillover effects from events in neighboring countries. To account for temporal shocks, the regressions include country-time specific fixed-effects $\theta_c \times \gamma_t$. I also include region fixed-effects (ϑ_{rc}) to account for the fact that *perceiv* and *event* may still be endogenous if unobserved regional differences in, e.g., endowments in natural resources drive the outcomes of interest, instability perceptions and events overtime, and other unobserved region-level variables may bias the estimates. Regression standard errors are clustered at regional level to account for potential correlation between households' perceptions of instability within a region.

In line with the discussions in the theoretical section, household wealth-heterogeneity is an important aspect to account for in this empirical investigation. Hence, Model (3) includes interactions between each measure of political instability and a dummy variable equals one if the household is poor. Household's poverty is determined based on a wealth index provided in the DHS datasets.

$$\begin{aligned} hhvar_{hrct} = & \beta_1 perceiv_{rct-c_j} + \beta_2 weighted_event_{rct} + \beta_3 perceiv_{rct-c_j} \times poor + \\ & \beta_4 weighted_event_{rct} \times poor + \beta_5 perceiv_{rct-c_j} \times \\ & weighted_event_{rct} + \beta_6 perceiv_{rct-c_j} \times weighted_event_{rct} \times poor + \\ & R'_{rct}\beta_7 + H'_{hrct}\beta_8 + \vartheta_{rc} + \beta_9(\theta_c \times \gamma_t) + \varepsilon_{hrct} \quad (3) \end{aligned}$$

For these regressions, I use lagged and pre-determined instability variables as well as a rich set of control variables and fixed effects at various levels in attempts to address endogeneity issues. Yet, other issues such as measurement error in the outcomes and instability variables as well as unobserved heterogeneity may still bias the estimates, limiting their interpretation as causal effects. Nonetheless, I use different measures of instability, estimate different model specifications to ascertain the robustness of the results.

2.5 Results

I present the results of the econometric analysis of the three models specified in Section 4. Tables 2.1 and 2.2 show the results for the four outcomes of interest for the first two specifications. The results are described for two types of covariates. First, I use the index of perceived political instability at the regional level. Second, I use factual instability measured by the weighted sum of events, where the sum is calculated as the log cumulative number of

events¹⁹ in years t , $t-1$, and $t-2$ at the regional level and the sum of events in neighboring regions each time weighted by the distance to the centroid in that neighboring region (see also Section 3).²⁰ For each outcome, the results shown are from regressions on both perceived instability and weighted events, and either with or without an interaction between the two.

Results presented are robust to outliers, i.e. observations for which non-robust regression residuals are larger than two times the standard deviations of these residuals have been dropped.²¹ Yet, Tables S.2.13, S.2.14, and S.2.15 in the Supplemental Material show that although regression coefficients may be smaller and less statistically significant when outliers are not dropped, the results are qualitatively unchanged. Again, as ethnic diversity is considered as an important driver of conflict and inequality in living standards across regions in Sub-Saharan Africa, I re-estimate my regressions controlling for the ethnic group of the household head. This analysis is done with a reduced sample as ethnic affiliation is not available in all surveys (the sample size is smaller by 60%). Doing so do not significantly change the results, shown in Tables S.2.19, S.2.20, and S.2.21 in the Supplemental Material.

2.5.1 Overall effects

Tables 2.1 and 2.2 show the results of the estimation of models (1) and (2) specified in Section 4. In addition, given that the regressions include the interaction of two continuous variables, these tables also show the average marginal effects with respect to factual and perceived instability in order to ease their interpretation. Both measures of factual (*Events*) and perceived (*Index PCA*) instability are standardized with mean zero and standard deviation one; they hence are interpreted as standard deviation changes.

As can be seen, the average marginal effects of factual and perceived instability show coefficients of the same sign, yet perceived instability appears to have no significant effect on the outcomes. Similarly, factual instability appears to have no significant effects on assets and enrollment in post-primary education. In contrast, factual instability has a significant negative effect on ownership of a financial account, but a significant positive effect on house improvements. On average, one standard deviation increase in political violence and civil unrests in residential and neighboring regions, i.e. factual instability decreases the ownership of financial accounts by 8.6% (0.206 standard deviations) (see Table 2.1), while it increases house improvements by 0.192 standard deviations (see Table 2.2). These effects are significant at the 1% statistical level.

When the analysis accounts for the interplay between factual and perceived instability, the above conclusion remains qualitatively the same, i.e. only factual instability shows significant effects on ownership of financial accounts and house improvements. However, for three outcomes, the interaction term between factual and perceived instability is significant at the 5% and 10% levels, and shows negative coefficients for ownership of financial accounts and house improvements, but a positive coefficient for enrollment in post-primary education. Hence, the interplay between the two types of instability plays a role in that it significantly affects the

¹⁹ Given that some regions did not record any event in some years, before calculating the log I added one to the number of events for all regions and years.

²⁰ The weighting procedure follows Kondo (2017), who presents a Stata command for calculating spatial lag variables.

²¹ Depending on the outcome, dropping outliers reduces the sample by 2.1% to 7%.

overall effects of instability on the outcomes. Therefore, this finding is taken into account in the subsequent analysis.

To summarize, I find that an increase in factual instability reduces the ownership of financial accounts but increases investments in house improvements. Perceived instability has no effect on the outcomes. Political instability whether factual or perceived has no effects on assets and enrollment in post-primary education. Although, there could be problems related to measurement error, given the large sample size I do not expect that a lack of power poses a significant threat to identification. Moreover, as discussed in Section 2 on the theoretical background, the effects of political instability on the outcomes may vary in an important way with household wealth status, i.e. whether the household is poor or rich. In the subsequent section, I address this latter issue by exploring whether the effect of political instability is different across the wealth distribution.

Table 2.1: Effects of political instability on ownership of financial accounts and assets

Outcomes	Panel A: Ownership of financial accounts		Panel B: Assets (z-score)	
	Regression without interaction term	Regression with interaction term	Regression without interaction term	Regression with interaction term
Covariates and marginal effects	(1)	(2)	(3)	(4)
Events	-0.086*** (0.022)	-0.082*** (0.023)	0.089 (0.062)	0.089 (0.064)
Perceived index PCA	-0.007 (0.009)	-0.011 (0.010)	0.025 (0.015)	0.023 (0.015)
Index PCA x Events		-0.014* (0.009)		-0.009 (0.013)
Average marginal effect (with respect to Events)	-8.6%*** (0.021)	-8.3%*** (0.023)	0.089 (0.062)	0.089 (0.064)
Average marginal effect (with respect to Index PCA)	-0.007 (0.009)	-0.011 (0.010)	0.025 (0.015)	0.023 (0.015)
Full set of controls	Yes	Yes	Yes	Yes
Country-time FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
R-squared	0.513	0.514	0.537	0.537
Observations	223,146	223,143	228,506	228,508
Region-groups	172	172	172	172

Notes: Table 2.1 shows regression coefficients along with the average marginal effects for two outcomes – ownership of financial accounts and assets. Column 1 shows the results from a regression that includes perceived instability and events, but not an interaction between both, while column 2 shows the results from the same regression, but including an interaction between perceived instability and events. Used are weighted events, i.e. the sum of events in residential and neighboring regions each time weighted by the distance to the centroid in that neighboring region. Perceived index PCA = proxy for perceived political instability calculated by principal component analysis (PCA) on eight dimensions of perceived instability drawn from Afrobarometer surveys. Higher values of the index read as higher levels of perceived instability. Ownership of financial accounts is a dummy equals one if at least one household member owns a bank or other financial accounts. Assets is measured as an index calculated by PCA on nine asset items. The regressions include the full set of the controls, region fixed-effects, and country-specific time trends. Robust standard errors clustered at the region level in parentheses. For the marginal effects, standard errors are calculated by the Delta-method. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 2.2: Effects of political instability on house improvements and school enrollment

Outcomes	Panel A: House improvements (z-score)		Panel B: Enrollment in post-primary schools (net rate)	
	Regression without interaction term (1)	Regression with interaction term (2)	Regression without interaction term (3)	Regression with interaction term (4)
Covariates and marginal effects				
Events	0.193** (0.078)	0.215*** (0.075)	-0.005 (0.008)	-0.005 (0.008)
Perceived index PCA	0.017 (0.028)	0.007 (0.025)	-0.005 (0.003)	-0.004 (0.003)
Index PCA x Events		-0.050** (0.022)		0.006** (0.003)
Average marginal effect (with respect to Events)	0.192** (0.078)	0.208*** (0.074)	-0.5% (0.008)	-0.5% (0.008)
Average marginal effect (with respect to Index PCA)	0.017 (0.028)	0.001 (0.025)	-0.5% (0.003)	-0.4% (0.003)
Full set of controls	Yes	Yes	Yes	Yes
Country-time FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
R-squared	0.558	0.558	0.530	0.530
Observations	196,819	196,827	133,233	133,230
Region-group	169	169	172	172

Notes: Table 2.2 shows regression coefficients along with the average marginal effects for two outcomes – house improvements and enrollment in post-primary schools (net rate). Column 1 shows the results from a regression that includes perceived instability and events, but not an interaction between both, while column 2 shows the results from the same regression, but including an interaction between perceived instability and events. Used are weighted events, i.e. the sum of events in residential and neighboring regions each time weighted by the distance to the centroid in that neighboring region. Perceived index PCA = proxy for perceived political instability calculated by principal component analysis (PCA) on eight dimensions of perceived instability drawn from Afrobarometer surveys. Higher values of the index read as higher levels of perceived instability. House improvements is measured as an index calculated by PCA on the quality of materials used for important parts of the house. The net rate of enrollment in post-primary schools is the ratio of the number of household members who are enrolled in post-primary education and who are in that level's legal age group to the number of members in that level's legal age group. The regressions include the full set of the controls, region fixed-effects, and country-specific time trends. Robust standard errors clustered at the region level in parentheses. For the marginal effects, standard errors are calculated by the Delta-method. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

2.5.2 Wealth-heterogeneity

In line with the theoretical discussion, I now analyze whether the effect of factual and perceived instability is significantly different for poor as compared to rich households. To do so, I include in the regressions the interaction between the measures of instability and a dummy variable that equals one if a household is categorized as poor according to a wealth index from the DHS datasets, and zero otherwise. Columns (1) to (4) of Table 2.3 below show the results of the estimation of Model (3) specified in Section 4. The presence of the interaction terms does not allow a direct interpretation of the coefficients, so the table also shows the average marginal effects with respect to factual and perceived instability. For each outcome, these effects are shown for households altogether as well as for poor households only and for rich households only. I discuss the results for each outcome in turn. Figure A.2.1 in the Appendix compares the effect sizes and their confidence intervals.

For ownership of a financial account, the average marginal effects of perceived instability are negative for households altogether as well as for poor and rich households separately, yet these effects are not statistically significant. Contrarily, factual instability has significant negative effects for households altogether, and for poor households in particular. One standard deviation increase in factual instability decreases the ownership of financial accounts by 8.2% (0.196 standard deviations) for poor households. That effect is not significant for rich households, which may be related to the already large share of rich households (33.5%) but the very small share of poor households (6.1%) owning financial accounts. Overall, the results show that when wealth-heterogeneity is accounted for, the negative effects of factual instability on the ownership of financial accounts is driven by its negative effect on poor households.

Contrary to the non-significant effects found for the linear case, both factual and perceived instability show now significant positive effects on investments in assets. The effects of factual instability are significant at the 5% and 10% levels, and are larger than the effects of perceived instability. It could be that perceived instability induce small adjustments of assets as compared to the effects of factual instability, which may induce large adjustments in response to the intensity level of violence and civil unrests. On average, one standard deviation increase in factual instability increases assets by 0.121 and 0.100 standard deviations both for rich and poor households. For perceived instability, one standard deviation increase in perceived instability increases assets by 0.065 standard deviations for rich households. Overall, taking into account wealth-heterogeneity shows that the effect of instability on assets becomes significant and is mainly driven by its positive effect on rich households. In the macroeconomic literature, Campos and Nugent (2003) also find that sociopolitical instability shows a positive relationship with investments. They explain this finding by the fact that sociopolitical instability delays investments and induces changes in government policies, which can create a business climate favorable to investments in the long run.

Similar to the positive effects of factual instability on house improvements found for the linear case, again I find that factual instability has a positive effect on house improvements both for households altogether, as well as for poor and rich households separately. These effects are even larger and significant at the 5% level. One standard deviation increases in factual instability increases house improvements by 0.222 and 0.236 standard deviations for rich and poor households respectively.

In the same respect, perceived instability shows now a significant positive effect on house improvements for rich households, yet, a significant negative effect for poor households. Hence for poor households, an increase in factual instability increases house improvements while an increase in perceived instability decreases house improvements. Although I lack obvious explanation of this difference, I think that when poor households perceive a deteriorating quality of institutions, they may revise their investments plans by drawing resources away from investment in housing, e.g. in favor of non-durable consumption.

Table 2.3: Heterogeneous effects by wealth status

	(1)	(2)	(3)	(4)
Covariates and marginal effects	Ownership of financial accounts	Assets (z-score)	House improvements	Enrollment in p.p. schools
Poor (=1)	-0.051*** (0.009)	-0.660*** (0.021)	-1.477*** (0.052)	-0.013*** (0.003)
Events	-0.028 (0.023)	0.121** (0.053)	0.222** (0.106)	-0.016* (0.008)
Perceived index PCA	-0.010 (0.010)	0.065*** (0.017)	0.091*** (0.032)	-0.003 (0.004)
Poor (=1) x Events	-0.053*** (0.009)	-0.023 (0.021)	0.029 (0.036)	0.014*** (0.002)
Poor (=1) x Index PCA	0.010 (0.008)	-0.087*** (0.021)	-0.244*** (0.037)	-0.004* (0.002)
Events x Index PCA	-0.007 (0.009)	0.011 (0.015)	0.008 (0.027)	0.001 (0.003)
Events x Index PCA x Poor (=1)	-0.019*** (0.007)	-0.043** (0.018)	-0.122*** (0.030)	0.009*** (0.002)
Average marginal effect (with respect to Events)				
All households	-5.1%** (0.022)	0.112** (0.051)	0.237** (0.103)	-1% (0.008)
Rich households	-2.8% (0.023)	0.121** (0.053)	0.222** (0.105)	-1.6%* (0.008)
Poor households	-8.2%*** (0.021)	0.100* (0.049)	0.236** (0.102)	-0.2% (0.008)
Average marginal effect (with respect to Index PCA)				
All households	-0.6% (0.010)	0.026* (0.013)	0.017 (0.032)	-0.4% (0.003)
Rich households	-1.1% (0.010)	0.065*** (0.017)	0.092*** (0.033)	-0.3% (0.004)
Poor households	-0.1% (0.010)	-0.022 (0.018)	-0.166*** (0.042)	-0.7%** (0.003)
Full set of controls	Yes	Yes	Yes	Yes
Country-time FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
R-squared	0.511	0.573	0.703	0.530
Observations	223,299	228,863	197,553	133,284
Region-group	172	172	169	172

Notes: Table 2.3 shows regression coefficients along with the average marginal effects for four outcomes. Used are weighted events, i.e. the sum of events in residential and neighboring regions each time weighted by the distance to the centroid in that neighboring region. Perceived index PCA = proxy for perceived political instability calculated by PCA on eight dimensions of perceived instability drawn from Afrobarometer surveys. Higher values of the index read as higher levels of perceived instability. Poor (=1) = a dummy equals one for poor households. Ownership of financial accounts is a dummy equals one if at least one household member owns a bank or other financial accounts. Assets are measured as an index calculated by PCA on nine asset items. House improvements is measured as an index calculated by PCA on the quality of materials used for important parts of the house. The net rate of enrollment in post-primary schools is the ratio of the number of household members who are enrolled in post-primary education and who are in that level's legal age group to the number of members in that level's legal age group. The regressions include the full set of the controls, region fixed-effects, and country-specific time trends. Robust standard errors clustered at the region level in parentheses. For the marginal effects, standard errors are calculated by the Delta-method. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

This explanation is further supported by the fact that we find that perceived instability is negatively associated with investments in assets, although not statistically significant. Yet when political violence and civil unrest increase, poor households may spend more on house improvements for future use if those events are likely to bring changes in public policies beneficial in the long run, especially in a context where mass destruction of property might not be expected (Campos and Nugent, 2003).

Finally, for the net rate of enrollment in post-primary education, both factual and perceived instability show negative coefficients. The effects of factual instability are not significant for households altogether and for poor households, but the effect is significant and negative on the enrollment of the children of rich households. On average, one standard deviation increase in factual instability decreases enrollment by 1.6% (0.042 standard deviations) for rich households, while one standard deviation increase in perceived instability decreases enrollment by 0.7% (0.018 standard deviations) for poor households.

2.5.3 Spillover effects

In this analysis I further account for the fact that instability in neighboring countries may also play a role. Table 2.4 shows the coefficients on the spatial lag variables that measure between-country spillover effects.

Table 2.4: Between-country spillover effects of factual instability

Specification	(1) Financial inclusion	(2) Assets z-score	(3) House improvements	(4) Enrollment in p.p. school
Events + Perceived index PCA	0.003 (0.019)	0.406*** (0.052)	0.009 (0.069)	0.024*** (0.009)
Index PCA x Events	-0.008 (0.020)	0.397*** (0.051)	-0.018 (0.071)	0.028*** (0.009)
Events x Index PCA x poor(=1)	0.001 (0.019)	0.417*** (0.050)	0.028 (0.070)	0.016 (0.013)
Full set of controls	Yes	Yes	Yes	Yes
Country-time FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
R-squared	0.513	0.573	0.558	0.530
Observations	223,143	228,863	196,827	133,230
Regions	172	172	169	172

Notes: Each coefficient is from one regression. The coefficients are those on the spatial lag variable on country level log cumulative number of events in current and past two years, which was calculated following Kondo (2017). For each dependent variable, coefficients are from regressions that include both the corresponding independent variable and a spatial lag variable based. Used are weighted events, i.e. the sum of events in residential and neighboring regions each time weighted by the distance to the centroid in that neighboring region. Perceived index PCA = proxy for perceived political instability calculated by PCA on eight dimensions of perceived instability drawn from Afrobarometer surveys. Higher values of the index read as higher levels of perceived instability. The dependent variable in col. (1) is a dummy equals one if at least one household member owns a bank account. In col. (2) it is an asset index calculated by principal component analysis (PCA) on nine assets. In col. (3) it is an index of house improvements calculated by PCA on the quality of materials used for house parts. In col. (4) it is the net rate of enrollment in post-primary schools. Events = the log cumulative number of events in current and past two years at country's regions level. Robust standard errors clustered at the region level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

As can be seen, political violence and civil unrest in neighboring countries have no significant effects on ownership of financial accounts and investments in house improvements. Yet, political instability in neighboring countries appears to have positive effects on enrollment in post-primary education and investments in assets. For enrollment in post-primary schools the spillover effect is insignificant when regressions account for wealth-heterogeneity. An explanation of the positive spillover effects of political violence and protests in neighboring countries might be that possibly such events increase investments in assets through increased remittances. Figures A.2.2 and A.2.3 in the appendix illustrate a positive correlation between remittances inflows and political violence and protests. For example, Côte d'Ivoire was in political crisis in 2010 when neighboring country Burkina Faso was stable. Figure A.2.2 shows that remittances from Burkina Faso to Côte d'Ivoire were higher in 2010 and slowly reduced when the latter country was coming out of the crisis. Conversely, Burkina Faso experienced a popular uprising in 2014 and registered terrorist attacks in 2015 and beyond when Côte d'Ivoire was stable. Again, Figure A.2.2 shows that remittances from Côte d'Ivoire to Burkina Faso more than tripled between 2014 and 2015. In the same respect, plotting the log remittances inflows and political violence and protest events for 19 countries over the 2000-16 period, Figure A.2.3 shows a positive linear relation between remittances inflow and political instability. Yet, it will take a thorough analysis to ascertain the relationship between remittances inflow and political instability, which is beyond the scope of this paper.

2.5.4 Robustness checks

The above estimates are obtained with the trimmed data. Yet, if outliers are not dropped the results do qualitatively not change, although the coefficients are sometimes smaller, less precisely estimated, and show a smaller R-squared (see Tables S.2.13, S.2.14, and S.2.15 in the Supplemental Material).

Households may care more about political violence and protests happening in their residential than in other regions of their country, i.e. events in neighboring regions may play minor role. To ascertain that, I re-run my regressions considering only events in residential regions. The results are qualitatively also unchanged when the regressions are on events in the residential regions only, i.e. when distance-weighted events in neighboring regions are not considered (see Tables S.2.16, S.2.17, and S.2.18 in the Supplemental Material).

As discussed above, ethnic affiliation might be a potentially important omitted variable from the analysis above. Using a reduced number of data sets that include also ethnic affiliation and re-running the regressions while controlling for ethnic affiliation of the household head does also not change the results substantially. Although the regressions show a better goodness of fit and the estimate are more or less precisely estimated, the same conclusions as those obtained using the full sample emerge from the analysis. However, instability in neighboring countries show now coefficients of different signs across the specifications for assets and enrollment in post-primary education, which result is different from what I found without taking into account ethnicity. Hence, this conclusion should be taken cautiously due to the relatively smaller sample size (see Tables S.2.19, S.2.20, and S.2.21 in the Supplemental Material).

2.6 Conclusion

This paper contributes to a small but growing literature on the effects of political instability at the micro-level. I here study the effects of such instability on the accumulation of physical, financial and human capital by households in 19 Sub-Saharan African countries. This work takes advantage of existing data on household perceptions of the quality of policies and institutions. I analyze the effects of the exposure to events of political violence and civil unrests (factual instability) as well as the effects of the perceived quality of policies and institutions, i.e. the perceived risk of an outbreak of political instability (perceived instability) on ownership of financial accounts, investments in assets, house improvements, and post-primary education of children. In particular, given that events and perceptions may reinforce each other, I test whether the interplay between factual and perceived instability play a significant role, and whether taking into account wealth distribution, i.e. household heterogeneity, improves our understanding of the effects of instability. In this analysis I also account for potential confounders at the households, regions, and countries levels as well as the possible spillover effects of political violence in neighboring countries.

Overall, factual and perceived instability are associated with higher investments in assets, and factual instability is also associated with more investment in house improvements, yet it is negatively associated with the ownership of financial accounts. With regard to the heterogeneous effects, increased factual or perceived instability is associated with more investments in physical capital but less investments in financial and human capital among rich households, and with less investments in physical, financial and human capital among poor households.

These findings suggest that political instability enhances the wealth accumulation by rich households while it reduces that of poor households. In addition, political instability induces both rich and poor households to reduce their investments in post-primary education, which implies long-term economic consequences. This may manifest through one or more of the channels (income, return on assets, and the rule of law) discussed in the theoretical framework, yet the data does not allow to disentangle this. This may suggest at least that in the context of instability for rich households the precautionary savings motive dominates whereas poor households are already in a process of depletion to meet their subsistence requirements. Alternatively, it may hint to lower expected returns among the poor. If these trends are confirmed, it would imply that poor households are those who suffer the most of the effects of political instability. In this case, political instability and perceived poor institutional quality would deepen the vulnerability and may lead to a vicious cycle of conflict. More generally, these findings suggest that a micro-level analysis of the effects of political instability, especially when household perceptions are considered, should take into account non-linearity, and in particular wealth heterogeneity. So far, this aspect had not yet been shown empirically in studies of political instability.

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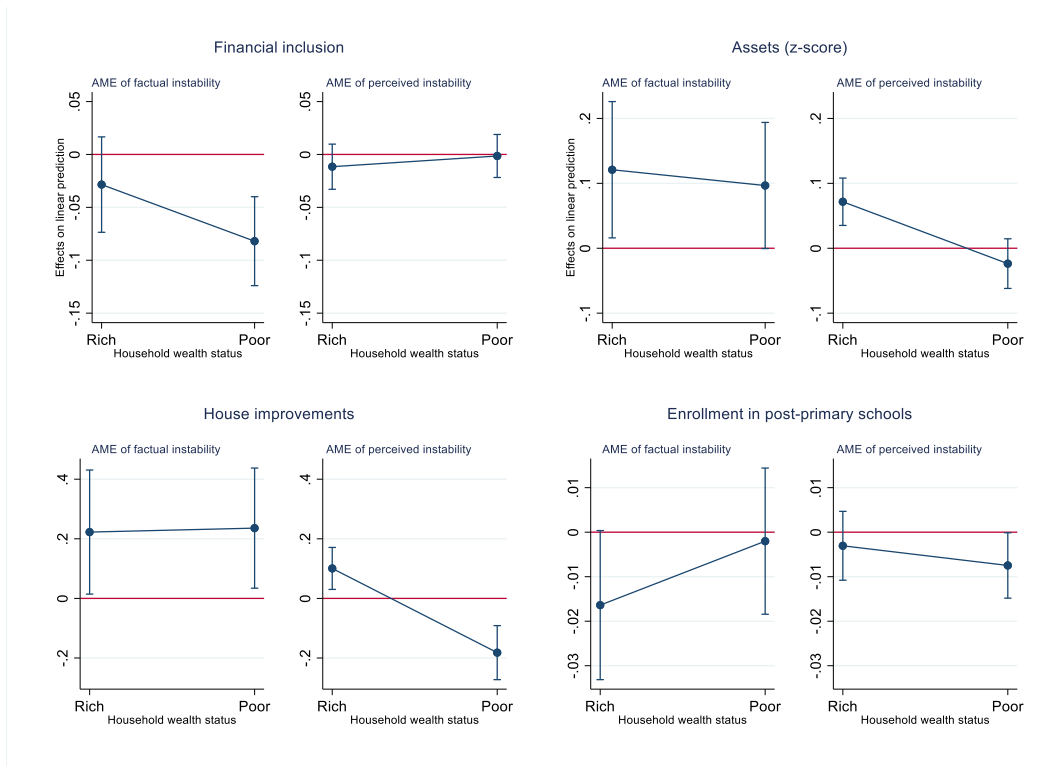
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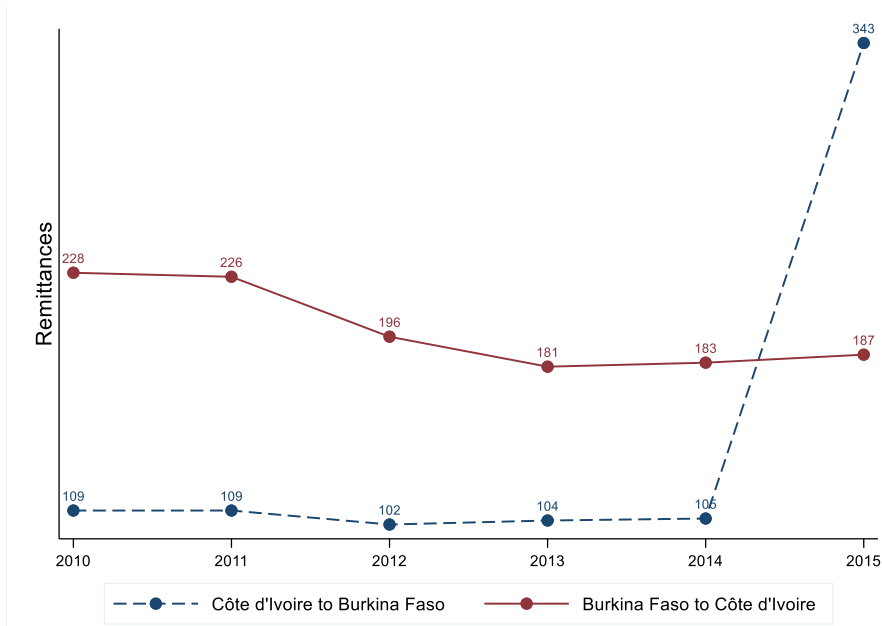
Appendix

A. Figures and Tables



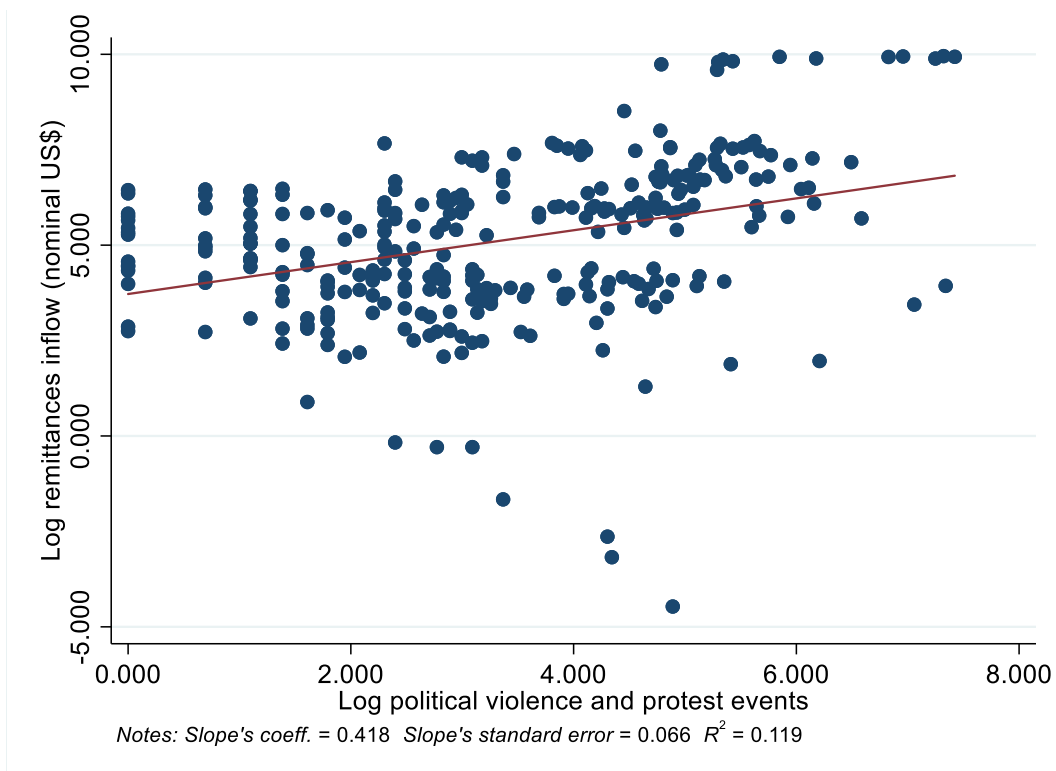
Notes: Figure A.2.1 shows the average marginal effects (AME) of political violence and protests on household ownership of a financial account (financial inclusion), and the average marginal effects of perceived instability on assets, house improvements, and the net rate of enrollment in post-primary schools. The 95% confidence intervals are based on standard errors calculated by the Delta-method.

Figure A.2.1: Average marginal effects of factual and perceived political instability on household outcomes



Notes: Nominal amounts in millions of US\$.
 Source: Data from World Bank staff calculation.

Figure A.2.2: Remittances inflows and outflows between Burkina Faso and Côte d'Ivoire in the 2010-15 period



Source: Data from World Bank staff calculation.

Figure A.2.3: Relation between remittances inflows and the number of political violence and protests in 19 countries over the 2000-16 period

C. Summary statistics on the dependent variables, and country surveys and years

Table A.2.1: Summary statistics on the dependent and independent variables

Variable	Observation	Mean	Standard deviation	Minimum	Maximum
<i>Dependent variables</i>					
Own a bank account	551,486	0.224	0.417	0	1
Post-primary school enrolment					
Net rate	326,122	0.243	0.382	0	1
Assets					
Index (9 assets)	551,063	-0.008	1.55	-1.52	6.68
House improvements					
PCA index (3 parts' material)	474,599	-0.001	1.39	-2.41	2.01
<i>Independent variables</i>					
# events	37,104	135	166	1	798
Perceived instability (PCA index)	551,275	0.261	0.915	-2.52	3.01

Notes: The # of events is for the period 2000-2016, and for the 19 countries in the sample.

Source: Own calculations using data from ACLED, Afrobarometer, and DHS.

Table A.2.2: Years of used DHS and Afrobarometer surveys

Country	DHS years	Afrobarometer survey years
Benin	2006; 2011	2005; 2008
Burkina Faso	2010	2008
Burundi	2016	2014
Ghana	2003; 2008; 2014	2002; 2008; 2014
Kenya	2003; 2008; 2014	2003; 2008; 2014
Lesotho	2004; 2009; 2014	2003; 2008; 2014
Liberia	2013	2012
Madagascar	2009	2008
Malawi	2005; 2010; 2015	2005; 2008; 2014
Mali	2006; 2012	2005; 2012
Namibia	2007; 2013	2006; 2012
Nigeria	2003; 2008; 2013	2003; 2008; 2012
Senegal	2013; 2014; 2015; 2016	2013; 2014*
Sierra Leone	2013	2012
Tanzania	2005; 2010; 2015	2005; 2008; 2014
Togo	2014	2014
Uganda	2006; 2011; 2016	2005; 2008; 2015
Zambia	2007; 2013	2005; 2013
Zimbabwe	2005; 2010; 2015	2005; 2009; 2014

Notes: Each DHS year was matched to a preceding Afrobarometer survey year as closely as possible. *For Senegal, the Afrobarometer survey in 2014 was matched to the DHS surveys in 2014, 2015, and 2016. This was done because after 2014, the next Afrobarometer survey was in 2017.

Source: Afrobarometer and DHS.

D. Definition of variables

Table A.2.3: Dependent variable

Variable	Definition	Data source
<i>Financial inclusion</i>		
Own a bank or other financial accounts (bkt)	Dummy = 1 if at least one household member has a bank or other financial account.	Demographic and Health Survey (DHS)
<i>Education</i>		
Post-primary school enrolment (net rate) (ppsenr)	Divide the number of household members who are enrolled in a post-primary school level and are in that level's legal age group by the number of members in that level's legal age group.	DHS
<i>Assets</i>		
Asset index (pasi9)	An index calculated as the first component of a principal component analysis (PCA) applied on a consistent list of 9 asset items namely radio, TV, fridge, bicycle, car, truck, landline and mobile phones, and cart.	DHS
Number of assets (dur9)	This counts the number of assets possessed by the household. The list comprises nine assets namely: radio, TV, fridge, bicycle, car, truck, fixed and mobile phones, and cart.	DHS
<i>House improvements</i>		
PCA index (hous1)	An index calculated as the first component of a principal component analysis (PCA) applied on the standardized measures for the quality of the ground wall, and roof.	DHS

Table A.2.3 *continued*

Variable	Definition	Data source
<i>Measures of political violence and protest events</i>		
Political violence and protest events (eventcryl)	Logarithm of the number of events in year t in region r of country c.	Armed Conflicts and Location of Events Data (ACLED)
Political violence and protest events (eventcry1l)	Logarithm of the number of events in year t-1 in region r of country c.	
Political violence and protest events (eventcry2l)	Logarithm of the number of events in year t-2 in region r of country c.	
Political violence and protest events (eventcry012l)	Logarithm of the cumulative number of events in years t, t-1 and t-2 in region r of country c, i.e. eventcryl + eventcry1l + eventcry2l.	
<i>Spatial lag variables</i>		
Variable for estimating within-country spillover effects (eventcry012l)	A spatial lag variable based on the log of the cumulative number of events in years t, t-1, and t-2 at the level of the regions in each country. This was calculated using Stata's spgen command.	ACLED
Variable for estimating within-country spillover effects (eventcry012l)	A spatial lag variable based on the log of the cumulative number of events in years t, t-1, and t-2. This was calculated using Stata's spgen command.	
<i>Indices of perceived political instability</i>		
Index of perceived political instability by PCA (pimaz)	A proxy for perceived political instability calculated by principal component analysis (PCA) on eight dimensions of perceived instability (See Table S3 in the Supplemental Material).	Afrobarometer surveys rounds 2, 3, 4, 5, and 6
Index of perceived political instability by unweighted average (pimasaz)	A proxy for perceived political instability calculated by an unweighted average on eight dimensions of perceived instability (See Table S3 in the Supplemental Material).	

Supplemental Material

A. Dependent variables measured as indices

Asset indices

Table S.2.1: Weights of assets in the asset indices

Asset	Asset index (# owned over 10 assets)	Asset index (# owned over 9 assets)	Asset index (# owned over 7 assets)
Radio	0,268	0,325	0,284
TV	0,475	0,511	0,515
Fridge	0,473	0,479	0,529
Bicycle	0,008	0,043	-0,003
Motorcycle	0,147	0,208	0,150
Car or truck	0,365	0,385	0,410
Cooking	0,380		0,428
Land telephone	0,286	0,288	
Mobile phone	0,313	0,359	
Cart	0,002	0,024	
Proportion of total variance explained	27%	27%	33%
Observations	551,264	558,966	551,645

Notes: The weights on the Table are from principal component analyses (PCA) applied on the list of assets. For each index, larger values read as higher wealth in assets.

Indices of house quality

Table S.2.2: Weights of materials in the house quality index

Asset	House quality index (5 parts' materials)	House quality index (3 parts' materials)
Ground	0.5892	0.6058
Wall	0.5177	0.5415
Roof	0.5694	0.5829
Room	0.1418	
Kitchen	0.2012	
Proportion of total variance explained	40%	64.30%
Observations	455,764	482,495

Notes: The weights on the Table are from principal component analyses (PCA) applied on the list of materials used in parts of the household house. For each index, larger values read as higher quality of house.

B. Calculation of indices of perceived political instability and summary statistics

Table S.2.3: Variables used for calculating the dimensions of perceived instability

Dimension of perceived instability	Variable used in calculation ^(a)	Interpretation of the dimension's values...
Safety or crime in residential area (<i>safety</i>)	Q11a. How often feared crime in home; Q11b. How often something stolen from house; Q11c. How often physically attacked	Higher crime means higher likelihood of instability
Engagement or participation in community affairs (<i>engage</i>)	Q25b. Attend a community meeting; Q25c. Join others to raise an issue; Q25d. Attend a demonstration or protest march	Higher citizen engagement in community affairs means higher likelihood of instability
Freedom of opinion (<i>freeop</i>)	Q15a. Freedom to say what you think; Q15b. Freedom to join any political organizations	Lesser citizen freedom of opinion and organization means higher likelihood of instability
Get news from the media (<i>getnews</i>)	Q26a. Radio news; Q26b. Television news; Q26c. Newspaper news	Better informed citizens means higher likelihood of instability
Political violence (<i>polviol</i>)	Q41b. Party competition leads to conflict; Q47. How much fear political intimidation or violence	Higher political violence means higher likelihood of instability
Free and fair elections (<i>elfreefair</i>)	Q45. Elections free and fair	Unfair and lesser free elections means higher likelihood of instability
Limit presidential terms (<i>term2</i>)	Q32. No term limits for president vs. two terms only	Higher preference for presidential term limits means higher likelihood of instability
Extent of democracy (<i>democ</i>)	Q37. How democratic is country; Q40. Satisfaction with democracy	Weaker democracy means higher likelihood of instability
Extent of discrimination (<i>discrim</i>)	Q41a. Careful about what you say; Q41d. People are treated unequally	Higher discrimination means higher likelihood of instability
Extent of impunity (<i>impuni</i>)	Q45e. How often ordinary people unpunished; Q45d. How often officials unpunished	The prevalence of more impunity means higher likelihood of instability
Country president ignores the Constitution (<i>consign</i>)	Q41c. President ignores the Constitution	The frequent breaches of the Constitution by the President means higher likelihood of instability

Table S.2.3 *continued ...*

Dimension of perceived instability	Variables used in calculation ^(a)	Interpretation of the dimension's higher values...
Trust in elective institutions (<i>truelins</i>)	Q43b. Trust Parliament/National Assembly; Q43c. Trust the National Electoral Commission; Q43f. Trust the ruling party	Lower trust in the elective institutions means higher likelihood of instability
Trust in executive institutions (<i>truexins</i>)	Q43i. Trust the police; Q43j. Trust courts of law	Lower trust in the police and justice bodies means higher likelihood of instability
Political instability as country's major issue (<i>improbpi</i>)	Q44pt1. Most important problems (considered responses where political instability is named as the first, second or third problem)	An increasing worries about political instability means higher likelihood of instability
Performance of elective institutions (<i>perelins</i>)	Q48a. Performance: President; Q48b. Performance: Member of Parliament; Q48d. Performance: Local Government / Official / Assembly	Lower performance of the elective institutions means higher likelihood of instability
Corruption in elective institutions (<i>corelins</i>)	Q51a. Corruption: office of the Presidency; Q56b. Corruption: Members of Parliament; Q56c. Corruption: local government councilors	Higher corruption in elective institutions means higher likelihood of instability
Corruption in executive institutions (<i>corexins</i>)	Q51c. Corruption: government officials; Q51d. Corruption: police; Q51f. Corruption: judges and magistrates; Q56g. Corruption: tax officials	Higher corruption in executive institutions means higher likelihood of instability
Ethnic discrimination (<i>ethnicdiscr</i>)	Q56. Identity group treated unfairly	Higher ethnic discrimination means higher likelihood of instability

Notes: The dimensions are in parentheses. (a) Question numbers are those for Afrobarometer survey round 2, but the same questions were asked in rounds 3, 4, 5, and 6 used in this study. The questions' response options are ordinal Likert scale or binary zero-one. I coded as missing values responses coded as "Don't know," "Refused or preferred not to answer," "Missing data," or "Not applicable."

Source: Afrobarometer survey's rounds 2, 3, 4, 5, and 6.

Table S.2.4: Dimensions used for calculating the indices of perceived instability

Indices	Dimensions
<i>Pima; pimas</i>	Safety getnews democ discrim consign truelins truexins prinsta perelins corelins freeop polviol term2 impuni corexins
<i>Pima2; pimas2</i>	Getnews democ discrim consign truelins truexins prinsta perelins
<i>Pisi; Pisis</i>	Safety democ discrim consign truelins truexins perelins corelins freeop polviol term2 impuni corexins
<i>Pisi2; Pisi2sa</i>	Democ discrim consign truelins truexins perelins

Notes: For each index, higher values read as higher perceived instability. Indices in italic, e.g. *pimasa*, are calculated as non-weighted averages of their dimensions, and the other indices are the first components of principal component analyses (PCA) applied on their dimensions. Details on the dimensions are presented in Table S.2.3.

Source: Own representation.

Table S.2.5: Weights of the dimensions of the perceived instability indices

Dimension	Pima	Pima2	Pisi	Pisi2
Safety or crime in residential area (<i>safety</i>)	0.060		0.061	
Get news from the media (<i>getnews</i>)	0.096	0.116		
Extent of democracy (<i>democ</i>)	0.300	0.326	0.302	0.331
Extent of discrimination (<i>discrim</i>)	0.250	0.210	0.252	0.213
Country president ignores the Constitution (<i>consign</i>)	0.251	0.269	0.254	0.272
Trust in elective institutions (<i>truelins</i>)	0.491	0.579	0.492	0.581
Trust in executive institutions (<i>truexins</i>)	0.442	0.529	0.444	0.529
Political instability as country's major issue (<i>improbpi</i>)	0.018	0.016		
Performance of elective institutions (<i>perelins</i>)	0.326	0.386	0.327	0.391
Corruption in elective institutions (<i>corelins</i>)	0.195		0.196	
Corruption in executive institutions (<i>corexins</i>)	0.209		0.2103	
Freedom of opinion (<i>freeop</i>)	0.201		0.205	
Political violence (<i>polviol</i>)	0.203		0.206	
Limit presidential terms (<i>term2</i>)	0.175		0.172	
Extent of impunity (<i>impuni</i>)	0.184		0.186	
Proportion of total variance explained	22.98%	34.28%	25.38%	40.90%
Observations	22,241	38,840	22,335	39,056

Notes: The weights on the Table are from principal component analyses (PCA) applied on the dimensions of the indices. PCAs were performed on the matrices of covariance. For each index, higher values read as higher perceived instability.

Source: Afrobarometer survey's rounds 2, 3, 4, 5, and 6.

Table S.2.6: Summary statistics of perceived instability indices

Index	Observation	Mean	SD	Minimum	Maximum
pimasaz	552,333	0.238	0.942	-2.49	3.42
pimasa2z	552,333	0.26	0.978	-2.21	3.16
pimaz	406,875	0.313	0.989	-1.94	2.88
pima2z	551,275	0.261	0.915	-2.52	3.01
Pisisaz	552,333	0.223	0.89	-2.54	3.48
Pisi2saz	552,333	0.267	0.927	-2.36	3.15
Pisiz	406,875	0.314	0.982	-1.95	2.87
Pisi2z	551,275	0.267	0.905	-2.59	3.01

Notes: The indices are standardized. SD stands for standard deviation.

Source: Afrobarometer survey's rounds 2, 3, 4, 5, and 6.

C. Pairwise correlation between indices of perceived instability and events of political instability

Table S.2.7: Pairwise correlation between indices of perceived instability

Index & Event	Pima	Pima2	Pisi	Pisi2	Pimasa	Pimasa2	Pisisa	Pisi2sa
Pima	1							
Pima2	0.967*	1						
Pisi	0.999*	0.963*	1					
Pisi2	0.967*	0.998*	0.966*	1				
Pimasa	0.945*	0.928*	0.938*	0.919*	1			
Pimasa2	0.922*	0.949*	0.912*	0.937*	0.958*	1		
Pisisa	0.959*	0.926*	0.957*	0.927*	0.977*	0.911*	1	
Pisi2sa	0.947*	0.972*	0.945*	0.972*	0.938*	0.961*	0.944*	1

Notes: * Bonferroni-adjusted significance level $p < 0.01$. The table shows coefficients of pairwise correlation between perceived instability indices and instability events. The indice names ending with 'sa' are calculated as unweighted averages of the dimensions (see Table S.2.4).

Table S.2.8: Pairwise correlation between indices of perceived instability and events of political instability

Index & Event	Pima	Pima2	Pisi	Pisi2	Pimasa	Pimasa2	Pisisa	Pisi2sa	Levent	Levent(-1)	Levent(-2)
Pima	1										
Pima2	0.967*	1									
Pisi	0.999*	0.963*	1								
Pisi2	0.967*	0.998*	0.966*	1							
Pimasa	0.945*	0.928*	0.938*	0.919*	1						
Pimasa2	0.922*	0.949*	0.912*	0.937*	0.958*	1					
Pisisa	0.959*	0.926*	0.958*	0.927*	0.977*	0.911*	1				
Pisi2sa	0.947*	0.972*	0.945*	0.972*	0.938*	0.961*	0.944*	1			
Levent	0.529*	0.497*	0.513*	0.481*	0.536*	0.551*	0.467*	0.476*	1		
Levent(-1)	0.492*	0.463*	0.479*	0.450*	0.520*	0.516*	0.460*	0.441*	0.914*	1	
Levent(-2)	0.494*	0.435*	0.481*	0.424*	0.477*	0.462*	0.438*	0.417*	0.862*	0.878*	1

Notes: * Bonferroni-adjusted significance level $p < 0.01$. The table shows coefficients of pairwise correlation between perceived instability indices and instability events. Shown are the logs of events, and their number of year-lags in parentheses. Source: Afrobarometer survey's rounds 2, 3, 4, 5, and 6.

D. Summary statistics of events of political instability

Table S.2.9: Summary statistics of country political violence and protest events between 2000 and 2016

Country	Observations	Mean	Standard deviation	Minimum	Maximum
Benin	95	5.51	4	1	12
Burkina Faso	662	23.70	23	1	66
Burundi	5,218	190.00	268	1	798
Ghana	460	10.50	8	1	30
Kenya	4,631	62.90	46	1	213
Lesotho	66	5.36	4	1	11
Liberia	1,122	64.50	47	1	136
Madagascar	821	36.00	29	1	93
Malawi	308	14.00	9	1	30
Mali	1,211	46.00	28	1	96
Namibia	582	19.90	18	1	56
Nigeria	9,288	223.00	147	1	527
Senegal	782	20.60	16	1	59
Sierra Leone	917	217.00	180	1	412
Tanzania	645	7.16	6	1	26
Togo	199	20.10	16	1	46
Uganda	3,944	207.00	189	4	565
Zambia	1,046	27.20	19	1	65
Zimbabwe	5,107	79.30	59	1	202
Total	37,104	135	166	1	798

Source: Armed Conflict Location and Events Data (ACLED).

Table S.2.10: Summary statistics of yearly political violence and protest events in sample countries

Year	Observations	Mean	Standard deviation	Minimum	Maximum
2000	2,298	123	140	1	412
2001	1,953	58.9	40.7	1	136
2002	2,417	124	131	1	402
2003	2,078	208	225	1	565
2004	1,364	114	115	1	306
2005	1,218	77.2	83.4	1	232
2006	1,012	73.5	81.1	1	221
2007	1,200	67.3	49.8	1	135
2008	1,805	98.8	73.6	1	213
2009	1,022	42.1	35.5	1	113
2010	1,224	56	50.6	1	143
2011	1,309	51.2	47.3	1	149
2012	2,564	105	110	1	355
2013	2,936	111	96.6	1	330
2014	3,389	169	169	1	497
2015	5,025	267	277	1	798
2016	4,290	144	127	1	374
Total	37,104	135	166	1	798

Source: Armed Conflict Location and Events Data (ACLED).

E. Full regression results

Table S.2.11a: Full regression results for the overall effects

Outcomes	Ownership of financial accounts		Assets (z-score)	
	Regression without interaction term	Regression with interaction term	Regression without interaction term	Regression with interaction term
Covariates	(1)	(2)	(3)	(4)
Events	-0.086*** (0.022)	-0.082*** (0.023)	0.089 (0.062)	0.089 (0.064)
Perceived index PCA	-0.007 (0.009)	-0.011 (0.010)	0.025 (0.015)	0.023 (0.015)
Index PCA x Events		-0.014* (0.009)		-0.009 (0.013)
Between-country spillover	0.003 (0.019)	-0.008 (0.020)	0.406*** (0.052)	0.397*** (0.051)
# years between DHS and Afrobarometer surveys	-0.219*** (0.050)	-0.252*** (0.056)	0.584*** (0.058)	0.563*** (0.067)
Household size squared	0.000*** (0.000)	0.000*** (0.000)	-0.000 (0.000)	-0.000 (0.000)
Household size	-0.005*** (0.001)	-0.005*** (0.001)	0.030*** (0.005)	0.030*** (0.005)
Household head is male	0.030*** (0.005)	0.030*** (0.005)	0.263*** (0.021)	0.264*** (0.021)
Household head age squared	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
Household head age	0.007*** (0.001)	0.007*** (0.001)	0.026*** (0.002)	0.026*** (0.002)
Household head education: primary	-0.002 (0.004)	-0.002 (0.004)	0.185*** (0.012)	0.185*** (0.012)
Household head education: secondary	0.107*** (0.010)	0.107*** (0.010)	0.497*** (0.018)	0.498*** (0.018)
Household head education: tertiary	0.451*** (0.014)	0.452*** (0.014)	1.291*** (0.037)	1.291*** (0.037)
# household members with primary education	-0.006*** (0.001)	-0.006*** (0.001)	0.028*** (0.004)	0.028*** (0.004)
# household members with secondary education	0.045*** (0.003)	0.045*** (0.003)	0.202*** (0.009)	0.202*** (0.009)
# household members with tertiary education	0.145*** (0.008)	0.145*** (0.008)	0.709*** (0.024)	0.710*** (0.024)
# household member under age 16	0.001 (0.001)	0.001 (0.001)	-0.022*** (0.005)	-0.022*** (0.005)
Household reside in an urban area	0.116*** (0.010)	0.115*** (0.010)	0.499*** (0.025)	0.499*** (0.025)
Household head occupation: agriculture	-0.055*** (0.009)	-0.055*** (0.009)	-0.300*** (0.026)	-0.300*** (0.026)
Household head occupation: industry	-0.037*** (0.005)	-0.037*** (0.005)	-0.060*** (0.008)	-0.060*** (0.009)
Household head occupation: services	0.045*** (0.005)	0.046*** (0.005)	0.045** (0.018)	0.046** (0.018)

Table S.2.11a *continued*

VARIABLES	Ownership of financial accounts		Assets (z-score)	
	Regression without interaction term	Regression with interaction term	Regression without interaction term	Regression with interaction term
	(1)	(2)	(3)	(4)
Nighttime light in current year	(0.007)	(0.007)	-0.062	-0.055
	-0.019	-0.010	(0.043)	(0.043)
Nighttime light last year	(0.035)	(0.036)	0.036	0.031
	-0.007	-0.015	(0.053)	(0.053)
Nighttime light last two years	(0.029)	(0.030)	0.047	0.047
	-0.005	-0.005	(0.040)	(0.040)
Average rainfall	(0.029)	(0.029)	0.143***	0.141***
	0.014	0.009	(0.040)	(0.040)
Coefficient of variation of rainfall	(0.020)	(0.020)	-0.233***	-0.237***
	-0.117***	-0.125***	(0.067)	(0.066)
Household distance to nearest potable water	(0.043)	(0.044)	-0.047***	-0.047***
	-0.010***	-0.010***	-0.062	-0.055
Constant	(0.001)	(0.001)	(0.043)	(0.043)
	(0.007)	(0.007)	0.036	0.031
Full set of controls	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
Country-specific time FE	Yes	Yes	Yes	Yes
R-squared	0.513	0.514	0.537	0.537
Observations	223,146	223,143	228,506	228,508
Region-groups	172	172	172	172

Notes: Table S.2.11a shows regression coefficients for two outcomes – ownership of financial accounts and assets. Column 1 shows the results from a regression that includes perceived instability and events, but not an interaction between both, while column 2 shows the results from the same regression, but including an interaction between perceived instability and events. Used are weighted events, i.e. the sum of events in residential and neighboring regions each time weighted by the distance to the centroid in that neighboring region. Perceived index PCA = proxy for perceived political instability calculated by principal component analysis (PCA) on eight dimensions of perceived instability drawn from Afrobarometer surveys. Higher values of the index read as higher levels of perceived instability. Ownership of financial accounts is a dummy equals one if at least one household member owns a bank or other financial accounts. Assets is measured as an index calculated by PCA on nine asset items. The regressions include the full set of the controls, region fixed-effects, and country-specific time trends. Robust standard errors clustered at the region level in parentheses. For the marginal effects, standard errors are calculated by the Delta-method. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table S.2.11b: Full regression results for the overall effects

Outcomes	House improvements (z-score)		Enrollment in post-primary schools (net rate)	
	Regression without interaction term	Regression with interaction term	Regression without interaction term	Regression with interaction term
Covariates	(1)	(2)	(3)	(4)
Events	0.193** (0.078)	0.215*** (0.075)	-0.005 (0.008)	-0.005 (0.008)
Perceived index PCA	0.017 (0.028)	0.007 (0.025)	-0.005 (0.003)	-0.004 (0.003)
Index PCA x Events		-0.050** (0.022)		0.006** (0.003)
Between-country spillover	0.009 (0.069)	-0.018 (0.071)	0.024*** (0.009)	0.028*** (0.009)
# years between DHS and Afrobarometer surveys	0.246** (0.097)	0.138 (0.100)	-0.015 (0.014)	-0.001 (0.015)
Household size squared	0.002*** (0.000)	0.002*** (0.000)	-0.000 (0.000)	-0.000 (0.000)
Household size	-0.076*** (0.009)	-0.075*** (0.009)	-0.044*** (0.006)	-0.044*** (0.006)
Household head is male	-0.024* (0.013)	-0.024* (0.013)	-0.027*** (0.004)	-0.027*** (0.004)
Household head age squared	-0.000*** (0.000)	-0.000*** (-0.000)	-0.000*** (0.000)	-0.000*** (0.000)
Household head age	0.017*** (0.003)	0.017*** (0.003)	0.010*** (0.001)	0.010*** (0.001)
Household head education: primary	0.202*** (0.021)	0.202*** (0.021)	0.016*** (0.002)	0.016*** (0.002)
Household head education: secondary	0.521*** (0.026)	0.522*** (0.026)	0.025*** (0.003)	0.025*** (0.003)
Household head education: tertiary	0.740*** (0.039)	0.741*** (0.039)	0.058*** (0.006)	0.058*** (0.006)
# household members with primary education	0.068*** (0.006)	0.068*** (0.006)	0.010*** (0.001)	0.010*** (0.001)
# household members with secondary education	0.181*** (0.010)	0.181*** (0.010)	0.178*** (0.003)	0.178*** (0.003)
# household members with tertiary education	0.150*** (0.017)	0.150*** (0.017)	0.118*** (0.007)	0.118*** (0.007)
# household member under age 16	0.008 (0.006)	0.008 (0.006)	0.045*** (0.005)	0.045*** (0.005)
Household reside in an urban area	0.784*** (0.055)	0.784*** (0.055)	0.011*** (0.002)	0.011*** (0.002)
Household head occupation: agriculture	-0.471*** (0.031)	-0.470*** (0.031)	-0.011*** (0.002)	-0.011*** (0.002)
Household head occupation: industry	-0.036*** (0.014)	-0.035** (0.014)	-0.014*** (0.002)	-0.013*** (0.002)
Household head occupation: services	0.017 (0.017)	0.019 (0.017)	-0.017*** (0.004)	-0.017*** (0.004)

Table S.2.11b *continued*

VARIABLES	House improvements (z-score)		Enrollment in post-primary schools (net rate)	
	Regression without interaction term	Regression with interaction term	Regression without interaction term	Regression with interaction term
	(1)	(2)	(3)	(4)
Nighttime light in current year	0.107 (0.082)	0.125 (0.078)	0.041*** (0.010)	0.036*** (0.010)
Nighttime light last year	0.107 (0.108)	0.083 (0.100)	-0.028** (0.014)	-0.023* (0.014)
Nighttime light last two years	0.064 (0.102)	0.055 (0.105)	0.013 (0.011)	0.013 (0.011)
Average rainfall	-0.175*** (0.063)	-0.192*** (0.063)	0.007 (0.008)	0.009 (0.008)
Coefficient of variation of rainfall	0.063 (0.115)	0.008 (0.117)	-0.032** (0.014)	-0.030** (0.014)
Household distance to nearest potable water	-0.094*** (0.013)	-0.094*** (0.013)	-0.000 (0.001)	-0.000 (0.001)
Constant	0.107 (0.082)	0.125 (0.078)	0.041*** (0.010)	0.036*** (0.010)
Full set of controls	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
Country-specific time FE	Yes	Yes	Yes	Yes
R-squared	0.558	0.558	0.530	0.530
Observations	196,819	196,827	133,233	133,230
Region-groups	169	169	172	172

Notes: Table S.2.11b shows regression coefficients along with the average marginal effects for two outcomes – house improvements and enrollment in post-primary schools (net rate). Column 1 shows the results from a regression that includes perceived instability and events, but not an interaction between both, while column 2 shows the results from the same regression, but including an interaction between perceived instability and events. Used are weighted events, i.e. the sum of events in residential and neighboring regions each time weighted by the distance to the centroid in that neighboring region. Perceived index PCA = proxy for perceived political instability calculated by principal component analysis (PCA) on eight dimensions of perceived instability drawn from Afrobarometer surveys. Higher values of the index read as higher levels of perceived instability. House improvements is measured as an index calculated by PCA on the quality of materials used for important parts of the house. The net rate of enrollment in post-primary schools is the ratio of the number of household members who are enrolled in post-primary education and who are in that level's legal age group to the number of members in that level's legal age group. The regressions include the full set of the controls, region fixed-effects, and country-specific time trends. Robust standard errors clustered at the region level in parentheses. For the marginal effects, standard errors are calculated by the Delta-method. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table S.2.12: Full regression results for the heterogeneous effect by wealth status

Covariates	(1) Ownership of financial accounts	(2) Assets (z-score)	(3) House improvements	(4) Enrollment in p.p. schools
Poor (=1)	-0.051*** (0.009)	-0.660*** (0.021)	-1.477*** (0.052)	-0.013*** (0.003)
Events	-0.028 (0.023)	0.121** (0.053)	0.222** (0.106)	-0.016* (0.008)
Perceived index PCA	-0.010 (0.010)	0.065*** (0.017)	0.091*** (0.032)	-0.003 (0.004)
Poor (=1) x Events	-0.053*** (0.009)	-0.023 (0.021)	0.029 (0.036)	0.000 (0.000)
Poor (=1) x Index PCA	0.010 (0.008)	-0.087*** (0.021)	-0.244*** (0.037)	0.014*** (0.002)
Events x Index PCA	-0.007 (0.009)	0.011 (0.015)	0.008 (0.027)	0.000 (0.000)
Events x Index PCA x Poor (=1)	-0.019*** (0.007)	-0.043** (0.018)	-0.122*** (0.030)	-0.004* (0.002)
Between-country spillover	0.001 (0.019)	0.417*** (0.050)	0.028 (0.070)	0.001 (0.003)
# years between DHS and Afrobarometer surveys	-0.254*** (0.050)	0.570*** (0.069)	0.025 (0.093)	0.000 (0.000)
Household size squared	0.000*** (0.000)	-0.001*** (0.000)	0.001*** (0.000)	0.009*** (0.002)
Household size	-0.003*** (0.001)	0.050*** (0.004)	-0.037*** (0.005)	0.026*** (0.009)
Household head is male	0.028*** (0.006)	0.245*** (0.021)	-0.049*** (0.009)	-0.002 (0.017)
Household head age squared	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000 (0.000)
Household head age	0.007*** (0.001)	0.022*** (0.002)	0.009*** (0.002)	-0.044*** (0.006)
Household head education: primary	-0.003 (0.004)	0.123*** (0.011)	0.058*** (0.012)	-0.028*** (0.004)
Household head education: secondary	0.096*** (0.008)	0.356*** (0.015)	0.210*** (0.014)	-0.000*** (0.000)
Household head education: tertiary	0.424*** (0.015)	1.077*** (0.035)	0.331*** (0.031)	0.010*** (0.001)
# household members with primary education	-0.008*** (0.001)	0.007** (0.003)	0.022*** (0.004)	0.015*** (0.002)
# household members with secondary education	0.041*** (0.003)	0.157*** (0.008)	0.088*** (0.009)	0.023*** (0.003)
# household members with tertiary education	0.139*** (0.008)	0.666*** (0.024)	0.093*** (0.013)	0.057*** (0.006)
# household member under age 16	0.000 (0.001)	-0.020*** (0.004)	0.011*** (0.004)	0.010*** (0.001)
Household reside in an urban area	0.095*** (0.009)	0.288*** (0.019)	0.350*** (0.034)	0.178*** (0.003)

Table S.2.12 *continued*

Covariates	(1) Ownership of financial accounts	(2) Assets (z-score)	(3) House improvements	(4) Enrollment in p.p. schools
Household head occupation: agriculture	-0.051*** (0.008)	-0.191*** (0.018)	-0.194*** (0.015)	-0.009*** (0.002)
Household head occupation: industry	-0.038*** (0.005)	-0.062*** (0.008)	-0.038*** (0.009)	-0.014*** (0.002)
Household head occupation: services	0.042*** (0.006)	0.029* (0.016)	-0.007 (0.014)	-0.017*** (0.004)
Nighttime light in current year	0.011 (0.034)	-0.016 (0.043)	0.137* (0.079)	0.032*** (0.011)
Nighttime light last year	-0.032 (0.029)	-0.010 (0.052)	-0.034 (0.123)	-0.021 (0.014)
Nighttime light last two years	0.009 (0.029)	0.069** (0.033)	0.079 (0.128)	0.013 (0.011)
Average rainfall	0.012 (0.019)	0.196*** (0.038)	-0.069 (0.070)	0.010 (0.008)
Coefficient of variation of rainfall	-0.105** (0.042)	-0.171*** (0.062)	0.065 (0.133)	-0.029** (0.014)
Household distance to nearest potable water	-0.008*** (0.001)	-0.028*** (0.004)	-0.040*** (0.008)	-0.000 (0.001)
Constant	-0.051*** (0.008)	-0.191*** (0.018)	-0.194*** (0.015)	-0.009*** (0.002)
Full set of controls	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
Country-specific time FE	Yes	Yes	Yes	Yes
R-squared	0.511	0.573	0.703	0.530
Observations	224,299	228,863	197,553	133,284
Region-groups	172	172	169	172

Notes: Table S.2.12 shows regression coefficients along with the average marginal effects for four outcomes. Used are weighted events, i.e. the sum of events in residential and neighboring regions each time weighted by the distance to the centroid in that neighboring region. Perceived index PCA = proxy for perceived political instability calculated by PCA on eight dimensions of perceived instability drawn from Afrobarometer surveys. Higher values of the index read as higher levels of perceived instability. Poor (=1) = a dummy equals one for poor households. Ownership of financial accounts is a dummy equals one if at least one household member owns a bank or other financial accounts. Assets are measured as an index calculated by PCA on nine asset items. House improvements is measured as an index calculated by PCA on the quality of materials used for important parts of the house. The net rate of enrollment in post-primary schools is the ratio of the number of household members who are enrolled in post-primary education and who are in that level's legal age group to the number of members in that level's legal age group. The regressions include the full set of the controls, region fixed-effects, and country-specific time trends. Robust standard errors clustered at the region level in parentheses. For the marginal effects, standard errors are calculated by the Delta-method. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

F. Results of regressions including outlier observations

Table S.2.13, S.2.14, and S.2.15 show regression results when outliers are not dropped. Outliers are those values for which when the full sample is considered the regression residuals are larger than two times the standard errors of these residuals.

Table S.2.13: Effects of political instability on the outcomes

Outcomes	Panel A: Ownership of financial accounts		Panel B: Assets (z-score)	
	Regression without interaction term	Regression with interaction term	Regression without interaction term	Regression with interaction term
Covariates and marginal effects	(1)	(2)	(3)	(4)
Events	-0.050** (0.025)	-0.049* (0.027)	0.101* (0.052)	0.104* (0.056)
Perceived index PCA	-0.009 (0.011)	-0.011 (0.011)	0.025 (0.016)	0.022 (0.016)
Index PCA x Events		-0.006 (0.011)		-0.015 (0.014)
Full set of controls	Yes	Yes	Yes	Yes
Country-time FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
R-squared	0.383	0.383	0.494	0.494
Observations	238,776	238,776	238,433	238,433
Region-groups	172	172	172	172

Notes: Table S.2.13 shows regression coefficients for two outcomes – ownership of financial accounts and assets. Column 1 shows the results from a regression that includes perceived instability and events, but not an interaction between both, while column 2 shows the results from the same regression, but including an interaction between perceived instability and events. Used are weighted events, i.e. the sum of events in residential and neighboring regions each time weighted by the distance to the centroid in that neighboring region. Perceived index PCA = proxy for perceived political instability calculated by principal component analysis (PCA) on eight dimensions of perceived instability drawn from Afrobarometer surveys. Higher values of the index read as higher levels of perceived instability. Ownership of financial accounts is a dummy equals one if at least one household member owns a bank or other financial accounts. Assets is measured as an index calculated by PCA on nine asset items. The regressions include the full set of the controls, region fixed-effects, and country-specific time trends. Robust standard errors clustered at the region level in parentheses. For the marginal effects, standard errors are calculated by the Delta-method. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table S.2.14: Effects of political instability on the outcomes

Outcomes	Panel A: House improvements (z-score)		Panel B: Enrollment in post- primary schools (net rate)	
	Regression without interaction term	Regression with interaction term	Regression without interaction term	Regression with interaction term
Covariates and marginal effects	(1)	(2)	(3)	(4)
Events	0.174** (0.078)	0.192** (0.076)	0.002 (0.013)	0.001 (0.013)
Perceived index PCA	0.011 (0.027)	0.004 (0.025)	-0.007* (0.004)	-0.006 (0.004)
Index PCA x Events		-0.040* (0.021)		0.004 (0.004)
Full set of controls	Yes	Yes	Yes	Yes
Country-time FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
R-squared	0.499	0.499	0.400	0.400
Observations	201,740	201,740	143,211	143,211
Region-group	169	169	172	172

Notes: Table S.2.14 shows regression coefficients for two outcomes – house improvements and enrollment in post-primary schools (net rate). Column 1 shows the results from a regression that includes perceived instability and events, but not an interaction between both, while column 2 shows the results from the same regression, but including an interaction between perceived instability and events. Used are weighted events, i.e. the sum of events in residential and neighboring regions each time weighted by the distance to the centroid in that neighboring region. Perceived index PCA = proxy for perceived political instability calculated by principal component analysis (PCA) on eight dimensions of perceived instability drawn from Afrobarometer surveys. Higher values of the index read as higher levels of perceived instability. House improvements is measured as an index calculated by PCA on the quality of materials used for important parts of the house. The net rate of enrollment in post-primary schools is the ratio of the number of household members who are enrolled in post-primary education and who are in that level's legal age group to the number of members in that level's legal age group. The regressions include the full set of the controls, region fixed-effects, and country-specific time trends. Robust standard errors clustered at the region level in parentheses. For the marginal effects, standard errors are calculated by the Delta-method. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table S.2.15: Heterogeneous effects by wealth status

	(1)	(2)	(3)	(4)
Covariates and marginal effects	Ownership of financial accounts	Assets (z-score)	House improvements	Enrollment in p.p. schools
Poor (=1)	-0.100*** (0.007)	-0.749*** (0.029)	-1.434*** (0.047)	-0.028*** (0.003)
Events	-0.009 (0.023)	0.138*** (0.044)	0.247** (0.116)	-0.008 (0.013)
Perceived index PCA	-0.015 (0.011)	0.065*** (0.019)	0.085** (0.034)	-0.008* (0.004)
Poor (=1) x Events	-0.053*** (0.008)	-0.003 (0.024)	0.028 (0.035)	0.009*** (0.003)
Poor (=1) x Index PCA	0.015** (0.007)	-0.104*** (0.026)	-0.212*** (0.038)	0.001 (0.002)
Events x Index PCA	-0.000 (0.011)	0.008 (0.017)	0.003 (0.028)	-0.001 (0.004)
Events x Index PCA x Poor (=1)	-0.016** (0.006)	-0.068*** (0.020)	-0.115*** (0.030)	0.011*** (0.002)
Full set of controls	Yes	Yes	Yes	Yes
Country-time FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
R-squared	0.397	0.536	0.665	0.401
Observations	238,776	238,433	201,740	143,211
Region-group	172	172	169	172

Notes: Table S.2.15 shows regression coefficients for four outcomes. Used are weighted events, i.e. the sum of events in residential and neighboring regions each time weighted by the distance to the centroid in that neighboring region. Perceived index PCA = proxy for perceived political instability calculated by PCA on eight dimensions of perceived instability drawn from Afrobarometer surveys. Higher values of the index read as higher levels of perceived instability. Poor (=1) = a dummy equals one for poor households. Ownership of financial accounts is a dummy equals one if at least one household member owns a bank or other financial accounts. Assets are measured as an index calculated by PCA on nine asset items. House improvements is measured as an index calculated by PCA on the quality of materials used for important parts of the house. The net rate of enrollment in post-primary schools is the ratio of the number of household members who are enrolled in post-primary education and who are in that level's legal age group to the number of members in that level's legal age group. The regressions include the full set of the controls, region fixed-effects, and country-specific time trends. Robust standard errors clustered at the region level in parentheses. For the marginal effects, standard errors are calculated by the Delta-method. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

G. Results of regressions on events in residential regions

Tables S.2.16, S.2.17, and S.2.18 show regression results when outliers are dropped and factual political instability is measured by events in residential regions only, i.e. not taking into account events in neighboring regions.

Table S.2.16: Effects of political instability on the outcomes

Outcomes	Panel A: ownership of financial accounts		Panel B: Assets (z-score)	
	Regression without interaction term	Regression with interaction term	Regression without interaction term	Regression with interaction term
Covariates and marginal effects	(1)	(2)	(3)	(4)
Events	-0.004 (0.014)	0.000 (0.014)	0.020 (0.022)	0.019 (0.024)
Perceived index PCA	-0.006 (0.009)	-0.008 (0.009)	0.021 (0.015)	0.022 (0.016)
Index PCA x Events		-0.010 (0.008)		0.000 (0.012)
Full set of controls	Yes	Yes	Yes	Yes
Country-time FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
R-squared	0.513	0.513	0.537	0.537
Observations	223,165	223,188	228,509	228,513
Region-groups	172	172	172	172

Notes: Table S.2.16 shows regression coefficients along with the average marginal effects for two outcomes – ownership of financial accounts and assets. Column 1 shows the results from a regression that includes perceived instability and events, but not an interaction between both, while column 2 shows the results from the same regression, but including an interaction between perceived instability and events. Used are weighted events, i.e. the sum of events in residential and neighboring regions each time weighted by the distance to the centroid in that neighboring region. Perceived index PCA = proxy for perceived political instability calculated by principal component analysis (PCA) on eight dimensions of perceived instability drawn from Afrobarometer surveys. Higher values of the index read as higher levels of perceived instability. Financial inclusion is a dummy equals one if at least one household member owns a bank account. Assets are measured as an index calculated by PCA on nine asset items. The regressions include the full set of the controls, region fixed effects, and country-specific time trends. Robust standard errors clustered at the region level in parentheses. For the marginal effects, standard errors are calculated by the Delta-method. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table S.2.17: Effects of political instability on the outcomes

Outcomes	Panel A: House improvements (z-score)		Panel B: Enrollment in post- primary schools (net rate)	
	Regression without interaction term	Regression with interaction term	Regression without interaction term	Regression with interaction term
	(1)	(2)	(3)	(4)
Covariates and marginal effects				
Events	0.038 (0.048)	0.051 (0.047)	-0.005 (0.004)	-0.006 (0.004)
Perceived index PCA	0.016 (0.037)	0.014 (0.036)	-0.004 (0.003)	-0.004 (0.003)
Index PCA x Events		-0.020 (0.019)		0.002 (0.002)
Full set of controls	Yes	Yes	Yes	Yes
Country-time FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
R-squared	0.558	0.558	0.530	0.530
Observations	196,819	196,825	133,232	133,236
Region-group	169	169	172	172

Notes: Table S.2.17 shows regression coefficients along with the average marginal effects for two outcomes – house improvements and enrollment in post-primary schools (net rate). Column 1 shows the results from a regression that includes perceived instability and events, but not an interaction between both, while column 2 shows the results from the same regression, but including an interaction between perceived instability and events. Used are weighted events, i.e. the sum of events in residential and neighboring regions each time weighted by the distance to the centroid in that neighboring region. Perceived index PCA = proxy for perceived political instability calculated by principal component analysis (PCA) on eight dimensions of perceived instability drawn from Afrobarometer surveys. Higher values of the index read as higher levels of perceived instability. House improvements is measured as an index calculated by PCA on the quality of materials used for important parts of the house. The net rate of enrollment in post-primary schools is the ratio of the number of household members who are enrolled in post-primary education and who are in that level's legal age group to the number of members in that level's legal age group. The regressions include the full set of the controls, region fixed effects, and country-specific time trends. Robust standard errors clustered at the region level in parentheses. For the marginal effects, standard errors are calculated by the Delta-method. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table S.2.18: Heterogeneous effects by wealth status

	(1)	(2)	(3)	(4)
Covariates and marginal effects	Ownership of financial accounts	Assets (z-score)	House improvements	Enrollment in p.p. schools
Poor (=1)	-0.059*** (0.012)	-0.643*** (0.021)	-1.468*** (0.053)	-0.010*** (0.002)
Events	0.037*** (0.013)	0.026 (0.028)	0.032 (0.047)	-0.014*** (0.005)
Perceived index PCA	-0.013 (0.010)	0.069*** (0.017)	0.098*** (0.035)	-0.001 (0.003)
Poor (=1) x Events	-0.055*** (0.012)	-0.004 (0.024)	0.023 (0.046)	0.017*** (0.002)
Poor (=1) x Index PCA	0.012 (0.011)	-0.105*** (0.022)	-0.280*** (0.039)	-0.006** (0.002)
Events x Index PCA	-0.008 (0.009)	0.033** (0.013)	0.015 (0.028)	0.001 (0.002)
Events x Index PCA x Poor (=1)	-0.006 (0.010)	-0.078*** (0.021)	-0.105*** (0.037)	0.001 (0.002)
Full set of controls	Yes	Yes	Yes	Yes
Country-time FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
R-squared	0.510	0.573	0.703	0.530
Observations	224,246	228,854	197,500	133,276
Region-group	172	172	169	172

Notes: Table S.2.18 shows regression coefficients along with the average marginal effects for four outcomes. Used are weighted events, i.e. the sum of events in residential and neighboring regions each time weighted by the distance to the centroid in that neighboring region. Perceived index PCA = proxy for perceived political instability calculated by PCA on eight dimensions of perceived instability drawn from Afrobarometer surveys. Higher values of the index read as higher levels of perceived instability. Poor (=1) = a dummy equals one for poor households. Ownership of financial accounts is a dummy equals one if at least one household member owns a bank account. Assets are measured as an index calculated by PCA on nine asset items. House improvements is measured as an index calculated by PCA on the quality of materials used for important parts of the house. The net rate of enrollment in post-primary schools is the ratio of the number of household members who are enrolled in post-primary education and who are in that level's legal age group to the number of members in that level's legal age group. The regressions include the full set of the controls, region fixed effects, and country-specific time trends. Robust standard errors clustered at the region level in parentheses. For the marginal effects, standard errors are calculated by the Delta-method. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

H. Results of regressions including the ethnic group of the household head as a control variable

Tables S.2.19, S.2.20, and S.2.21 show regression results when outliers are dropped and the ethnic group of the household head is accounted for.

Table S.2.19: Effects of political instability on the outcomes

Outcomes	Panel A: ownership of financial accounts		Panel B: Assets (z-score)	
	Regression without interaction term	Regression with interaction term	Regression without interaction term	Regression with interaction term
	(1)	(2)	(3)	(4)
Events	-0.107*** (0.030)	-0.109*** (0.031)	0.093 (0.068)	0.099 (0.071)
Perceived index PCA	0.026* (0.013)	0.027* (0.014)	0.042* (0.021)	0.035* (0.021)
Index PCA x Events		0.002 (0.013)		-0.024 (0.019)
Full set of controls	Yes	Yes	Yes	Yes
Country-time FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
R-squared	0.492	0.492	0.530	0.530
Observations	76,110	76,110	77,040	77,040
Region-groups	90	90	90	90

Notes: Table S.2.19 shows regression coefficients along with the average marginal effects for two outcomes – ownership of financial accounts and assets. Column 1 shows the results from a regression that includes perceived instability and events, but not an interaction between both, while column 2 shows the results from the same regression, but including an interaction between perceived instability and events. Used are weighted events, i.e. the sum of events in residential and neighboring regions each time weighted by the distance to the centroid in that neighboring region. Perceived index PCA = proxy for perceived political instability calculated by principal component analysis (PCA) on eight dimensions of perceived instability drawn from Afrobarometer surveys. Higher values of the index read as higher levels of perceived instability. Financial inclusion is a dummy equals one if at least one household member owns a bank account. Assets are measured as an index calculated by PCA on nine asset items. The regressions include the full set of the controls, region fixed effects, and country-specific time trends. Robust standard errors clustered at the region level in parentheses. For the marginal effects, standard errors are calculated by the Delta-method. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table S.2.20: Effects of political instability on the outcomes

Outcomes	Panel A: House improvements (z-score)		Panel B: Enrollment in post- primary schools (net rate)	
	Regression without interaction term	Regression with interaction term	Regression without interaction term	Regression with interaction term
	(1)	(2)	(3)	(4)
Covariates and marginal effects				
Events	0.054 (0.089)	0.069 (0.092)	-0.014*** (0.005)	-0.013** (0.005)
Perceived index PCA	0.014 (0.041)	-0.005 (0.041)	-0.030** (0.014)	-0.030** (0.014)
Index PCA x Events		-0.057* (0.034)		0.004 (0.005)
Full set of controls	Yes	Yes	Yes	Yes
Country-time FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
R-squared	0.558	0.558	0.544	0.544
Observations	68798	68798	47901	47901
Region-group	87	87	90	90

Notes: Table S.2.20 shows regression coefficients along with the average marginal effects for two outcomes – house improvements and enrollment in post-primary schools (net rate). Column 1 shows the results from a regression that includes perceived instability and events, but not an interaction between both, while column 2 shows the results from the same regression, but including an interaction between perceived instability and events. Used are weighted events, i.e. the sum of events in residential and neighboring regions each time weighted by the distance to the centroid in that neighboring region. Perceived index PCA = proxy for perceived political instability calculated by principal component analysis (PCA) on eight dimensions of perceived instability drawn from Afrobarometer surveys. Higher values of the index read as higher levels of perceived instability. House improvements is measured as an index calculated by PCA on the quality of materials used for important parts of the house. The net rate of enrollment in post-primary schools is the ratio of the number of household members who are enrolled in post-primary education and who are in that level's legal age group to the number of members in that level's legal age group. The regressions include the full set of the controls, region fixed effects, and country-specific time trends. Robust standard errors clustered at the region level in parentheses. For the marginal effects, standard errors are calculated by the Delta-method. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table S.2.21: Heterogeneous effects by wealth status

	(1)	(2)	(3)	(4)
Covariates and marginal effects	Ownership of financial accounts	Assets (z-score)	House improvements	Enrollment in p.p. schools
Poor (=1)	-0.079*** (0.016)	-0.673*** (0.023)	-1.440*** (0.062)	-0.015*** (0.004)
Events	-0.011 (0.031)	0.179*** (0.055)	0.125 (0.101)	-0.046*** (0.014)
Perceived index PCA	0.005 (0.014)	0.071*** (0.025)	0.016 (0.045)	-0.006 (0.006)
Poor (=1) x Events	-0.099*** (0.019)	-0.005 (0.025)	-0.001 (0.047)	0.017*** (0.003)
Poor (=1) x Index PCA	0.043** (0.019)	-0.111*** (0.035)	-0.159*** (0.056)	-0.014*** (0.004)
Events x Index PCA	0.003 (0.014)	0.025 (0.019)	-0.030 (0.040)	0.003 (0.005)
Events x Index PCA x Poor (=1)	-0.005 (0.018)	-0.121*** (0.022)	-0.106** (0.042)	0.004 (0.004)
Full set of controls	Yes	Yes	Yes	Yes
Country-time FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
R-squared	0.499	0.569	0.686	0.544
Observations	76,399	77,152	69,200	47,933
Region-group	90	90	87	90

Notes: Table S.2.21 shows regression coefficients along with the average marginal effects for four outcomes. Used are weighted events, i.e. the sum of events in residential and neighboring regions each time weighted by the distance to the centroid in that neighboring region. Perceived index PCA = proxy for perceived political instability calculated by PCA on eight dimensions of perceived instability drawn from Afrobarometer surveys. Higher values of the index read as higher levels of perceived instability. Poor (=1) = a dummy equals one for poor households. Financial inclusion is a dummy equals one if at least one household member owns a bank account. Assets are measured as an index calculated by PCA on nine asset items. House improvements is measured as an index calculated by PCA on the quality of materials used for important parts of the house. The net rate of enrollment in post-primary schools is the ratio of the number of household members who are enrolled in post-primary education and who are in that level's legal age group to the number of members in that level's legal age group. The regressions include the full set of the controls, region fixed effects, and country-specific time trends. Robust standard errors clustered at the region level in parentheses. For the marginal effects, standard errors are calculated by the Delta-method. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table S.2.22: Between-country spillover effects of factual instability

Specification	(1) Financial inclusion	(2) Assets z-score	(3) House improvements	(4) Enrollment in p.p. school
Events + Perceived index PCA	0.209*** (0.046)	-0.190*** (0.050)	-0.090 (0.079)	-0.009 (0.009)
Index PCA x Events	0.210*** (0.046)	-0.200*** (0.050)	-0.106 (0.080)	-0.008 (0.009)
Events x Index PCA x poor(=1)	0.197*** (0.043)	0.417*** (0.050)	-0.153** (0.068)	0.016 (0.013)
Full set of controls	Yes	Yes	Yes	Yes
Country-time FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
R-squared	0.492	0.530	0.558	0.544
Observations	76,110	77,040	68,798	47,901
Regions	90	90	87	90

Notes: Each coefficient is from one regression. The coefficients are those on the spatial lag variable on country level log cumulative number of events in current and past two years, which was calculated following Kondo (2017). For each dependent variable, coefficients are from regressions that include both the corresponding independent variable and a spatial lag variable. Used are weighted events, i.e. the sum of events in residential and neighboring regions each time weighted by the distance to the centroid in that neighboring region. Perceived index PCA = proxy for perceived political instability calculated by PCA on eight dimensions of perceived instability drawn from Afrobarometer surveys. Higher values of the index read as higher levels of perceived instability. The dependent variable in col. (1) is a dummy equals one if at least one household member owns a bank account. In col. (2) it is an asset index calculated by principal component analysis (PCA) on nine assets. In col. (3) it is an index of house improvements calculated by PCA on the quality of materials used for house parts. In col. (4) it is the net rate of enrollment in post-primary schools. Events = the log cumulative number of events in current and past two years at country's regions level. Robust standard errors clustered at the region level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

I. Definitions of the control variables

Table S.2.23: Definitions of the control variables

Variable	Definition	Data source
Gap between survey years (yeargap)	Number of year separating a DHS and an Afrobarometer survey	DHS and Afrobarometer
<i>Household level</i>		DHS
Household size (hhsiz)	Total number of persons in the household.	
Gender of the household head (hheadsex)	Dummy = 1 if the household head is male.	
Age of the household head (hheadage)	Age of the household head.	
Education of the household head: no education (hheadnoedu)	Dummy = 1 if the household head has zero formal education level.	
Education of the household head: primary education (hheadpedu)	Dummy = 1 if primary education is the highest level reached by the household head.	
Education of the household head: secondary education (hheadsedu)	Dummy = 1 if secondary education is the highest level reached by the household head.	
Education of the household head: tertiary or higher education (hheadhedu)	Dummy = 1 if tertiary education is the highest level reached by the household head.	
Number of household members per education level: primary (hhpeduct)	Number of household members with primary education as the highest level.	
Number of household members per education level: secondary (hhseduct)	Number of household members with secondary education as the highest level.	
Number of household members per education level: tertiary (hhheduct)	Number of household members with tertiary education as the highest level.	
Household members aged less than 16 years (under16ct)	Number of household members below 16 years old.	
Residential location (urban)	Dummy = 1 if the household is located in an urban area.	
Distance to a potable water source (distwaterzs)	The time to the nearest potable water source (Z-score)	

Table S.2.23 *continued*

Variable	Definition	Data source
Occupational status of the household head: subsistence agriculture (hheadagri2)	Dummy = 1 if the household head's occupation is subsistence agriculture	
Occupational status of the household head: manufacturing sector (hheadmanu2)	Dummy = 1 if the household head works in the manufacturing sector	
Occupational status of the household head: services sector (hheadserv2)	Dummy = 1 if the household head works in the services sector	
Household is poor (poor)	Dummy = 1 if the household is categorized as poor according to a wealth index provided by the DHS	
<i>Country's region level</i>		
Nighttime light intensity (ntlle)	Logarithm of the intensity of nighttime lights at the level of countries' regions.	National Oceanic and Atmospheric Administration (NOAA)
Average of rainfall in country regions (rainseavglk5)	Average volume of rainfall in millimeters (mm) over the growing season at the level of countries' regions. For instance, the rainfall volume in region A is calculated as the average rainfall volume recorded by the five meteorological stations nearest to the centroid of region A, and weighting by the inverse of the distance between each station and region A's centroid.	University of Delaware
Coefficient of variation of rainfall in country regions (raingrowseacvlk5)	Coefficient of variation of the volume of rainfall calculated as indicated for the average rainfall.	

3. Political instability and households' investment behavior. Evidence from Burkina Faso

With Nicolas Büttner and Michael Grimm

3.1 Introduction

Political instability and latent social conflict are widespread in many low and middle-income countries. Households are exposed to economic uncertainty, endemic violence, civil protests, military coups, and terrorism. The last decade has seen an increase of such incidents engendering political instability in many countries (SIPRI 2016, 2017). For instance, the Arab Spring in Tunisia and Egypt, the ten-year long political crisis in Côte d'Ivoire, the military coup and terrorism in Mali, and the 2014 popular insurrection and terrorism in Burkina Faso are all cases of political turmoil that occasioned many deaths and affected the living conditions of households even if they did not lead to a lasting civil war.

There is a large and still growing literature that shows that political instability and social conflict are associated with poor economic outcomes including lower investment and reduced economic growth (see e.g. Stewart and Venieris, 1985; Venieris and Gupta, 1986; Gupta, 1990; Rodrik, 1991; Alesina and Perotti, 1996; Alesina et al., 1996; Ades and Chua, 1997; Svensson, 1998; Gyimah-Brempong and Traynor, 1999; Rodrik, 1999; Acemoglu and Robinson, 2001; Campos and Nugent, 2002; Jong-A-Pin, 2009; Roe and Siegel, 2011; Aisen and Veiga, 2013; Fang et al., 2020). Most of this literature focuses on cross-country data. There is also some emerging research on firms (Chong and Gradstein, 2009), but there is very little research on households' saving and investment behavior; notable exceptions are González and Lopez (2007), Aaberge, Liu and Zhu (2017) and Giesing and Musić (2019). Dupas and Robinson (2010, 2012) focus on the incomes, expenditures and consumption of small-scale business owners, shopkeepers and women who supply transactional sex exposed to the 2007/2008 post-election violence in Kenya. Yet, most of the literature on households tends to focus on the consequences of interstate and civil wars (see e.g. Akresh, Verwimp and Bundervoet, 2011; Akresh, Lucchetti and Thirumurthy, 2012; León, 2012; Justino and Verwimp, 2013; Islam et al., 2016, Brück, d'Errico and Pietrelli, 2019, Mercier, Ngenzebuke and Verwimp, 2020; Calvo et al., 2020) and not on instability and latent social conflict.

We address this gap and analyze, following some of the macroeconomic literature, the effects of political instability and latent social conflict on households' saving and investment behavior. We do this for the case of Burkina Faso, a very poor country that has increasingly experienced political instability stemming from both internal and external sources, and that is quite typical for many countries in the Sub-Saharan African region. For our empirical analysis, we merge six rounds of household survey data with a geo-referenced time series of politically motivated events and fatalities from the Armed Conflict Location and Event Data Base (ACLED). We analyze households' decisions relative to asset and investment portfolios, i.e. financial savings, investments in durable goods, housing improvements and livestock, and investments in human capital, especially health and education. For identification, we exploit variation in the intensity of political instability across time and space while controlling for

time- and municipality-fixed effects, rainfall and nighttime light intensity, and many other potential confounders.

We find a negative effect of political instability on financial savings, the accumulation of durables, investment in house improvements, and investment in education and health. Instability seems in particular to lead to a reshuffling from investment expenditures to increased food consumption. Overall, the pattern found in the data suggests that the exposure to instability comes with higher income risks and frequent shocks that force households to engage in consumption smoothing. Our results are robust to a whole range of checks, yet a few concerns remain, including selective migration.

The findings of this paper add to the extensive, rather macroeconomic, literature cited above by highlighting an important channel of how political instability impairs economic growth. This channel might be hidden in much of the cross-country panel data analyses that is the basis of this literature and focuses typically on corporate and public investment. Increased household consumption at the cost of reduced accumulation reduces the growth prospects of an economy. Lower investment in human capital in particular will come with high long-term costs and slow down the progress of achieving many of the Sustainable Development Goals (SDGs), and hold back structural change. Our study also complements the more microeconomic literature on the consequences of conflict and war, also cited above, as it shows that even the risk of conflict and war, and not just the actual occurrence, affects households' savings and investment decisions. Finally, this paper adds to the literature on shocks and risk-coping in developing countries (see e.g. Townsend, 1994; Fafchamps, 2003; Dercon, 2004a). This literature has largely focused on the short-run implications, whereas our paper emphasizes the longer-term implications for growth and development. The literature has also limited itself to the analysis of weather and health shocks, but not sufficiently to the risks related to poorly functioning political institutions, which are probably even more important in at least some parts of Sub-Saharan Africa (Dercon, 2008).

The roadmap of the paper is as follows. Section 2 provides an overview of the political and socio-economic context of Burkina Faso. Section 3 illustrates some theoretical considerations. Section 4 describes the data and Section 5 the empirical specifications used for identification. Section 6 presents the results and Section 7 concludes.

3.2 The political and socio-economic context of this study

From the pre-colonial to the post-independence period, the root causes of violence and political instability have become more diverse along the history of Burkina Faso. In the pre-colonial period, the slave trade engendered violence and social conflict by corrupting pre-existing legal structures, creating mistrust within and between local communities and by increasing the stock of guns available in these communities. Members of communities and even of families raided and commodified their fellows to supply slaves to the slave trade networks (Hubbell, 2001; Nunn, 2008; Nunn and Wantchekon, 2009). The available empirical evidence hints to a causal relationship between slave exports and gun-powder imports (see e.g., Nunn, 2008; Whatley, 2018), which suggests that the slave trade increased the stock of imported guns in the communities. Moreover, communities formed small clusters to protect members from raiding and enslaving, which caused ethnic fractionalization and the prevalence of violence (Bates,

2000; Hubbell, 2001; Whatley and Gillezeau, 2011). Nunn (2008), referring to Herbst (2000, ch. 2-4), reports that the colonization did not change significantly the pre-existing political structures, which suggests that the causes of political instability might be similar before and during the colonial period. Yet, Ouattara (1998) reports that colonization increased urbanization and rural to urban migration, which could also have contributed to increasing social tensions.

In the post-independence period, the main causes of violence and political instability in Burkina Faso are attributed to state failures (see Gupta, 1967; Bates, 2006) and conflicts between agriculturalists and pastoralists. Yet, until 2014 group violence was relatively low in the country. Despite four military coups over the three decades following its independence, Burkina Faso's history was marked by relatively few instances of violent social conflicts (Loada, 1999). Hence, Burkina Faso was an exception as compared to other countries in West Africa and the Sahel region (see Kirwin, 2010; Loada and Romaniuk, 2014). The country was qualified as rather stable and politically peaceful under the ruling of the then-President Blaise Compaoré. However, political scientists characterized it as 'semi-authoritarian' (Hilgers and Mazzocchetti, 2010; Loada, 2010). On the one hand, the country had functioning democratic institutions, many political parties including an opposition, and a relative freedom of media and public opinion. On the other hand, the governing system was marred by accusations that the ruling party enforced a system of governing intended to grasp the country's financial resources and to keep the president in power for life. There were also many accounts of oppressions and economic crimes (Hagberg, 2002; Hilgers and Mazzocchetti, 2010). Although assassinations of opponents and journalists, along with corruption, favoritism and clientelism, troubled both the urban and the rural population (Kouléga, 2013), there were few politically motivated violent events up to the end of the nineties. Following the assassination of the now national hero, the journalist Norbert Zongo, in 1998, several events and economic stagnation vitiated the political atmosphere.

For two decades, Burkina Faso has had very low scores in the 'Human Development Index' and has been ranked on average at the 97th percentile.¹ Poverty affected almost half of the population in 1998 and the rate only slowly declined to 40% in 2014 (INSD, 2015). In the same period, the absolute number of poor people steeply increased due to the still high rate of population growth fueled by a total fertility rate of 6.7 children per woman in 1998. Since then, it has declined only moderately and was still at about 5.5 children per woman in 2014.² Although corruption is pervasive and has always been a serious concern in the country, recent numbers based on expert judgments show contrasting trends over the past twenty years. Whereas the 'Corruption Perception Index' produced by Transparency International shows a significant improvement in the country's score and its relative ranking, the index on 'Control of Corruption' from the Worldwide Governance Indicators provided by the World Bank shows a decrease in its score.³⁴ The mix of impunity and economic vulnerability caused general discontent among the population and hence Burkina Faso started to encounter a political crisis coupled with repeated protests by civil servants, students, and the army. Protests increased from

¹ See <http://www.hdr.undp.org/en/global-reports> (reports from 1998 to 2015).

² See <https://databank.worldbank.org/source/world-development-indicators>.

³ See <https://www.transparency.org/en/cpi/2019/index/bfa>.

⁴ See <http://info.worldbank.org/governance/wgi/Home/Reports>

2003 onwards and reached an apex in 2011 following a military mutiny and an organized opposition to the enactment of the senate and a possible constitutional amendment.

As a landlocked country and importer of many manufactured goods, Burkina Faso relies heavily on the ports of neighboring Côte d'Ivoire, Ghana and Togo for international trade. In addition, about three million Burkinabè reside in Côte d'Ivoire. They account for nearly half of the remittances that are transferred from foreign countries to families in Burkina Faso (Bambio, 2011). Hence, the country sustains strong socio-economic and political ties on various levels with its neighboring countries. However, Côte d'Ivoire experienced ten years of political instability following a coup d'état in 2000, a civil war onset in 2002, and post-electoral violence in 2011, which led to the return-migration of thousands of immigrants back to Burkina Faso. Moreover, during the study period, neighboring Mali and Togo experienced political instability related to presidential elections, armed secessionist groups, and terrorism.

In addition, a high level of uncertainty surrounded the possibility of a third revision of the constitution to enable the then-President Compaoré to participate in the 2015 presidential elections. However, most of the population opposed this: in 2008, 60% of the population was against this revision; this share increased to 71% and 92% in 2012 and 2015 respectively.⁵ Opposition to re-election of the president was not only concentrated in the country's two main cities (Ouagadougou and Bobo-Dioulasso), but was also very high, and even increased over time, in most of the rural and urban municipalities across the country. As a result, households faced high levels of uncertainty regarding the socio-economic development of the country, which showed a deepening of political instability from 2007 up to the popular uprising in 2014. This uncertainty and anticipated instability were also nurtured by the ease of access to information through new information and communications technologies (ICTs) such as mobile phones and through conventional radios (Hagberg, 2002), but also through the use of social media, especially Facebook, YouTube and the like, in urban areas (Hagberg et al., 2015). In the main cities of Ouagadougou and Bobo-Dioulasso, the share of internet users increased from 18% and 8% respectively in 2008 to 24% and 26% respectively in 2015.⁶ New technologies are likely to ease access to information that can trigger a regime change, as the literature on the Arab Spring has suggested (Angeletos, Hellwig and Pavan, 2007; Kirkpatrick, 2010; Howard et al., 2011; Dewey, 2012; Edmond, 2013; Fergusson and Molina, 2019).

Although Burkina Faso has its own particular history, which makes it different from other countries, it also shares many features with other countries in the Sub-Saharan region, and hence, we believe the findings of this paper have validity beyond the specific case of Burkina Faso. For instance, in Transparency International's ranking of the 'Corruption Perception Index', Burkina Faso is ranked 78th and shares a similar index value with countries such as Côte d'Ivoire, Gambia, Ghana, Lesotho, Mali, Senegal, South Africa, and Tanzania.⁷ In the ranking of the World Bank's 'Political Stability and Absence of Violence Index', Burkina Faso ranks in the lowest quintile world-wide, together with countries such as Cameroun, Chad, Côte d'Ivoire, Ethiopia, Kenya, Mali, Niger, Nigeria, and Togo.⁸ UNDP's 'Human Development

⁵ Own calculations based on Afrobarometer Surveys 2008, 2012 and 2015.

⁶ Own calculations based on Afrobarometer Surveys 2008 and 2015.

⁷ See <https://www.transparency.org/en/cpi/2019/index/bfa>.

⁸ See <http://info.worldbank.org/governance/wgi/Home/Reports>.

Index' ranks Burkina Faso in position 185 out of 188 countries and most other countries in the last quintile are also located in Sub-Saharan Africa.⁹

3.3 Theoretical considerations

The focus of this paper is on the relationship between political instability and households' asset accumulation. We move away from the process of income generation and are solely interested in the household's allocation of income between consumption and net savings for future periods. We expect that instability increases the volatility of household income and possibly makes households poorer as political instability negatively impacts economic activity, raises unemployment and lowers agricultural yields, among others. In the absence of social safety nets and fully functioning credit and insurance markets, the primary way that households use to cope with such shocks is to deplete their assets and possibly to reduce investments in human capital investments (see e.g. Paxson, 1992; Morduch, 1995; Townsend, 1994).

As a starting point, we use a fairly standard model of asset accumulation, where the motivation to accumulate can stem from precautionary savings to smooth consumption and from accumulation in the long run (Deaton, 1991). We assume that households have decreasing absolute risk aversion which per se motivates households to engage in precautionary savings. We further assume that households are impatient to some extent. The household's intertemporal optimization problem is to allocate in each period t total resources, i.e. income y_t and assets A_t , between consumption and savings to maximize expected utility in period t over the remaining decision horizon T (e.g. lifetime) (see e.g. Deaton, 1991; Bardhan and Udry, 1999). Hence,

$$\max_{c_t} [E(\sum_{t=0}^T \beta^t u(c_t))] \quad \forall t = 0 \dots T, \quad (1)$$

where β is the household's time discount factor. The function u is the utility function and c_t is consumption in period t . The utility function is continuous and concave and is only defined for non-negative values for c_t .

We further assume that in a context of political instability there is a risk that assets will be looted or destroyed (d).¹⁰ If we denote the household's asset stock at the start of period t with A_t , (exogenous) income with y_t , consumption with c_t , the rate of return that may by simplification also apply to borrowing with r_t , and the share of assets that is looted with d_t , assets in $t+1$, A_{t+1} , are given by the following equation:

$$A_{t+1} = (1 + r_t)(1 - d_t)(A_t + y_t - c_t). \quad (2)$$

Hence, the household chooses consumption to maximize (1) subject to (2) and the transversality condition $A_{t+1} \geq 0$. In principle, the household could be a debtor in any but the final period if the household had access to credit transactions. The implied optimality condition is given by:

$$u'(c_t) = \beta E_t[(1 + r_t)(1 - d_t)u'(c_{t+1})], \quad (3)$$

i.e. saving and lending decisions are made so that the marginal utility of current consumption is set equal to the discounted expected marginal utility of next period's consumption.

⁹ See <http://hdr.undp.org/en/2018-update>.

¹⁰ This follows for instance Dercon (2004b) who introduced risky asset returns into the basic buffer stock model and Verpoorten (2009) who introduced risky returns to cattle and the risk of cattle raiding into a model where farmers invest in cattle to protect themselves against shocks.

Although there is plenty of evidence that households in this context engage to a substantial degree in consumption smoothing, perfect smoothing is typically rejected, for example because households in developing countries do not have access to perfect credit markets (Fafchamps, Udry and Czukas, 1998; Bardhan and Udry, 1999). Further, there is evidence that especially the very poor, who experience extreme scarcity, tend to focus more on those needs where the scarcity is the most salient, such as food, and hence are generally more present-biased (low β) by putting too much weight on current, relative to future, consumption (Duflo, Kremer and Robinson, 2011; Shah, Mullainathan and Shafir, 2012; Mani et al., 2013). Political instability has potentially an ambiguous effect on β . On the one hand it may further lower β as future returns carry a high degree of uncertainty, on the other hand, it may increase β as households perceive a higher need of engaging in precautionary savings. Moreover, political instability is likely to reduce the rate of return and increase the risk of looting, leading to an increase in current consumption at the cost of future consumption.

We enrich the above model by explicitly considering that households have to choose between different types of assets. We distinguish financial assets (A^f), durable consumption goods (A^d), estate or housing assets (A^e) and human capital (A^h).¹¹ These assets differ with respect to the risk of being looted or destroyed (d), the degree to which they can be reconverted to cash (l) and their divisibility (v). We assume that the risk of plunder or destruction is moderate for financial assets, at least if held in a bank account, much higher for consumption durables, and again higher for housing assets given that the latter are difficult to hide. For human capital the risk of plunder or destruction is zero, unless a person is severely injured or even killed. The reconvertibility to cash and the divisibility are in turn very high for financial assets, still relatively high for consumption durables, somewhat lower for housing and house parts. Human capital is an extreme case with respect to these two latter properties as it cannot be reconverted into cash and it is therefore also not divisible. Human capital cannot serve as a buffer stock, investments are only made in view of future income generation and possibly old age insurance.

Hence, overall, we expect that political instability rather increases current consumption relative to asset accumulation and that savings are rather reshuffled away from human capital and housing towards financial savings and consumption durables. However, ultimately, this is an empirical question as the effects associated with looting can counteract those associated with reconvertibility to cash and divisibility; this is the most obvious for human capital. Table 3.1 below summarizes our hypotheses and will guide the interpretation of our empirical results.

The effect of political instability on the expected returns on investments in these assets is complex and not straightforward to predict, certainly also for the households themselves, and hence we refrain from making any predictions as this would be very speculative, very much depend on the exact nature of instability and the time horizon considered. Yet, overall, we believe that political instability and the fear of conflict rather decrease than increase returns to

¹¹ Unfortunately, in our dataset the information on livestock has only limited comparability across survey years and is restricted to the period 1998 to 2007. This period was quite peaceful, and instability only started to increase drastically after 2010. For these reasons, we analyze livestock only in a Supplemental Material. We refrain from making strong hypotheses, but believe that investments in livestock react to instability in a similar way as investments in durables or housing. Investment in cattle in wartime has been analyzed in detail by Verpoorten (2009).

assets so that it is likely that the rate of time preference exceeds the rate of return, i.e. households attribute more value to current consumption relative to future consumption. The general uncertainty may even itself further increase impatience (see e.g. Voors et al., 2012). Hence, political instability and the fear of conflict will depress investment in general relative to consumption and it may especially increase the reluctance to invest in human capital as it takes a long time until the returns can be reaped and it cannot be reconverted to cash in the short term. Moreover, the induced higher volatility of income streams that is likely to come with political instability will force household to deplete more frequently assets to keep their consumption stream stable. Hence, our expectation is that a systematic reallocation of resources away from longer term investments into assets that are easy to deplete and the depletion of assets to keep consumption, especially food consumption stable, will reduce the prospects for long-term growth and provide a direct and relevant cost to instability.

Table 3.1: Assumptions on assets

	A ^f	A ^d	A ^e	A ^h
Easiness to liquidate (l)	high	middle	middle for parts, low for houses	not realizable
Divisibility (v)	high	middle	middle for parts, zero for entire houses	not divisible
Risk of being looted or destroyed (d)	low if held in a bank account	middle	high	nearly zero in moderate conflicts, but high in severe conflicts

Source: Authors.

3.4 Data

We use five different data sources: Household Living Standard Surveys from the Institut National de la Statistique et de la Démographie (INSD), the Armed Conflict Location & Event Data Project (ACLED), nighttime lights data from the U.S. National Oceanic and Atmospheric Administration (NOAA), terrestrial precipitation data from the University of Delaware (UD) and data on the geolocation of industrial mines from the Burkina Faso Ministry of Mines (MM).

Household Living Standard Surveys

We use six nationally representative household surveys covering the period 1998 to 2014. The sample sizes vary between 8,422 and 10,831 households, depending on the year. The questionnaires differ in terms of their level of detail, but largely use harmonized questions in those sections that overlap.

Financial savings are measured through a dummy that equals one if at least one adult household member currently saves money at a bank or at home and zero otherwise. Unfortunately, the surveys do not measure the size of the savings made. We measure durable goods possession

by counting durables owned by households using a consistent list of durable goods (iron, gas/electric cooker, fridge, radio, TV, bicycle, motorcycle, car). In addition, we measure investment in durable goods by summing up the monthly per capita expenditures on the purchase of furniture, fridges, radios, televisions, bicycles, motorcycles, and cars. Investment in housing is measured through dummy variables concerning the type of roof and floor material. These dummies indicate whether the materials are traditional or modern. Investment in livestock is captured through the number of livestock owned; more specifically, the count of big livestock (cattle, donkeys, horses, camels) and the count of small livestock (sheep, goats, pigs). To analyze investment in human capital, we look at school enrollment, school expenditures, and health expenditures. Since primary school is compulsory and indeed nowadays almost all children in Burkina Faso go at least to primary school, we look at enrollment in secondary education and higher, i.e. the number of household members of post-primary school age (13 to 19 years) currently enrolled in a post-primary school divided by all household members in that same age group. We calculate schooling expenditures as the yearly household expenditures for school fees per child in the 7 to 16 years age range and health expenditures as per capita monthly expenditures for medication, medical examinations, consultations, hospitalizations, and other medical services.

Table 3.2: Summary statistics of outcome variables

Outcome variables	Obs.	Mean	Std. Dev.
<i>Income (y)</i>			
Monthly total household expenditures per capita	27,437	9,026	12,824
<i>Consumption (c)</i>			
Monthly household food expenditures per capita	27,520	4,208	3,972
Monthly household non-food/non-durables expenditures per capita	27,580	3,359	6,084
Monthly household temptation goods expenditures per adult	27,475	817	1,490
<i>Financial assets (A^f)</i>			
At least one adult household member reported savings (=1)	18,536	0.692	0.462
<i>Durable consumption goods (A^d)</i>			
Number of durable goods owned by household	53,122	2.129	1.589
Monthly household durable goods expenditures per capita	27,580	375	4,841
<i>Estate/housing assets (A^e)</i>			
Roof made from concrete, metal sheets, or tiles (=1)	52,974	0.548	0.498
Floor made from tiles, carpet, or cement (=1)	52,911	0.465	0.499
<i>Livestock (A^l)</i>			
Number of big livestock owned by household*	22,502	4.468	9.488
Number of small livestock owned by household*	22,506	9.354	12.484
<i>Human capital (A^h)</i>			
Post-primary school net enrollment rate	28,912	0.182	0.348
Annual household schooling expenditures per pupil	27,532	1,897	11,726
Monthly household health expenditures per capita	27,573	450	2,335

Notes: All expenditures data are only available for the years 1998, 2003 and 2014. They were deflated to 1998 Ouagadougou prices. Savings data is only available for the years 2009 and 2014. Livestock data is only available for 1998, 2003, 2005 and 2007. The net enrollment rate at the post-primary education level was only calculated for those households with children in the relevant age group. * Only rural households considered.

We capture consumption expenditures based on three categories: food expenditures, expenditures on temptation goods, and non-food/non-durables expenditures. As a proxy for household income, we also calculated the total monthly household expenditures per capita as the sum of the household's monthly per capita expenditures on food, non-food/non-durable items, temptation goods, durable goods, education and health.

All monetary variables were deflated across space and time using regional and national deflators; hence, values are expressed in CFA Francs in 1998 Ouagadougou prices. 1,000 CFA F correspond to 1,418.28 CFA F end of 2016 or 6.75 \$ PPP. Table 3.2 provides summary statistics for all outcome variables.¹² Since not all variables are available in all survey years, we included an overview table in the Supplemental Material that reports the availability for each outcome variable in each year (see Table S.3.2, Section A).

Armed Conflict Location & Event Data Project

ACLED provides disaggregated and geocoded event-based conflict data. It collects the dates, actors, types of violence, locations, and fatalities of all reported political violence and protest events. For Burkina Faso, ACLED data is available from January 1997 onwards. The geographical information of the data allows allocating each event to one of the 351 municipalities of Burkina Faso. Events include battles between violent armed groups, the establishment of bases and strategic development by rebels, militias or governments, riots/protests, violence against civilians, the non-violent transfer of territory, and remote violence (e.g. bombings, missile attacks). We first calculated the number of events and the number of fatalities caused by these events per year and municipality.¹³ We believe that, for a household, it is not only instability in its own municipality that matters, but that events and fatalities occurring in other municipalities may also affect their saving and investment behavior. However, we expect this effect to decrease (exponentially) with distance, i.e. the effects of a protest in the capital Ouagadougou are strong for households in Ouagadougou itself, weaker, but still important for households in e.g. Koudougou, but negligible for households in municipalities bordering Côte d'Ivoire. For this reason, we modified our instability measures by means of spatial weighting based on Kondo (2021). The resulting variables are the number of spatially weighted events respectively fatalities of municipality m in year t . In addition, we assume that households when they make investment decisions in a specific year do not only consider the level of political instability in that particular year, but also that in the near past. Hence, we also calculate cumulative measures of instability: the sum of spatially weighted events respectively fatalities over the period $t-2$, $t-1$, and t .¹⁴ Our sample of event-based instability measures comprises 1,536 municipality-by-year observations across the six years. Table A.3.1 in the Appendix provides summary statistics. Figure A.3.1 below illustrates the spatial variation of conflict intensity across time. To describe conflict intensity, we use the

¹² More details on the definition of the dependent variables are provided in Section A in the Supplemental Material.

¹³ Before calculating event-based measures of instability, we corrected for an extreme outlier in terms of fatalities. This concerns an event of violence against civilians in 2002 that supposedly affected five municipalities across the country and led to a total of 106 fatalities. Due to incomplete information about the exact location and number of fatalities, we revised the fatalities from 21 resp. 22 down to 5 in all affected municipalities. Readers can refer to Section B in the Supplemental Material for more details.

¹⁴ More details on the definition of the measures of political instability are also provided in Section B in the Supplemental Material.

number of events in the current and past two years, once without and once with spatial weighting. The maps show that spatial weighting increases the spatial variation of conflict significantly. It also shows that, while conflict was concentrated in Ouagadougou in 1998, it slowly expanded over time and was distributed across the entire country by 2014. However, with more than 100 events, instability remains extraordinarily high in the capital.

Nighttime lights data

Since we work with observational data, we need to control for a large range of potential confounders to identify the effects of instability on our outcomes of interest. The household surveys introduced above provide many useful variables in this respect. These controls will be discussed in more detail when we come to the empirical specification in the next section. However, controlling for local economic development is especially important. Hence, we mobilize two additional data sources, namely nighttime lights data and rainfall data.

In the absence of subnational GDP data, the use of nighttime light intensity as a proxy for local economic development has become increasingly popular in the literature. Brüderle and Hodler (2018) show that nighttime lights are positively associated with different aspects of human development and that nighttime lights can explain a substantial share of the variation in the local development of 29 African countries. We use the NOAA annual time series dataset on nighttime lights based on weather satellite recordings covering the period 1992 to 2013 to calculate annual mean nighttime light intensity at the municipality level. Summary statistics are provided in Table A.3.2 in the Appendix.¹⁵

Rainfall data

Given that almost 80% of the rural population still depends on rain-fed agriculture, we assume that rainfall shocks are an important control for general economic conditions. We use a global monthly time series dataset on terrestrial precipitation by Matsuura and Willmott (2018). It provides (interpolated) 0.5 by 0.5 grid resolution data on monthly total precipitation (in mm) from 1900 to 2017. We calculate monthly total precipitation for all municipalities in Burkina Faso during our observation period by applying inverse distance weighting using the four precipitation data points that are closest to a municipality's centroid. On this basis, we calculate both the average rainfall level as well as the coefficient of variation of rainfall during the growing season (May to September) that preceded the data collection period of the household surveys. Summary statistics are provided in Table A.3.2 in the Appendix.¹⁶

Industrial mines data

Burkina Faso has recently experienced a boom of the gold industry, leading to a sharp increase in artisanal mining activities as well as the establishment of industrial mines. Bazillier and Girard (2019) analyze the local welfare impacts of this recent gold boom. They emphasize that the opening of an industrial mine often supersedes existing artisanal mining activities. Since such mining activities might therefore affect some of our outcome variables and be correlated

¹⁵ More details on the construction of our measure of nighttime lights and maps are provided in Section C in the Supplemental Material.

¹⁶ The spatial variation of rainfall levels and rainfall variability across time is illustrated in Figures S2 and S3 in Section D in the Supplemental Material.

with conflict without being, however, a driver of *political* instability, we believe this is potentially an important control variable to consider. Local instability could for instance be caused by a general discontent of the nearby population engaged in artisanal mining who is pushed away by industrial mining. Hence, we use data on the geolocation of all industrial mines active during our study period provided by the Burkina Faso Ministry of Mines (MM) to create a measure of households' exposure to such a mining site. Specifically, we create a municipality level dummy that equals one if the municipality centroid is within 25 km distance of an active industrial mining site's centroid. Summary statistics are provided in Table A.3.2 in the Appendix.¹⁷

Data merging

We merged the data at the level of municipalities using the geographical information that was provided in each of these five different data sources. We kept the outcome variables from the household living standard surveys at the household level but aggregated the data from ACLED, nighttime lights, rainfall indicators and mining locations at the municipality level. The nighttime lights data is only available until 2013; hence, we merged the 2013 nighttime light intensity data with the 2014 household living standard surveys data. This gave us a pooled household level dataset covering 53,166 households across 339 municipalities over a period of 16 years.¹⁸ However, since information on some outcomes was not available in all six surveys used (see Table S.3.2, Section A), we had to work with sub-samples whenever we analyzed these outcomes.¹⁹

3.5 Empirical specification

To identify the effects of instability on households' resource allocation, we use the variation of the intensity of instability over municipalities and over time conditional on municipality-fixed effects, time-fixed effects and a whole range of household and municipality-specific time-variant characteristics. Hence, the econometric model we estimate takes the following form:

$$hhvar_{hmt} = \beta_1 instab_{mt} + \beta_2 Y_{mt} + R'_{mt} \beta_3 + \beta_4 M_{mt} + X'_{hmt} \beta_5 + u_m + T_t + \varepsilon_{hmt},$$

(4)

where the variable *hhvar* stands for the various outcomes we are interested in of household *h* in municipality *m* and at time *t*. The variable *instab* stands for the municipality-specific instability at time *t*. Note that we intend to capture the effect of uncertainty with this measure and not the direct consequence of actual events. *Y* stands for nighttime light intensity in municipality *m* at time *t*, our control for the level of local development. The vector *R* captures rainfall shocks in municipality *m* at time *t* through the level of rainfall and its coefficient of variation over the growing season. *M* is a dummy for the presence of an active industrial mine in proximity to municipality *m* at time *t*. The vector *X* controls for a range of possible confounders at the household level, such as gender, age, education and occupation of household

¹⁷ More details on the construction of our measure of industrial mines exposure and a map are provided in Section E in the Supplemental Material.

¹⁸ Twelve municipalities were not sampled in either of the six INSD household surveys and are thus not included in our sample.

¹⁹ More details on the construction of the dataset is provided in Section F in the Supplemental Material.

head, as well as household size and location (urban or rural). We also control for the distance of the household to various infrastructures, including the distance to the nearest market, to the next source of piped water, to the next primary school, and to the next health center. Finally, we include municipality-fixed effects (v_m) and time-fixed effects (T_t). ε_{hmt} is the error term. To account for the correlation of observations within municipalities, we cluster standard errors at the municipality level. In our preferred specifications we do not control for household income (or household expenditures). First, because we believe it has to be considered as endogenous and second, because it is not available in all years. We prefer to measure changes in living standards by nighttime light intensity and rainfall shocks, but our results are also robust to the inclusion of household expenditures as a control, obviously then only for a subset of years. Given that nighttime light intensity is not measured at the household level, we believe it is less prone to an endogeneity bias, yet a bias can of course not fully be excluded. Therefore, we reran all our regressions below also without nighttime light intensity (and household expenditures) as a control and the results do only marginally change. Hence, in our preferred specifications we kept nighttime light intensity as a control. Table A.3.2 in the Appendix provides summary statistics for all control variables.

The identifying assumption of our specification is that comparing two municipalities that have the same time-invariant endowments, such as geography, institutional and ethnical background, the same household structure, level of infrastructure, exposure to mining activities, experienced the same rainfall conditions and have the same level of development as measured through nighttime light intensity, any difference in instability can be considered as random. Put differently, anything that could cause instability in one municipality and not in another is, conditional on these controls, orthogonal to the households' decisions over their resource allocation.

Yet, there remain several threats to identification. First, selective migration, i.e. people with specific characteristics and specific saving behavior may migrate to specific municipalities, for instance more stable municipalities. In this case we would confound the effects of these specific characteristics with the effects stemming from instability. Although we cannot fully rule out this bias, it is important to note that rural-rural migration has always been quite low in Burkina Faso. Only about a third of all adults has at some point in his or her life changed the place of residence. This is quite low compared to other countries in the region (Maga et al., 2006). Migration is mainly to Ouagadougou, the capital, to neighboring countries, like Côte d'Ivoire, and to Europe. People fleeing conflict hotspots is a quite recent phenomenon and not yet relevant during our observation window. Second, a simultaneity bias, i.e. instability might itself be driven by households' resource allocation. Third, there might still be time-varying municipality-specific shocks such as the emergence of banks, traders of durables etc., yet it is difficult to construct a story where these shocks would also cause instability.

3.6 Results

3.6.1 The effect of factual instability on households' asset accumulation

Table 3.3 shows the effects of political instability on financial savings, the accumulation of durables, and investment in house improvements. We use four alternative measures of

instability, as illustrated in Section 4. Hence, each coefficient in Table 3.3 comes from one regression. The complete results with all coefficients associated with the used control variables are shown in Section G in the Supplemental Material; here, we focus just on the effects associated with political instability. To facilitate the interpretation of our results, the coefficients measure the effect of a one standard deviation increase in the respective instability measure.

Table 3.3: Effects of factual instability on households' saving and investment decisions (OLS)

Instability measure (standardized)	Financial assets (A ^f)	Durable goods (A ^d)		Estate/housing assets (A ^e)	
	(HH saved (=1)) (1)	(Owned, count) (2)	(ln p.c. exp., monthly) (3)	(Quality roof (=1)) (4)	(Quality floor (=1)) (5)
Number of spatially weighted events in current year	-0.016*** (0.004)	-0.020*** (0.005)	-0.034 (0.022)	-0.018*** (0.002)	-0.011*** (0.002)
Number of spatially weighted events in current and past 2 years	-0.016*** (0.004)	-0.029*** (0.004)	-0.032 (0.020)	-0.020*** (0.002)	-0.012*** (0.002)
Number of spatially weighted fatalities in current year	-0.015*** (0.004)	-0.034*** (0.004)	-0.028** (0.011)	-0.013*** (0.002)	-0.009*** (0.002)
Number of spatially weighted fatalities in current and past 2 years	-0.018*** (0.005)	-0.030*** (0.009)	-0.008 (0.014)	-0.013*** (0.004)	-0.006* (0.003)
Sample mean of outcome (level)	0.691	2.141	3,778	0.553	0.469
Full set of controls	yes	yes	yes	yes	yes
Municipality-fixed effects	yes	yes	yes	yes	yes
Time-fixed effects	yes	yes	yes	yes	yes
Observations	17,938	50,892	25,849	50,767	50,707
Municipality groups	331	339	329	339	339

Notes: Each coefficient corresponds to one regression. Savings data is only available for the years 2009 and 2014. The variable savings takes the value one if at least one household member aged 15 or older reported to save money. Durable goods possession is a count over eight different assets. Durable expenditures data is only available for the years 1998, 2003 and 2014; they are in per capita terms, ln-transformed and deflated to 1998 Ouagadougou prices. Quality roof takes the value one if the roof is of concrete, metal sheets, or tiles vs. straw or thatch. Quality floor takes the value one if the floor is of tiles, carpet, or cement vs. dirt or sand. Controls include ln nighttime light intensity, ln mean rainfall and the coefficient of variation of rainfall during the last growing season, a dummy if the municipality's centroid is within 25 km distance to an industrial mine, a dummy if the household lives in an urban area, gender, age, age squared, education level, and occupation of the household head, household size, household size squared, distance to the nearest market, distance to the nearest portable water source, distance to the nearest primary school, and distance to the nearest health center. Robust standard errors clustered at the municipality level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Detailed regression results including the coefficients of all controls are shown in Table S4 in Section G of the Supplemental Material.

The results displayed in column (1) show that instability is associated with a significantly lower probability that households save. This is in line with the evidence from many cross-country studies (e.g. Stewart and Venieris, 1985; Venieris and Gupta, 1986; Gyimah, Brempong and Traynor, 1996). The estimated effect implies that an increase in the number of spatially weighted events (hereafter just 'number of events') in the current year by one standard deviation reduces the probability that a household has made any savings in that year by 1.6%. The effect is the same if this measure also accounts for events that occurred in the past two

years. Furthermore, when using the number of fatalities instead of the number of events, the coefficients remain also similar. Across the four different instability measures, the coefficients vary between -1.5% and -1.8%. To check robustness, we also estimated the regressions using a probit model instead of a linear probability model. All coefficients associated with instability remain statistically significant at the 1%-level and barely change in magnitude (-1.4% to -1.7%).

We also find a negative effect of instability on the accumulation of durable consumption goods. In column (2) we look at the number of durables owned and in column (3) at the log per capita spending on durables in the past month. In both columns, we see a clear negative effect of instability on durables possession and spending on durables. Depending on which instability measure we use, a one standard deviation increase in instability leads to a decrease in the number of durables owned by around 0.03. This is a very small effect. When using a Poisson model instead (since durable goods possession is measured through a count variable), the effect remains statistically significant and decreases slightly to around -0.02. While the effect on durable goods expenditures is up to -3%, it is only statistically significant if we look at the number of fatalities in the current year. Since durable goods expenditures display tremendous zero bulking, we also analyzed them with a Tobit model. In this case, three of the four instability measures become significant and the effect size increases to almost -5%. Overall, both results taken together may imply that consumption durables are sold, possibly to smooth consumption.

Columns (4) and (5) assess the effects of instability on investments in house improvements, i.e. the probability that the roof respectively floor of the household's dwelling is made from modern materials. For both outcomes we use a linear probability model. Again, instability is associated with a lower probability that households have made such investments. While the coefficients are statistically significant, they are rather small. For roof improvements, the effects are no bigger than -2% and for floor improvements they are around -1% per one standard deviation increase in instability. The use of a probit model only slightly decreases the statistical significance and coefficient sizes for both outcomes and thus confirms the results from the linear probability model.

For the analysis of investment into livestock, we only considered rural households. There is no clear pattern visible for big livestock. For holdings of small livestock, however, the effect seems to be negative and sizable (a decrease up to 30 in the count of small livestock as a response to a one standard deviation increase in instability). However, the effect is only significant for one out of four instability measures. As our data for livestock is not of high quality, patchy and not available in all years, these results are only shown in the Supplemental Material (Section H).

Next, we look at human capital investments, namely education and health. The results are shown in Table 3.4. The coefficients in column (1) suggest that instability lowers the probability that children continue their education beyond primary school. The post-primary net enrollment rate, that is the share of children in the 13 to 19 years age group that attends secondary school or higher per household, is reduced by about 1 percentage point for an increase of any of the instability measures by one standard deviation. When, alternatively, using a fractional probit model, coefficients remain highly significant and become even slightly larger. Monthly per pupil schooling expenditures are lower by 33% to 35% for a one standard

deviation increase in instability. Column (3) shows that health investments are also negatively associated with instability. A one standard deviation increase in instability reduces health investments by 7% to 9%. For all three measures of human capital, all coefficients are highly statistically significant (mostly at the 1%-level). Since both schooling and health expenditures have many zeros, we also analyzed them with a Tobit model. This has no impact on statistical significance, but it reduces somewhat the coefficient size for schooling expenditures and it increases somewhat the coefficient size for health expenditures. With the Tobit model, the effect size ranges between -8% and -11% for schooling expenditures and between -11% and -13% for health expenditures. These sizable adverse effects on human capital accumulation are striking and in line with our expectations; households seem to anticipate that in an unstable context these investments will not pay off in the long term.

Table 3.4: Effects of factual instability on households' human capital investments (OLS)

Instability measure (standardized)	Education (A ^b)		Health (A ^b)
	(Post-primary net enrollment rate)	(ln p.p. exp., monthly)	(ln p.c. exp., monthly)
	(1)	(2)	(3)
Number of spatially weighted events in current year	-0.010*** (0.002)	-0.326*** (0.027)	-0.084*** (0.025)
Number of spatially weighted events in current and past 2 years	-0.011*** (0.002)	-0.349*** (0.027)	-0.086*** (0.024)
Number of spatially weighted fatalities in current year	-0.011*** (0.001)	-0.330*** (0.021)	-0.083*** (0.022)
Number of spatially weighted fatalities in current and past 2 years	-0.011*** (0.002)	-0.336*** (0.058)	-0.072** (0.030)
Sample mean of outcome (level)	0.185	1,951	457
Full set of controls	yes	yes	yes
Municipality-fixed effects	yes	yes	yes
Time-fixed effects	yes	yes	yes
Observations	27,514	25,808	25,846
Municipality groups	339	329	329

Notes: Each coefficient corresponds to one regression. The net enrollment rate at the post-primary education level is only calculated for those households with children in the relevant age group. Education and health expenditures data are only available for the years 1998, 2003 and 2014. They are in per pupil respectively per capita terms, ln-transformed and deflated to 1998 Ouagadougou prices. Controls include ln nighttime light intensity, ln mean rainfall and the coefficient of variation of rainfall during the last growing season, a dummy if the municipality's centroid is within 25 km distance to an industrial mine, a dummy if the household lives in an urban area, gender, age, age squared, education level, and occupation of the household head, household size, household size squared, distance to the nearest market, distance to the nearest portable water source, distance to the nearest primary school, and distance to the nearest health center. Robust standard errors clustered at the municipality level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Detailed regression results including the coefficients of all controls are shown in Table S5 in Section G of the Supplemental Material.

The results above show a very clear, if economically moderate, negative effect of political instability on financial savings, the accumulation of durables, investment in house

improvements, and investment in education and health.²⁰ For this reason, we now focus on specific categories of current expenditures to see whether households that are exposed to high instability increase in turn their current expenditures on some consumption items. Table 3.5 shows regressions for log monthly per capita household food expenditures (col. (2)), for log monthly per capita household non-food/non-durables expenditures (col. (3)), and for log monthly per adult household temptation goods expenditures (col. (4)). In column (1), we also show regressions for log total monthly per capita household expenditures. This regression shows that there is no economically important effect on total expenditures, i.e. conditional on our controls there is no difference in expenditure levels between households exposed to high instability and households exposed to low or no instability. Yet, whereas expenditures for non-food/non-durable items and temptation goods go down, instability is associated with higher food expenditures.²¹ Thus, instability seems to lead in particular to a reshuffling from investment expenditures to increased food consumption. These results do also hold if we look at expenditure shares and not absolute amounts (results not shown in Table). All this is consistent with the hypothesis that consumption smoothing is one of the driving forces of our results. The results also largely hold, though are less precisely estimated, if we distinguish events into incidences of potentially ‘light violence’ such as protests and riots and incidences of potentially ‘strong violence’ such as battles, strategic development and violence against civilians. The corresponding results are shown in Section I in the Supplemental Material Overall, this heterogeneity analysis confirms our main results and does not suggest that our results are driven by one rather than the other event category. Admittedly, the results get less stable for some outcomes when focusing on ‘strong violence’; however, this is not surprising as the number of events is much smaller than in the main analysis, especially for this category. Figure A.3.2 summarizes our findings in a comparative bar chart. For each outcome, we show the estimated effects for a one standard deviation change in our instability measure. Our estimates suggest that a one standard deviation increase in instability is associated with a reduction in per capita expenditures for education, health and durables by about 35%, 9% and 3% respectively and an increase in food expenditures by about 4%.

Since our results suggest that consumption smoothing behavior is an important driver of our findings, we briefly check the effect of instability on the performance of farms and non-agricultural firms in the following sub-section. If the consumption smoothing story is right, we would expect that farms and firms perform less well in times of instability forcing households to react by depleting savings and assets.

²⁰ These results are also largely robust to the inclusion of total household expenditures per capita. However, as explained above, household expenditures are obviously a bad control in our setting.

²¹ Due to zero bulking, we re-estimated the regressions for temptation goods expenditures, which led to a slight increase in coefficient sizes.

Table 3.5: Effects of factual instability on households' total and consumption expenditures (OLS)

Instability measure (standardized)	Total HH expenditures (y)	Food (c)	Non-food/ non-durables (c)	Temptation goods (c)
	(ln p.c. exp., monthly)	(ln p.c. exp., monthly)	(ln p.c. exp., monthly)	(ln p.a. exp., monthly)
	(1)	(2)	(3)	(4)
Number of spatially weighted events in current year	-0.002 (0.010)	0.039*** (0.012)	-0.042*** (0.015)	-0.111*** (0.019)
Number of spatially weighted events in current and past 2 years	0.000 (0.009)	0.044*** (0.010)	-0.045*** (0.014)	-0.112*** (0.019)
Number of spatially weighted fatalities in current year	0.004 (0.005)	0.053*** (0.005)	-0.033*** (0.007)	-0.113*** (0.017)
Number of spatially weighted fatalities in current and past 2 years	0.025* (0.014)	0.075*** (0.014)	-0.021 (0.016)	-0.092*** (0.030)
Sample mean of outcome (level)	9,175	4,244	3,452	829
Full set of controls	yes	yes	yes	yes
Municipality-fixed effects	yes	yes	yes	yes
Time-fixed effects	yes	yes	yes	yes
Observations	25,716	25,790	25,849	25,747
Municipality groups	329	329	329	329

Notes: Each coefficient corresponds to one regression. All expenditures data are only available for the years 1998, 2003 and 2014. They are in per capita respectively per adult terms, ln-transformed and deflated to 1998 Ouagadougou prices. Controls include ln nighttime light intensity, ln mean rainfall and the coefficient of variation of rainfall during the last growing season, a dummy if the municipality's centroid is within 25 km distance to an industrial mine, a dummy if the household lives in an urban area, gender, age, age squared, education level, and occupation of the household head, household size, household size squared, distance to the nearest market, distance to the nearest portable water source, distance to the nearest primary school, and distance to the nearest health center. Robust standard errors clustered at the municipality level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Detailed regression results including the coefficients of all controls are shown in Table S6 in Section G of the Supplemental Material.

3.6.2 The effect of factual instability on the performance of farms and non-agricultural firms

We rerun regressions of the type above using alternatively turnover and profits of non-agricultural firms as an outcome. The results in columns (1) and (2) in Table 3.6 below show that instability is indeed negatively associated with both turnover and profits. Both decline in times of instability, irrespective of which instability measure we use and conditional on controlling for a large number of potential confounders, municipality-fixed effects and time-fixed effects. Columns (3) and (4) in Table 3.6 show the results from regressions where we use a binary variable indicating whether the household produced any agricultural goods and a continuous variable measuring the revenue from agricultural production for those households who produce any agricultural goods. Unfortunately, it is not possible to derive better measures of farm performance consistently over time. Nevertheless, the results support the hypothesis that instability adversely affects economic activity. In times of instability households engage less in agricultural production and households that engage in production seem to experience a

decline in revenue, yet the negative coefficient is not significant and for the longer-term fatality measure even switches the sign (but remains insignificant).

Table 3.6: Effects of political instability on households' total turnover and profits from non-agricultural firms (OLS)

Instability measure (standardized)	Firm performance		Agricultural production	
	(Total turnover)	(Total profits)	(Any production (=1))	(Total revenue)
	(1)	(2)	(3)	(4)
Number of spatially weighted events in current year	-0.065*** (0.019)	-0.074*** (0.022)	-0.006** (0.003)	-0.157 (0.144)
Number of spatially weighted events in current and past 2 years	-0.065*** (0.018)	-0.074*** (0.020)	-0.005* (0.003)	-0.126 (0.136)
Number of spatially weighted fatalities in current year	-0.061*** (0.013)	-0.065*** (0.014)	-0.004** (0.002)	0.000 (0.118)
Number of spatially weighted fatalities in current and past 2 years	-0.064*** (0.014)	-0.070*** (0.020)	-0.004* (0.002)	0.070 (0.122)
Sample mean of outcome (level)	1,030,481	436,734	0.720	47,288
Full set of controls	yes	yes	yes	yes
Municipality-fixed effects	yes	yes	yes	yes
Time-fixed effects	yes	yes	yes	yes
Observations	12,758	11,598	42,670	18,373
Municipality groups	328	326	329	329

Notes: Each coefficient corresponds to one regression. Data on firm performance is only available in 1998, 2003 and 2014. Regressions were run on a subsample of households that reported to own at least one firm. We excluded those firms that reported turnovers of zero as we consider it highly likely that such zero turnovers are misreported. Data on agricultural production is only available in 1998, 2003, 2005, 2007 and 2014. Data on agricultural revenue is only available in 1998, 2003 and 2014. Regressions on agricultural revenue were run on a subsample of households that reported to have engaged in agricultural production. Controls include ln nighttime light intensity, ln mean rainfall and the coefficient of variation of rainfall during the last growing season, a dummy if the municipality's centroid is within 25 km distance to an industrial mine, a dummy if the household lives in an urban area, gender, age, age squared, education level, and occupation of the household head, household size, household size squared, distance to the nearest market, distance to the nearest portable water source, distance to the nearest primary school, and distance to the nearest health center. Robust standard errors clustered at the municipality level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

3.6.3 Robustness checks

We have shown that our results are robust to the inclusion of a whole range of controls, including household characteristics, local infrastructure, local economic development, rainfall variability, mining activities, municipality-fixed effects and time-fixed effects. In this section, we present the results from further robustness checks: first, a falsification test with fake outcomes, second, rerunning the regressions without the observations from Ouagadougou, third, controlling for household production and auto-consumption of food crops, fourth, randomization inference, fifth an event study analysis and sixth an analysis of the potential bias due to unobservables. In the following, we briefly go through the results of each test. The details can be found in Section J in the Supplemental Material.

Falsification test

The idea of this falsification test is to replace our outcomes of interest with fake outcomes and rerun the analysis. The fake outcomes should change in response to changing circumstances, but obviously not change, in theory, in response to the treatment, i.e. political instability. If, however, the coefficients associated with political instability are significant with these fake outcomes, it may suggest that our results are driven by unobserved variables that are correlated with both political instability and our outcomes of interest. If the coefficients are insignificant, this further supports our main findings.

Since we found quite strong effects on health investments associated with political instability, we constructed two fake outcomes related to health: (i) the incidence of accidents (caused in non-violent situations) among household members and (ii) the incidence of visual impairments among household members.²² The rationale of choosing these two is that we would expect effects of political instability on these two outcomes if the effects on health investments are not driven by behavioral response to instability but rather by the general disease and health risk environment as both could be correlated with households' health investments and with political instability. Table S.3.14 in Section J in the Supplemental Material shows the results from these tests. For both outcomes, all coefficients are close to zero. This may reduce concerns that our results are driven by unobserved variables that are both correlated with our measures of instability and our outcomes of interest rather than political instability.

Excluding Ouagadougou

Politically motivated events occurred more frequently and with higher intensity and severity in the country's capital, Ouagadougou, compared to all other municipalities. The average number of events per year in our sample is 14.2 for Ouagadougou against around 2.7 in all other affected municipalities. While one event in Ouagadougou caused on average 0.3 fatalities, the average for all other affected municipalities is 0.2 fatalities. Given this spatial concentration of events and fatalities in Ouagadougou, we check in the following to what extent the results change if the analysis is done without the capital. We thus reran our regression analysis excluding all observations from Ouagadougou. Tables S.3.15 to S.3.17 in Section J in the Supplemental Material present the results. Overall, we note that the negative effects on savings, durables and housing persist, but are much less precisely estimated, also due to a loss of power. We also still find sizeable negative effects on health and education expenditures, even bigger than for the national sample. However, for enrolment in secondary and higher education, we find in contrast to the national sample, now a small significant positive effect if the event measures are used. The positive effect vanishes again if fatalities are used. The effects on total household expenditures and its components are also a bit less clear-cut in the reduced sample. While we still observe a reshuffling towards food expenditures if fatalities are considered as a measure of instability, we find negative effects on food and total expenditures if just the general event measure is used. However, if we control for total household expenditures or look at

²² More information on the definition of the placebo outcomes is provided in Section J in the Supplemental Material.

expenditure shares, the results are again very similar to those from the main regressions (results not shown). We then see a small negative effect on school attendance and a sizable positive effect on food expenditures (or food expenditure share). To conclude, the main difference when excluding Ouagadougou is the negative effect on total household expenditures, but conditional on this, the overall pattern with regards to all other outcomes is very similar to our main regressions.

Robustness to differential food price inflation

In 2008, as many other Sub-Saharan African countries, Burkina Faso was hit by a sharp increase in prices for staple foods, which not only affected households across the country economically, but also caused discontent in the population fueling political instability (Grimm and Günther, 2007; Günther and Grimm, 2007). However, there was a substantial degree of heterogeneity as to how households were affected by this crisis. While most urban households buy their staple foods at the market, most rural households produce at least some of their foodstuff on their own. Some are even net producers and hence benefit from such price hikes. This heterogeneity is a potential source of endogeneity as both the level of local instability as well as households' consumption and investment behavior are likely to be correlated with the extent that households were affected by the food price crisis. As we do not have data on food crops production and consumption in all survey years, we cannot control for this heterogeneity in our main specification. Instead, we can rely on those years with appropriate data and show that at least for these years our results are robust to the inclusion of two alternative controls for households' exposure to the food price crisis. First, we control for a dummy that equals one if the household produces any food crops (millet, maize, sorghum, rice, cowpea) and zero otherwise.²³ Alternatively, we use the share of auto-consumption in total consumption of food crops as a control.²⁴ As Tables S.3.18 to S.3.23 in Section J in the Supplemental Material show, our results remain very robust to including either of the two alternative controls. For better comparison, we also ran the regressions with the reduced samples without controlling for the food crops variables, again confirming the robustness. Note that the robustness check was not applied to financial assets as we would have to rely only on a cross section when including the food crops controls given the data gaps we have.

Randomization inference

As a further robustness check, we applied randomization inference, i.e. we randomly rearranged 5,000 times our event data across years and municipalities and rerun our regressions for each generated sample. The coefficients obtained with the permuted samples should approximately follow a normal distribution with a high density around zero as the permuted values of the events should be orthogonal to the actual events and hence have no explanatory power. Hence, the 'true' regression coefficient should be significantly larger in magnitude and be significantly different from the distribution of coefficients obtained with the randomized samples. If, however, this is not the case, it could be a hint that the estimated effect is in fact driven by unobserved third variables and hence falsely attributed to the true events. Hence, we

²³ Not available in 2009.

²⁴ Not available in 2005, 2007 and 2009.

first permuted all actual events for a given year across all municipalities 5,000 times leading to 5,000 different samples. As an alternative approach, we also permuted the events across municipalities and years. Next, we applied again the spatial weighting procedure and standardized the instability variables in all samples. Lastly, we ran our regressions using each of the 5,000 permuted samples. The kernel density plots in Figure S.3.6 in Section J in the Supplemental Material plot the coefficients obtained with the permuted samples (permutations across municipalities within years) and compare them to the coefficient from the true sample. In almost all cases, the ‘true’ coefficient is located to the extreme ends of the distribution. In addition, we calculated a one-sided p -value that equals the share of permuted coefficients that exceed the magnitude of the true coefficient. In most cases, this p -value is well below 0.1 or even below 0.01.²⁵ Overall, the permutation test strongly supports our results and suggests that our estimated effects are not driven by third variables. The results are very similar for the test where the events are permuted across municipalities and years (results not shown).

Event study analysis

For this kind of empirical setting, a natural way of verifying robustness is to check whether the timing of the measured impacts is in line with the timing of the events that are supposed to cause them. This is often called an event-study analysis. Yet, in our case there are a few conceptual specificities to consider. A first problem is that we do use the events not as a measure of shocks in a precise point in time, but rather as a measure that shall mirror the intensity of instability. Hence, an event or a series of several events rather show a peak in instability, but we would not assume that before or after that event the circumstances are ‘stable’. So, what we measure is clearly different than a rainfall shock, an earthquake or a locust outbreak. If household behavior in terms of savings, asset allocation and consumption varies with the exposure to instability, we would not expect to see these behaviors unaffected just before or just after an event of politically motivated violence. We rather assume that instability rises slowly, becomes more and more intense and then an event may erupt. Likewise, after that event, we assume it will take time until political stability is re-established and hence household behavior would continue to be affected. The path towards an event and away from an event would have no reason to be linear, in contrast it could be very erratic. Thus, overall, we do not expect to see impacts just in the period in which the event occurs. The facts that in some municipalities there was a series of events further complicates the analysis and interpretation. We nevertheless conducted an event study analysis to see whether it supports our main findings above, despite all caveats we just mentioned. To avoid the problem that may stem from multiple events in a row, we excluded Ouagadougou from this analysis, since there many events follow on one another. Of our four instability measures, we used the spatially weighted events in the current year. We then moved this measure year-by-year forward and backward.

Figure S.3.7 in Section J in the Supplemental Material shows the results. Importantly, the reference point for this analysis are the results from the sample excluding Ouagadougou (Tables S.3.15 to S.3.17). Our event study analysis largely confirms the pattern from these regressions. The effects are typically strong for events that occur in $t=0$, however, also events

²⁵ For total expenditures, we calculated a two-sided p -value. This p -value is close to 1, which is line with our expectations as the ‘true’ coefficient was very close to zero and statistically insignificant.

in the near past and in the near future are often significant. This is not surprising or worrying as we see these events as exposure to instability, hence, events from the near past might still affect peoples' current behavior and they might also anticipate violent events in the near future and already react to this anticipation. It is also reassuring that across almost all outcomes (except school attendance and housing assets), events in the more remote future (t=3 to t=6) do not have any significant effects on current household behavior.

In conclusion, this analysis does not invalidate our main regressions, to a very large extent it even confirms it. Nevertheless, we think the results of this robustness check must be interpreted with caution, given the conceptual caveats of applying this methodology for our purpose.

A test of unobservable selection and coefficient stability

Even though we control for a large number of household- and municipality-level confounders, in addition to accounting for municipality- and time-fixed effects, one might still be worried about remaining omitted variable bias. In order to get some sense of the magnitude of potential omitted variable bias, we follow Altonji, Elder and Taber (2005) and Oster (2019) and calculate bias-adjusted coefficients for our instability variables using the following formula:

$$\rho^* \approx \tilde{\rho} - \delta \frac{R_{max} - \tilde{R}}{\tilde{R} - \hat{R}} (\hat{\rho} - \tilde{\rho}), \quad (5)$$

where ρ^* is the bias-adjusted coefficient, $\hat{\rho}$ and \hat{R} ($\tilde{\rho}$ and \tilde{R}) are the coefficient and the R-squared from the regressions without any controls, except time- and municipality-fixed effects, (with the full list of controls) and δ measures the importance of unobserved variables relative to observed variables. Analog to Kung and Zhou (2021), we follow Oster (2019) and set $\delta = 1$ and $R_{max} = 1.3\tilde{R}$. In short, the assumption is that the closer ρ^* to $\tilde{\rho}$, the smaller the extent of unobserved variable bias. According to Oster (2019), a coefficient can be considered as robust if the bias-adjusted coefficient has the same sign as the unadjusted coefficient. In addition, we calculate the value for δ that would be necessary to 'explain away' the effect of instability on our outcomes of interest, i.e. an estimate of how much more important the unobservables need to be than the observables (Calvo et al., 2020). Tables S.3.24 to S.3.26 in Section J in the Supplemental Material present values for ρ^* and δ for each regression from our main results.²⁶ With the exception of housing and durables goods expenditures, all results are robust to this exercise. Bias-adjusted coefficients are usually of the same sign and very similar in magnitude to the unadjusted coefficients. δ is mostly larger than 3 implying that the unobservables would need to be at least three times as important as the observed control variables in order to nullify our estimated effects. We often even report negative values for δ , indicating that adding relevant controls would further increase the coefficients. We can thus conclude that, for the most part, our results are not driven by any remaining omitted variable bias.

3.7 Conclusion

The results from this study add to the relatively large and still growing macroeconomic literature on the impact of political instability on investment and economic growth. This study

²⁶ We exclude total household expenditures from this robustness check as the main regressions already yielded mostly insignificant coefficients around zero.

abstracts from corporate and public investment and considers the problem at the level of households in a low-income country context and highlights several relevant transmission channels linking instability to economic outcomes. Our results confirm the findings in the macroeconomic literature; instability lowers the prospects for economic growth. We show a negative effect of political instability on financial savings, the accumulation of durables, investment in house improvements, and investment in education and health. Instability seems in particular to lead to a reshuffling from investment expenditures to increased food consumption. Quantitatively, our estimates suggest that a one standard deviation increase in instability is associated with a reduction in per capita expenditures for education, health and durables by about 35%, 9% and 3% respectively and an increase in food expenditures by about 4%. Expressed in units of their standard deviation our effects are about the same to a third of those in the macroeconomic literature.²⁷ Although we cannot claim that our effects are causal, they are robust to a large range of controls, including household characteristics, local economic development, local rainfall conditions, local mining activities, as well as municipality- and time-fixed effects. They also hold when we use alternative specifications and they survive all state-of-the-art robustness checks including a randomization inference test.

With respect to economic growth, the sizable education and health effects seem to be particularly worrisome. Given the increasing instability in some parts of Sub-Saharan Africa, these results underpin the need for well-functioning and stable institutions. Considering the rising demographic burden, at least in Sub-Saharan Africa, and the still stalling structural change away from subsistence agriculture toward more internationally integrated value chains, this study adds to the evidence that stability is a prerequisite to dealing with these challenges. Growth is unlikely to take pace if households continuously save too little and underinvest, not just in capital, but also in health and education.

²⁷ Using a sample of 39 countries in Sub-Saharan Africa Gyimah-Brempong and Traynor (1999), for instance, find for a one standard deviation change in instability a change in GDP per capita growth of 0.037 standard deviations and a change in investment per GDP of 0.109 standard deviations.

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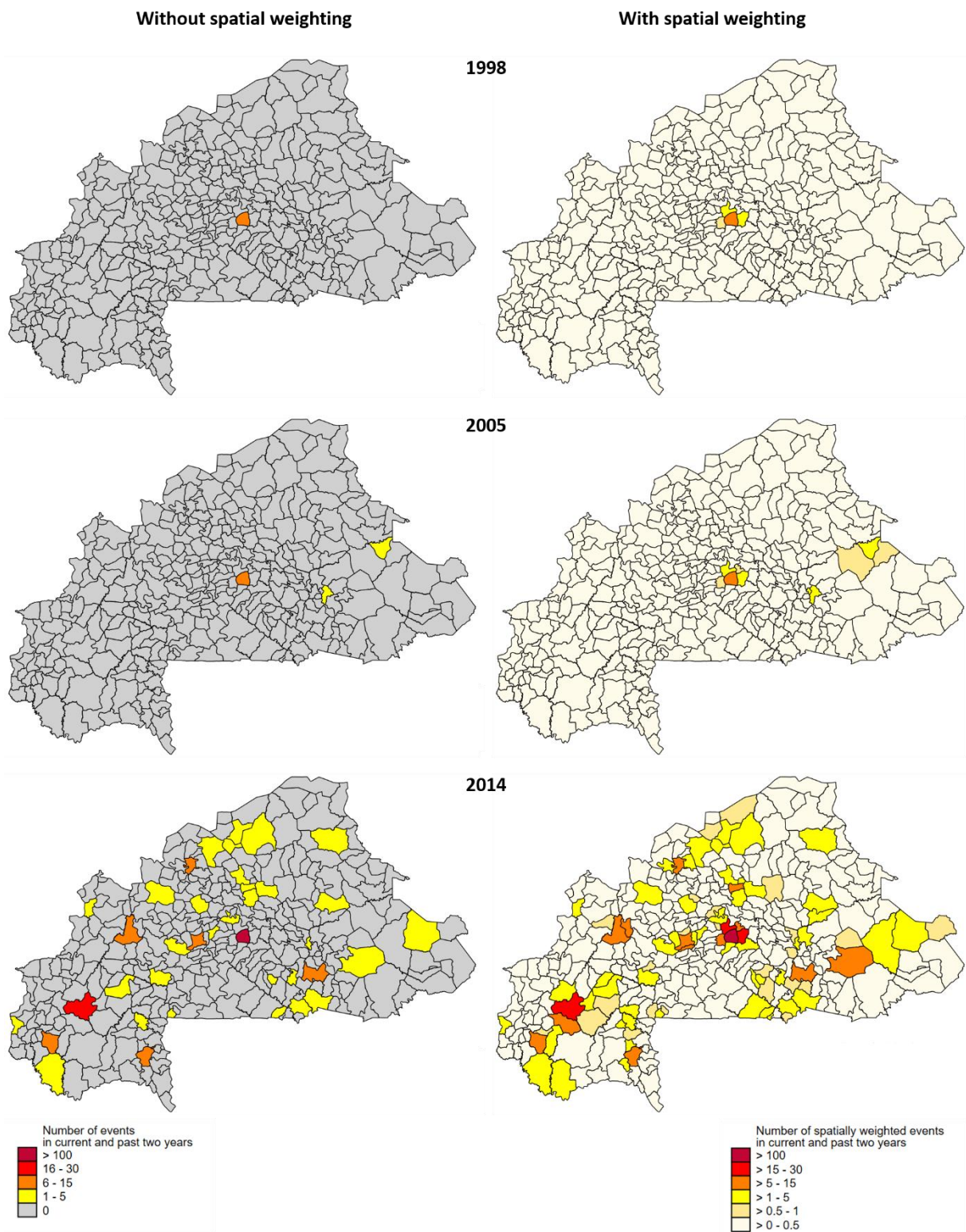
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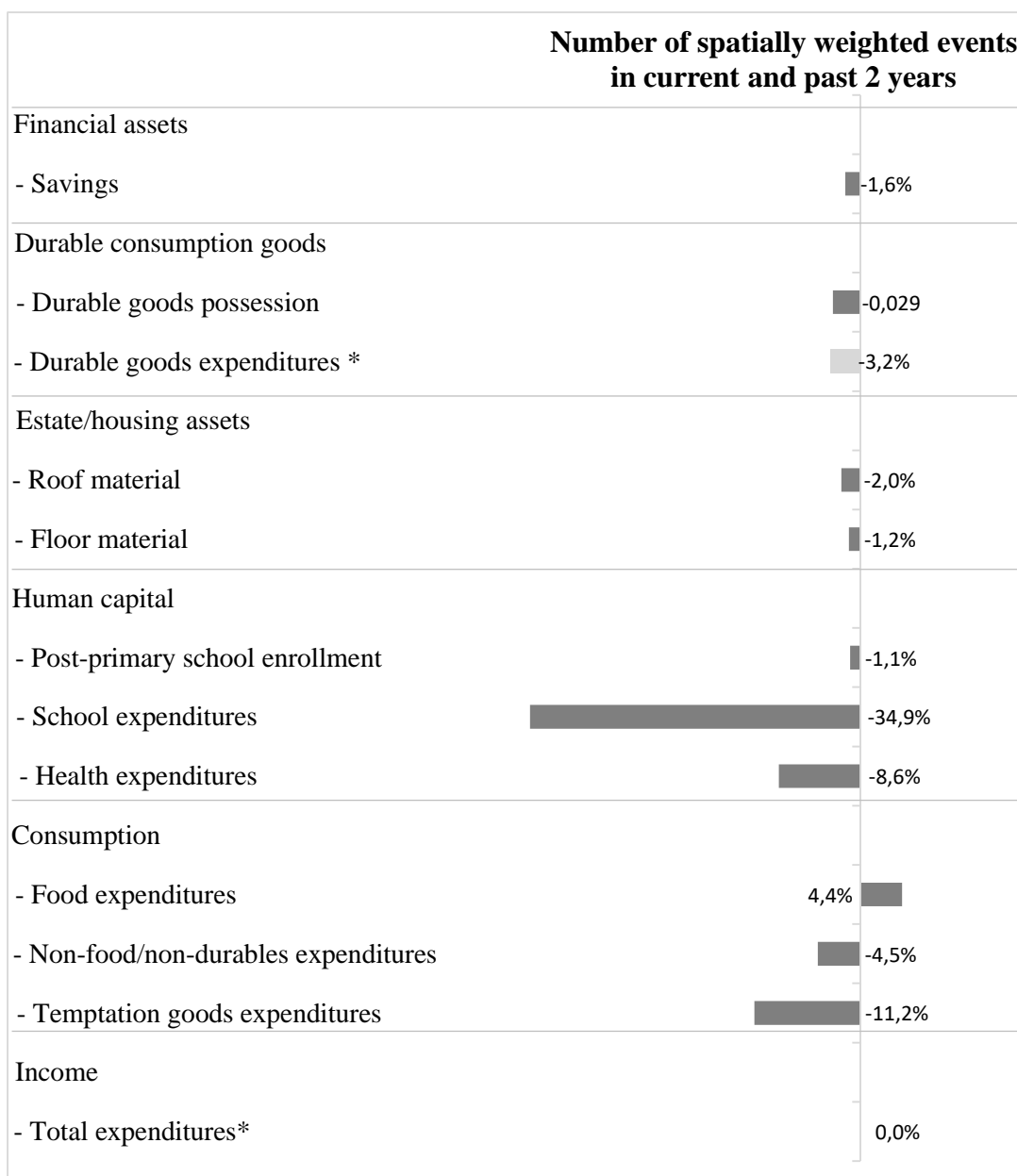
Appendix

Number of events in current and past two years per municipality



Source: Own calculations using data from ACLED.

Figure A.3.1: Intensity of factual instability across time and space in Burkina Faso, 1998, 2005, 2014



Notes: * Coefficients are not significant. All other coefficients are statistically significant at the 1%-level. All expenditures are log-transformed and thus coefficients are interpreted as percentage changes. Durable goods possession is a count variable and thus the coefficient is interpreted as a level change. School enrollment is measured as a rate and thus the coefficient is interpreted as a change in percentage points. All coefficients come from the second row of tables 3, 4 and 5 respectively.

Source: Own estimations using data from ACLED, INSD, NOAA, UD and MM.

Figure A.3.2: Overview – the effects of factual political instability on households’ saving, investment, and consumption behavior

Table A.3.1: Summary statistics of measures of political instability at municipality level

	Obs.	Mean	Std. Dev.	Min.	Max.
<i>Factual political instability</i>					
Number of spatially weighted events in current year	1,536	0.138	1.849	0	66
Number of spatially weighted events in current and past two years	1,536	0.302	2.938	0	104
Number of spatially weighted fatalities in current year	1,536	0.045	0.659	0	23
Number of spatially weighted fatalities in current and past two years	1,536	0.165	1.064	0	24

Source: Own calculations using data from ACLED.

Table A.3.2: Summary statistics of control variables

	Obs.	Mean	Std. Dev.
Household is urban (=1)	53,166	0.328	0.469
Household head is male (=1)	53,163	0.885	0.319
Household head's age	53,053	45.180	15.232
Household size	52,833	6.569	4.097
Number of children in household	52,917	3.206	2.678
<i>Household head's education</i>			
No education (=1)	52,861	0.754	0.431
Pre-school (=1)	52,861	0.001	0.038
Primary school (=1)	52,861	0.115	0.318
Secondary school (cycle 1) (=1)	52,861	0.056	0.231
Secondary school (cycle 2) (=1)	52,861	0.047	0.211
Tertiary education (=1)	52,861	0.027	0.163
<i>Household head's occupation</i>			
Employee (=1)	52,901	0.125	0.331
Self-employed/employer (=1)	52,901	0.760	0.427
Family worker/volunteer/apprentice (=1)	52,901	0.035	0.183
Unemployed/inactive (=1)	52,901	0.080	0.271
<i>Time to nearest market</i>			
Less than 30 min (=1)	52,853	0.575	0.494
30 to 60 min (=1)	52,853	0.238	0.426
More than 60 min (=1)	52,853	0.187	0.390
<i>Time to nearest portable water source</i>			
Less than 30 min (=1)	52,473	0.853	0.354
30 to 60 min (=1)	52,473	0.095	0.294
More than 60 min (=1)	52,473	0.051	0.221
<i>Time to nearest primary school</i>			
Less than 30 min (=1)	52,853	0.706	0.456
30 to 60 min (=1)	52,853	0.197	0.397
More than 60 min (=1)	52,853	0.098	0.297
<i>Time to nearest health center</i>			
Less than 30 min (=1)	52,657	0.440	0.496
30 to 60 min (=1)	52,657	0.261	0.439
More than 60 min (=1)	52,657	0.299	0.458
<i>Nighttime lights*</i>			
Mean luminosity in municipality	1,536	0.175	1.533
<i>Rainfall during last growing season (May to September)*</i>			
Average monthly rainfall (mm)	1,536	139.575	28.335
Coefficient of variation of rainfall	1,536	0.454	0.113
<i>Industrial mines*</i>			
Municip. centroid within 25 km of industrial mine (=1)	1,536	0.027	0.161

Notes: * Nighttime lights, rainfall and industrial mines statistics were computed at the municipality level.

Source: Own calculations using data from INSD, NOAA, UD and MM.

Supplemental Material

A. Construction of the outcome variables

In this section, we explain how we calculated our various outcome variables using data from the six INSD household surveys: The Enquête Prioritaire (1998), the Enquête Burkinabè sur les Conditions de Vie des Ménages (2003), the Enquête Annuelle sur les Conditions de Vie des Ménages (2005, 2007), the Enquête Intégrale sur les Conditions de Vie des Ménages (2009), and the Enquête Multisectorielle Continuée (2014).

Financial assets (A^f)

Savings

Information on financial assets is only available in the last two INSD surveys, i.e. in 2009 and 2014. In both surveys, household members were asked if they are currently saving any money. While in 2014 the survey distinguished between savings at home and savings in a bank account, this distinction was not made in 2009. Hence, we also do not distinguish between these two types of savings. Furthermore, in 2009 household members aged ten years or older were asked, while in 2014 only those aged 15 years or older were asked. Consequently, we considered only answers from those aged 15 years or older in both years. In 30.8% of all households none of the household members saved any money, in 47.8% one or two household members and in only 22.2% three or more household members reported to save money suggesting that the decision about savings is typically made at the household level rather than at the individual level. Hence, to measure investment in financial assets, we created a dummy variable that equals one if at least one adult household member (aged 15 or older) reported to save any money at home or at a bank and zero otherwise. There is no information about the amount of savings.

Durable consumption goods (A^d)

We measure investment in durable consumption goods using two alternative approaches. First, the possession or count of durable goods, and second, expenditures on durable goods.

Durable goods possession

For the first approach, we can exploit all six INSD household surveys, since all of them collected data on the possession of durables. While the survey in 1998 considered 23 items, the surveys in 2003, 2005, 2007, 2009 and 2014 considered 12, 14, 16, 28 and 26 items respectively. We thus started by selecting a consistent list of eight durables present in all the surveys. These durables are iron, fridge, cooking stove, television, radio, bicycle, motorcycle, and car. For each of the selected durables, we constructed a dummy variable that takes the value one if a household owns at least one unit of this good and zero otherwise. Then, for each household, we calculated the sum of these dummies. Hence, we measure durable goods possession by the number of different durables (from a consistent list of eight items) currently owned by the household.

Durable goods expenditures

Information on households' expenditures on durable goods was collected in three of the six surveys, namely in 1998, 2003 and 2014. The 1998 and 2003 surveys provide durable goods expenditures for the past month, the 2014 survey for the past three months. As for durable goods possession, the surveys differ in terms of the list of durable goods for which expenditure information is available. For the sake of comparability, we decided to consider expenditures for the purchase of seven durable goods, which are available in all three surveys: furniture, fridges, radios, televisions, bicycles, motorcycles and cars. Hence, in each year, we summed up the households' expenditures for these items and scaled them down to one month. We only considered expenditures by the household itself and did not add gifts received by others. Further, we divided the expenditures by the number of household members. Lastly, we deflated the expenditures over time and space to account for inflation as well as regional price differences. As a result, we measure the per capita monthly durable goods expenditures (from a consistent list of seven items), expressed in CFA-Francs in 1998 Ouagadougou prices.

Estate/housing assets (A^e)

All six INSD household surveys collected information on various aspects of households' housing characteristics such as location, ownership, and property rights, as well as the number of rooms, housing equipment, and construction materials. To measure investments in estate or housing assets, we decided to analyze specific aspects of housing quality, namely the construction material of the dwelling's roof and floor. Information on both aspects is reported in a comparable way at the household level throughout the years 1998 to 2014. On this basis, we categorized the different roof and floor materials as either modern or traditional.

Roof material

Modern roof materials include concrete, cement, tile, and sheet metal; traditional roof materials include dirt, straw, and thatch. We created a dummy that equals one if the roof material of the household's dwelling classifies as modern and zero if it classifies as traditional.

Floor material

Modern floor materials include cement, tile, and fitted carpet; traditional floor materials include dirt and sand. We created a dummy that equals one if the floor material of the household's dwelling classifies as modern and zero if it classifies as traditional.

Livestock (A^l)

The first four INSD household surveys collected information on households' livestock ownership. In 1998, the survey asks about the ownership and number of units for a whole list of animals, including cattle, sheep, goats, donkey, horses, camels, and pigs. The later surveys only distinguish between big and small animals. On this basis, we created two variables measuring investment in livestock that ensure comparability across survey years.

Big livestock. For each household, we summed up the number of big livestock such as cattle, donkeys, horses, and camels. Consequently, we measure investment in big livestock as the total count of big livestock owned by the household.

Small livestock. For each household, we summed up the number of small livestock such as sheep, goats, and pigs. Consequently, we measure investment in small livestock as the total count of small livestock owned by the household.

Human capital (A^h)

To analyze investment in human capital, we focus on school enrollment, school expenditures, and health expenditures.

Post-primary school net enrollment rate

All six INSD surveys provide information about school enrollment. Household members were asked if they are regularly attending school in the current school year. In addition, they were asked which class they are attending, if enrolled. These questions were formulated in the same way across all surveys. Since primary school is compulsory and indeed almost all children in Burkina Faso go at least to primary school, we focus only on enrollment in secondary and tertiary education and vocational training (6^{ème}, 5^{ème}, 4^{ème}, 3^{ème}, 2^{nde}, 1^{ère}, Terminale, Supérieur, Profession Secondaire après CEP, Profession Secondaire après BEPC). More specifically, we calculated the ‘post-primary school net enrollment rate’ by dividing the number of household members in post-primary school age (13 to 19 years old) currently enrolled in a post-primary education institution divided by all household members in that same age group. The net enrollment rate naturally ranges between 0 and 1.

School expenditures

The INSD surveys of 1998, 2003 and 2014 provide information about households’ school expenditures. Questions about school expenditures differ in the following ways across surveys. First, in 1998 and 2003 expenditures are reported for the past 12 months and in 2014 for the past three months. We scaled them in all years to 12 months which implies of course a possible bias due to recall error that is correlated with the recall period. In our regressions, we use survey specific effects (time-effects) to redress such a possible bias. While in 2014 only information about expenditures on school fees are included, in the other years the surveys additionally include expenditures on schoolbooks, transportation costs, and other parental contributions. To ensure comparability across all years, we only consider expenditures for school fees. This includes fees for pre-school, primary school, secondary school, higher education, and apprenticeships. We only considered expenditures by the household itself and did not add gifts received by others for school expenditures. Further, we divided the expenditures by the number of children aged 7 to 16, the age range of mandatory school enrollment. Lastly, we deflated the expenditures over time and space to account for inflation as well as regional price differences.

Health expenditures

The surveys of 1998, 2003 and 2014 provide information on health expenditures. The list of items is consistent over all surveys, however, the recall periods are different. We considered the household’s out of pocket expenditures for medication, medical examination, consultation, hospitalization and for other medical services. At the end we expressed the aggregate in per capita terms by dividing by the number of household members and deflated across time and space.

Consumption (c)

We capture consumption expenditures in terms of three categories: expenditures for food, temptation goods, and non-food/non-durables.

Food expenditures

The surveys of 1998, 2003 and 2014 provide information about household food expenditures at the household level. While in 1998 and 2003 the reference period is the past two weeks, it is the past week in 2014. Furthermore, the surveys differ in the list of food items included in the questionnaire. Both changes in the survey design are likely to affect the comparability of the expenditure aggregates over time, yet, as above, in our regression analysis such a bias can be redressed through the use of time-effects. We adjusted the expenditure aggregates to a common reference period and used a consistent list of food items. For each household, we summed up the monthly expenditures for a consistent list of food items including cereals, vegetables, fruits, eggs, milk products, meat, fish, and drinking water. We considered cash expenditures as well as consumed own production evaluated at market prices. At the end, we divided total food expenditures by the number of household members and deflated across time and space, i.e. express them in CFA-Francs in 1998 Ouagadougou prices.

Temptation goods expenditures

The surveys of 1998, 2003 and 2014 provide also information about expenditures for so-called temptation goods such as alcohol, tobacco, or cinema. We again scaled all expenditures to a common reference period (one month) and used a consistent list of items over time. For each household, we summed up the monthly expenditures for caffeine-containing foods and beverages (coffee, tea, cocoa, cola nut), alcoholic beverages (traditional beer, local and imported industrial beer, wine and liquor), tobacco and cigarettes, and leisure activities (e.g. sports, cinema, museum, literature). We only considered own expenditures of the household. We transformed them in per adult terms by dividing the aggregate by the number of adult household members (all household members aged 15 or older), since most temptation goods are typically not consumed by children. Lastly, we deflated across time and space.

Non-food/non-durables expenditures

The surveys of 1998, 2003 and 2014 provide also information on expenditures for a variety of other items. Again, information is provided at the item level, though with varying reference periods across items. We define non-food/non-durables expenditures as expenditures for consumption other than food, temptation and durable goods. More specifically, we consider household expenditures for energy (e.g. gas, petrol, electricity), hygiene / personal care (e.g. soap, detergent, cosmetic products), clothing, transport (incl. public transport and maintenance of own vehicles) and small household items (e.g. dishes, cutlery, cooking utensils). Again, we divide by the number of household members and deflate across time and space.

Income (y)

In absence of income data, we use, as it is common in the literature, total household expenditures as a proxy.

As mentioned above, the surveys of 1998, 2003 and 2014 collected information for various types of expenditure categories. We calculated the total household expenditures as the sum of the monthly expenditures for food, non-food/non-durable items, temptation goods, durable goods, education, and health. Then, we divided by the number of household members to get them in per capita terms and deflated across time and space.

Table S.3.1: Definition of the dependent variables

Dependent variable	Definition of variable	Additional explanations
<i>Income (y)</i> Total expenditures	Per capita monthly total expenditures of household, deflated	Expenditures in 1998 Ouagadougou CFA-Francs Expenditures include expenditures for food, non-food/non-durable items, temptation goods, durable goods, schooling, and health
<i>Consumption (c)</i> Food expenditures	Per capita monthly food expenditures of household, deflated	Expenditures in 1998 Ouagadougou CFA-Francs Expenditures include expenditures for and auto-consumption of a consistent list of food items including cereals, vegetables, fruits, eggs, milk products, meat, fish, drinking water
Non-food/non-durables expenditures	Per capita monthly non-food/non-durables expenditures of household, deflated	Expenditures in 1998 Ouagadougou CFA-Francs Expenditures include expenditures for consumption other than food, temptation and durable goods, i.e. energy (e.g. gas, petrol, electricity), hygiene / personal care, clothing, transport, small household items
Temptation goods expenditures	Per adult monthly temptation goods expenditures of household, deflated	Expenditures in 1998 Ouagadougou CFA-Francs Expenditures include expenditures for caffeine-containing foods and beverages, alcoholic beverages, tobacco and cigarettes, leisure activities (e.g. sports, cinema) Adult household members are defined as household members aged 15 or older
<i>Financial assets (A^f)</i> Savings	Dummy=1 if at least one adult household member reports to currently save money at home or at a bank	Adult household members are defined as household members aged 15 or older
<i>Durable consumption goods (A^d)</i> Durable goods possession	Number of durable goods owned by household based on a consistent list of goods	Durable goods include the following eight items: iron, gas/electric cooker, fridge, radio, television, bicycle, motorcycle, car
Durable goods expenditures	Per capita monthly durable goods expenditures of household, deflated	Expenditures in 1998 Ouagadougou CFA-Francs Expenditures include expenditures for the purchase of furniture, fridges, radios, televisions, bicycles, motorcycles, and cars
<i>Estate/housing assets (A^e)</i>		

Roof material	Dummy=1 if roof is constructed from modern material	Modern roof materials: concrete, cement, tile, sheet metal Traditional roof materials: dirt, straw, thatch
Floor material	Dummy=1 if floor is constructed from modern material	Modern floor materials: cement, tile, fitted carpet Traditional floor materials: dirt, sand
<i>Livestock (A^l)</i>		
Big livestock	Number of big livestock owned by the household	Big livestock: cattle, donkeys, horses, camels
Small livestock	Number of small livestock owned by the household	Small livestock: sheep, goats, pigs
<i>Human capital (A^h)</i>		
Post-primary school net enrollment rate	Number of household members aged 13 to 19 that are currently enrolled in post-primary school divided by the number of household members aged 13 to 19	13 to 19: common age range of post-primary school enrollment Only calculated for households with children in relevant age range
Schooling expenditures	Per pupil annual schooling expenditures of household, deflated	Expenditures in 1998 Ouagadougou CFA-Francs Expenditures include school fees for all household members enrolled in school (from pre-school to university) Pupils are defined as school-aged children (7 to 16)
Health expenditures	Per capita monthly health expenditures of household, deflated	Expenditures in 1998 Ouagadougou CFA-Francs Expenditures include medication, medical examination, consultation, hospitalization, and other medical services

Source: Authors.

B. Construction of the measures of factual instability

In this section, we explain how we used the data from the Armed Conflict Location & Event Data (ACLED) Project to construct objective, event-based measures of factual political instability.

Introduction to ACLED dataset

ACLED provides disaggregated and geocoded event-based conflict data. It collects the dates, actors, types of violence, locations, and fatalities of all reported political violence and protest events across Africa, South Asia, Southeast Asia, and the Middle East.⁴⁹ For Burkina Faso, ACLED data is available for the period January 1997 to September 2020.⁵⁰ The database includes events that occur during civil wars and periods of instability, public protests, and regime breakdowns. All events are classified as one of the following types: battles between violent armed groups, establishment of bases and strategic development by rebels, militias or governments, riots/protests, violence against civilians, non-violent transfer of territory, and remote violence (e.g. bombings, missile attacks).

Politically motivated events

Our first approach of measuring factual instability is based on the occurrence of politically motivated events as captured by ACLED. Using the geographical information in the database, we first allocated each reported event to one of the 351 municipalities of Burkina Faso. These events were then summed up on an annual basis for each municipality in order to calculate the total number of events that occurred in a specific year in a specific municipality. We assumed that municipalities that did not report any event did not experience any event. We are aware that underreporting of events might be a problem in the ACLED database; yet, we do not expect this to be systematic. We believe that for a household not only instability in its own municipality matters, but that also events and fatalities occurring in other municipalities may affect their saving and investment behavior. Yet, we expect that this effect decreases (exponentially) with the distance of the event to the household, i.e. the effects of a protest in the capital Ouagadougou are strong for households in Ouagadougou itself, weaker, but still important for households in e.g. Koudougou, but negligible for households in municipalities bordering Côte d'Ivoire. For this reason, we modified our instability measures by means of spatial weighting based on Kondo (2021). First, for each municipality m , the inverse distances between this municipality and all other 350 municipalities were calculated. Then, a decay parameter δ was introduced to ensure that weights of events further away from municipality m were exponentially decreasing, i.e. the inverse distances were raised to the power of δ .⁵¹ Next, the exponentiated inverse distances were normalized so that they summed up to one. Lastly, the events outside municipality m were weighted by the normalized exponentiated inverse distances and added to the count of events in municipality m . The resulting variable is the number of spatially weighted events of municipality m in year t . In addition, we assumed that for a household's decisions in a specific

⁴⁹ <https://www.acleddata.com/about-acledd/>

⁵⁰ At time of download

⁵¹ We choose $\delta = 8$, following some of Kondo's (2017) examples. A higher δ means a 'faster' decay of the weighting of more distant events.

year, not only violent events in that particular year matter, but also those in the near past. Hence, we also calculated more cumulative measures of instability: the number of spatially weighted events over the period $t-2$, $t-1$, and t . In the regressions, we standardized both measures of instability by transforming them in units of their standard deviation.

Politically motivated fatalities

Our second approach of measuring factual instability is based on the occurrence of fatalities caused by the politically motivated events presented above. This approach differs from the first one in that it emphasizes the violence component of political instability. More specifically, it only considers a politically motivated event as relevant for our analysis if at least one person died in the course of it. The problem of under- or misreporting increases when considering fatalities rather than just the occurrence of events. Different sources at times report different numbers of fatalities for the same event. In such cases, ACLED provides the number reported by the most credible source. If the most credible source cannot be easily determined, ACLED provides the lowest reported number of fatalities. However, except for the major outlier presented above (which was carefully adjusted), we have no reason to believe that there are any other drastic cases of misreporting, especially not over-reporting. The construction of the fatality-based instability measures was analog to the event-based measures. This means, after the above-mentioned outlier correction, we allocated each fatality to a municipality in order to create the number of fatalities per year and municipality and then applied the same spatial weighting procedure to the municipal fatality counts as we did for the events. This led to the following two fatality-based instability measures. The number of spatially weighted fatalities of municipality m in year t , and the number of spatially weighted fatalities over the period $t-2$, $t-1$, and t . In the regressions, we again standardized both measures by expressing them in units of their standard deviation.

Table S.3.2 on the next page summarizes the definitions of our measures of factual political instability.

Outlier correction

Before calculating our event-based measures of factual political instability, we corrected for one major outlier. The ACLED dataset includes an event of violence against civilians in 2002. The description of this event is as follows: ‘106 bodies that were bullet-ridden and handcuffed were found in the areas of: Bobo-Dioulasso, Kaya, Ouagadougou and surroundings, Boulsa and Ouahigouya. The bodies were dumped after being killed by police officers. Fatalities: 106 civilians.’ Since ACLED didn’t have precise information about the spatial distribution of the fatalities, they evenly allocated them to the five affected municipalities. That is ACLED’s standard approach when information about the location of fatalities is incomplete. This leads to a fatality count of 21 resp. 22 in each of the mentioned municipalities, which is, compared to all other events in our study period, an extremely high number. Most events come without any fatalities, and those that cause fatalities have a median fatality count of about two. Hence, while the data suggests that these five municipalities were heavily affected, we do not know how many fatalities actually occurred in which municipality. As a source for this event, ACLED names the Amnesty International Report of 2003. However, this report does also not mention

any geographic information, it merely states that ‘106 bodies had been found between October 2001 and January 2002 in various parts of the country’. Interestingly, the five municipalities mentioned by ACLED are spread across the country and none of them are neighboring municipalities. This raises the question of whether the mentioned municipalities were truly affected and/or if other municipalities were also affected. Given the high uncertainty about the exact locations of the killings, together with the extremely high number of fatalities in the (supposedly) affected municipalities, we think that is reasonable to revise the fatalities downwards. More specifically, we decided to adjust the fatality count in the mentioned municipalities down to five. This may seem like a drastic adjustment, however, five fatalities is still a very high fatality count in the context under study.

Table S.3.2: Overview of outcome variables availability

Dependent variable	Year					
	1998	2003	2005	2007	2009	2014
<i>Income (y)</i>						
Total expenditures	✓	✓				✓
<i>Consumption (c)</i>						
Food expenditures	✓	✓				✓
Non-food/non-durables expenditures	✓	✓				✓
Temptation goods expenditures	✓	✓				✓
<i>Financial assets (A^f)</i>						
Savings					✓	✓
<i>Durable consumption goods (A^d)</i>						
Durable goods possession	✓	✓	✓	✓	✓	✓
Durable goods expenditures	✓	✓				✓
<i>Estate/housing assets (A^e)</i>						
Roof material	✓	✓	✓	✓	✓	✓
Floor material	✓	✓	✓	✓	✓	✓
<i>Livestock (A^l)</i>						
Big livestock	✓	✓	✓	✓		
Small livestock	✓	✓	✓	✓		
<i>Human capital (A^h)</i>						
Post-primary school net enrollment rate	✓	✓	✓	✓	✓	✓
Schooling expenditures	✓	✓				✓
Health expenditures	✓	✓				✓

Source: Authors.

Table S.3.3: Definition of the independent variables: factual political instability

Factual instability variables	Definition of variables	Additional explanations
Number of spatially weighted events in current year	Count of events that occurred in municipality m plus events that occurred in other municipalities, weighted by inverse distance between municipalities, in current year t	<p>Events include:</p> <ul style="list-style-type: none"> - battles between violent armed groups - establishment of bases and strategic development by rebels, militias, or governments - riots/protests - violence against civilians - non-violent transfer of territory - remote violence (e.g. bombings, missile attacks)
Number of spatially weighted events in current and past two years	Count of events that occurred in municipality m plus events that occurred in other municipalities, weighted by inverse distance between municipalities, in current year t, year t-1, and year t-2	<p>Spatial weighting:</p> <ul style="list-style-type: none"> - inverse distances between municipality m and all other municipalities were calculated - decay parameter: inverse distances were risen to the power of 8 (decay parameter ensured that weights of events further away from municipality m were exponentially decreasing) - exponentiated inverse distances normalized so they summed up to 1 - events outside municipality m were weighted by the normalized exponentiated inverse distances and added to count of events in municipality m
Number of spatially weighted fatalities in current year	Count of fatalities that occurred in municipality m plus fatalities that occurred in other municipalities, weighted by inverse distance between municipalities, in current year t	<p>Fatalities were restricted to fatalities that occurred in the course of the above-described events, i.e. fatalities related to political conflict.</p>
Number of spatially weighted fatalities in current and past two years	Count of fatalities that occurred in municipality m plus fatalities that occurred in other municipalities, weighted by inverse distance between municipalities, in current year t, year t-1, and year t-2	<p>Spatial weighting of fatalities was analog to that of events.</p>

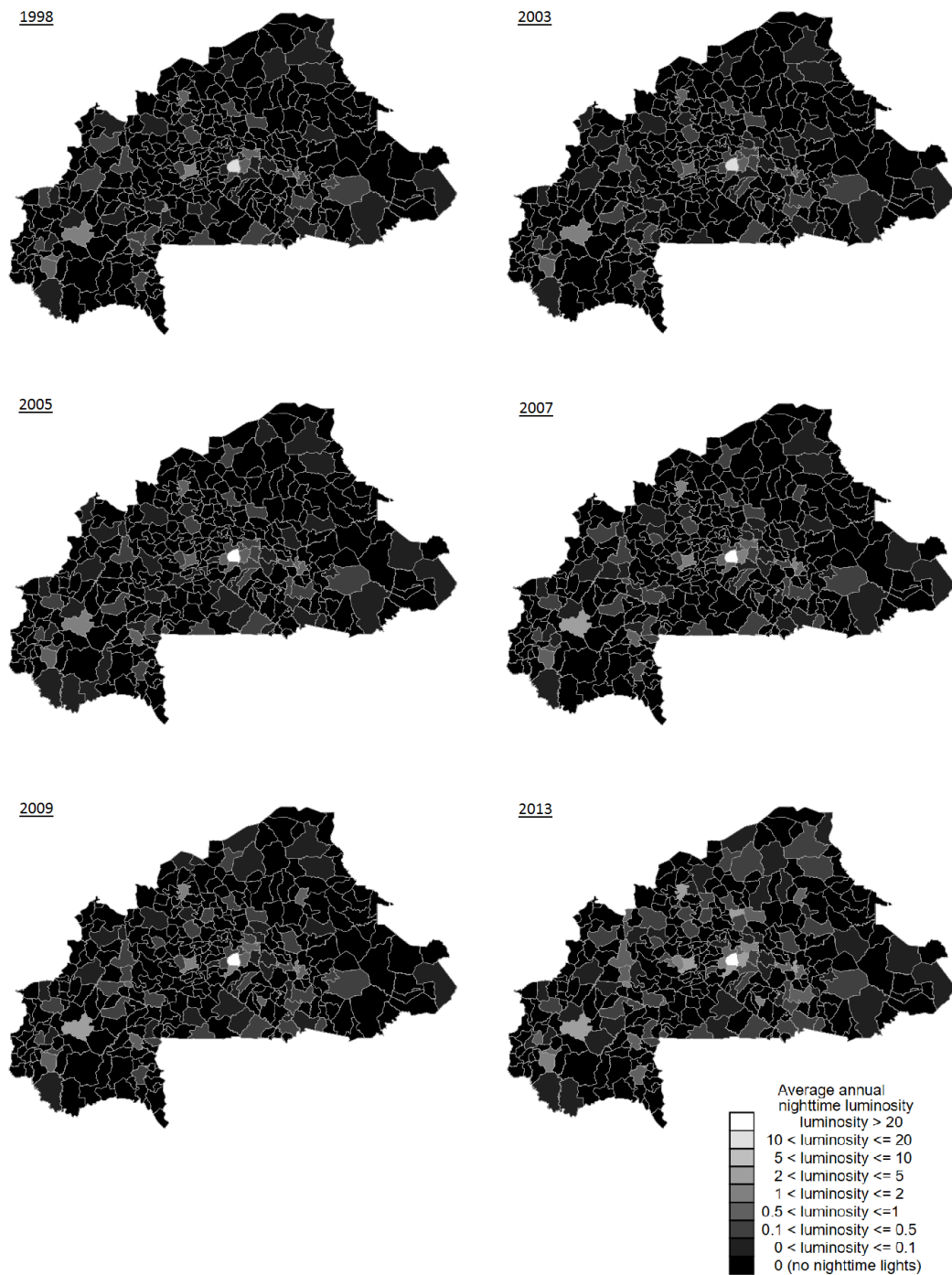
Source: Authors.

C. Construction of nighttime lights as proxy for local economic development

We use a global annual time series dataset on nighttime lights calculated from weather satellite recordings by the U.S. National Oceanic and Atmospheric Administration (NOAA) covering the period 1992 to 2013. Among the different available nighttime lights variables, we chose the stable lights series, as most other researchers in the economics literature have done. For each year, NOAA provides a gridded dataset covering the entire globe comprised of more than 725 million pixels sized 30x30 arc seconds, i.e. one pixel corresponds to less than one square kilometer at the equator. Each pixel reports annual average nighttime light intensity as a number ranging from 0 to 63, with higher numbers indicating higher nighttime luminosity. In combination with a shape file of the 351 municipalities of Burkina Faso, we calculated the mean nighttime luminosity for each municipality in each year as the unweighted average of the numbers reported by all pixels within the municipality boundaries.⁵² Since the distribution of the obtained variable is heavily right-skewed and shows tremendous zero bulking (about 73% zero values in our sample), we transform it before using it in regressions. We follow the literature and apply two alternative transformations (Michalopoulos and Papaioannou, 2013, 2014; Hodler and Raschky, 2014a, 2014b). First, we add a very small value (0.01) and then take the natural logarithm. Alternatively, we apply the inverse hyperbolic sine transformation (IHS-Transformation) (Burbidge, Magee and Robb, 1988).⁵³ Figure S.3.1 on the next page illustrates the spatial variation of annual average municipality nighttime luminosity in Burkina Faso across all six INSD survey years (no data for 2014 available, hence nighttime luminosity for 2013 shown instead).

⁵² For details, please refer to Lowe (2014). We followed his technical guide ‘Night Lights and ArcGIS: A Brief Guide’ for data preparation. On average, one municipality contained about 932 pixels. For some years, NOAA provides two datasets (from different satellites); for these years, we work with the average values of both datasets.

⁵³ We only show the results using ln-transformed nighttime luminosity, but the results using the HIS-transformed nighttime luminosity barely differ.



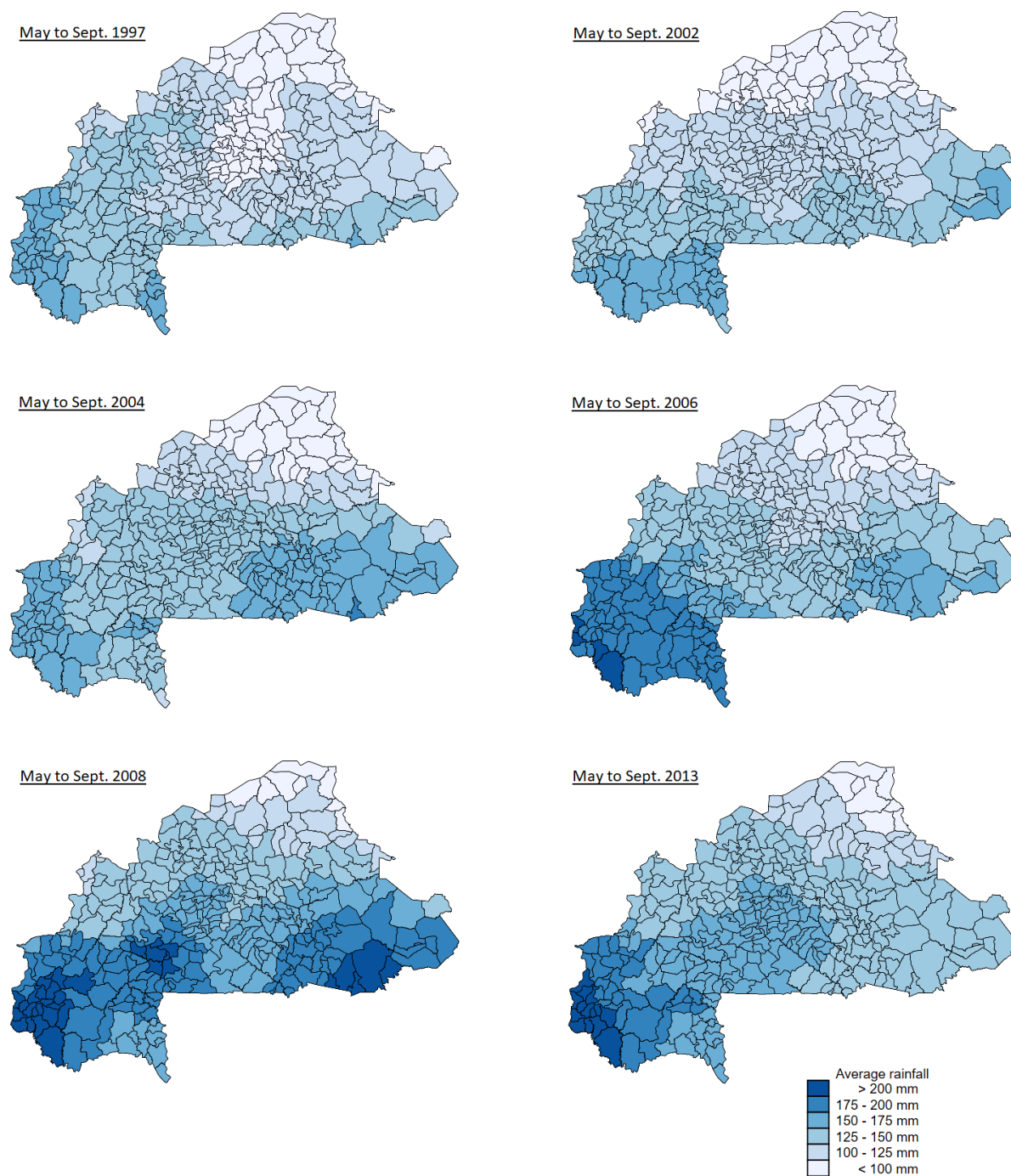
Notes: Lighter municipalities display more nighttime luminosity; completely black municipalities are municipalities with zero nighttime luminosity. The scale was adjusted to make differences between low luminosity municipalities more easily visible.

Source: Own calculations using data from NOAA.

Figure S.3.1: Spatial variation of nighttime luminosity in Burkina Faso across time

D. Spatial variation of rainfall levels and variability across time

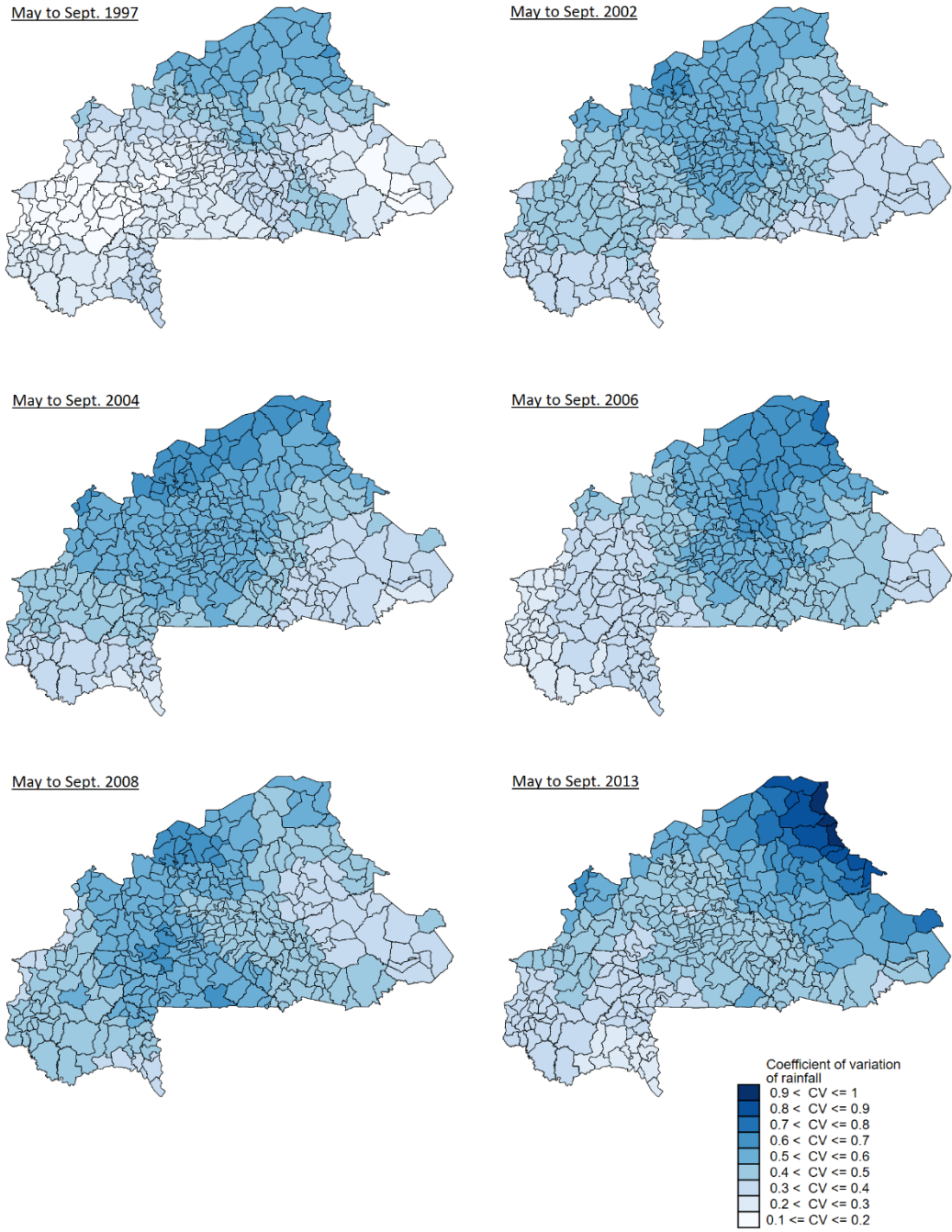
Figure S.3.2 illustrates the spatial variation of annual municipal rainfall levels (average rainfall in the preceding growing season) in Burkina Faso across all six INSD survey years.



Source: Own calculations using data from UD.

Figure S.3.2: Spatial variation of rainfall levels in Burkina Faso across time

Figure S.3.3 illustrates the spatial variation of annual municipal rainfall variability (coefficient of variation in the preceding growing season) in Burkina Faso across all six INSD survey years.

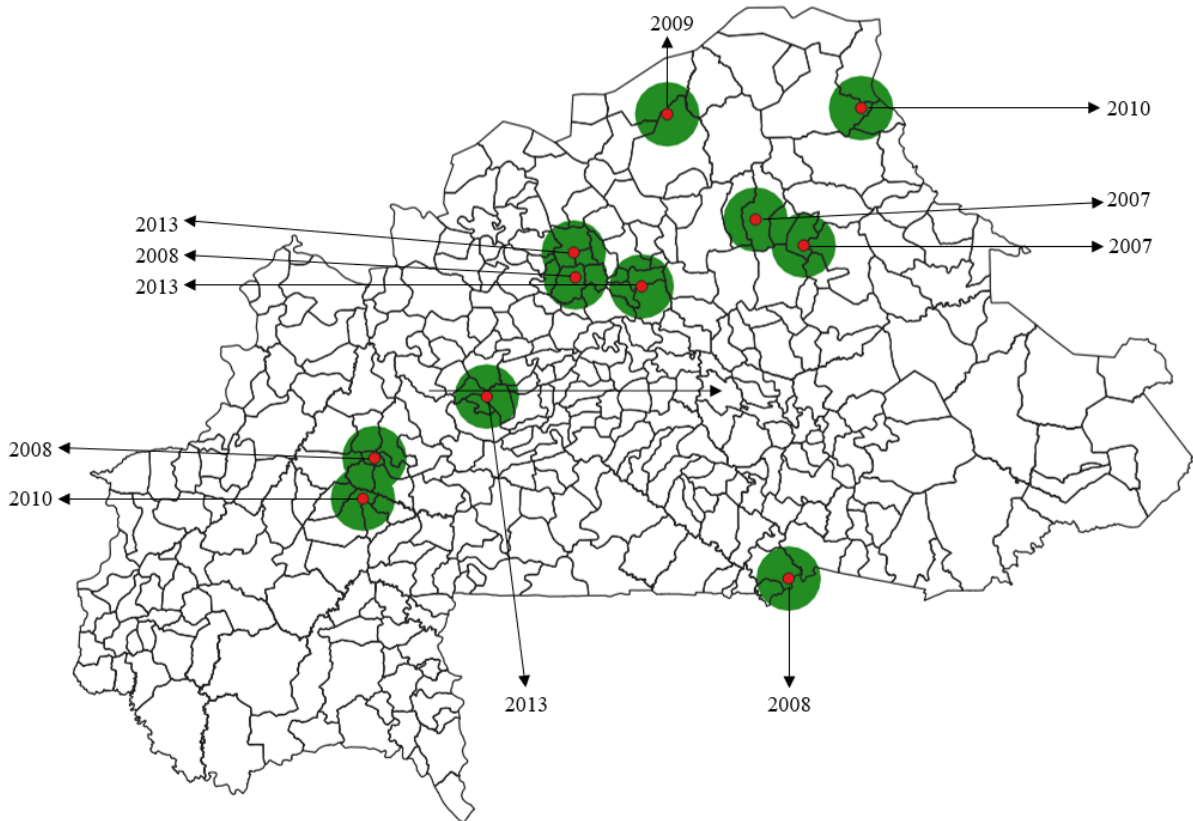


Source: Own calculations using data from UD.

Figure S.3.3: Spatial variation of rainfall variability in Burkina Faso across time

E. Construction of a measure of exposure to industrial mines

We use data on the geolocation of all industrial mines active during our study period in Burkina Faso provided by the Ministry of Mines (MM). These data also include the starting date of production, yearly output, surface area and type of the mined metal of each mine. During our study period seven large gold mines (of which two have additional smaller sites) and two large zinc and manganese mines were active (in at least one survey year), leading to eleven separate industrial mining sites. Since the data on the extent of the mining sites is not very precise and we do not have data on the geolocation of the households, we had to work with approximations. Specifically, we first drew a 25 km radius around the mining sites’ centroids. Then, in each year and for each municipality we verified whether the municipality’s centroid falls within the 25 km radius around any of the active mining sites. Hence, we created a municipality level dummy that equals one if the municipality centroid is within 25 km distance of an active industrial mining site’s centroid. Figure S.3.4 below illustrates the locations of all eleven mining sites across municipalities



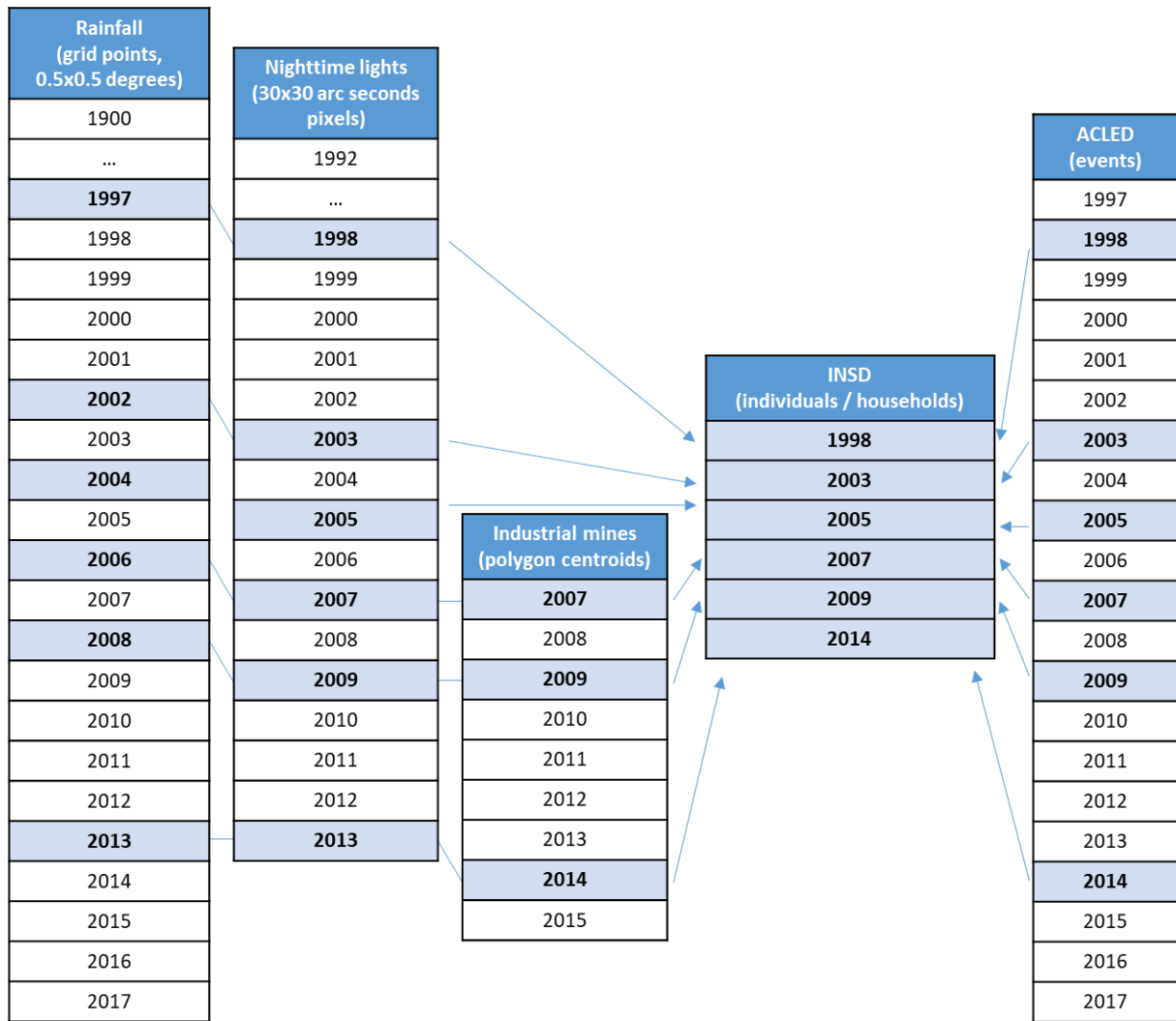
Notes: Red points denote industrial mining sites’ centroids and the green circles their 25 km buffer zone. Years indicate the opening years of the mines.
Source: Own calculations using data from MM.

Figure S.3.4: Locations of industrial mines across Burkina Faso

F. Geographic mapping and merging of the different data sources

We used five different data sources to build a novel dataset containing information related to households' investment and saving behavior and political instability in Burkina Faso as well as a variety of household and municipality level control variables. Our data sources are Household Living Standard Surveys conducted by the Institut National de la Statistique et de la Démographie (INSD) of Burkina Faso, the Armed Conflict Location & Event Data Project (ACLED), the Version 4 DMSP-OLS Nighttime Lights Time Series (Stable Lights) compiled by the U.S. National Oceanic and Atmospheric Administration (NOAA), the Terrestrial precipitation: 1900-2017 gridded monthly time series (V 5.01) provided by the University of Delaware (UD) and geolocation data of industrial mines provided by the Ministry of Mines (MM) of Burkina Faso. The data from the INSD were collected at the household and individual level (different households across years and surveys), whereas the datasets from ACLED, NOAA, UD and MM are organized as yearly respectively monthly time series. Fortunately, all datasets provide sufficient geographical information that enabled us to merge the data from the different sources at the level of municipalities. Burkina Faso is divided into 351 municipalities that constitute the third level of administrative division after regions and provinces. Before merging, we aggregated all variables with respect to nighttime lights, rainfall and industrial mining at the municipality level, while keeping all outcome and control variables from the INSD surveys as household level variables. Then, to each of the six survey years of the INSD data (1998, 2003, 2005, 2007, 2009, 2014), we matched the event-based measures of political instability from ACLED. The municipality level indicators of rainfall level and variability were calculated for the growing season (May to September) preceding the INSD collection period. This means rainfall indicators for the growing season 1997 were matched to the INSD data of 1998, those from the growing season 2002 to the INSD data of 2003 and so forth. The annual municipality level nighttime lights data were generally allocated to the INSD data of the same year. Yet, since nighttime lights data is currently only available until 2013, we allocated the 2013 nighttime lights data to the 2014 INSD data. Lastly, for each INSD year, we allocated the municipality level industrial mining dummies of that specific year. All in all, this gave us a household level dataset covering a total of 53,166 households from 339 municipalities across six years (1998, 2003, 2005, 2007, 2009 and 2014).⁵⁴ Figure S5 illustrates the process of data merging graphically.

⁵⁴ Twelve municipalities were not sampled in either of the six INSD household surveys and are thus not included in our sample.



Notes: Rainfall, nighttime lights, industrial mines, and ACLED data were all aggregated at the municipality level before being merged with the household level INSD data.

Source: Own representation by the authors.

Figure S.3.5: Merging of data from INSD, ACLED, NOAA, UD and MM

G. Detailed regression tables: factual instability

In this section, we present the detailed results from our main analysis, with factual political instability as the main regressor. As compared to the tables in the main text, here we additionally show the coefficients of all control variables. Yet, still for the sake of space, we only show the results from one regression for each outcome variable. More specifically, we show the results from the regressions using *the number of spatially weighted events in the current and past 2 years* as factual instability measure. However, the coefficients of the control variables barely differ when using any of the other three measures of factual political instability. Hence, the tables below provide a comprehensive picture about the correlations between our outcome and control variables.

Table S.3.4: Effects of factual instability on households' saving and investment decisions (OLS)

– detailed results

Instability measure (standardized), control variables	Financial assets (A ^f)	Durable goods (A ^d)		Estate/housing assets (A ^e)	
	(HH saved (=1)) (1)	(Owned, count) (2)	(ln p.c. exp., monthly) (3)	(Quality roof (=1)) (4)	(Qual. floor (=1)) (5)
Number of spatially weighted events in current and past 2 years	-0.016*** (0.004)	-0.029*** (0.004)	-0.032 (0.020)	-0.020*** (0.002)	-0.012*** (0.002)
Household location (=1), urban	-0.013 (0.023)	0.444*** (0.047)	0.069 (0.076)	0.296*** (0.033)	0.302*** (0.032)
Gender of household head (=1), female	0.041*** (0.011)	0.539*** (0.083)	0.115** (0.055)	-0.022*** (0.007)	-0.027*** (0.006)
Age of household head	-0.003* (0.001)	0.019** (0.010)	-0.007 (0.005)	-0.002*** (0.001)	-0.002** (0.001)
Age of household head squared	0.000 (0.000)	-0.000*** (0.000)	0.000 (0.000)	0.000** (0.000)	0.000 (0.000)
Education of household head (=1), pre-school	-0.037 (0.064)	-0.010 (0.208)	-0.110 (0.309)	-0.017 (0.042)	0.093* (0.052)
Education of household head (=2), primary school	0.078*** (0.010)	0.442*** (0.073)	0.022 (0.042)	0.087*** (0.014)	0.096*** (0.009)
Education of household head (=3), secondary school, 1 st cycle	0.128*** (0.019)	1.130*** (0.124)	0.180*** (0.059)	0.126*** (0.033)	0.166*** (0.027)
Education of household head (=4), secondary school, 2 nd cycle	0.172*** (0.028)	2.006*** (0.123)	0.216*** (0.069)	0.149*** (0.042)	0.199*** (0.036)
Education of household head (=5), higher education	0.234*** (0.032)	2.759*** (0.135)	0.252*** (0.082)	0.084*** (0.029)	0.144*** (0.027)
Occupation of household head (=1), fam. work. / volunt. / appr.	-0.048* (0.027)	-0.083** (0.039)	-0.001 (0.098)	-0.033** (0.013)	-0.041*** (0.014)
Occupation of household head (=2), employee	0.047** (0.023)	0.498*** (0.074)	0.166*** (0.063)	0.049** (0.021)	0.056* (0.029)

Occupation of household head (=3), employer / self-employed	0.035*	0.098**	0.007	-0.033***	-0.045***
	(0.021)	(0.040)	(0.050)	(0.007)	(0.008)
Household size	0.025***	0.151***	0.016*	0.007***	0.005***
	(0.003)	(0.026)	(0.010)	(0.002)	(0.002)
Household size squared	-0.001***	-0.004***	0.000	0.000*	0.000
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
Time to nearest market (=2), 30 – 60 min	-0.025**	-0.094***	-0.052	-0.027***	-0.034***
	(0.011)	(0.021)	(0.037)	(0.008)	(0.007)
Time to nearest market (=3), > 60 min	0.006	-0.112***	0.013	-0.051***	-0.051***
	(0.019)	(0.024)	(0.054)	(0.011)	(0.010)
Time to nearest portable water source (=2), 30 – 60 min	-0.023	-0.022	0.004	-0.035***	-0.038***
	(0.015)	(0.018)	(0.050)	(0.008)	(0.008)
Time to nearest portable water source (=3), > 60 min	-0.020	0.023	-0.131*	-0.033***	-0.030***
	(0.025)	(0.026)	(0.076)	(0.011)	(0.011)
Time to nearest primary school (=2), 30 – 60 min	0.001	-0.042**	-0.017	-0.022***	-0.011*
	(0.015)	(0.017)	(0.039)	(0.007)	(0.007)
Time to nearest primary school (=3), > 60 min	-0.033	-0.045**	-0.057	-0.034***	-0.017
	(0.025)	(0.022)	(0.062)	(0.013)	(0.012)
Time to nearest health center (=2), 30 – 60 min	-0.024**	-0.127***	0.038	-0.034***	-0.048***
	(0.012)	(0.027)	(0.038)	(0.007)	(0.008)
Time to nearest health center (=3), > 60 min	-0.022	-0.187***	0.006	-0.085***	-0.094***
	(0.019)	(0.029)	(0.052)	(0.010)	(0.010)
Ln average rainfall during last growing season	-0.107	0.042	-0.290	-0.038	0.023
	(0.179)	(0.253)	(0.377)	(0.039)	(0.034)
Coefficient of rainfall variation during last growing season	-0.359*	-0.058	0.200	-0.102**	-0.072
	(0.203)	(0.244)	(0.523)	(0.045)	(0.045)
Ln average nighttime nights	-0.012	-0.019	-0.022	-0.022**	-0.011
	(0.042)	(0.026)	(0.054)	(0.010)	(0.009)
Municipality centroid within 25 km of industrial mine (=1)	0.188**	0.141	0.023	0.098**	-0.022
	(0.087)	(0.108)	(0.261)	(0.045)	(0.037)
Constant	0.860	-0.415	1.423	0.613***	0.312*
	(0.961)	(1.588)	(1.813)	(0.203)	(0.165)
Sample mean of outcome (level)	0.691	2.141	3,778	0.553	0.469
Municipality-fixed effects	yes	yes	yes	yes	yes
Time-fixed effects	yes	yes	yes	yes	yes
Observations	17,938	50,892	25,849	50,767	50,707
Municipality groups	331	339	329	339	339

Notes: Each column corresponds to one regression. Savings data is only available for the years 2009 and 2014. The variable savings takes the value one if at least one household member aged 15 or older reported to save money. Durable goods possession is a count over eight different assets. Durable expenditures data is only available for the years 1998, 2003 and 2014; they are in per capita terms, ln-transformed and deflated to 1998 Ouagadougou prices. Quality roof takes the value one if the roof is of concrete, metal sheets, or tiles vs. straw or thatch. Quality floor takes the value one if the floor is of tiles, carpet, or cement vs. dirt or sand. Robust standard errors clustered at the municipality level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table S.3.5: Effects of factual instability on households' human capital investments (OLS)
– detailed results

Instability measure (standardized), control variables	Education (A ^h)		Health (A ^h)
	(Post-primary net enrollment rate)	(ln p.p. exp., monthly)	(ln p.c. exp., monthly)
	(1)	(2)	(3)
Number of spatially weighted events in current and past 2 years	-0.011*** (0.002)	-0.349*** (0.027)	-0.086*** (0.024)
Household location (=1), urban	0.180*** (0.011)	0.571*** (0.149)	0.389*** (0.090)
Gender of household head (=1), female	-0.048*** (0.006)	-0.520*** (0.087)	-0.102 (0.070)
Age of household head	0.009*** (0.002)	0.077*** (0.020)	-0.004 (0.008)
Age of household head squared	-0.000*** (0.000)	-0.001*** (0.000)	-0.000 (0.000)
Education of household head (=1), pre-school	0.067 (0.054)	-0.288* (0.158)	-0.103 (0.341)
Education of household head (=2), primary school	0.088*** (0.009)	0.478*** (0.063)	0.412*** (0.052)
Education of household head (=3), secondary school, 1 st cycle	0.232*** (0.010)	0.997*** (0.094)	0.470*** (0.081)
Education of household head (=4), secondary school, 2 nd cycle	0.286*** (0.012)	1.490*** (0.261)	1.043*** (0.196)
Education of household head (=5), higher education	0.325*** (0.021)	1.883*** (0.398)	0.955*** (0.279)
Occupation of household head (=1), fam. work. / volunt. / appr.	-0.064*** (0.014)	-0.173 (0.138)	-0.682*** (0.125)
Occupation of household head (=2), employee	-0.002 (0.010)	-0.167 (0.123)	0.009 (0.123)
Occupation of household head (=3), employer / self-employed	-0.051*** (0.009)	-0.502*** (0.112)	-0.264*** (0.096)
Household size	0.003* (0.001)	0.420*** (0.098)	0.127*** (0.018)
Household size squared	-0.000** (0.000)	-0.015*** (0.004)	-0.004*** (0.001)
Time to nearest market (=2), 30 – 60 min	-0.014*** (0.005)	-0.036 (0.056)	-0.114** (0.053)
Time to nearest market (=3), > 60 min	-0.018*** (0.007)	0.035 (0.066)	-0.022 (0.076)
Time to nearest portable water source (=2), 30 – 60 min	-0.005 (0.006)	0.006 (0.063)	0.049 (0.076)
Time to nearest portable water	-0.021**	0.159**	0.155

source (=3), > 60 min	(0.008)	(0.079)	(0.120)
Time to nearest primary school (=2), 30 – 60 min	-0.019*** (0.006)	-0.158*** (0.044)	-0.153 (0.104)
Time to nearest primary school (=3), > 60 min	-0.012* (0.006)	-0.404*** (0.073)	-0.122 (0.123)
Time to nearest health center (=2), 30 – 60 min	-0.026*** (0.006)	-0.091 (0.057)	-0.080 (0.058)
Time to nearest health center (=3), > 60 min	-0.039*** (0.006)	-0.107 (0.075)	-0.174** (0.069)
Ln average rainfall during last growing season	0.008 (0.024)	0.275 (0.395)	0.605 (0.732)
Coefficient of rainfall variation during last growing season	-0.077** (0.031)	1.493*** (0.395)	-1.276 (1.064)
Ln average nighttime nights	-0.002 (0.007)	-0.292*** (0.077)	-0.020 (0.076)
Municipality centroid within 25 km of industrial mine (=1)	-0.053** (0.022)	0.380 (0.408)	0.128 (0.325)
Constant	-0.158 (0.117)	-5.346** (2.268)	0.711 (3.651)
Sample mean of outcome (level)	0.185	1,951	457
Municipality-fixed effects	yes	yes	yes
Time-fixed effects	yes	yes	yes
Observations	27,514	25,808	25,846
Municipality groups	339	329	329

Notes: Each column corresponds to one regression. The net enrollment rate at the post-primary education level is only calculated for those households with children in the relevant age group. Education and health expenditures data are only available for the years 1998, 2003 and 2014. They are in per pupil respectively per capita terms, ln-transformed and deflated to 1998 Ouagadougou prices. Robust standard errors clustered at the municipality level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table S.3.6: Effects of factual instability on households' total and consumption expenditures (OLS)

– detailed results

Instability measure (standardized), control variables	Total HH expenditures (y) (ln p.c. exp., monthly) (1)	Food (c) (ln p.c. exp., monthly) (2)	Non-food/ non-durables (c) (ln p.c. exp., monthly) (3)	Temptation goods (c) (ln p.a. exp., monthly) (4)
Number of spatially weighted events in current and past 2 years	0.000 (0.009)	0.044*** (0.010)	-0.045*** (0.014)	-0.112*** (0.019)
Household location (=1), urban	0.176*** (0.038)	0.042 (0.030)	0.424*** (0.064)	-0.515*** (0.119)
Gender of household head (=1), female	0.157*** (0.044)	-0.009 (0.068)	0.241*** (0.054)	0.640*** (0.072)
Age of household head	0.007** (0.003)	0.013 (0.008)	0.003 (0.004)	0.060*** (0.007)
Age of household head squared	-0.000*** (0.000)	-0.000* (0.000)	-0.000** (0.000)	-0.000*** (0.000)
Education of household head (=1), pre-school	-0.004 (0.077)	0.061 (0.070)	0.035 (0.115)	0.072 (0.293)
Education of household head (=2), primary school	0.167*** (0.034)	0.084*** (0.029)	0.282*** (0.028)	0.103 (0.072)
Education of household head (=3), secondary school, 1 st cycle	0.418*** (0.060)	0.222*** (0.047)	0.571*** (0.067)	0.368*** (0.123)
Education of household head (=4), secondary school, 2 nd cycle	0.721*** (0.069)	0.528*** (0.045)	0.958*** (0.066)	0.903*** (0.204)
Education of household head (=5), higher education	0.987*** (0.087)	0.692*** (0.076)	1.265*** (0.093)	1.247*** (0.244)
Occupation of household head (=1), fam. work. / volunt. / appr.	-0.017 (0.035)	0.067 (0.052)	-0.021 (0.049)	0.233** (0.114)
Occupation of household head (=2), employee	0.150*** (0.057)	0.212** (0.084)	0.228*** (0.076)	0.613*** (0.086)
Occupation of household head (=3), employer / self-employed	0.039 (0.025)	0.145*** (0.051)	0.046 (0.029)	0.469*** (0.070)
Household size	-0.130*** (0.004)	-0.041 (0.030)	-0.152*** (0.006)	-0.057** (0.027)
Household size squared	0.004*** (0.000)	0.001 (0.001)	0.005*** (0.000)	0.002 (0.001)
Time to nearest market (=2), 30 – 60 min	-0.063*** (0.016)	-0.033* (0.018)	-0.066*** (0.024)	-0.083 (0.053)
Time to nearest market (=3), > 60 min	-0.026 (0.023)	-0.006 (0.025)	-0.037 (0.032)	-0.034 (0.074)
Time to nearest portable water	0.006	-0.000	-0.028	0.011

source (=2), 30 – 60 min	(0.019)	(0.023)	(0.026)	(0.064)
Time to nearest portable water source (=3), > 60 min	0.038	0.019	0.030	0.091
Time to nearest primary school (=2), 30 – 60 min	(0.029)	(0.030)	(0.045)	(0.097)
Time to nearest primary school (=3), > 60 min	-0.026	-0.022	-0.026	-0.113*
Time to nearest primary school (=2), 30 – 60 min	(0.018)	(0.018)	(0.023)	(0.061)
Time to nearest primary school (=3), > 60 min	-0.064**	-0.058**	-0.106***	-0.083
Time to nearest health center (=2), 30 – 60 min	(0.029)	(0.029)	(0.039)	(0.084)
Time to nearest health center (=2), 30 – 60 min	-0.051***	-0.026*	-0.078***	-0.006
Time to nearest health center (=3), > 60 min	(0.016)	(0.015)	(0.025)	(0.055)
Time to nearest health center (=3), > 60 min	-0.075***	-0.028	-0.164***	-0.121*
Ln average rainfall during last growing season	(0.020)	(0.021)	(0.034)	(0.069)
Ln average rainfall during last growing season	0.031	-0.349**	-0.054	1.385*
Coefficient of rainfall variation during last growing season	(0.221)	(0.173)	(0.181)	(0.829)
Coefficient of rainfall variation during last growing season	-0.127	-0.048	-0.822***	-0.177
Ln average nighttime nights	(0.216)	(0.213)	(0.280)	(0.613)
Ln average nighttime nights	-0.037	-0.043	-0.048	-0.194**
Municipality centroid within 25 km of industrial mine (=1)	(0.028)	(0.029)	(0.036)	(0.079)
Municipality centroid within 25 km of industrial mine (=1)	0.184	0.258**	0.263	0.422
Constant	(0.136)	(0.109)	(0.212)	(0.275)
Constant	8.750***	9.540***	7.728***	-4.875
	(1.126)	(0.814)	(0.845)	(3.967)
Sample mean of outcome (level)	9,175	4,244	3,452	829
Municipality-fixed effects	yes	yes	yes	yes
Time-fixed effects	yes	yes	yes	yes
Observations	25,716	25,790	25,849	25,747
Municipality groups	329	329	329	329

Notes: Each column corresponds to one regression. All expenditures data are only available for the years 1998, 2003 and 2014. They are in per capita respectively per adult terms, ln-transformed and deflated to 1998 Ouagadougou prices. Robust standard errors clustered at the municipality level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

H. Regressions: livestock and factual instability

Table S.3.7 presents the results from regressions of factual political instability on investment in small and big livestock using a subsample of rural households for which information on livestock is available.

Table S.3.7: Effects of factual instability on households' livestock investments (OLS)

Instability measure (standardized)	Livestock (A ¹)	
	(Big livestock owned, count)	(Small livestock owned, count)
	(1)	(2)
Number of spatially weighted events in current year	27.694** (11.247)	-23.371 (18.262)
Number of spatially weighted events in current and past 2 years	2.072 (10.660)	-8.568 (16.340)
Number of spatially weighted fatalities in current year	-28.878*** (8.865)	-29.898*** (5.242)
Number of spatially weighted fatalities in current and past 2 years	0.258 (0.908)	-0.151 (1.378)
Sample mean of outcome (level)	4.396	9.156
Full set of controls	yes	yes
Municipality-fixed effects	yes	yes
Time-fixed effects	yes	yes
Observations	21,313	21,316
Municipality groups	229	229

Notes: Each coefficient corresponds to one regression. Data on livestock is only available in 1998, 2003, 2005 and 2007 and measured as a count variable. Regressions were run on a subsample of rural households. Controls include ln nighttime light intensity, ln mean rainfall and the coefficient of variation of rainfall during the last growing season, a dummy if the municipality's centroid is within 25 km distance to an industrial mine, a dummy if the household lives in an urban area, gender, age, age squared, education level, and occupation of the household head, household size, household size squared, distance to the nearest market, distance to the nearest portable water source, distance to the nearest primary school, and distance to the nearest health center. Robust standard errors clustered at the municipality level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

I. Heterogeneity analysis: Types of instability

During our study period, ACLED reported the occurrence of five different event types in Burkina Faso: Protests, riots, battles, strategic developments, and violence against civilians. This provides scope for a heterogeneity analysis in order to investigate whether households respond differently to different types of events. It also allows us to examine whether our results are driven by only specific types of events. For this analysis, we consider protests and riots as the first category of events, and battles, strategic developments and violence against civilians as the second. We then rerun all regressions from our main analysis, once considering only events and fatalities from the first category, and once considering only events and fatalities from the second category.

Tables S.3.8 to S.3.10 show the results for the first event category and tables S.3.11 to S.3.13 show the results for the second event category. Overall, the heterogeneity analysis confirms our main results and does not suggest that our results are driven by one rather than the other event category. Admittedly, the results get less stable for some outcomes when using the second event category; however, this is not surprising as the number of events is much smaller than in the main analysis, especially for this category.

Protests and riots

Table S.3.8: Effects of protests and riots on households' saving and investment decisions (OLS)

Instability measure (standardized)	Financial assets (A ^f)	Durable goods (A ^d)		Estate/housing assets (A ^e)	
	(HH saved (=1)) (1)	(Owned, count) (2)	(ln p.c. exp., monthly) (3)	(Quality roof (=1)) (4)	(Quality floor (=1)) (5)
Number of spatially weighted events in current year	-0.016*** (0.004)	-0.018*** (0.005)	-0.036 (0.024)	-0.018*** (0.002)	-0.012*** (0.002)
Number of spatially weighted events in current and past 2 years	-0.016*** (0.004)	-0.029*** (0.004)	-0.035 (0.022)	-0.020*** (0.002)	-0.012*** (0.002)
Number of spatially weighted fatalities in current year	-0.015*** (0.004)	-0.026*** (0.004)	-0.018* (0.009)	-0.016*** (0.002)	-0.010*** (0.001)
Number of spatially weighted fatalities in current and past 2 years	-0.015*** (0.004)	-0.024*** (0.005)	-0.016* (0.009)	-0.016*** (0.002)	-0.010*** (0.001)
Sample mean of outcome (level)	0.691	2.141	3,778	0.553	0.469
Full set of controls	yes	yes	yes	yes	yes
Municipality-fixed effects	yes	yes	yes	yes	yes
Time-fixed effects	yes	yes	yes	yes	yes
Observations	17,938	50,892	25,849	50,767	50,707
Municipality groups	331	339	329	339	339

Notes: Each coefficient corresponds to one regression. Only events coded as protests or riots in the ACLED dataset and their corresponding fatalities were considered. Savings data is only available for the years 2009 and 2014. The variable savings takes the value one if at least one household member aged 15 or older reported to save money. Durable goods possession is a count over eight different assets. Durable expenditures data is only available for the years 1998, 2003 and 2014; they are in per capita terms, ln-transformed and deflated to 1998 Ouagadougou prices. Quality roof takes the value

one if the roof is of concrete, metal sheets, or tiles vs. straw or thatch. Quality floor takes the value one if the floor is of tiles, carpet, or cement vs. dirt or sand. Controls include ln nighttime light intensity, ln mean rainfall and the coefficient of variation of rainfall during the last growing season, a dummy if the municipality's centroid is within 25 km distance to an industrial mine, a dummy if the household lives in an urban area, gender, age, age squared, education level, and occupation of the household head, household size, household size squared, distance to the nearest market, distance to the nearest portable water source, distance to the nearest primary school, and distance to the nearest health center. Robust standard errors clustered at the municipality level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Own estimations using data from ACLED, INSD, NOAA, UD and MM.

Table S.3.9: Effects of protests and riots on households' human capital investments (OLS)

Instability measure (standardized)	Education (A ^b)		Health (A ^b)
	(Post-primary net enrollment rate)	(ln p.p. exp., monthly)	(ln p.c. exp., monthly)
	(1)	(2)	(3)
Number of spatially weighted events in current year	-0.010*** (0.002)	-0.322*** (0.026)	-0.087*** (0.026)
Number of spatially weighted events in current and past 2 years	-0.011*** (0.002)	-0.345*** (0.028)	-0.089*** (0.024)
Number of spatially weighted fatalities in current year	-0.011*** (0.001)	-0.294*** (0.016)	-0.062*** (0.018)
Number of spatially weighted fatalities in current and past 2 years	-0.011*** (0.001)	-0.290*** (0.015)	-0.061*** (0.019)
Sample mean of outcome (level)	0.185	1,951	457
Full set of controls	yes	yes	yes
Municipality-fixed effects	yes	yes	yes
Time-fixed effects	yes	yes	yes
Observations	27,514	25,808	25,846
Municipality groups	339	329	329

Notes: Each coefficient corresponds to one regression. Only events coded as protests or riots in the ACLED dataset and their corresponding fatalities were considered. The net enrollment rate at the post-primary education level is only calculated for those households with children in the relevant age group. Education and health expenditures data are only available for the years 1998, 2003 and 2014. They are in per pupil respectively per capita terms, ln-transformed and deflated to 1998 Ouagadougou prices. Controls include ln nighttime light intensity, ln mean rainfall and the coefficient of variation of rainfall during the last growing season, a dummy if the municipality's centroid is within 25 km distance to an industrial mine, a dummy if the household lives in an urban area, gender, age, age squared, education level, and occupation of the household head, household size, household size squared, distance to the nearest market, distance to the nearest portable water source, distance to the nearest primary school, and distance to the nearest health center. Robust standard errors clustered at the municipality level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Own estimations using data from ACLED, INSD, NOAA, UD and MM.

Table S.3.10: Effects of protests and riots on households' total and consumption expenditures (OLS)

Instability measure (standardized)	Total HH expenditures (y)	Food (c)	Non-food/ non-durables (c)	Temptation goods (c)
	(ln p.c. exp., monthly)	(ln p.c. exp., monthly)	(ln p.c. exp., monthly)	(ln p.a. exp., monthly)
	(1)	(2)	(3)	(4)
Number of spatially weighted events in current year	-0.004 (0.012)	0.038*** (0.013)	-0.044*** (0.016)	-0.109*** (0.019)
Number of spatially weighted events in current and past 2 years	-0.002 (0.010)	0.042*** (0.011)	-0.047*** (0.015)	-0.113*** (0.019)
Number of spatially weighted fatalities in current year	0.008 (0.005)	0.047*** (0.005)	-0.030*** (0.007)	-0.089*** (0.016)
Number of spatially weighted fatalities in current and past 2 years	0.009* (0.005)	0.048*** (0.005)	-0.029*** (0.007)	-0.090*** (0.016)
Sample mean of outcome (level)	9,175	4,244	3,452	829
Full set of controls	yes	yes	yes	yes
Municipality-fixed effects	yes	yes	yes	yes
Time-fixed effects	yes	yes	yes	yes
Observations	25,716	25,790	25,849	25,747
Municipality groups	329	329	329	329

Notes: Each coefficient corresponds to one regression. Only events coded as protests or riots in the ACLED dataset and their corresponding fatalities were considered. All expenditures data are only available for the years 1998, 2003 and 2014. They are in per capita respectively per adult terms, ln-transformed and deflated to 1998 Ouagadougou prices. Controls include ln nighttime light intensity, ln mean rainfall and the coefficient of variation of rainfall during the last growing season, a dummy if the municipality's centroid is within 25 km distance to an industrial mine, a dummy if the household lives in an urban area, gender, age, age squared, education level, and occupation of the household head, household size, household size squared, distance to the nearest market, distance to the nearest portable water source, distance to the nearest primary school, and distance to the nearest health center. Robust standard errors clustered at the municipality level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Own estimations using data from ACLED, INSD, NOAA, UD and MM.

Battles, strategic developments and violence against civilians

Table S.3.11: Effects of battles, strategic developments and violence against civilians on households' saving and investment decisions (OLS)

Instability measure (standardized)	Financial assets (A ^f)		Durable goods (A ^d)		Estate/housing assets (A ^e)	
	(HH saved (=1))	(Owned, count)	(ln p.c. exp., monthly)	(Quality roof (=1))	(Quality floor (=1))	
	(1)	(2)	(3)	(4)	(5)	
Number of spatially weighted events in current year	-0.012* (0.006)	-0.032*** (0.008)	-0.003 (0.018)	-0.024*** (0.005)	-0.005 (0.004)	
Number of spatially weighted events in current and past 2 years	-0.014*** (0.005)	-0.026*** (0.008)	-0.000 (0.014)	-0.029*** (0.004)	-0.007** (0.003)	
Number of spatially weighted fatalities in current year	0.022* (0.012)	-0.033*** (0.010)	-0.043** (0.021)	0.028*** (0.004)	0.012*** (0.003)	
Number of spatially weighted fatalities in current and past 2 years	-0.034* (0.017)	-0.012 (0.014)	0.057* (0.034)	0.020* (0.012)	0.015*** (0.006)	
Sample mean of outcome (level)	0.691	2.141	3,778	0.553	0.469	
Full set of controls	yes	yes	yes	yes	yes	
Municipality-fixed effects	yes	yes	yes	yes	yes	
Time-fixed effects	yes	yes	yes	yes	yes	
Observations	17,938	50,892	25,849	50,767	50,707	
Municipality groups	331	339	329	339	339	

Notes: Each coefficient corresponds to one regression. Only events coded as battles, strategic developments or violence against civilians in the ACLED dataset and their corresponding fatalities were considered. Savings data is only available for the years 2009 and 2014. The variable savings takes the value one if at least one household member aged 15 or older reported to save money. Durable goods possession is a count over eight different assets. Durable expenditures data is only available for the years 1998, 2003 and 2014; they are in per capita terms, ln-transformed and deflated to 1998 Ouagadougou prices. Quality roof takes the value one if the roof is of concrete, metal sheets, or tiles vs. straw or thatch. Quality floor takes the value one if the floor is of tiles, carpet, or cement vs. dirt or sand. Controls include ln nighttime light intensity, ln mean rainfall and the coefficient of variation of rainfall during the last growing season, a dummy if the municipality's centroid is within 25 km distance to an industrial mine, a dummy if the household lives in an urban area, gender, age, age squared, education level, and occupation of the household head, household size, household size squared, distance to the nearest market, distance to the nearest portable water source, distance to the nearest primary school, and distance to the nearest health center. Robust standard errors clustered at the municipality level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Own estimations using data from ACLED, INSD, NOAA, UD and MM.

Table S.3.12: Effects of battles, strategic developments and violence against civilians on households' human capital investments (OLS)

Instability measure (standardized)	Education (A ^h)		Health (A ^h)
	(Post-primary net enrollment rate)	(ln p.p. exp., monthly)	(ln p.c. exp., monthly)
	(1)	(2)	(3)
Number of spatially weighted events in current year	-0.009* (0.005)	-0.324*** (0.045)	-0.044 (0.037)
Number of spatially weighted events in current and past 2 years	-0.010*** (0.004)	-0.354*** (0.033)	-0.052* (0.027)
Number of spatially weighted fatalities in current year	0.003* (0.002)	0.152** (0.065)	-0.060 (0.041)
Number of spatially weighted fatalities in current and past 2 years	0.003 (0.004)	0.274* (0.146)	0.050 (0.089)
Sample mean of outcome (level)	0.185	1,951	457
Full set of controls	yes	yes	yes
Municipality-fixed effects	yes	yes	yes
Time-fixed effects	yes	yes	yes
Observations	27,514	25,808	25,846
Municipality groups	339	329	329

Notes: Each coefficient corresponds to one regression. Only events coded as battles, strategic developments or violence against civilians in the ACLED dataset and their corresponding fatalities were considered. The net enrollment rate at the post-primary education level is only calculated for those households with children in the relevant age group. Education and health expenditures data are only available for the years 1998, 2003 and 2014. They are in per pupil respectively per capita terms, ln-transformed and deflated to 1998 Ouagadougou prices. Controls include ln nighttime light intensity, ln mean rainfall and the coefficient of variation of rainfall during the last growing season, a dummy if the municipality's centroid is within 25 km distance to an industrial mine, a dummy if the household lives in an urban area, gender, age, age squared, education level, and occupation of the household head, household size, household size squared, distance to the nearest market, distance to the nearest portable water source, distance to the nearest primary school, and distance to the nearest health center. Robust standard errors clustered at the municipality level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Own estimations using data from ACLED, INSD, NOAA, UD and MM.

Table S.3.13: Effects of battles, strategic developments and violence against civilians on households' total and consumption expenditures (OLS)

Instability measure (standardized)	Total HH expenditures (y)	Food (c)	Non-food/ non-durables (c)	Temptation goods (c)
	(ln p.c. exp., monthly)	(ln p.c. exp., monthly)	(ln p.c. exp., monthly)	(ln p.a. exp., monthly)
	(1)	(2)	(3)	(4)
Number of spatially weighted events in current year	0.016* (0.009)	0.047*** (0.017)	-0.017 (0.017)	-0.111*** (0.024)
Number of spatially weighted events in current and past 2 years	0.021** (0.009)	0.055*** (0.013)	-0.024* (0.013)	-0.093*** (0.024)
Number of spatially weighted fatalities in current year	-0.035** (0.016)	-0.025 (0.017)	0.020 (0.014)	-0.050 (0.048)
Number of spatially weighted fatalities in current and past 2 years	0.050** (0.020)	0.031 (0.051)	0.079*** (0.019)	0.128* (0.073)
Sample mean of outcome (level)	9,175	4,244	3,452	829
Full set of controls	yes	yes	yes	yes
Municipality-fixed effects	yes	yes	yes	yes
Time-fixed effects	yes	yes	yes	yes
Observations	25,716	25,790	25,849	25,747
Municipality groups	329	329	329	329

Notes: Each coefficient corresponds to one regression. Only events coded as battles, strategic developments or violence against civilians in the ACLED dataset and their corresponding fatalities were considered. All expenditures data are only available for the years 1998, 2003 and 2014. They are in per capita respectively per adult terms, ln-transformed and deflated to 1998 Ouagadougou prices. Controls include ln nighttime light intensity, ln mean rainfall and the coefficient of variation of rainfall during the last growing season, a dummy if the municipality's centroid is within 25 km distance to an industrial mine, a dummy if the household lives in an urban area, gender, age, age squared, education level, and occupation of the household head, household size, household size squared, distance to the nearest market, distance to the nearest portable water source, distance to the nearest primary school, and distance to the nearest health center. Robust standard errors clustered at the municipality level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Own estimations using data from ACLED, INSD, NOAA, UD and MM.

J. Robustness checks

In this section, we present the results from our four robustness checks. Table S.3.14 shows the results from the falsification test with two different fake outcomes. Tables S.3.15 to S.3.17 show the results from regressions without the observations from Ouagadougou. Tables S.3.18 to S.3.20 and tables S.3.21 to S.3.23 shows the results from regressions with the additional controls of food crops production respectively food crops auto-consumption. Figure S.3.6 shows the results from the randomization inference and figure S.3.7 shows the results from the event study analysis. Tables S.3.24 to S.3.26 show bias-adjusted coefficients and degree of selection required for null effects based on Oster (2019).

Falsification test

Table S14: Falsification test with fake outcomes for the health investment channel

Instability measure (standardized)	Fake outcomes	
	(Accidents (=1)) (1)	(Visual impairments (=1)) (2)
Number of spatially weighted events in current year	-0.001* (0.000)	0.000 (0.001)
Number of spatially weighted events in current and past 2 years	-0.001 (0.000)	0.001 (0.001)
Number of spatially weighted fatalities in current year	-0.001* (0.000)	-0.000 (0.001)
Number of spatially weighted fatalities in current and past 2 years	0.000 (0.001)	0.000 (0.001)
Sample mean of outcome (level)	0.022	0.037
Full set of controls	yes	yes
Municipality-fixed effects	yes	yes
Time-fixed effects	yes	yes
Observations	43,716	50,873
Municipality groups	339	339

Notes: Each coefficient corresponds to one regression. Data on accidents is not available for 1998. Controls include ln nighttime light intensity, ln mean rainfall and the coefficient of variation of rainfall during the last growing season, a dummy if the municipality's centroid is within 25 km distance to an industrial mine, a dummy if the household lives in an urban area, gender, age, age squared, education level, and occupation of the household head, household size, household size squared, distance to the nearest market, distance to the nearest portable water source, distance to the nearest primary school, and distance to the nearest health center. Robust standard errors clustered at the municipality level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Excluding Ouagadougou

Table S.3.15: Effects of political instability on households' saving and investment decisions (OLS)

– excluding Ouagadougou

Instability measure (standardized)	Financial assets (A ^f)	Durable goods (A ^d)		Estate/housing assets (A ^e)	
	(HH saved (=1)) (1)	(Owned, count) (2)	(ln p.c. exp., monthly) (3)	(Quality roof (=1)) (4)	(Qual. floor (=1)) (5)
Number of spatially weighted events in current year	-0.034* (0.018)	-0.049* (0.026)	-0.431*** (0.039)	-0.030** (0.013)	-0.007 (0.012)
Number of spatially weighted events in current and past 2 years	-0.015 (0.039)	-0.104** (0.041)	-0.571*** (0.060)	-0.042** (0.017)	0.000 (0.019)
Number of spatially weighted fatalities in current year	-0.021 (0.048)	-0.079 (0.099)	-0.599** (0.273)	0.015 (0.040)	0.039 (0.026)
Number of spatially weighted fatalities in current and past 2 years	-0.058 (0.036)	0.029 (0.044)	-0.032 (0.060)	0.024* (0.014)	0.025* (0.015)
Sample mean of outcome (level)	0.692	1.931	316	0.492	0.403
Full set of controls	yes	yes	yes	yes	yes
Municipality-fixed effects	yes	yes	yes	yes	yes
Time-fixed effects	yes	yes	yes	yes	yes
Observations	16,680	44,585	22,799	44,465	44,407
Municipality groups	330	338	328	338	338

Notes: Each coefficient corresponds to one regression. All regressions were run on a sample that excludes all observations from Ouagadougou. Savings data is only available for the years 2009 and 2014. The variable savings takes the value one if at least one household member aged 15 or older reported to save money. Durable goods possession is a count over eight different assets. Durable expenditures data is only available for the years 1998, 2003 and 2014; they are in per capita terms, ln-transformed and deflated to 1998 Ouagadougou prices. Quality roof takes the value one if the roof is of concrete, metal sheets, or tiles vs. straw or thatch. Quality floor takes the value one if the floor is of tiles, carpet, or cement vs. dirt or sand. Controls include ln nighttime light intensity, ln mean rainfall and the coefficient of variation of rainfall during the last growing season, a dummy if the municipality's centroid is within 25 km distance to an industrial mine, a dummy if the household lives in an urban area, gender, age, age squared, education level, and occupation of the household head, household size, household size squared, distance to the nearest market, distance to the nearest portable water source, distance to the nearest primary school, and distance to the nearest health center. Robust standard errors clustered at the municipality level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table S.3.16: Effects of political instability on households' human capital investments (OLS)
– excluding Ouagadougou

Instability measure (standardized)	Education (A ^h)		Health (A ^h)
	(Post-primary net enrollment rate)	(ln p.p. exp., monthly)	(ln p.c. exp., monthly)
	(1)	(2)	(3)
Number of spatially weighted events in current year	0.021* (0.012)	-0.832*** (0.056)	-0.441*** (0.056)
Number of spatially weighted events in current and past 2 years	0.029* (0.016)	-1.159*** (0.119)	-0.632*** (0.100)
Number of spatially weighted fatalities in current year	0.028 (0.019)	-1.325*** (0.424)	-0.225 (0.401)
Number of spatially weighted fatalities in current and past 2 years	0.008 (0.014)	0.043 (0.220)	-0.139 (0.214)
Sample mean of outcome (level)	0.156	850	349
Full set of controls	yes	yes	yes
Municipality-fixed effects	yes	yes	yes
Time-fixed effects	yes	yes	yes
Observations	24,506	22,763	22,798
Municipality groups	338	328	328

Notes: Each coefficient corresponds to one regression. All regressions were run on a sample that excludes all observations from Ouagadougou. The net enrollment rate at the post-primary education level is only calculated for those households with children in the relevant age group. Education and health expenditures data are only available for the years 1998, 2003 and 2014. They are in per pupil respectively per capita terms, ln-transformed and deflated to 1998 Ouagadougou prices. Controls include ln nighttime light intensity, ln mean rainfall and the coefficient of variation of rainfall during the last growing season, a dummy if the municipality's centroid is within 25 km distance to an industrial mine, a dummy if the household lives in an urban area, gender, age, age squared, education level, and occupation of the household head, household size, household size squared, distance to the nearest market, distance to the nearest portable water source, distance to the nearest primary school, and distance to the nearest health center. Robust standard errors clustered at the municipality level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Own estimations using data from ACLED, INSD, NOAA, UD and MM.

Table S.3.17: Effects of political instability on households' consumption expenditures (OLS)
– excluding Ouagadougou

Instability measure (standardized)	Total HH expenditures (y)	Food (c)	Non-food/ non-durables (c)	Temptation goods (c)
	(ln p.c. exp., monthly)	(ln p.c. exp., monthly)	(ln p.c. exp., monthly)	(ln p.a. exp., monthly)
	(1)	(2)	(3)	(4)
Number of spatially weighted events in current year	-0.212*** (0.028)	-0.192*** (0.022)	-0.292*** (0.036)	-0.440*** (0.095)
Number of spatially weighted events in current and past 2 years	-0.272*** (0.038)	-0.227*** (0.035)	-0.407*** (0.048)	-0.599*** (0.133)
Number of spatially weighted fatalities in current year	-0.122 (0.184)	-0.092 (0.168)	-0.180 (0.246)	-0.290 (0.403)
Number of spatially weighted fatalities in current and past 2 years	0.101*** (0.034)	0.163** (0.064)	0.102*** (0.035)	-0.041 (0.111)
Sample mean of outcome (level)	8,043	4,010	2,851	792
Full set of controls	yes	yes	yes	yes
Municipality-fixed effects	yes	yes	yes	yes
Time-fixed effects	yes	yes	yes	yes
Observations	22,699	22,769	22,801	22,733
Municipality groups	328	328	328	328

Notes: Each coefficient corresponds to one regression. All regressions were run on a sample that excludes all observations from Ouagadougou. All expenditures data are only available for the years 1998, 2003 and 2014. They are in per capita respectively per adult terms, ln-transformed and deflated to 1998 Ouagadougou prices. Controls include ln nighttime light intensity, ln mean rainfall and the coefficient of variation of rainfall during the last growing season, a dummy if the municipality's centroid is within 25 km distance to an industrial mine, a dummy if the household lives in an urban area, gender, age, age squared, education level, and occupation of the household head, household size, household size squared, distance to the nearest market, distance to the nearest portable water source, distance to the nearest primary school, and distance to the nearest health center. Robust standard errors clustered at the municipality level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Own estimations using data from ACLED, INSD, NOAA, UD and MM.

Robustness to differential food price inflation

Table S.3.18: Effects of political instability on households' saving and investment decisions (OLS)

– controlling for food crops production

Instability measure (standardized)	Durable goods (A ^d)		Estate/housing assets (A ^e)	
	(Owned, count)	(ln p.c. exp., monthly)	(Quality roof (=1))	(Qual. floor (=1))
	(2)	(3)	(4)	(5)
Number of spatially weighted events in current year	-0.034*** (0.006)	-0.034 (0.021)	-0.021*** (0.002)	-0.014*** (0.002)
Number of spatially weighted events in current and past 2 years	-0.044*** (0.005)	-0.033* (0.020)	-0.023*** (0.002)	-0.015*** (0.002)
Number of spatially weighted fatalities in current year	-0.046*** (0.005)	-0.028** (0.011)	-0.017*** (0.002)	-0.012*** (0.002)
Number of spatially weighted fatalities in current and past 2 years	-0.055*** (0.010)	-0.009 (0.014)	-0.017*** (0.005)	-0.010** (0.004)
Sample mean of outcome (level)	2.190	379	0.546	0.467
Full set of controls	yes	yes	yes	yes
Municipality-fixed effects	yes	yes	yes	yes
Time-fixed effects	yes	yes	yes	yes
Observations	42,663	25,774	42,552	42,488
Municipality groups	329	329	329	329

Notes: Each coefficient corresponds to one regression. Savings data is only available for the years 2009 and 2014. The variable savings takes the value one if at least one household member aged 15 or older reported to save money. Durable goods possession is a count over eight different assets. Durable expenditures data is only available for the years 1998, 2003 and 2014; they are in per capita terms, ln-transformed and deflated to 1998 Ouagadougou prices. Quality roof takes the value one if the roof is of concrete, metal sheets, or tiles vs. straw or thatch. Quality floor takes the value one if the floor is of tiles, carpet, or cement vs. dirt or sand. Controls include ln nighttime light intensity, ln mean rainfall and the coefficient of variation of rainfall during the last growing season, a dummy if the municipality's centroid is within 25 km distance to an industrial mine, a dummy if the household lives in an urban area, gender, age, age squared, education level, and occupation of the household head, household size, household size squared, distance to the nearest market, distance to the nearest portable water source, distance to the nearest primary school, and distance to the nearest health center. Additionally, we control for a dummy that equals one when the household produces any food crops. Robust standard errors clustered at the municipality level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Own estimations using data from ACLED, INSD, NOAA, UD and MM.

Table S.3.19: Effects of political instability on households' human capital investments (OLS)
– controlling for food crops production

Instability measure (standardized)	Education (A ^h)		Health (A ^h)
	(Post-primary net enrollment rate)	(ln p.p. exp., monthly)	(ln p.c. exp., monthly)
	(1)	(2)	(3)
Number of spatially weighted events in current year	-0.013*** (0.002)	-0.327*** (0.027)	-0.084*** (0.025)
Number of spatially weighted events in current and past 2 years	-0.014*** (0.002)	-0.350*** (0.027)	-0.086*** (0.024)
Number of spatially weighted fatalities in current year	-0.014*** (0.001)	-0.331*** (0.021)	-0.083*** (0.022)
Number of spatially weighted fatalities in current and past 2 years	-0.015*** (0.002)	-0.338*** (0.058)	-0.073** (0.030)
Sample mean of outcome (level)	0.189	1,953	457
Full set of controls	yes	yes	yes
Municipality-fixed effects	yes	yes	yes
Time-fixed effects	yes	yes	yes
Observations	22,960	25,738	25,771
Municipality groups	329	329	329

Notes: Each coefficient corresponds to one regression. The net enrollment rate at the post-primary education level is only calculated for those households with children in the relevant age group. Education and health expenditures data are only available for the years 1998, 2003 and 2014. They are in per pupil respectively per capita terms, ln-transformed and deflated to 1998 Ouagadougou prices. Controls include ln nighttime light intensity, ln mean rainfall and the coefficient of variation of rainfall during the last growing season, a dummy if the municipality's centroid is within 25 km distance to an industrial mine, a dummy if the household lives in an urban area, gender, age, age squared, education level, and occupation of the household head, household size, household size squared, distance to the nearest market, distance to the nearest portable water source, distance to the nearest primary school, and distance to the nearest health center. Additionally, we control for a dummy that equals one when the household produces any food crops. Robust standard errors clustered at the municipality level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Own estimations using data from ACLED, INSD, NOAA, UD and MM.

Table S.3.20: Effects of political instability on households' consumption expenditures (OLS)
– controlling for food crops production

Instability measure (standardized)	Total HH expenditures (y) (ln p.c. exp., monthly) (1)	Food (c) (ln p.c. exp., monthly) (2)	Non-food/ non-durables (c) (ln p.c. exp., monthly) (3)	Temptation goods (c) (ln p.a. exp., monthly) (4)
Number of spatially weighted events in current year	-0.003 (0.011)	0.040*** (0.012)	-0.044*** (0.015)	-0.106*** (0.018)
Number of spatially weighted events in current and past 2 years	-0.001 (0.009)	0.045*** (0.010)	-0.047*** (0.014)	-0.107*** (0.019)
Number of spatially weighted fatalities in current year	0.004 (0.005)	0.053*** (0.005)	-0.035*** (0.007)	-0.109*** (0.017)
Number of spatially weighted fatalities in current and past 2 years	0.024* (0.013)	0.076*** (0.014)	-0.023 (0.016)	-0.088*** (0.029)
Sample mean of outcome (level)	9,170	4,241	3,448	828
Full set of controls	yes	yes	yes	yes
Municipality-fixed effects	yes	yes	yes	yes
Time-fixed effects	yes	yes	yes	yes
Observations	25,646	25,715	25,774	25,672
Municipality groups	329	329	329	329

Notes: Each coefficient corresponds to one regression. All expenditures data are only available for the years 1998, 2003 and 2014. They are in per capita respectively per adult terms, ln-transformed and deflated to 1998 Ouagadougou prices. Controls include ln nighttime light intensity, ln mean rainfall and the coefficient of variation of rainfall during the last growing season, a dummy if the municipality's centroid is within 25 km distance to an industrial mine, a dummy if the household lives in an urban area, gender, age, age squared, education level, and occupation of the household head, household size, household size squared, distance to the nearest market, distance to the nearest portable water source, distance to the nearest primary school, and distance to the nearest health center. Additionally, we control for a dummy that equals one when the household produces any food crops. Robust standard errors clustered at the municipality level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Own estimations using data from ACLED, INSD, NOAA, UD and MM.

Table S.3.21: Effects of political instability on households' saving and investment decisions (OLS)³

– controlling for the share of food crops auto-consumption

Instability measure (standardized)	Durable goods (A ^d)		Estate/housing assets (A ^e)	
	(Owned, count)	(ln p.c. exp., monthly)	(Quality roof (=1))	(Qual. floor (=1))
	(2)	(3)	(4)	(5)
Number of spatially weighted events in current year	-0.006 (0.005)	-0.036 (0.023)	-0.026*** (0.003)	-0.020*** (0.002)
Number of spatially weighted events in current and past 2 years	-0.006 (0.005)	-0.034 (0.021)	-0.028*** (0.003)	-0.021*** (0.003)
Number of spatially weighted fatalities in current year	-0.006 (0.005)	-0.029** (0.012)	-0.024*** (0.002)	-0.019*** (0.003)
Number of spatially weighted fatalities in current and past 2 years	0.004 (0.013)	-0.010 (0.013)	-0.026*** (0.005)	-0.019*** (0.006)
Sample mean of outcome (level)	2.118	379	0.555	0.469
Full set of controls	yes	yes	yes	yes
Municipality-fixed effects	yes	yes	yes	yes
Time-fixed effects	yes	yes	yes	yes
Observations	25,790	25,786	25,746	25,633
Municipality groups	329	329	329	329

Notes: Each coefficient corresponds to one regression. Savings data is only available for the years 2009 and 2014. The variable savings takes the value one if at least one household member aged 15 or older reported to save money. Durable goods possession is a count over eight different assets. Durable expenditures data is only available for the years 1998, 2003 and 2014; they are in per capita terms, ln-transformed and deflated to 1998 Ouagadougou prices. Quality roof takes the value one if the roof is of concrete, metal sheets, or tiles vs. straw or thatch. Quality floor takes the value one if the floor is of tiles, carpet, or cement vs. dirt or sand. Controls include ln nighttime light intensity, ln mean rainfall and the coefficient of variation of rainfall during the last growing season, a dummy if the municipality's centroid is within 25 km distance to an industrial mine, a dummy if the household lives in an urban area, gender, age, age squared, education level, and occupation of the household head, household size, household size squared, distance to the nearest market, distance to the nearest portable water source, distance to the nearest primary school, and distance to the nearest health center. Additionally, we control for the household's share of auto-consumption in total consumption of food crops. Robust standard errors clustered at the municipality level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Own estimations using data from ACLED, INSD, NOAA, UD and MM.

Table S.3.22: Effects of political instability on households' human capital investments (OLS)
– controlling for the share of food crops auto-consumption

Instability measure (standardized)	Education (A ^b)		Health (A ^b)
	(Post-primary net enrollment rate)	(ln per pupil exp., monthly)	(ln p.c. exp., monthly)
	(1)	(2)	(3)
Number of spatially weighted events in current year	-0.010*** (0.002)	-0.333*** (0.027)	-0.083*** (0.026)
Number of spatially weighted events in current and past 2 years	-0.010*** (0.002)	-0.357*** (0.028)	-0.085*** (0.024)
Number of spatially weighted fatalities in current year	-0.009*** (0.002)	-0.336*** (0.021)	-0.081*** (0.022)
Number of spatially weighted fatalities in current and past 2 years	-0.012*** (0.003)	-0.342*** (0.060)	-0.070** (0.031)
Sample mean of outcome (level)	0.196	1,956	457
Full set of controls	yes	yes	yes
Municipality-fixed effects	yes	yes	yes
Time-fixed effects	yes	yes	yes
Observations	14,696	25,745	25,783
Municipality groups	329	329	329

Notes: Each coefficient corresponds to one regression. The net enrollment rate at the post-primary education level is only calculated for those households with children in the relevant age group. Education and health expenditures data are only available for the years 1998, 2003 and 2014. They are in per pupil respectively per capita terms, ln-transformed and deflated to 1998 Ouagadougou prices. Controls include ln nighttime light intensity, ln mean rainfall and the coefficient of variation of rainfall during the last growing season, a dummy if the municipality's centroid is within 25 km distance to an industrial mine, a dummy if the household lives in an urban area, gender, age, age squared, education level, and occupation of the household head, household size, household size squared, distance to the nearest market, distance to the nearest portable water source, distance to the nearest primary school, and distance to the nearest health center. Additionally, we control for the household's share of auto-consumption in total consumption of food crops. Robust standard errors clustered at the municipality level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Own estimations using data from ACLED, INSD, NOAA, UD and MM.

Table S.3.23: Effects of political instability on households' consumption expenditures (OLS)
– controlling for the share of food crops auto-consumption

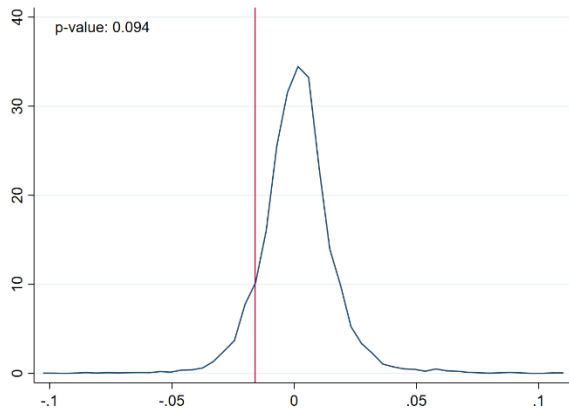
Instability measure (standardized)	Total HH expenditures (y) (ln p.c. exp., monthly) (1)	Food (c) (ln p.c. exp., monthly) (2)	Non-food/ non-durables (c) (ln p.c. exp., monthly) (3)	Temptation goods (c) (ln p.a. exp., monthly) (4)
Number of spatially weighted events in current year	-0.003 (0.011)	0.041*** (0.012)	-0.042*** (0.016)	-0.108*** (0.019)
Number of spatially weighted events in current and past 2 years	-0.001 (0.009)	0.046*** (0.010)	-0.045*** (0.015)	-0.110*** (0.019)
Number of spatially weighted fatalities in current year	0.004 (0.005)	0.054*** (0.005)	-0.032*** (0.007)	-0.111*** (0.017)
Number of spatially weighted fatalities in current and past 2 years	0.024* (0.014)	0.077*** (0.014)	-0.020 (0.016)	-0.089*** (0.030)
Sample mean of outcome (level)	9,175	4,244	3,438	829
Full set of controls	yes	yes	yes	yes
Municipality-fixed effects	yes	yes	yes	yes
Time-fixed effects	yes	yes	yes	yes
Observations	25,716	25,790	25,786	25,747
Municipality groups	329	329	329	329

Notes: Each coefficient corresponds to one regression. All expenditures data are only available for the years 1998, 2003 and 2014. They are in per capita respectively per adult terms, ln-transformed and deflated to 1998 Ouagadougou prices. Controls include ln nighttime light intensity, ln mean rainfall and the coefficient of variation of rainfall during the last growing season, a dummy if the municipality's centroid is within 25 km distance to an industrial mine, a dummy if the household lives in an urban area, gender, age, age squared, education level, and occupation of the household head, household size, household size squared, distance to the nearest market, distance to the nearest portable water source, distance to the nearest primary school, and distance to the nearest health center. Additionally, we control for the household's share of auto-consumption in total consumption of food crops. Robust standard errors clustered at the municipality level in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

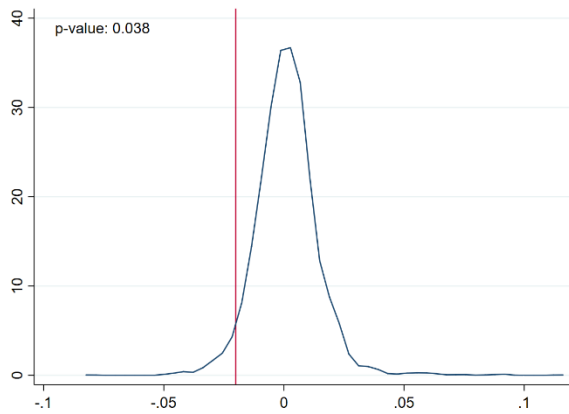
Source: Own estimations using data from ACLED, INSD, NOAA, UD and MM.

Randomization inference

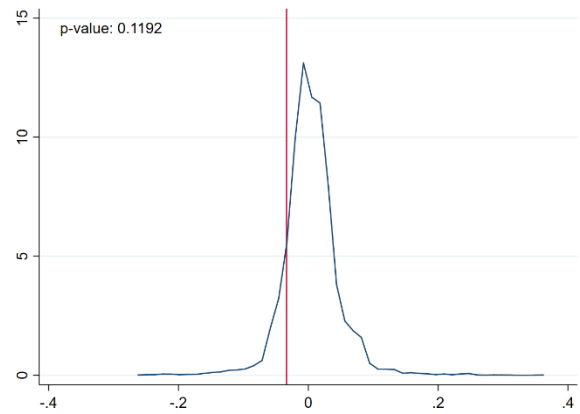
Financial assets



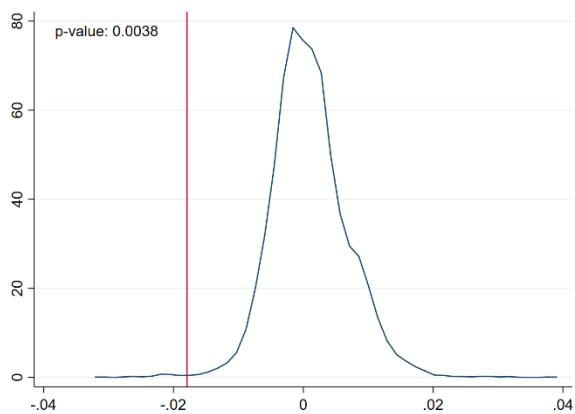
Durable goods – possession



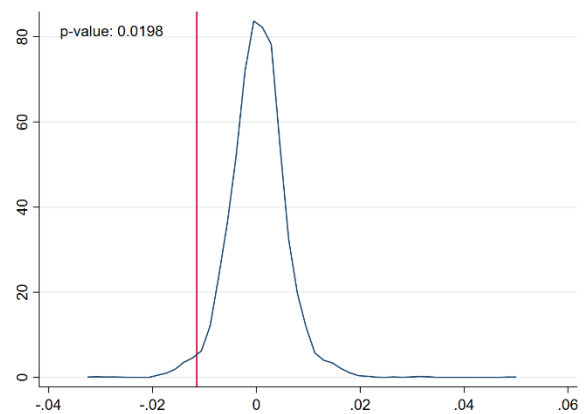
Durable goods - expenditures

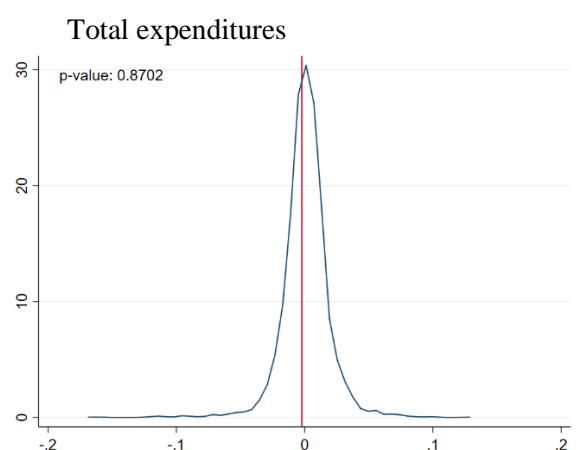
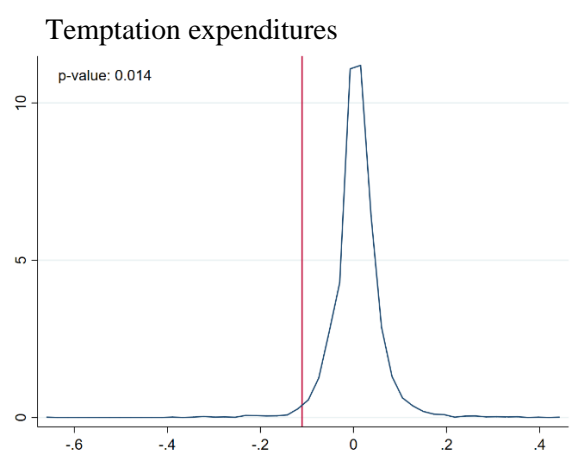
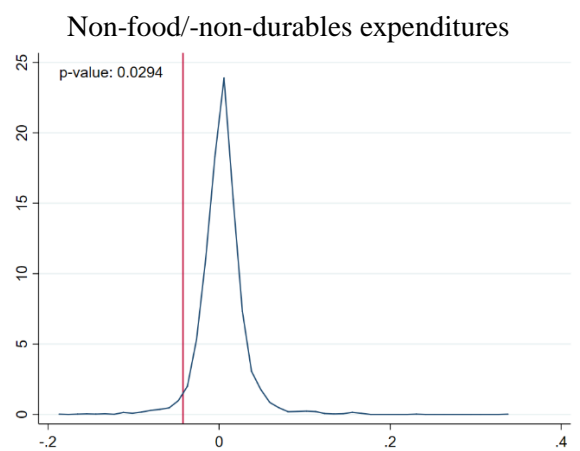
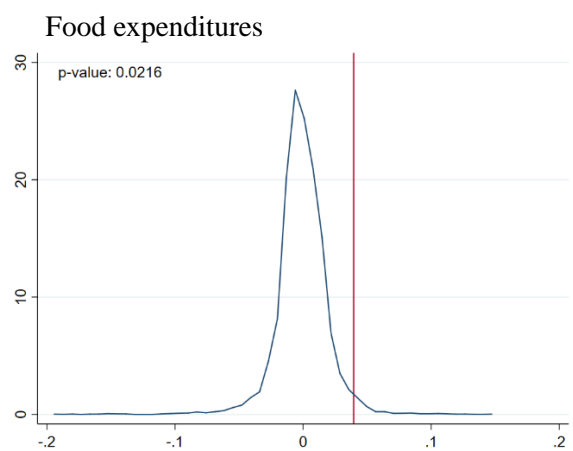
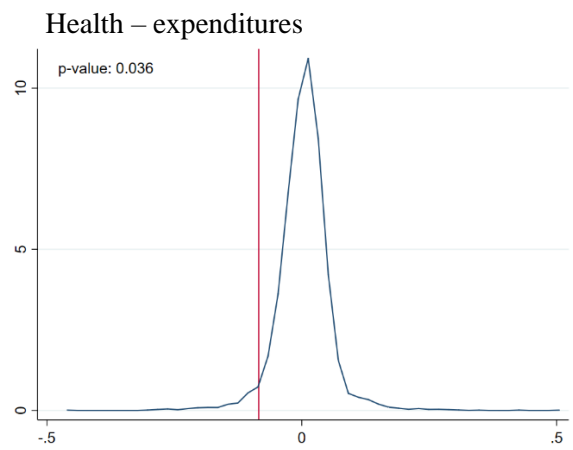
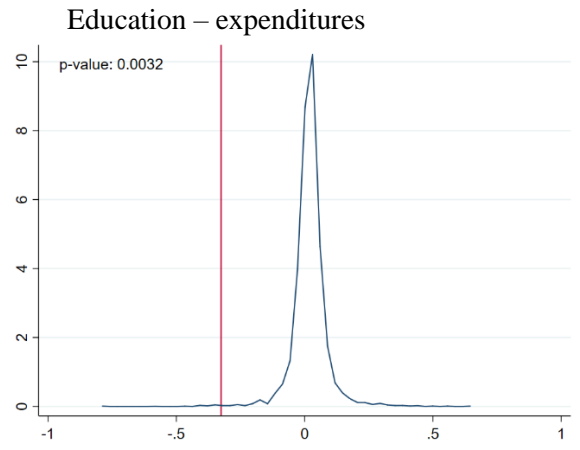
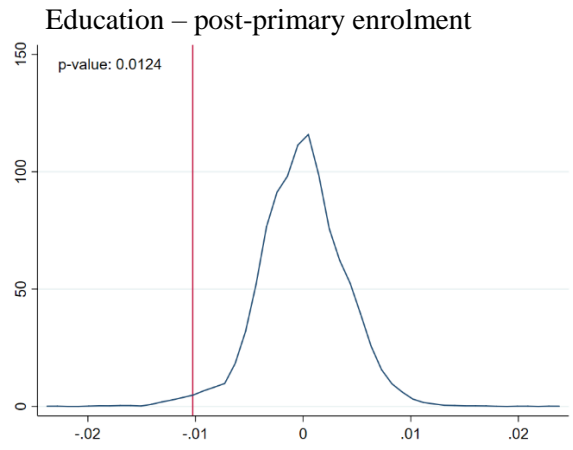


Estate/housing assets - roof



Estate/housing assets - floor



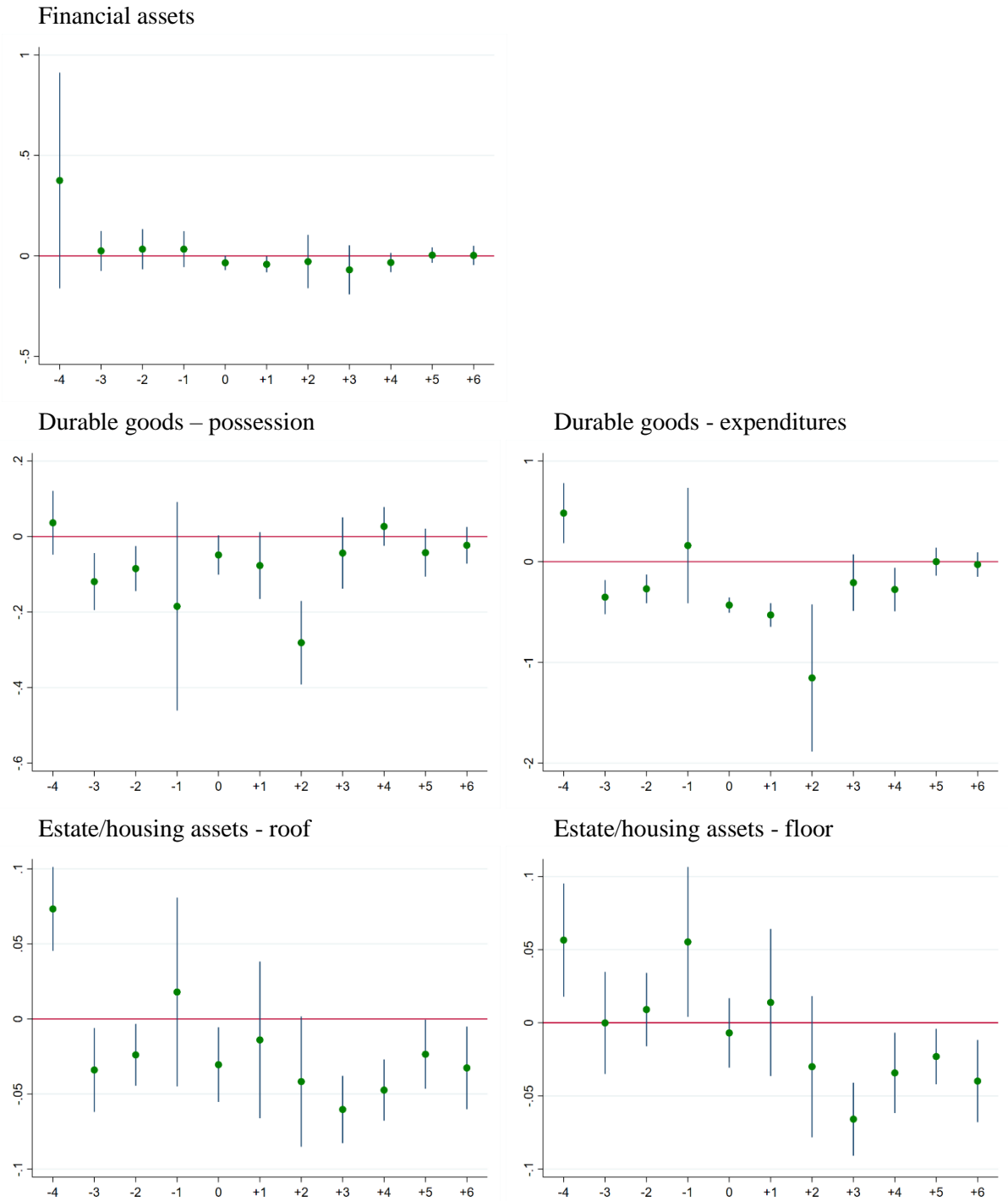


Source: Own estimations using data from ACLED, INSD, NOAA, UD and MM.

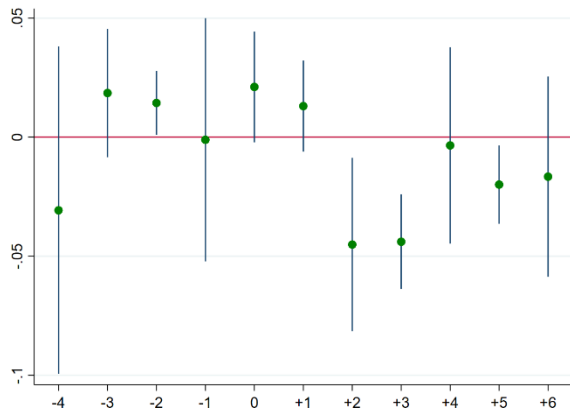
Notes: The red line indicates the coefficient obtained with the true sample and the blue line the distribution of the coefficients from the permuted samples.

Figure S.3.6: Randomization inference

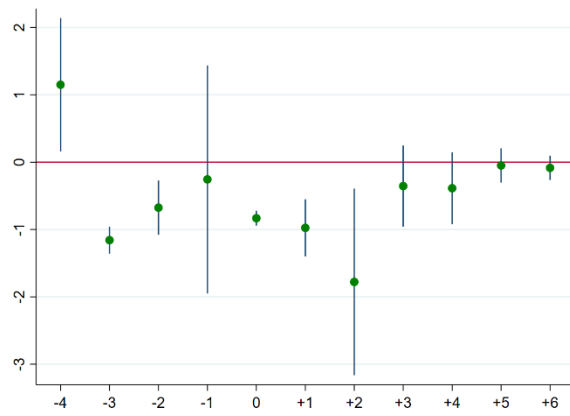
Event study analysis



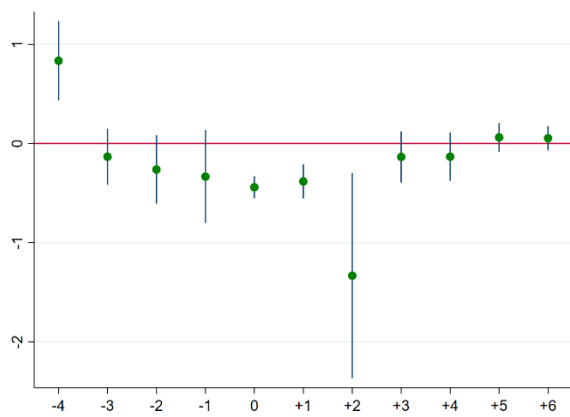
Education – post-primary enrolment



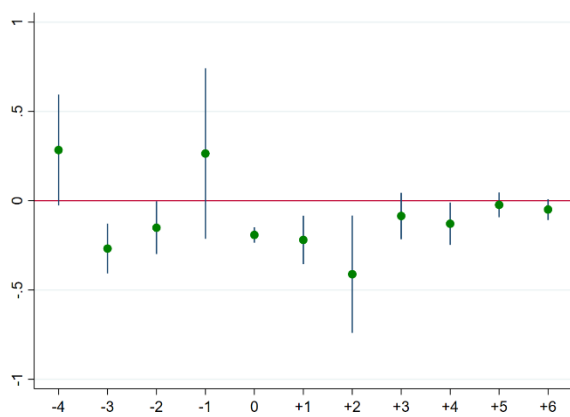
Education – expenditures



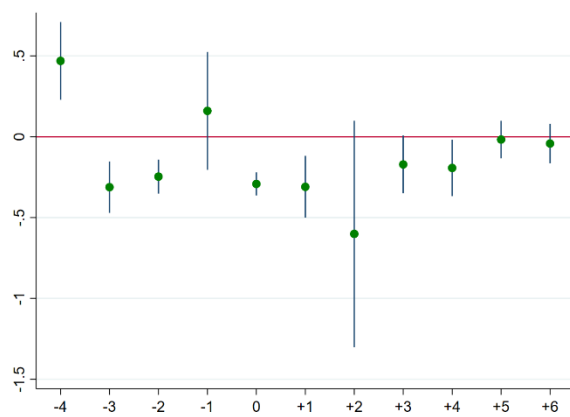
Health – expenditures



Food expenditures

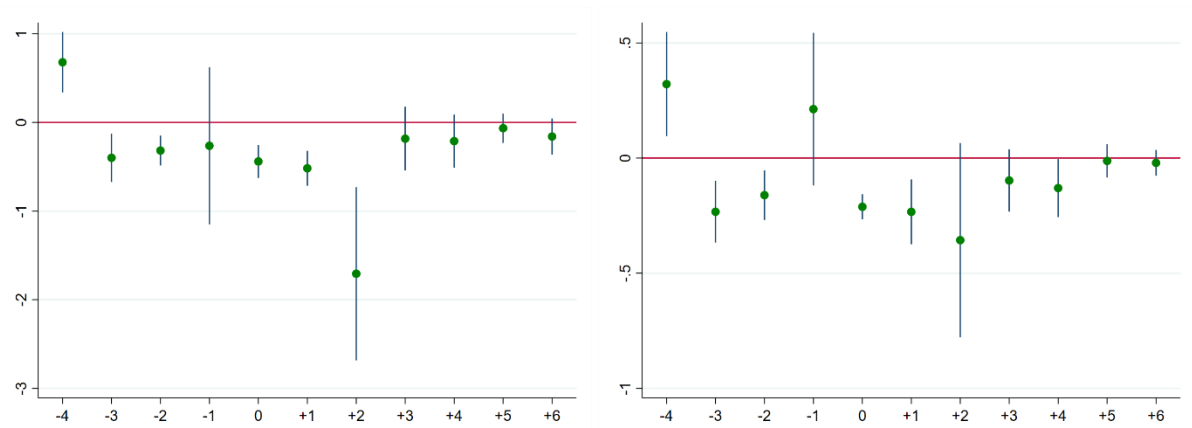


Non-food/-non-durables expenditures



Temptation expenditures

Total expenditures



Source: Own estimations using data from ACLED, INSD, NOAA, UD and MM.

Notes: The y-axis denotes the coefficient size. The x-axis denotes the timing of the event, where 0 indicates an event in the current year and minus- and plus-signs indicate yearly lags respectively leads of events. Each lag/lead is estimated in a separate regression as joint regressions do not allow a sharp identification given that the instability measure rather captures the exposure to latent instability than the occurrence of an event at a very precise moment of time. The green dots correspond to coefficient sizes and the blue lines to their 5%-confidence intervals.

Figure S.3.7: Event study analysis

A test of unobservable selection and coefficient stability

Table S.3.24: Effects of political instability on households' saving and investment decisions (OLS)

– bias-adjusted coefficients (β) and degree of selection required for null effects (δ)

Instability measure (standardized)	Financial assets (A ^f)	Durable goods (A ^d)		Estate/housing assets (A ^e)	
	(HH saved (=1)) (1)	(Owned, count) (2)	(ln p.c. exp., monthly) (3)	(Quality roof (=1)) (4)	(Quality floor (=1)) (5)
Number of spatially weighted events in current year	-0.020 [†] (-13.448)	-0.020 [†] (15.924)	0.093 (0.478)	0.002 (0.926)	0.001 (0.934)
Number of spatially weighted events in current and past 2 years	-0.020 [†] (-13.074)	-0.030 [†] (260.555)	0.137 (0.410)	0.000 (0.983)	0.001 (0.924)
Number of spatially weighted fatalities in current year	-0.018 [†] (-40.712)	-0.030 [†] (7.391)	0.079 (0.412)	0.002 (0.866)	0.002 (0.825)
Number of spatially weighted fatalities in current and past 2 years	-0.022 [†] (-44.637)	-0.033 [†] (-13.807)	0.158 (0.101)	0.001 (0.962)	0.003 (0.716)
Sample mean of outcome (level)	0.691	2.141	3,778	0.553	0.469
Observations	17,938	50,892	25,849	50,767	50,707
Municipality groups	331	339	329	339	339

Notes: For each combination of outcome and instability measure, i.e. for each regression, we calculated a value for the bias-adjusted coefficient (β) and for the degree of selection required for null effects (δ). β is presented in the first row and δ in the row below in parentheses. The values are calculated based on the assumption that $R_{max} = 1.3\bar{R}$. [†] indicates robustness to unobservable selection. The reduced set of controls only comprises municipality- and time-fixed effects. The full set of controls additionally includes ln nighttime light intensity, ln mean rainfall and the coefficient of variation of rainfall during the last growing season, a dummy if the municipality's centroid is within 25 km distance to an industrial mine, a dummy if the household lives in an urban area, gender, age, age squared, education level, and occupation of the household head, household size, household size squared, distance to the nearest market, distance to the nearest portable water source, distance to the nearest primary school, and distance to the nearest health center. Savings data is only available for the years 2009 and 2014. The variable savings takes the value one if at least one household member aged 15 or older reported to save money. Durable goods possession is a count over eight different assets. Durable expenditures data is only available for the years 1998, 2003 and 2014; they are in per capita terms, ln-transformed and deflated to 1998 Ouagadougou prices. Quality roof takes the value one if the roof is of concrete, metal sheets, or tiles vs. straw or thatch. Quality floor takes the value one if the floor is of tiles, carpet, or cement vs. dirt or sand.

Source: Own estimations using data from ACLED, INSD, NOAA, UD and MM.

Table S.3.25: Effects of political instability on households' human capital investments (OLS)
– bias-adjusted coefficients (β) and degree of selection required for null effects (δ)

Instability measure (standardized)	Education (A ^h)		Health (A ^h)
	(Post-primary net enrollment rate)	(ln p.p. exp., monthly)	(ln p.c. exp., monthly)
	(1)	(2)	(3)
Number of spatially weighted events in current year	-0.009 [†] (4.650)	-0.274 [†] (2.959)	-0.136 [†] (-37.657)
Number of spatially weighted events in current and past 2 years	-0.009 [†] (4.580)	-0.301 [†] (2.934)	-0.158 [†] (-11.074)
Number of spatially weighted fatalities in current year	-0.010 [†] (6.920)	-0.265 [†] (2.951)	-0.130 [†] (-9.590)
Number of spatially weighted fatalities in current and past 2 years	-0.011 [†] (9.740)	-0.296 [†] (3.470)	-0.143 [†] (-3.344)
Sample mean of outcome (level)	0.185	1,951	457
Observations	27,514	25,808	25,846
Municipality groups	339	329	329

Notes: For each combination of outcome and instability measure, i.e. for each regression, we calculated a value for the bias-adjusted coefficient (β) and for the degree of selection required for null effects (δ). β is presented in the first row and δ in the row below in parentheses. The values are calculated based on the assumption that $R_{max} = 1.3\tilde{R}$. [†] indicates robustness to unobservable selection. The reduced set of controls only comprises municipality- and time-fixed effects. The full set of controls additionally includes ln nighttime light intensity, ln mean rainfall and the coefficient of variation of rainfall during the last growing season, a dummy if the municipality's centroid is within 25 km distance to an industrial mine, a dummy if the household lives in an urban area, gender, age, age squared, education level, and occupation of the household head, household size, household size squared, distance to the nearest market, distance to the nearest portable water source, distance to the nearest primary school, and distance to the nearest health center. The net enrollment rate at the post-primary education level is only calculated for those households with children in the relevant age group. Education and health expenditures data are only available for the years 1998, 2003 and 2014. They are in per pupil respectively per capita terms, ln-transformed and deflated to 1998 Ouagadougou prices.

Source: Own estimations using data from ACLED, INSD, NOAA, UD and MM.

Table S.3.26: Effects of political instability on households' total and consumption expenditures (OLS)

– bias-adjusted coefficients (β) and degree of selection required for null effects (δ)

Instability measure (standardized)	Food (c)	Non-food/ non-durables (c)	Temptation goods (c)
	(ln p.c. exp., monthly) (2)	(ln p.c. exp., monthly) (3)	(ln p.a. exp., monthly) (4)
Number of spatially weighted events in current year	0.045 [†] (-86.525)	-0.037 [†] (3.691)	-0.187 [†] (-2.235)
Number of spatially weighted events in current and past 2 years	0.051 [†] (-73.290)	-0.040 [†] (3.611)	-0.202 [†] (-2.031)
Number of spatially weighted fatalities in current year	0.057 [†] (51.560)	-0.032 [†] (5.811)	-0.180 [†] (-2.492)
Number of spatially weighted fatalities in current and past 2 years	0.086 [†] (-96.919)	-0.009 [†] (1.523)	-0.177 [†] (-1.581)
Sample mean of outcome (level)	4,244	3,452	829
Observations	25,790	25,849	25,747
Municipality groups	329	329	329

Notes: For each combination of outcome and instability measure, i.e. for each regression, we calculated a value for the bias-adjusted coefficient (β) and for the degree of selection required for null effects (δ). β is presented in the first row and δ in the row below in parentheses. The values are calculated based on the assumption that $R_{max} = 1.3\bar{R}$. [†] indicates robustness to unobservable selection. The reduced set of controls only comprises municipality- and time-fixed effects. The full set of controls additionally includes ln nighttime light intensity, ln mean rainfall and the coefficient of variation of rainfall during the last growing season, a dummy if the municipality's centroid is within 25 km distance to an industrial mine, a dummy if the household lives in an urban area, gender, age, age squared, education level, and occupation of the household head, household size, household size squared, distance to the nearest market, distance to the nearest portable water source, distance to the nearest primary school, and distance to the nearest health center. All expenditures data are only available for the years 1998, 2003 and 2014. They are in per capita respectively per adult terms, ln-transformed and deflated to 1998 Ouagadougou prices.

Source: Own estimations using data from ACLED, INSD, NOAA, UD and MM.

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4. Short-term impacts of targeted cash grants and Business Development Services. Experimental Evidence from Entrepreneurs in Burkina Faso

With Michael Grimm and Michael Weber

4.1 Introduction

Many studies have shown that micro and small firms in low- and middle-income countries exhibit high marginal returns to investment, yet most of them also seem to rapidly reach their optimal size and can neither generate very high profits nor much employment (Banerjee and Duflo, 2004; Schündeln, 2006; Udry and Anagol, 2006; McKenzie and Wodruff, 2006, 2008; De Mel et al., 2008, Kremer et al., 2011; Grimm et al. 2011; Fafchamps et al., 2014; Blattman et al., 2016). Banerjee and Duflo (2011, ch. 2) suggest that growing further requires in many cases to adopt more sophisticated technologies and organisational structures which in turn demand entrepreneurial skills, risk taking behaviour and determination, traits that many firm owners do not have (see also Karlan et al., 2015; Banerjee et al., 2019). This may explain why many support programs whether they used training, microcredit, cash grants, business development services (BDSs) or combinations of these have not shown transformative effects, but instead, at best, had lasting effects on specific subgroups (Cho and Honorati, 2014; Banerjee et al., 2015; Grimm and Paffhausen, 2015). Building on these insights, such programs are increasingly implemented with appropriate targeting mechanisms to select those entrepreneurs that can make the most out of such support. Those who lack the necessary skills and entrepreneurial spirit are instead rather targeted with social safety nets, hoping that they do find jobs in those firms that flourish.

With this background, this paper assesses the impact of cash grants and matching grants for a sample of entrepreneurs that have been carefully selected using a BPC and personal interviews in the Bagré growth pole area which is located in the Centre-Est region of Burkina Faso. In 2018, 2,279 men and women, many already owners of micro, small or medium-sized informal or formal enterprises (MSMEs), submitted a business plan to the Maison de l'Entreprise du Burkina Faso (MEBF), a semi-public local business organisation, with a detailed plan how they would use their grant in case they are chosen. In the course of the competition which also included a standard business training and personal interviews, 1,200 entrepreneurs were selected based on their performance and their potential to develop their business and ultimately to create jobs and randomly allocated into two treatment groups (cash grants and matching grants) and a control group. Firms could ask for grants in either form for up to US\$ 8,000. Whereas cash grants can be used for any type of investment including machines, tools, livestock, constructions, land, training and inventories and came with only light procurement rules to prevent misuse outside the business, matching grants can be used only for technical training, require an own contribution of 20% and follow much stricter rules and regulations. Matching grants have already been administered for some time by MEBF, but, so far, are perceived as rather ineffective. A baseline survey was conducted in November/December 2018, disbursements started in August 2019 and a first follow-up survey was conducted in

October/November 2020.⁵⁵ Both the implementation and accompanying evaluation were co-financed and technically supported by the World Bank.

This paper contributes to the literature on small firm growth in several respects. First, it adds to the literature on targeting business support (see e.g. Fafchamps and Woodruff, 2017; McKenzie, 2017; Crépon et al., 2020); and similar to McKenzie (2017), the grants in this project are with a size of several thousands of dollars much bigger than in most other support programs that targeted MSMEs and have so far been rigorously assessed. Second, it is the first that compares cash-grants that can be used for business purposes only with matching grants that are earmarked for technical support. Previous projects rather compared fully fungible cash grants with in-kind grants (e.g. De Mel, 2008) or cash grants with loans (e.g. Fiala, 2018; Crépon et al., 2020). Matching grants programs are quite common in developing countries as an instrument to support private sector development. Yet, there are hardly any rigorous impact evaluations (Campos et al., 2012; Hristova and Coste, 2016). Third, this project is implemented by local institutions and hence frictions in changing the implementation partner are avoided when upscaling this program. Fourth, unlike many other programs, the Bagré Growth Pole has a focus of agri-business activities such as livestock breeding and other activities related to agriculture such as food processing and manufacturing of agricultural tools and inputs. This is an important sector given the concentration of poor people in rural areas and in agriculture in most parts of Sub-Saharan Africa. Fifth, the project is implemented in a difficult context. According to the Fragile States Index (FSI) Burkina Faso, once considered as one of the most stable countries in West-Africa, is classified as the fourth most worsened country in the 2020.⁵⁶ Given that the literature on fragile countries is thin and that fragile countries and conflicts seem to increase worldwide, this paper makes an important contribution also to that literature.

This paper provides an assessment of the short-term effects and explores how the COVID-19 pandemic affected the intervention and whether the support could cushion some of the adverse effects of the pandemic. A full-fledged analysis with a focus on the medium and longer terms effects will be conducted once further rounds of data have been collected.

The remainder of this paper is structured as follows. Section 2 gives an overview of the country context and the Bagré Growth Pole Project. Section 3 provides the details of the intervention and explains the intended pathways to impact. Section 4 outlines the evaluation design including the randomization of applicants into treatment arms. Section 5 presents the specifications used for the estimation of impacts. Section 6 presents the results. Section 7 concludes.

4.2 Country context and background of the Bagré Growth Pole Project

Burkina Faso's private sector is small and dominated by informal micro-enterprises, with only a small number of formal small and medium enterprises (SMEs) located in urban areas. Informal non-agricultural enterprises make up about 88 percent of the private sector and they account for roughly 60 percent of total employment. Informal firms are mainly present in commercial activities (58 percent), followed by other services (21 percent) and manufacturing (20 percent). Half of all informal enterprises have no employees or not more than one employee.

⁵⁵ This study is registered in the American Economic Association (AEA) Randomized Controlled Trial (RCT) Registry (AEARCTR-0004867).

⁵⁶ <https://fragilestatesindex.org/>.

One third of them are not older than a year. Informal firms more than formal firms are constrained by low productivity, a low skill base, limited access to credit and high input costs (especially electricity) (Weber, 2018). Addressing these gaps and especially increasing the productivity of informal and formal businesses can play a critical role in expanding the private sector to better contribute to inclusive growth and job creation in Burkina Faso. The national development plan (*Plan National de Développement Economique et Social*, PNDES) defines private sector development as a key element that has to push the process of structural transformation to substantially contribute to job creation, diversification and increased exports.

The ‘Bagré Growth Pole Project’ represents one of Burkina Faso’s major private sector operations. It supports entrepreneurship in agriculture and agri-processing, investments, and the establishment of an industrial park in the project area. The ultimate goal of the project is to deliver jobs. Especially youth and women are expected to benefit from the new employment opportunities. Since 2012, the project has offered matching grants to agricultural and non-agricultural firms of any size with an investment stake in the Bagré area including smallholders and professional associations as well as private providers of BDSs.⁵⁷ The rationale of the matching grants scheme is to direct public subsidies to firms that need such services, but are unable to cover the related costs, while insuring an adequate use of those subsidies.

Yet, a review of the program revealed that the results of the matching grants program were mixed, basically for three reasons: (a) long and complex selection procedures; (b) insufficient monitoring of grant recipients; and (c) procurement rules that prevent beneficiaries from using the grants to hire workers, purchase equipment and acquire land. Therefore, the World Bank, MEBF and the Bagrépole sought to pilot cash grants as an alternative support instrument accompanied by a rigorous impact evaluation to shed light on the effectiveness of both instruments. The difference between both is that the matching grants are conditional on an own contribution, they require compliance with World Bank’s procurement rules, and they can only be used for capacity building services. The cash grants will neither require an own contribution, nor a full compliance with the World Bank’s procurement rules, nor are they limited to the usage for services only. The cash grants can be used for technical assistance, equipment or inventory. The impact assessment will not be able to disentangle the role of each single feature, but rather assess the effects of each intervention package along with their respective procedures of implementation.

The matching grants program is managed by MEBF in collaboration with Bagrépole, which is the managing and implementing agency of the entire Bagré Growth Pole Project. Bagrépole is a public-private company created by the Government. The Growth Pole Project covers nine municipalities including the municipality of Bagré. Bagré has been identified as a growth pole because of its high potential for agribusiness, horticulture, livestock, fish farming, and staple crops production. The Bagré Development Zone was initiated in 1989 with the construction of a hydropower dam. The development zone covers about 500,000 hectares around the lake created by the dam, with 57,800 h of irrigable land downstream of the dam called the zone de concentration. This zone constitutes the project area. Bagré is in the Boulgou province which

⁵⁷ BDSs can provide a large array of services to businesses, smallholders and associations, including specialized or general trainings such as training of livestock fattening, pisciculture, leadership and governance of associations, sewing, quality management, marketing, use of specific equipment, warrantage system (inventory credit), safe use of pesticides, business management, and so on.

is in the Centre-Est region. The pole is close to large markets in Ghana, Togo, and Niger through adjacent trade corridors. According to the Institut National de la Statistique et de la Démographie (INSD), in 2019, the Centre-Est region had 1.578 million inhabitants, of which 736,559 inhabitants (47%) were in the Boulgou Province. The impact evaluation will cover all nine municipalities with a total population estimated at about 687,065 inhabitants of which roughly 37,849 are in the Bagré municipality. Six of these municipalities are rural and three are urban.

4.3 The intervention and the pathways to impact

4.3.1 Selection of beneficiaries and rollout

The intervention was planned over six phases: (a) Advertisement of the program and communication of eligibility criteria, (b) collection of applications, (c) selection of applicants (d) training of all selected applicants, (e) randomization of selected applicants into treatment arms through a public lottery, and (f) grant disbursements. In the following paragraphs we will describe each phase in detail.

Phase 1 - Advertisement of the program and communication of eligibility criteria. In January–March 2018, MEBF reached out to agricultural and non-agricultural MSMEs in the study area by means of public information sessions, the local radio channels, and meetings with local authorities and potential applicants. Prospective applicants were informed about the program details and the application requirements.

Phase 2 - Collection of applications. Following a call for expressions of interest to receive a matching grant or a cash grant, MEBF deployed teams in the targeted municipalities to help applicants to fill out the application form which had a simplified business plan template. In particular, the applicant had to provide details on the proposed project and, if applicable, details on the existing firm including its sector of activity, the main products and the production process. The business plan also had to include the reasons for the investment decision, the objectives and expected results, an assessment of potential competitors and the plan for physical and soft investments (cost and quantities). The applicant also had to provide an estimate of the total cost of the project, the timeline for implementing the project and the jobs expected to be created. Finally, the applicant had to provide information about the performance of his or her business, if applicable, including annual turnover. The support of MEBF staff was deemed necessary as the program intervened in a rural area where many applicants were illiterate and hence needed help to fill out the application and business plan template. MEBF staff also supported applicants to define comprehensively their needs in terms of technical assistance and trainings for their businesses as well as investments in equipment or inventory that they could buy in case they were offered a cash grant. In total, 2,279 business plans were collected.

Phase 3 - Selection of applicants. By May 2018, MEBF staff and staff of Bagrépole shortlisted 1,612 of the 2,279 applicants. Each applicant was scored based on a predefined set of eligibility criteria. These included for example the cogency of the justifications on the needs expressed by the applicant, the relevance of the applicant's personal experience in relation to the proposed business and the potential of the proposed project to create and consolidate employment. Then MEBF conducted individual interviews with all preselected applicants to double check their level of commitment to their proposed business plan.

Phase 4 - Training of all selected applicants. MEBF invited all the pre-selected 1,612 applicants for a training based on a simplified module of the ‘Start and Improve Your Business Training’ (SIYB) developed by the International Labour Organization (ILO). As in McKenzie (2017), the intention of the training was to provide all applicants with the basics of business management, including accounting and financial and business planning, to help grant recipients to finalize and implement their business plan. Of the pre-selected applicants, 1,575 attended the training. Using another round of face-to-face interviews, by August 2018, MEBF then selected, again based on performance and quality of the proposed project, a final list of 1,300 applicants, of which 1,200 were then foreseen for the lottery and 100 were put on a reserve list in case some applicants would drop out of the experiment before the implementation starts. A baseline survey with all 1,300 firms was conducted in November/December 2018. This survey was implemented with Innovations for Poverty Action (IPA). The sample size was chosen based on power considerations and budget constraints. Power is discussed in more detail in Section 4.

Phase 5 - Randomization of selected applicants into treatment arms through a public lottery. In April–May 2019, with technical support from the World Bank, MEBF ran public lotteries in each participating municipality to select 400 beneficiaries for each of the two treatment arms and the control group. The lottery was supervised by a bailiff. We used a stratified randomization design to ensure a balanced grant size distribution across both treatment arms and the control group. The procedure is explained in detail in Section 4. Out of the 1,200 entrepreneurs, 26 did not participate in the lottery, and hence were replaced by other candidates selected during a follow-up lottery to complete the sample.

Phase 6 - Grant disbursement. Each selected beneficiary of cash or matching grant could receive up to US\$8,000. The exact amount had to be specified and justified in the business plan. Following the lottery, grant agreements between MEBF and the beneficiaries were signed in August–September 2019. The disbursement of both types of grants was delayed and in general was relatively slow. Delays were further exacerbated by the COVID-19 pandemic as the country closed its airport and borders, imposed a curfew, and put the capital city into quarantine. Yet, by July 2020, all beneficiaries of cash grants (except two) had received their funds into their account and approval to start spending on their grants. By October 2020, so just before the survey started, about 98% of all beneficiaries had withdrawn at least a part of their grant from their account. At that time about 55% of the total amount granted to firms was withdrawn. The disbursement of matching grants was even more delayed, partly also because of COVID-19 as the pandemic made face-to-face meetings and hence any type of training even more difficult and because matching grants required more action by MEBF staff than cash grants. Yet, MEBF even organized a public fair to help entrepreneurs identify suppliers of BDSs with which they could use their grants to procure needed services. By July 2020, 35% of all beneficiaries of matching grants had made at least a first request and 18% had received approval. These shares increased to 89% and 82% by October 2020 respectively. Obviously, this difference in the speed of rollout will affect the comparability between the cash grant and the matching grant treatment. Nevertheless, matching grants are mostly used for services that are delivered in a shorter time than the time taken by most beneficiaries of cash grants to invest in equipment and infrastructure. Hence, despite the delayed start of matching grants disbursements, this treatment may yield rapid impacts on intermediate outcomes such as innovations, business practices, and

formalization, which can be compared with the impact of cash grants.⁵⁸ The entire time-line of the intervention is shown in Figure 1.

Apart from the fact that matching grants required a 20% contribution of the beneficiary and could only be used for BDSs whereas cash grants could be used for any type of service, investment or inventory, both types of supports also strongly differed in their disbursement procedures. Beneficiaries of matching grants had to go through five steps. First, MEBF staff supported the beneficiaries to prepare the disbursement requests; second, together they identified a supplier of the BDSs that the beneficiary requested; third the beneficiary had to prove to MEBF that he or she can contribute 20 percent of the total cost of the service;⁵⁹ fourth, MEBF validated the disbursement and, fifth, the beneficiary received the requested service and was reimbursed for 80 percent of the cost in advance. Beneficiaries were allowed to submit several disbursement requests up to the total amount requested in the business plan. Cash beneficiaries were supported to open accounts with accredited banks and microfinance institutions and the grant was then transferred into that account up-front. The disbursement procedure then differed in whether it was the first request or a follow-up request. To start the disbursement with an amount less than 15 percent of the grant, the beneficiary withdrew the amount directly from the financial account without approval from MEBF. To withdraw an amount exceeding 15 percent of the grant, the beneficiary had to request approval from MEBF. Starting from the second disbursement, four tranches of disbursement rates were defined. Within each tranche, the beneficiary could disburse many times, but when disbursing in the next tranche, the beneficiary had to again request approval from MEBF. Consultants hired by MEBF also supported these beneficiaries to prepare their disbursement requests and MEBF and the beneficiaries' financial institutions coordinated to check whether the disbursements were done according to the rules.

Beneficiaries were also encouraged to formalize, but they were not forced. Yet, if they did not formalize they had to name an underwriter who had to confirm to MEBF that they would guarantee for the beneficiary.

⁵⁸ Once the disbursement is approved, most beneficiaries of matching grants enrolled in training lasting less than one month, or participated in commercial fairs lasting less than one week. As such matching grant beneficiaries improve their knowledge in a shorter time, and given that most of the firms are small and produce unsophisticated products, the treatment may yield rapid impacts on some outcomes shortly after disbursement started. In contrast, most beneficiaries of cash grants invested in equipment and infrastructure, and by the program procurement rules had to go through a third-party service provider to make their investments, which may take time. Hence, apart from cash beneficiaries who used part of their grants for BDSs, the treatment may have a slower impact on some outcomes as compared with the impact of matching grants.

⁵⁹ All firms were informed that a 20% own contribution will be required if they are selected as matching grant recipient. The scoring and interviews checked the interests and soundness of business ideas of all shortlisted candidates, though whether a specific firm would be able to pay the contribution was not checked ex ante for any firm, but ex post for matching grant recipients only.

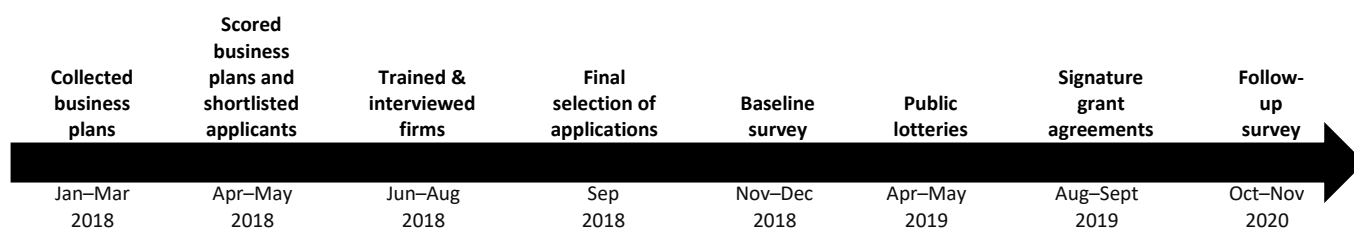


Figure 4.1: Timeline of the program’s main activities

4.3.2 Pathways to impact

The overall goal of both interventions was to identify dynamic, growth-oriented, capital-constrained MSMEs, to supply these firms with capacity building services or alternatively capital to address shortages in skills and finance that paralyze their productivity and inhibit their growth. Hence, both interventions were intended to enhance productivity and profits. The ultimate goal of the interventions was an increase in employment in the intervention area and lasting effects on investment. Yet, BDSs and investments in capital could of course also lead to reduction of labor demand if production processes become more efficient and if labor is substituted by capital. The latter could especially happen, if firms previously had to be labor intensive due to imperfect capital markets.

The rationale behind the matching grants intervention is to support recipient firms in selecting trainers or providers of BDSs that can address their needs. Firms may want to improve their business skills, optimize their organization or production process by adopting new technologies or even invent new products and services.⁶⁰ This assumes a close collaboration between the implementing agency and the recipient firm to ensure that the firm does use the grant for a business-related service and not for any other purpose. On the demand side, earmarking a grant to specific services and asking for an own contribution as opposed to giving a cash grant directly to a business owner may increase commitment and hence address problems of self-control, it may also address problems of mental accounting and help to protect the funds from requests from the family (Fafchamps et al., 2014). On the supply side, matching grant programs also come with a huge administrative work due to the close monitoring and strict procurement rules as well as making sure that the recipient pays the 20% contribution, overall this may lower the cost-effectiveness of such programs (Hristova and Coste, 2016).

Cash grants, in contrast, do not require co-funding and, in the case of the program under evaluation, give recipients more flexibility to allocate the grant according to their needs. As such, cash grants can address not only the firms’ technical and management constraints but also their capital constraints more broadly. Moreover, cash grants come with a relatively light administrative burden and are thus less time consuming for the beneficiary and maybe more cost-effective for the provider. They are also paid directly into an account of the recipient to create commitment and to ‘ earmark’ the grant though there is also a risk that recipients spend the cash on items unrelated to the business. Yet, in our case the monitoring is still relatively strict, so we anticipate misuse or fraud to be relatively low. This also means that the

⁶⁰ Entrepreneurs get for example training in food processing, specific techniques of tailoring, breeding and livestock farming or market gardening.

administrative costs are probably higher than in other cash grants programs that are discussed in the literature.

Both treatments should also have improved entrepreneurs’ business practices, especially given the close monitoring and advisory role MEBF takes. Moreover, having won in the lottery may also have increased entrepreneurs’ confidence and improved their attitudes towards their business (McKenzie, 2017). It may also send positive signals to financial institutions and through this channel relax their credit constraint.

Both matching and cash grants to firms usually also raise concerns regarding their additionality, that is, whether firms receiving grants would not have undertaken the subsidized activities in any case, even without the subsidy. This would be expected to happen if firms were not credit constrained (McKenzie, 2017). Yet we believe this is not true for most entrepreneurs and inconsistent with what firms report in terms of capital needs and access to credit.

There are also more general concerns with such grants, which will not affect this experiment, but which need to be considered if such policies are designed. For example, subsidies can make firms less productive because subsidies may reduce the firms’ incentive to strive for cost-reducing technologies. Firms may also, if the pay-off from subsidies is high enough, tend to invest in subsidy-seeking activities rather than other more efficient activities. Hence, the main challenge of such interventions is to avoid allocative inefficiencies and inefficient firm behavior due to a lack of competition. Governments must therefore select those firms that are the most efficient but would not survive or be created without the subsidy. There should be a good chance, that the effects are lasting and do not evaporate so that continuous support would be required to keep the firm on the growth path. At the same time, there needs to be a sufficiently developed monitoring system to avoid any fraud on the side of the recipient and the provider.

4.4 Randomization, balance tests and attrition

4.4.1 Randomization

Earlier we explained how MEBF attracted firms and prospective firm into the BPC and selected the most promising ones for participation in the public lottery. In this subsection we provide more details about the stratified randomization.

Table 4.1 : Number of entrepreneurs per stratum and treatment arm

Blocks	Cash amount (in US\$)	Cash group (#)	Matching group (#)	Control group (#)	Total (#)
1	. ≤ 1,999	68	68	70	206
2	2,000–2,999	153	154	153	460
3	3,000–3,999	106	106	105	317
4	4,000–4,999	42	41	41	124
5	5,000–5,999	12	12	12	36
6	6,000–6,999	5	5	7	17
7	7,000–8,000	14	14	12	40
	Total (#)	400	400	400	1,200

Source: Data from MEBF’s report on the public lottery (2019).

In each municipality, we stratified applicants according to the size of the financial support they requested and justified in their business plan. Given that the amount requested in cash could differ from the amount requested for a matching grant, we used the requested amount in cash for all firms for that purpose. This amount was in almost all cases higher than the one requested for a matching grant. Within each stratum, each applicant had the same chance to be allocated to one of the three groups (matching, cash, and control). Table 4.1 shows the number of entrepreneurs assigned into each stratum and randomly assigned to one of the three groups.

Table 4.2 shows the mean and distribution within each treatment group. On average, every entrepreneur was granted US\$3,420. The lowest grant is US\$628 and the highest is US\$11,659. By mistake nine entrepreneurs in Block 7 of which four were cash grants and five were matching grants beneficiaries were granted amounts larger than the ceiling of US\$8,000.⁶¹ As intended the distributions of the grant amounts are nearly identical across all three groups.

Table 4.2: Summary statistics of grants (US\$) across groups

Group	Business (#)	Mean (US\$)	Median (US\$)	Standard deviation (US\$)	Minimum (US\$)	Maximum (US\$)
Cash	400	3,421	3,110	1,515	1,020	11,273
Matching	400	3,443	3,161	1,535	1,002	11,659

Source: Data from MEBF’s report on the public lottery (2019).

Since, the distribution of requests significantly deviated from a uniform distribution across the seven strata, the number of winners that had to be drawn was determined in each stratum according to the share of all requests (cash and matching grants) in that stratum, i.e. in each stratum the number of winners is proportional to the number of applicants.

The sample size of 1,200 entrepreneurs, i.e. 400 per group, had been chosen based on power calculations and cost considerations. A sample size of 400 firms per group allows detecting effects in the order of about 0.20 standard deviations, with at least 80% power. If the calculations account in addition for a reasonable amount of sample attrition, the minimum detectable effect size increases to about 0.22 standard deviations. If a power of 90% is imposed the measurable effects increase to 0.23 standard deviations and 0.26 standard deviations respectively. Given, that we have baseline data, at least for the existing firms, we can also estimate ANCOVA specifications and use a large set of covariates which further adds to power.

On top of the quantitative surveys, we also used qualitative methods to probe into contextual factors, especially focus group discussions with firm owners and indepth interviews with staff of MEBF and Bagrépole and also some grant beneficiaries. Moreover, we can draw on monitoring data on program demand, delivery of grants and services, actual program take-up, and process information. All sources taken together, provide a rich data set complementing the survey data, which can help to understand the mechanisms linking program inputs to outputs and ultimate impacts and, more generally, can help validate our results.

⁶¹ The four cash grant beneficiaries received US\$11,273, US\$11,000, US\$9,291, and US\$8,741. The five matching grant beneficiaries received US\$11,659, US\$11,091, US\$10,009, US\$9,436, and US\$9,364.

4.4.2 Balance tests

Tables A.4.1 and A.4.2 in the Appendix show baseline characteristics and pairwise balance tests across all three groups. Table A.4.1 focuses on characteristics of the entrepreneur and Table A.4.2 on characteristics of the firm. Table A.4.1 shows that in our sample entrepreneurs are on average about 42 years old, a bit less than half are women, most are married, about 55% are the head of their household, have about five to six children, a bit more than 20% have completed secondary school and have on average 10 years of professional experience and more than 90% have already completed a business training either in 2017 or in 2018. Almost all characteristics are balanced across the three groups. There are only some minor differences for religious affiliation, age and gender. But even these differences are relatively small in absolute terms. Their firms exist on average for eight years, more than 50% are in agriculture including livestock, 20% are in services and about 15% in manufacturing. They have on average a capital stock of US\$3,500–US\$6,500, generate profits of about US\$500 over the six months preceding the baseline survey, yielding an annual return to capital ratio of about 15%–30% and a profit margin of about 30%–40%, yet profits may include a substantial part of the owner’s labor income. They employ on average 2.5 workers. About 40%–45% keep books. Almost all characteristics are balanced across the three groups, yet there is substantial variation for the reported capital stock, driven by some extreme values, though even these differences are statistically not significant given the high variance of the distribution. Despite the overall very good balance, we will, for robustness reasons, include in all regressions a large set of controls to redress any potential bias. It will also increase the precision with which we estimate the impacts.

Since the sample comprises already existing firms and new firms and for many outcomes it makes sense to analyze the impacts separately for these two types, we also did balance tests for these two subgroups. They are shown in the baseline report (Grimm, Soubeiga, and Weber, 2020). The balance tests suggest that most observable characteristics are also balanced for these subgroups and hence already existing and new businesses are quite evenly distributed across the two treatment groups and the control group. Yet, in general, it must be noted that any subgroup analysis, whether by firm status, or by gender or grant size, is subject to lower power. Hence, at this stage, we mainly focus on the sample of all firms and the sample of already existing firms and leave a further analysis of heterogeneity for later stages when more data are available.

4.4.3 Attrition

Of the 1,200 entrepreneurs, 92.7% responded to the follow-up survey, implying an attrition rate of 7.3%. In our case, attrition has two major sources: respondents who could not be found for instance because they moved away or because they were temporally not available because of a traveling or the like and respondents who refused to participate in the second wave of the survey. Yet, in each case, several attempts had been made to reach out to all participants interviewed at baseline and to limit attrition to its absolute minimum. With respect to the treatment arms, the attrition rate is higher in the group of matching grant beneficiaries (9.3%), followed by the rate in the control group (7.5%), and the group of cash grant beneficiaries (5.3%). Yet, if we run regressions of attrition on respondent’s characteristics and the treatment arms, the coefficients associated with the latter are insignificant. The observables that are

correlated with attrition include the sector of activity, the number of employees and a range of household characteristics such as marital status, family size, religious affiliation, ethnicity and household's assets. When estimating the impacts, we will use regressions and control for these factors. According to MEBF, no one dropped out because of the inability to pay the 20% contribution as they were allowed a deferred payment if that was needed.

4.5 Empirical specifications

Given the randomized evaluation design, impacts can in principle be assessed by simple mean comparisons of the outcomes of interest, Y_i , between the two treatment groups and the control group. Yet, to redress minor imbalances that occurred despite the randomization and to redress a potential bias due to attrition, we use regressions techniques to include appropriate control variables. Hence, we estimate:

$$Y_i = \beta_0 + \beta_1 T_i^M + \beta_2 T_i^C + X'_{i0} \gamma + u_i, \quad (1)$$

where T_i^M and T_i^C are dummy variables that equal 1 if respondent i was offered a matching or cash grant respectively, and 0 otherwise. β_1 and β_2 are the effects of either treatment relative to the control group. Simple Wald tests can be conducted to test whether β_1 and β_2 do significantly differ, i.e. whether one treatment is significantly more effective than another. The vector X includes control variables and γ stands for regression coefficients that are associated with these. β_0 is the intercept and shows the control group mean of the outcome Y_i . u_i is the error term. Since each entrepreneur has been sampled in one of the nine municipalities, we cluster standard errors at the municipality level. The parameters β_1 and β_2 give intention to treat (ITT) effects as the treatment variables T_i^M and T_i^C do not measure whether a firm actually used (or could already use) the grant but only if it was offered (or promised) a grant. Yet, given the substantial delays in the disbursement of the matching grants and hence the limited comparability of matching grant beneficiaries with the cash grant beneficiaries at this stage of the intervention, we must interpret the effects associated with the matching grants rather as an anticipation effect than a real treatment effect.

Of particular interest is also the treatment heterogeneity, for example, with respect to the size of the grant, gender, sector of activity or the initial capital stock. In this case, the treatment effects can be interacted with this characteristic, for example the block category, B_{ij} , used for the randomization. As discussed above, the sample size at hand will obviously put limits on these analyses, so whether different effects can be associated with the different grant sizes, for example, will again depend on the general size of the effects and how large the differences across the blocks really are. The regression equation becomes:

$$Y_i = \beta_0 + \beta_1 T_i^M + \beta_2 T_i^C + \sum_j \beta_{3j} (T_i^M \times B_{ij}) + \sum_j \beta_{4j} (T_i^C \times B_{ij}) + X'_{i0} \gamma + u_i, \quad (2)$$

Again, other characteristics can be substituted, B_{ij} , and be analyzed correspondingly.

It will also be analyzed whether firms in the control group are positively or negatively affected by the presence of treated firms in their area of activity. As mentioned above, such effects may occur if, for example, firms in the control group have backward or forward linkages with treated firms because they now receive better or cheaper intermediate inputs or can sell more final goods to them for their production. Negative effects could occur if control group firms are direct competitors of the treated firms and loose market shares because of the

increased productivity differential. Assuming that such spillovers lose their importance with rising distance between treatment and control firms, the following regression can be estimated:

$$Y_i = \beta_0 + \beta_1 T_i^M + \beta_2 T_i^C + \sum_j \beta_{3j} NT_{ij}^{M,D} + \sum_j \beta_{4j} NT_{ij}^{C,D} + X'_{i0} \gamma + u_i, \quad (3)$$

where $NT_{ij}^{M,D}$ and $NT_{ij}^{C,D}$ stand for the number of treated firms, matching and cash respectively, in a distance D of firm i . The distance D can be set for example to 500 m, 1 km, 2 km and so on. Alternatively, to better capture forward and backward linkages, it is also possible to consider the number of treated firms in the same sector of activity or further up or down the value chain. The number of treated firms in a certain distance can also be interacted with the treatment status of the firm, to allow for spillover effects that vary by treatment status.

The sampling design also allows to estimate ANCOVA specifications, i.e. to condition all impact estimates on pre-intervention outcomes. This further increases the power. ANCOVA is of greatest value when the autocorrelation of outcome measures across time is low (McKenzie, 2012). Equation (1) transformed into an ANCOVA specification can be written as follows:

$$Y_{i,t} = \beta_0 + \beta_1 T_{i,t}^M + \beta_2 T_{i,t}^C + \theta Y_{i,PRE} + X'_{i0} \gamma + u_i, \quad (4)$$

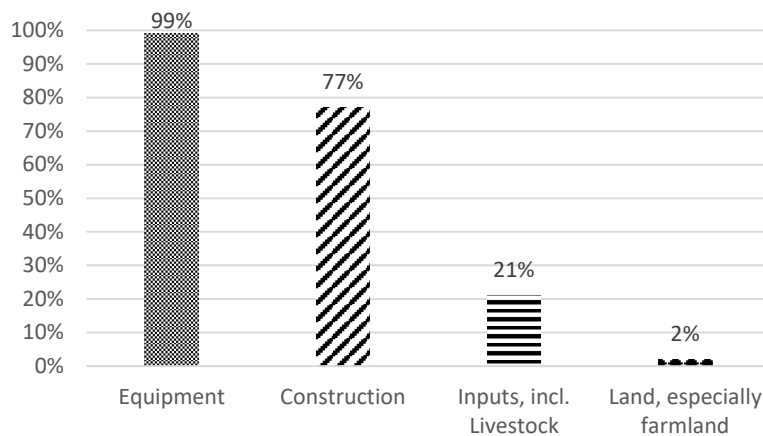
where $Y_{i,PRE}$ is the pre-intervention (or baseline) level of the outcome. ANCOVA is more efficient than either the simple post estimator shown in equation (1) or the difference-in-difference estimator, which would be another possible specification with pre and post-intervention data (Frison and Pocock, 1992; McKenzie, 2012).

Depending on the nature of the outcome variable in each case and its distribution we use in some cases also non-linear models and where useful transform outcome variables using a simple log function or the inverse hyperbolic sine (ihs) function (Burbidge, 1988).

4.6 Results

4.6.1 Use of grants

Before we analyze impacts of the intervention, we focus on the use of the two types of grants according to the entrepreneurs' business plans they had submitted to MEBF. These plans do not allow to distinguish what each entrepreneur would do in either treatment, they rather include both their potential needs in BDSs and their needs for equipment, inventory, livestock and intermediate inputs. An entrepreneur drawn into the cash grant group could of course also spend the entire grant or a part of it on BDSs. Figure 4.2 shows the share of firms who have defined a need for the respective category. We do not include the share for BDSs as all firms had define a need for that category in case they would be drawn for a matching grant.



Notes: Equipment refers to the purchase of machines, production materials and so on.; Inputs refer to the purchase of livestock used in production (e.g. donkey), livestock for breeding, other production inputs; construction work refers to the construction of a warehouse, wall, hangar, cowshed, piggery, pond, and so on.; and land refers to the acquisition of farmland, developed land and so on.

Figure 4.2: Planned investments and purchases (without BDSs)

4.6.2 Effects on investment

In this subsection we analyze whether treated firms show higher investment than control firms. It is important to keep in mind that for the beneficiaries of matching grants any effect of investment would be a second-round effect as the support is earmarked for BDSs and cannot be used for equipment, construction or land.

Further it is important to note that the survey question on investment asked for investment undertaken over the six months preceding the survey, i.e. roughly April–September 2020, and, to avoid any Hawthorne effects, did not ask specifically about investment financed with the grant received. Figure 4.3 shows that according to the monitoring data 43.5% of the beneficiaries of grants, or 174 firms, have withdrawn cash from their account. Nearly 55% had done so already between January and March 2020. These 174 firms that withdrew cash between April and September 2020 withdrew on average US\$ 1,955, or 25% of the total amount granted. The total sum already withdrawn by the time the survey started corresponds to 55% of the total amount granted. This is shown in Figure 4.4.

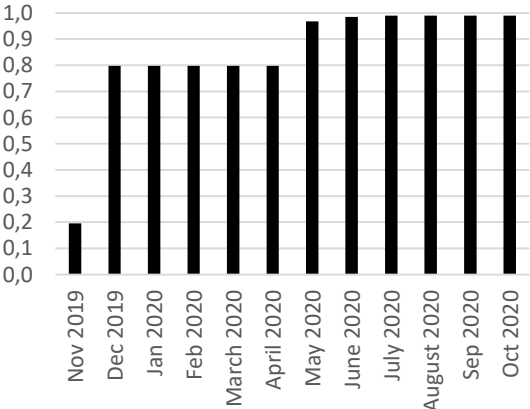
So, overall there are several reasons why even for beneficiaries of cash grants, the impact may deviate from the pure grants that were handed out. First, many grants had not yet been (fully) invested or were spent on inventory or BDSs rather than on equipment, construction or land. Second, some had already used at least a part of their grant before April 2020. Third, the grants may have simply substituted for own resources that would have been used for investment anyway. Fourth, those who did invest may have matched their cash grants with additional resources from the firm and hence report investments much larger than the cash injection they got. Moreover, firms in the control group could have lowered their investment in case they expect to receive support in the future or to the contrary have increased their investment to stand a possibly increased competition with treated firms.

Again, for beneficiaries of matching grants we do not expect direct effects on investment, just indirect effects that are for instance triggered by an increased productivity owing to the

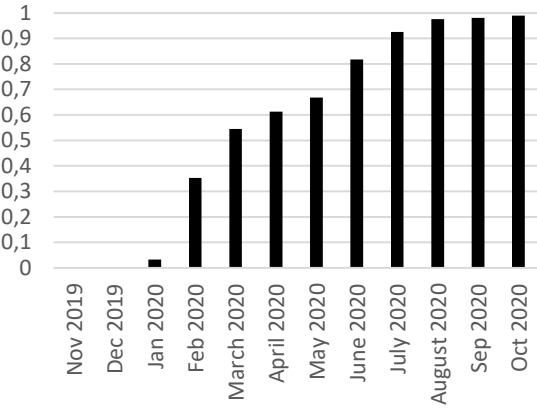
BDSs. Figure 4.3 shows that by the time the survey started, 88% had made a request to MEBF and 82% had received approval and hence may have already benefitted from the support, yet this is probably too late to already expect second order effects on investment.

We use the log of the total amount of capital invested in equipment such as machines, furniture, tools, construction, inputs and land in millions of XOF as an outcome and estimate simple ITT effects, i.e. we are using the treatment status as the treatment and not the actual amount transferred to the firm. We use both simple ordinary least squares (OLS) and the ANCOVA specification. To avoid a bias through outliers, we trimmed the data by removing the top 1% of firms in the distribution.

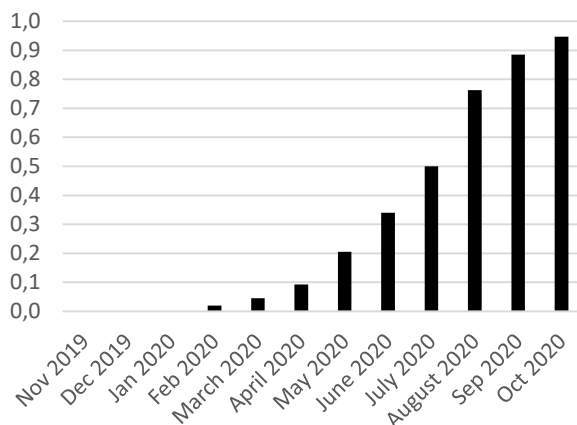
Table 4.3 shows the results. The OLS specification shows a significant positive impact for the group of cash beneficiaries. The results are very similar if we use the ANCOVA specification, i.e. control for baseline investment values. There is hardly a difference in the effect size whether we use the sample of all firms controlling for their status at baseline – already existing or new – or whether we use the sample of already existing firms at baseline only. The estimated impact on investment corresponds to an increase of about 16%. In terms of shares, in the group of cash beneficiaries 35% reported some investment (on average XOF 0.882 million or US\$1,600), whereas this share was only at 19% (on average XOF 0.154 million or US\$280) in the control group. So, clearly more firms in the group of cash beneficiaries invested and they invested on average much higher amounts. It is interesting to see that the average of US\$1,600 is not far from the average cash withdrawn reported in the monitoring data for the same firms over the same period. As expected, we do not yet find any effects for beneficiaries of matching grants.



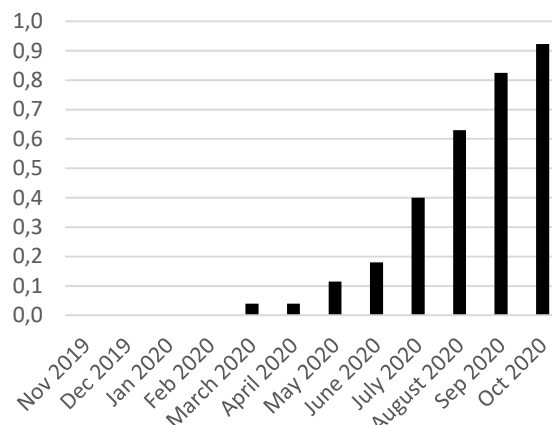
(a) Share of beneficiaries of cash grants who received transfer into their account by month



(b) Share of beneficiaries of cash grants who withdrew cash from their account by month



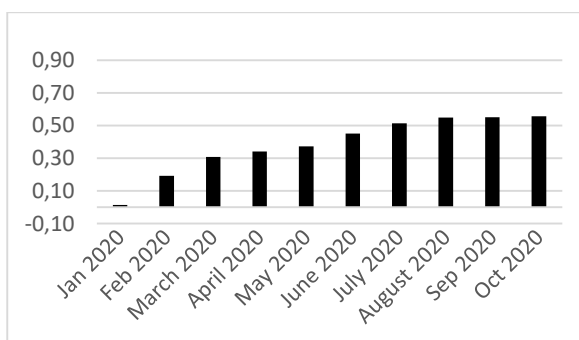
(c) Share of beneficiaries of matching grants who filed a request to MEBF by month



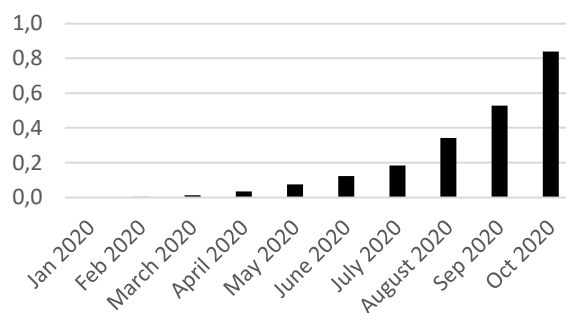
(d) Share of beneficiaries of matching grants who received approval for their request from MEBF by month

Source: Monitoring data.

Figure 4.3: Rollout of cash and matching grants



(a) Cumulative share of total amount of cash grants withdrawn by month



(b) Cumulative share of total amount of matching grants approved by month

Source: Monitoring data.

Figure 4.4: Cumulative share of total grants used by months

We also plotted (unconditional) post-treatment cumulative distribution functions (CDFs) of investment by treatment group (Figure A.4.1, Appendix). The graph shows that among those who invested, the investment is substantially higher in the group of cash grant recipients compared to the two other groups. Their distribution is clearly to the right of the two other groups. The distributions of the matching grant recipients and the control group do not show a noticeable difference.

We do not find any systematic difference in the effect size within cash beneficiaries, whether we look at gender, the sector of activity, initial capital stock or the size of the support requested (results not presented in Table 4.3). Yet, this also has to do with the fact that we are somewhat limited in power with the sample size at hand. Some of the differences across groups might simply be too small to be detectable.

Table 4.3: Intention-to-treat effects on total investment in physical capital and land (past 6 months)

		Total investment (log)	
		All	Existing
Post			
	Cash	0.159*** (0.014)	0.152*** (0.013)
	Matching	0.004 (0.012)	0.007 (0.011)
ANCOVA			
	Cash	0.149*** (0.011)	0.149*** (0.011)
	Matching	0.009 (0.011)	0.009 (0.011)
Control group mean (in XOF, millions), all		0.029	0.027
St. Dev.		0.133	0.122
Control group mean (in XOF, millions), investment>0		0.154	0.273
St. Dev.		0.145	0.252
S.E. clustered		Municipality	Municipality
Controls		Yes	Yes
R2 (Post)		0.126	0.113
R2 (ANCOVA))		0.110	0.110
N (Post)		1,032	960
N (ANCOVA)		952	952

Notes: *** p<0.01, ** p<0.05, * p<0.1. Investment has been trimmed at the 99th percentile. All control variables come from the baseline survey. The list of controls include a dummy that equals one if the firm is already existing (vs. new); dummies for whether the firm's sector is industry or services, with agriculture being the reference; a share of correct recalls by the owner from a digit span memory test; a dummy that equals one if the owner is female; the age and number of years of professional experience of the owner; dummies for whether the owner is Christian or Muslim; dummies for whether the owner is of the two largest ethnic groups (Bissa or Mossi); dummies for whether the owner reads and writes French and a local language or reads and writes a local language only; dummies for whether the owner attained primary, secondary, or other education levels, with the excluded being no education level; the size of the owner household; the number of assets owned; and dummies for whether the owner is a household head and whether a member in the owner household is a community leader. The control group mean refers to the follow-up survey. The detailed regression results are provided in Table A.4.3 in the Appendix.

4.6.3 Effects on profits and turnover

For both, beneficiaries of cash grants and beneficiaries of matching grants, we find negative treatment effects on turnover (total revenues on products and services over the last six months) and profits (total profits on products and services over the last six months) (see Table 4.4 and Figures A.4.2 and A.4.3). The unconditional posttreatment CDFs show that the distributions are clearly different between the 70th and 90th percentile and between the 80th and 95th percentile respectively. Yet, for recipients of matching grants, the negative treatment effects turn insignificant if we use the ANCOVA specification. For treated firms that already existed at baseline the reduction of profits is of the order of XOF 60,000–70,000 (or US\$108–126). For turnover, the estimates are less precise and for the subgroups of already existing firms in case of the ANCOVA specification, they are insignificant. In the simple OLS specification the effect has roughly a size of minus 7% (or XOF 97,000, i.e. US\$175). The reduction in revenues and profits may surprise, especially because of the positive effect on investment, but beneficiaries may need time to transform their business, for example, to reach out to new customers, develop new products and learn to deal with new technologies and forms of organization. It might also be due to increased competition, which we investigate further when we explore spillover effects. In a comparable experiment with cash grants in Nigeria, McKenzie (2017) showed that the impacts on profits and sales were insignificant in the first year for all retained indicators except one but reached significant and economically sizeable effects in the second and third years after the rollout. Of course, it could also be that the COVID-19 pandemic and the associated decline in demand made it difficult for firms to market a higher output. The possible consequences of COVID-19 will be analyzed in more detail later.

If we analyze heterogenous effects by gender, initial capital stock, size of the grant and sector, we do not detect any special pattern. Almost all interactions are insignificant. As noted earlier, this has to do with the limited power we have to analyze such interactions. We find that only treated firms in the service sector seem to get around negative short-term effects on their profits. This may imply that transformations in the business model are faster, for example, in this sector compared to the manufacturing sector.

Table 4.4: Intention-to-treat effects on profits (total profits on products and services) and turnover (total revenues on products and services), past 6 months

		Profits		Turnover (log)	
		All	Existing	All	Existing
Post					
	Cash	-0.0697** (0.025)	-0.074** (0.027)	-0.080* (0.036)	-0.070* (0.036)
	Matching	-0.062** (0.021)	-0.063** (0.023)	-0.050 (0.028)	-0.047 (0.033)
ANCOVA					
	Cash	-0.057** (0.023)	-0.057** (0.023)	-0.059 (0.035)	-0.059 (0.035)
	Matching	-0.048 (0.029)	-0.048 (0.029)	-0.012 (0.036)	-0.012 (0.036)
Control group					
mean (in XOF, millions)		0.254	0.260	1.374	1.381
St. Dev.		0.386	0.394	2.078	2.107
S.E. clustered		Municipality	Municipality	Municipality	Municipality
Controls		Yes	Yes	Yes	Yes
R2 (Post)		0.111	0.113	0.144	0.141
R2 (ANCOVA))		0.155	0.155	0.289	0.289
N (Post)		1,024	952	1,019	946
N (ANCOVA)		940	940	931	931

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Profits are in XOF, millions (XOF 1 million = US\$1,820), turnover is in log. Profit and turnover have been trimmed at the 99th percentile. All control variables come from the baseline survey. The list of controls include a dummy that equals one if the firm is already existing (vs. new); dummies for whether the firm sector is industry or services, with agriculture being the reference; a share of correct recalls by the owner from a digit span memory test; a dummy that equals one if the owner is female; the age and number of years of professional experience of the owner; dummies for whether the owner is Christian or Muslim; dummies for whether the owner is of the two largest ethnic groups (Bissa or Mossi); dummies for whether the owner reads and writes French and a local language or reads and writes a local language only; dummies for whether the owner attained primary, secondary, or other education levels, with the excluded being no education level; the size of the owner household; the number of assets owned; and dummies for whether the owner is a household head and whether a member in the owner household is a community leader. The control group mean refers to the follow-up survey. The detailed regression results are provided in Tables A.4.4 and A.4.5 in the Appendix.

4.6.4 Effects on employment

One of the ultimate goals that shall be achieved with the interventions under study is employment creation. Therefore, we included a whole battery of outcome indicators related to jobs and work in our surveys, such as the total number of employees, the number of paid wage workers, the number of unpaid workers, the number of employees that belong to the entrepreneur's household, the number of casual workers, the number of days and alternatively hours worked by the employees in a normal week, and the average wage paid to the employees. Note that these categories are partly overlapping and not mutually exclusive. Table 4.5 shows the results for four different indicators. Overall, we do not find any significant effects on employment-related outcomes, neither for beneficiaries of cash grants nor for beneficiaries of matching grants, and whether we look at all firms or at already existing firms only, if at all, it seems that the short-term effects are slightly negative. The only exception is 'days worked', it seems that beneficiaries of cash grants increased the number of days they are working per week by 0.16 from 5.66 to 5.82 or roughly 3%. This is a relatively small effect. Digging deeper reveals that treated firms seem to use less household helpers and casual work. This could hint to a higher capital intensity in these firms. Yet, more generally, we believe that the time that elapsed between the investments that have been undertaken and the survey is still too short to expect substantial employment effects; if employment creation materializes it will certainly take more time. Here as well, it must be assumed that the COVID-19 pandemic did not offer favorable conditions for an expansion of jobs.

Table 4.5: Intention-to-treat effects on total and paid wage employments

		Total employment		Paid wage employment		Unpaid employment		Days worked	
		All	Existing	All	Existing	All	Existing	All	Existing
Post									
	Cash	-0.248*	-0.212	-0.0533	-0.008	-0.062	-0.047	0.161**	0.086
		(0.109)	(0.129)	(0.087)	(0.097)	(0.090)	(0.098)	(0.063)	(0.058)
	Matching	-0.056	-0.084	0.006	-0.002	0.145	0.149	-0.139	-0.178*
		(0.231)	(0.263)	(0.115)	(0.122)	(0.086)	(0.097)	(0.096)	(0.086)
ANCOVA									
	Cash	-0.0968	-0.097	-0.002	-0.002	-0.043	-0.043		
		(0.143)	(0.143)	(0.079)	(0.079)	(0.099)	(0.099)		
	Matching	0.017	0.017	0.045	0.045	0.138	0.138		
		(0.283)	(0.283)	(0.124)	(0.124)	(0.095)	(0.095)		
Control group mean		2.271	2.302	1.106	1.106	0.507	0.506	5.663	5.707
St. Dev.		2.29	2.327	1.881	1.908	1.236	1.246	1.585	1.559
S.E. clustered		Municipality	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality
Controls		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R2 (Post)		0.085	0.084	0.080	0.081	0.030	0.027	0.072	0.073
R2 (ANCOVA))		0.221	0.221	0.233	0.233	0.061	0.061		
N (Post)		1,067	989	1,042	969	1,042	969	851	796
N (ANCOVA)		989	989	969	969	969	969		

Notes: *** p<0.01, ** p<0.05, * p<0.1. The dependent variables are the total number of employees, the number of paid wage employees, the number of unpaid employees, and the average number of days worked in a week (only available at midline) respectively. All control variables come from the baseline survey. The list of controls include a dummy that equals one if the firm is already existing (vs. new); dummies for whether the firm sector is industry or services, with agriculture being the reference; a share of correct recalls by the owner from a digit span memory test; a dummy that equals one if the owner is female; the age and number of years of professional experience of the owner; dummies for whether the owner is Christian or Muslim; dummies for whether the owner is of the two largest ethnic groups (Bissa or Mossi); dummies for whether the owner reads and writes French and a local language or reads and writes a local language only; dummies for whether the owner attained primary, secondary, or other education levels, with the excluded being no education level; the size of the owner household; the number of assets owned; and dummies for whether the owner is a household head whether a member in the owner household is a community leader. The control group mean refers to the follow-up survey. The detailed regression results are provided in Tables A.4.6 and A.4.7 in the Appendix.

4.6.5 Effects on business skills, business practices, banking and formalization

We also included in our survey a whole range of outcome indicators that relate to business skills and business practices including banking and formalization. Although all firms in our sample received SIYB training developed by the ILO, treated firms more than untreated firms may have felt the necessity to adapt their practices with the upcoming investment opportunity. For those firms that invested their grant on technical support, especially the beneficiaries of matching grants, new skills and practices may also have been transmitted together with the technical support they received.

Formalization (i.e. registration with social security, the tax administration and possibly with the trade registry) was strongly recommended by MEBF to all firms in the sample, but not enforced or made obligatory. The results in Table 4.6 show that at least beneficiaries of cash grants have a probability to be formalized that is higher by about 7–8 percentage points relative to control firms. This corresponds to almost a doubling of the share of formalized firms; the share of formalized firms in the control group is about 7 percent. The estimated coefficients for beneficiaries of matching grants are also throughout positive, but mostly very small and insignificant.

For beneficiaries of cash grants, we also see sizeable and highly significant positive effects of having a bank account (+22 percentage points), even if the control group mean of 62% is already impressive. This is probably due to the good targeting of the intervention. The large effect for cash beneficiaries is not surprising because beneficiaries of cash grants needed to open a bank account and obtained, if needed, assistance to do so to receive their grant. Although this makes ‘having a bank account’ more a project output than an outcome, this is an important achievement as experience with a formal bank and improved financial literacy might have lasting impacts for the beneficiaries.

For the beneficiaries of cash grants we also see an increased probability by 13 percentage points (from a control group base of 29%) to keep books on sales and purchases. This is also an outcome with potentially lasting effects.

The survey also asked the entrepreneurs several questions regarding their ability and plans to innovate by introducing e.g. new or modified products, services, management or operational processes, and their plans to use the internet. To analyze impacts on innovation, we aggregated the answers using Principal Component Analysis (PCA). At least based on OLS, we find sizeable positive effects in this case for both beneficiaries of cash and matching grants. We find impacts in the order of 0.18 and 0.15 units of a standard deviation for beneficiaries of cash grants and matching grants respectively. If we use the ANCOVA specification, the effects for beneficiaries of matching grants turn insignificant, but borderline and the effect size does not change much. Hence, it seems that even beneficiaries of matching grants, maybe partly in anticipation, increased their innovation potential.

Overall, we cannot find significant heterogenous effects at this stage. With respect to gender, for women, we see slightly lower effects on formalization and slightly higher effects for bookkeeping and innovation, but these differences are statistically insignificant. There is also no difference for banking. There is otherwise no systematic pattern that emerges with respect to the sector of activity, the size of the capital stock at baseline, or the size of the grant firms received.

More generally, the positive effects on these softer intermediate outcomes may transform in the medium and longer terms into more sizeable and lasting effects for the ultimate outcomes.

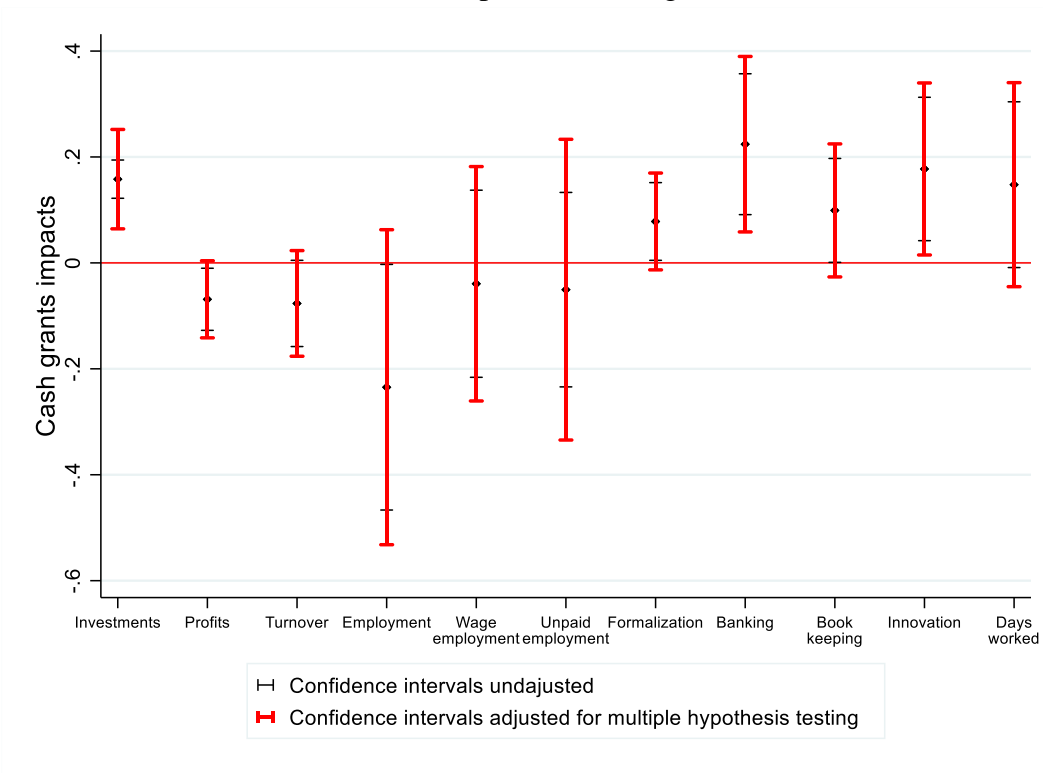
Table 4.6: Intention-to-treat effects on formalization, banking, bookkeeping and innovation

		Formalization		Banking		Bookkeeping		Innovation	
		All	Existing	All	Existing	All	Existing	All	Existing
Post									
	Cash	0.077** (0.031)	0.089** (0.032)	0.216*** (0.045)	0.204*** (0.047)	0.101* (0.045)	0.123** (0.047)	0.181** (0.060)	0.179** (0.077)
	Matching	0.032 (0.026)	0.034 (0.024)	0.043 (0.047)	0.031 (0.050)	0.006 (0.030)	0.022 (0.039)	0.149* (0.068)	0.158* (0.077)
ANCOVA									
	Cash	0.102** (0.034)	0.102** (0.034)	0.209*** (0.043)	0.198*** (0.046)	0.130** (0.047)	0.130** (0.047)	0.193* (0.090)	0.193* (0.090)
	Matching	0.051* (0.024)	0.051* (0.024)	0.033 (0.045)	0.019 (0.051)	0.027 (0.038)	0.027 (0.038)	0.124 (0.078)	0.124 (0.078)
Control group mean		0.066	0.064	0.619	0.627	0.292	0.282	-0.123	-0.121
St. Dev.		0.248	0.244	0.486	0.484	0.455	0.451	0.844	0.853
S.E. clustered		Municipality	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality
Controls		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R2 (Post)		0.126	0.130	0.164	0.167	0.153	0.148	0.081	0.085
R2 (ANCOVA))		0.208	0.208	0.312	0.308	0.172	0.172	0.123	0.123
N (Post)		1,042	969	1,107	970	1,042	969	1,009	937
N (ANCOVA)		969	969	1,107	970	969	969	913	913

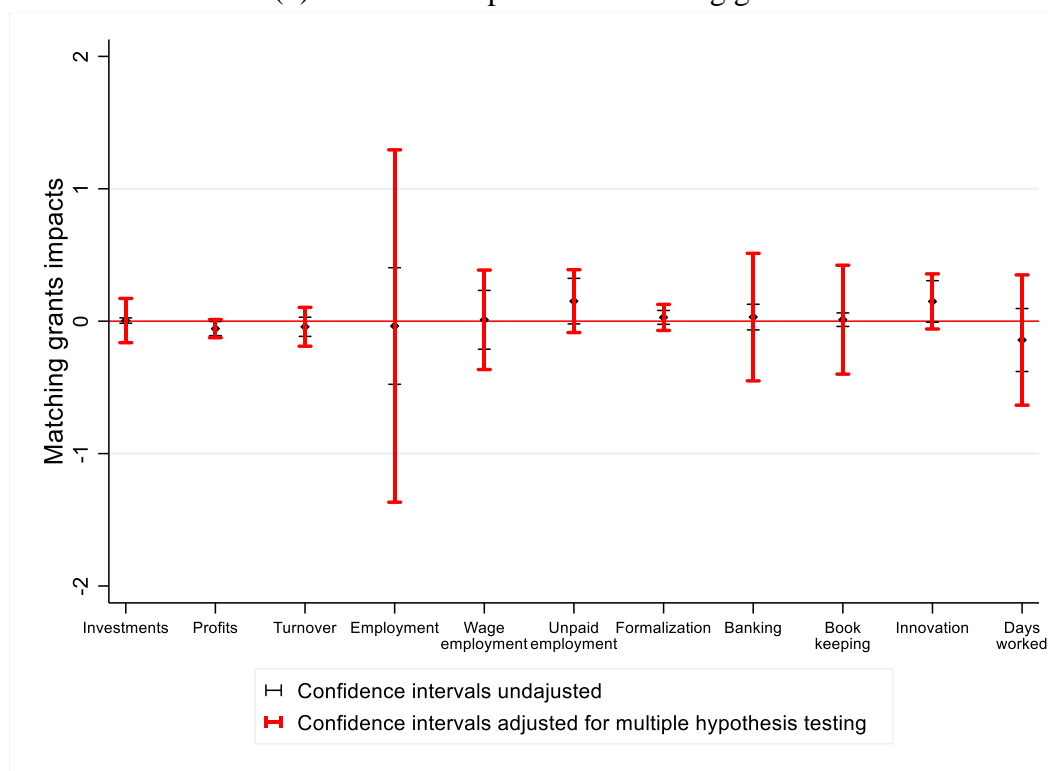
Notes: *** p<0.01, ** p<0.05, * p<0.1. Formalization, banking, bookkeeping are dummies each equals one if the firm is formalized, owns a financial account, or keeps books on sales and purchases respectively. Innovation is an index, i.e. the first component from a PCA applied on 15 dummies each taking the value one if the firm introduced either of the 15 listed innovations. All control variables come from the baseline survey. The list of controls include a dummy that equals one if the firm is already existing (vs. new); dummies for whether the firm sector is industry or services, with agriculture being the reference; a share of correct recalls by the owner from a digit span memory test; a dummy that equals one if the owner is female; the age and number of years of professional experience of the owner; dummies for whether the owner is Christian or Muslim; dummies for whether the owner is of the two largest ethnic groups (Bissa or Mossi); dummies for whether the owner reads and writes French and a local language or reads and writes a local language only; dummies for whether the owner attained primary, secondary, or other education levels, with the excluded being no education level; the size of the owner household; the number of assets owned; and dummies for whether the owner is a household head and whether a member in the owner household is a community leader. The control group mean refers to the follow-up survey. The detailed regression results are provided in Tables A.4.8 and A.4.9 in the Appendix.

Figure 4.5 summarizes the impacts along with their 95% confidence intervals across all outcomes we analyzed. To account for the fact that we test impacts across multiple outcomes, we also present confidence intervals that are adjusted using Romano-Wolf stepdown adjusted p-values. The reason is that even if none of the treatments has an effect, with an assumed significance level of 5% statistically 1 out of 20 impacts will show up as significant. Hence, the adjusted confidence intervals are more conservative and redress this possible bias by reducing the probability of false rejections (errors of type 1).

(a) For recipients of cash grants



(b) For recipients of matching grants



Notes: The adjusted confidence intervals are obtained from regressions that use (a) recipients of cash grants and the control group only and (b) the matching grant recipients and the control group only.

Figure 4.5: Impacts and confidence intervals (adjusted and non-adjusted for multiple hypotheses testing)

4.6.6 Spillovers

Given that the treatment status varies within each of the nine municipalities and given that many of the treated firms operate within the same sector, it is worth exploring possible spillover effects. These are interesting for two reasons. First, it is important to check whether firms in the control group are affected by beneficiary firms which would reduce their suitability as a control group. Second, it is worth exploring whether the gains of beneficiaries depend on the competition they face (McKenzie, 2017). In our case, especially, the negative treatment effects on profits and turnover that we find for recipients of cash grants despite increased investment could, for instance, be due to the competition they face with other treated firms. Competition might make it difficult to increase sales especially in a context where the market size is relatively small and offers little possibilities to expand for example through exportation. Table 4.7 shows the effects of the number of treated firms (with cash) alternatively within 500 m, 2 km and 5 km for recipients of cash grants, recipients of matching grants and control firms. These results suggest that overall there are only very small, if any, spillover effects. The only remarkable pattern that comes out of these estimations is that the negative treatment effect on profits, decreases slightly with the number of cash beneficiaries within a radius of 5 km. Yet, again, overall, we see little spillovers so far, neither negative nor positive. This issue will be further explored as more rounds of data become available. The survey includes various variables that measure in one way or another the competition firms face. These variables can

be interacted with the treatment status. Yet, so far, the sample size is too small to investigate that type of heterogeneity.

Table 4.7: Spillover effects on profits stemming from cash beneficiaries

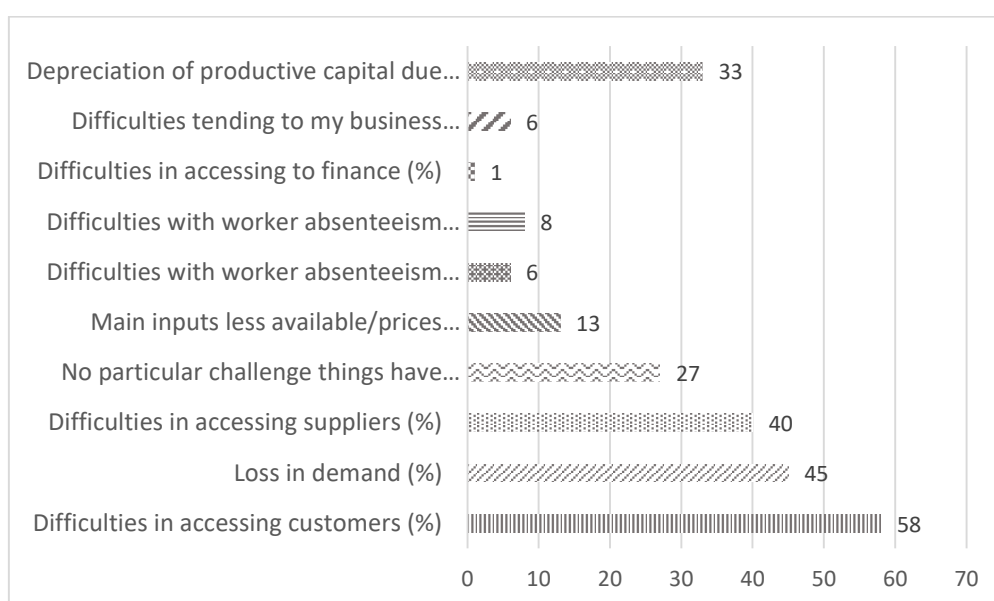
		500 m		2 km		5 km	
		All	Existing	All	Existing	All	Existing
Post							
	Cash	-0.0526 (0.031)	-0.055 (0.032)	-0.065 (0.045)	-0.062 (0.050)	-0.137*** (0.032)	-0.133*** (0.032)
	Cash*#Cash	-0.003 (0.001)	-0.003 (0.002)	-0.0003 (0.001)	-0.0006 (0.001)	0.002*** (0.001)	0.002*** (0.000)
	within a radius of ...						
	Matching	-0.053* (0.028)	-0.055* (0.028)	-0.073** (0.028)	-0.076* (0.033)	-0.096** (0.029)	-0.096** (0.032)
	Matching*#Cash	-0.002 (0.002)	-0.001 (0.002)	0.0004 (0.001)	0.0006 (0.001)	0.0001** (0.000)	0.0001 (0.001)
	within a radius of ...						
	#Cash	-0.001 (0.001)	-0.001 (0.001)	-0.0007 (0.001)	-0.0009 (0.001)	-0.0009 (0.001)	-0.001 (0.001)
ANCOVA							
	Cash	-0.027 (0.028)	-0.027 (0.028)	-0.0306 (0.040)	-0.031 (0.040)	-0.106*** (0.026)	-0.106*** (0.026)
	Cash*#Cash	-0.004** (0.002)	-0.004** (0.002)	-0.001 (0.001)	-0.001 (0.001)	0.0015*** (0.000)	0.0015*** (0.000)
	within a radius of ...						
	Matching	-0.032 (0.039)	-0.032 (0.039)	-0.056 (0.046)	-0.056 (0.046)	-0.079 (0.047)	-0.079 (0.047)
	Matching*#Cash	-0.002 (0.002)	-0.002 (0.002)	0.0004 (0.001)	0.0004 (0.001)	0.001 (0.001)	0.001 (0.001)
	within a radius of ...						
	#Cash	-0.0003 (0.001)	-0.0003 (0.001)	-0.0002 (0.001)	-0.0002 (0.001)	-0.0005 (0.001)	-0.0005 (0.001)
S.E. clustered		Municipality	Municipality	Municipality	Municipality	Municipality	Municipality
Controls		Yes	Yes	Yes	Yes	Yes	Yes
R2 (Post)		0.113	0.119	0.109	0.115	0.111	0.116
R2 (ANCOVA))		0.161	0.161	0.157	0.157	0.157	0.157
N (Post)		1,024	952	1,024	952	1,024	952
N (ANCOVA)		940	940	940	940	940	940

Notes: *** p<0.01, ** p<0.05, * p<0.1. Profit has been trimmed at the 99th percentile. All control variables come from the baseline survey. The list of controls include a dummy that equals one if the firm is already existing (vs. new); dummies for whether the firm sector is industry or services, with agriculture being the reference; a share of correct recalls by the owner from a digit span memory test; a dummy that equals if the owner is female; the age and number of years of professional experience of the owner; dummies for whether the owner is Christian or Muslim; dummies for whether the owner is of the two largest ethnic groups (Bissa or Mossi); dummies for whether the owner reads and writes French and a local language or reads and writes a local language only; dummies for whether the owner attained primary, secondary, or other education levels, with the excluded being no education level; the size of the owner household; the number of assets owned; and dummies for whether the owner is a household head and whether a member in the owner household is a community leader. The control group mean refers to the follow-up survey. The detailed regression results are provided in Tables A.4.10.1 and A.4.10.2 in the Appendix.

4.6.7 Did the intervention mitigate the adverse effects of the COVID-19 pandemic?

The period between the baseline and the follow-up survey overlaps with the worldwide COVID-19 pandemic that also affected Burkina Faso. The first case of COVID-19 in Burkina Faso was detected on March 9, 2020. The country went through a prolonged lockdown, a nightly *couvre feu* and a closure of the international airport for several months which affected imports and exports of goods as well as the number of international travelers. Although the health impact was less dramatic as initially feared, the impact on the economy was clearly visible.

Indeed, almost 60% of our sampled firms reported in the follow-up survey that they faced difficulties. 58% reported problems in reaching out to their customers, 45% reported a decline in demand, 40% reported a problem in getting their supplies and 13% reported problems with worker absenteeism (see Figure 4.6).



Source: Bagré Growth Pole Data Set.

Figure 4.6: Percentage of firms which encountered difficulties due to COVID-19 and government response measures

Firms were also explicitly asked whether they faced changes in their production, sales, investment, employment and overall performance over the past six months, i.e. over the period April/May 2020 to October/November 2020. Whereas in the cash group 44% reported a decline in their production, this share was 52% and 51% in the matching grants and control groups respectively. Hence, the support in the form of cash grants may have protected cash beneficiaries to some extent or at least mitigated the negative impact of the crisis. Indeed, sales also decreased less for them; 52% of them reported a decline vs. 59% and 58% in the two other groups respectively. The same pattern is also visible for investment and reported performance. The share that reports a decline in performance is 19% significantly lower for beneficiaries of cash grants compared to beneficiaries of matching grants and the control group where 24% and 25% reported a decline respectively. Recall that most of the matching grant recipients received their support very late or not yet at all, hence not in time to mitigate the effects of the pandemic. Yet, these differences between beneficiaries of cash grants and all others are on average

relatively small, so the protective effect was not more than moderate. We also do not see any difference in terms of workers temporarily or permanently laid off or having had to accept reduced salaries.

Table 4.8 analyzes these differences across the three groups more systematically. Based on the reported information, we coded six binary variables that take the value one if the entrepreneur reported that due to COVID-19 production, sales, investment, temporary employment, permanent employment or performance respectively declined. If the entrepreneur reported that they remained unchanged or even increased the respective variables take the value zero. We then run regressions similar to those in our impact evaluation, to test whether beneficiaries of cash grants reported less often a decline in the respective outcomes.

Note that this analysis differs in several respects from our analysis above. Whereas here we compare *qualitative trends* over the past six months across the three groups, above we compared *quantitative levels* over the past six months across the three groups.

The regression results suggest that beneficiaries of cash grants were less likely to report a decline in production, investment and performance due to the COVID-19 pandemic.

Again, the fact that beneficiaries of cash grants were better protected than the beneficiaries of matching grants or firms in the control group is not necessarily at odds with the finding above that the cash grants have not yet had any positive impact on profits and turnover. Over the past six months, cash beneficiaries, on average, may well have generated over the past six months lower profits than firms in the control group, but still a smaller share could have experienced a negative trend. The negative effect on profits can even be driven by a relatively small share of firms that incurred very low or negative profits. It may just imply that fewer firms experienced a decline in performance, but those that had experienced a more substantial loss.

Table 4.8: Effects of COVID-19 on decline in production, sales, investment, employment, and general performance

	Production		Sales		Investment		Employment		Performance	
	All	Existing	All	Existing	All	Existing	All	Existing	All	Existing
Cash	-0.125*	-0.084	-0.109	-0.066	-0.281***	-0.272***	0.036	0.047	-0.197*	-0.186**
	(0.066)	(0.059)	(0.093)	(0.086)	(0.093)	(0.075)	(0.230)	(0.242)	(0.106)	(0.090)
Matching	0.071	0.099	0.076	0.080	-0.028	0.011	0.089	0.061	-0.034	-0.015
	(0.075)	(0.078)	(0.094)	(0.096)	(0.118)	(0.117)	(0.180)	(0.145)	(0.107)	(0.105)
Control group										
mean	0.508	0.524	0.578	0.606	0.219	0.230	0.024	0.024	0.243	0.255
StDev.	0.501	0.500	0.494	0.489	0.414	0.422	0.154	0.154	0.430	0.436
S.E. clustered	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R2	0.066	0.055	0.077	0.050	0.048	0.034	0.108	0.111	0.046	0.036
N (Post)	1,107	970	1,107	970	1,107	970	1,107	970	1,107	970

Notes: *** p<0.01, ** p<0.05, * p<0.1. Each of the dependent variables, production, sales, investment, employment, and general performance is a dummy that equals one if it decreased for the firm due to COVID-19. The list of controls include a dummy that equals one if the firm is already existing (vs. new); dummies for whether the firm sector is industry or services, with agriculture being the reference; a share of correct recalls by the owner from a digit span memory test; a dummy that equals if the owner is female; the age and number of years of professional experience of the owner; dummies for whether the owner is Christian or Muslim; dummies for whether the owner is of the two largest ethnic groups (Bissa or Mossi); dummies for whether the owner reads and writes French and a local language or reads and writes a local language only; dummies for whether the owner attained primary, secondary, or other education levels, with the excluded being no education level; the size of the owner household; the number of assets owned; and dummies for whether the owner is a household head and whether a member in the owner household is a community leader. The control group mean refers to the follow-up survey. The detailed regression results are provided in Table A.4.11 in the Appendix.

4.6.8 Qualitative evidence

To get further insights into the impact of the support given to firms in the treatment groups and to understand what factors may explain the delay in achieving some of the goals, we conducted 13 focus group discussions with about 120 participants in total and 54 semi-structured interviews with treated and control firms as well as community leaders.

In line with the results above that we derived from the structured survey, matching grant beneficiaries also reported in these rather open conversations increased business management knowledge that is helping them to innovate and to diversify their product offerings, to improve product quality, and to save on costs for more reinvestments in the firm. Cash grant beneficiaries reported in particular increased investments in physical capital (equipment and infrastructure), inventory, and production inputs. Even firms in the control group reported some improvements in business management practices following SIYB training that all sampled firms had to follow. These entrepreneurs especially hailed their improved knowledge in financial management, marketing, and customer relationships. A control firm said: “Yes, the competitiveness of my firm improved in particular in the management of the firm and in the domain of financial management.”

Yet, among the treated entrepreneurs many found the selection and disbursement procedures lengthy and disturbing for their production plans. But many respondents have rather positive expectations for the months to come. Beneficiaries of cash and matching grants expect a major change in their productions owing to the training and financial support received. One beneficiary said: “In the next twelve months, our production situation will change thanks to the knowledge acquired from the training; we can build business relationships with other firms thanks to the commercial fairs, and this will increase our business knowledge further.” A beneficiary of a cash grant said: “The production will increase with the construction of a bigger building and the acquisition of a full set of equipment for a modern hairdressing salon. Also, I plan to hire employees and train myself.” Interviewees also reported more generally that the activities of the Bagré Growth Pole project created opportunities and incentives, which motivated them to grow their existing businesses or to engage in entrepreneurship. For example, the provision of irrigated lands, inputs for livestock production, and BDSs also induced the development of markets for products that are locally consumed and exported to neighboring countries.

Regarding the distinct impact of the program on men and women, most entrepreneurs reported that female entrepreneurs produce and sell more than male entrepreneurs. Many perceive women as demonstrating better entrepreneurial traits such as perseverance, strong engagement, trustworthiness, and saving and marketing abilities which would enable them to grow their businesses. Yet, it is also emphasized that some activities are only suited to men while others are only suited to women given local norms and customs. In addition, it was said several times that female entrepreneurs can grow their firm above a certain size only if their husband and their family support them.

Finally, the focus group discussions and indepth interviews suggest that many entrepreneurs in the treatment groups face additional constraints that need to be removed to unlock the full potential of their activities. Many entrepreneurs said that they are not yet fully exploiting their equipment and would need to hire more staff but are unable to pay the wages. Many reported that they are not able to hire qualified workers who often require a higher wage and a formal

contract. A beneficiary of a cash grant said: “Yes, I think I need more workers for managing my firm,” and a beneficiary of a matching grant said: “I am not hiring because I do not have the financial means to pay a worker for now.” Other beneficiaries prefer to improve the conditions of their current workers or to employ family labor to save costs for reinvestment in their firms. A beneficiary of a matching grant said: “There is no need of hiring more workers now, I prefer to treat better my current workers.”

4.7 Conclusion

We analyzed the short-term impacts of two innovative interventions to enhance private sector development and to create jobs in a resource-poor and rather rural setting. The interventions relied on a rigorous targeting based on a BPC and offered sizeable grants and complementary training in business practices as well as a careful monitoring. These are all features that many previous interventions that have been subject to rigorous evaluations were missing and, at least partly, may explain that they generated only moderate or no effects.

Yet, the interventions of this study had to deal with many difficulties, including institutional frictions, an increasing country-wide political and social instability and the COVID-19 pandemic. Together, these seriously affected the project implementation, especially by delaying the transfers to the beneficiaries and by dampening demand making it difficult to draw benefits from new investments. Nevertheless, the results based on the first follow-up survey can provide many interesting insights and are rather promising from the perspective of the implementers, at least with respect to the beneficiaries of cash grants, who were served on average a bit earlier than recipients of matching grants.

Investment significantly increased for the beneficiaries of cash grants. More firms in the group of cash beneficiaries invested and they invested on average much higher amounts. Yet, the period was too short to have triggered any additional investment beyond the grants handed out. There is also no effect on investment for recipients of matching grants, yet, matching grants were earmarked for BDSs only, so any investment effect would be a second-order effect. The impact on profits for beneficiaries is slightly negative. Although, we cannot pinpoint the exact mechanism behind, but a plausible explanation could be that the investments caused additional costs and that more time is needed to increase production and sales especially in the context of several overlapping crises. There is also not yet an effect on employment, maybe for the same reasons; yet at least for recipients of cash grants one can detect a small effect on the number of working days suggesting a higher effort level. The reason for optimism gives results on a whole range of intermediate outcomes. The impacts on formalization, banking, bookkeeping and a summary measure of innovative behavior are throughout positive for beneficiaries of cash grants and the latter even for beneficiaries of matching grants. The next follow-up survey planned for end-2021 will show whether these changes also result in sizeable impacts on the targeted ultimate outcomes, especially employment.

The follow-up survey will then also allow to conduct a rigorous comparison between cash grants and matching grants. Besides their differences in use, they differ significantly in the procurement rules that are attached to them. Already during this first phase of the project, it became apparent that strict procurement rules create substantial costs in terms of time and staff. In-depth discussions with beneficiaries document their difficulties to understand and comply with the complexities of the entire disbursement process. Hence, we will compare the costs of

procurement to the costs of misuse and fraud to see which is the most cost-effective avenue to provide support.

Although this is not a focus of this assessment, it is nevertheless interesting to see that the cash grants also mitigated the adverse effects of the COVID-19 pandemic. Compared to beneficiaries of matching grants and firms in the control group, recipients of cash grants reported less often a decline of production, sales, investment, employment, and the general performance due to the pandemic. This is an important result for the debate on how the private sector can be protected from this crisis.

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Appendix

Table A.4.1: Baseline characteristics of the entrepreneur and pairwise balance tests across all three groups

Variable	Matching (M)		Cash (C)		Control (CT)		M vs CT	p-value	
	Mean	N	Mean	N	Mean	N		C vs CT	C vs M
<i>Age, gender, and marital status</i>									
Age (#)	42.39	400	42.02	400	43.57	400	0.14	0.06	0.64
Entrepreneurs age below 35 (#)	0.28	400	0.29	400	0.24	400	0.19	0.11	0.75
Female (=1)	0.43	400	0.37	400	0.44	400	0.78	0.07	0.13
Married or in union (=1)	0.92	400	0.92	400	0.91	400	0.90	0.70	0.80
<i>Education and trainings (=1)</i>									
No schooling	0.33	397	0.32	399	0.36	398	0.28	0.17	0.78
Primary school	0.23	397	0.26	399	0.22	398	0.66	0.16	0.34
Secondary school	0.23	397	0.21	399	0.20	398	0.25	0.55	0.58
Trained in 2017 or 2018	0.94	400	0.93	400	0.95	400	0.28	0.22	0.89
<i>Score of Digit Span Test (over 7)</i>									
Literate	1.87	294	1.81	298	1.85	271	0.88	0.77	0.64
Illiterate	0.82	106	1.04	102	0.91	129	0.42	0.33	0.06
<i>Religion (=1)</i>									
Christian	0.36	400	0.38	400	0.31	400	0.13	0.02	0.42
Muslim	0.64	400	0.61	400	0.69	400	0.14	0.02	0.42
<i>Ethnic group (=1)</i>									
Bissa	0.67	400	0.68	400	0.68	400	0.71	0.94	0.65
Mossi	0.24	400	0.23	400	0.22	400	0.56	0.74	0.80
Household head (=1)	0.57	387	0.60	392	0.56	388	0.80	0.23	0.34
Years of work experience (#)	16.62	400	17.18	400	17.27	400	0.41	0.91	0.47
Own children (#)	5.46	381	5.65	379	5.96	384	0.11	0.34	0.54

Source: Bagré Growth Pole Data Set, World Bank (2018).

Notes: (=1) indicates a dummy variable. N indicates the number of observations. p-values are from t-tests with equal variances. The marital status includes free union. Education corresponds to the highest level attained. The training concerns business management. The work experience includes work in any activity sector.

Table A.4.2: Baseline characteristics of the firm and pairwise balance tests across all three groups

Variable	Matching (M)		Cash (C)		Control (CT)		M vs CT	p-value	
	Mean	N	Mean	N	Mean	N		C vs CT	C vs M
<i>Age and sector of activity (=1)</i>									
Years since business created (#)	8.60	344	8.63	345	9.09	356	0.40	0.41	0.96
Agriculture, excluding livestock	0.11	341	0.08	343	0.13	355	0.39	0.02	0.14
Agriculture, including livestock	0.51	341	0.56	343	0.51	355	0.99	0.14	0.15
Manufacturing	0.16	341	0.15	343	0.16	355	0.94	0.67	0.73
Services	0.20	341	0.19	343	0.18	355	0.65	0.75	0.89
<i>Physical and financial capital</i>									
Physical capital stock (US\$)	3,778.69	333	6,484.62	334	3,530.77	348	0.89	0.35	0.44
Ever took a formal loan (=1)	0.27	268	0.27	258	0.29	238	0.67	0.72	0.95
<i>Business performance and staff</i>									
Profit (US\$), past six months	489.02	341	466.32	344	531.47	354	0.60	0.43	0.80
Turnover (US\$), past six months	1,209.82	343	1,228.35	345	1,244.67	355	0.83	0.91	0.91
Employees (#)	2.58	344	2.48	345	2.76	356	0.34	0.10	0.57
<i>Business practices and attitudes (=1)</i>									
Bookkeeping	0.44	337	0.39	344	0.43	350	0.72	0.33	0.19
Monitoring products stock	0.27	229	0.23	235	0.23	229	0.39	0.97	0.36
Willing to take risks	0.71	400	0.71	400	0.73	400	0.43	0.39	0.94
Member of a business association (=1)	0.25	400	0.29	400	0.32	400	0.03	0.32	0.23
<i>Business plan and grant</i>									
Grant amount (US\$)	3,442.88	400	3,420.52	400	3,395.99	400	0.66	0.82	0.84
Business plan score (over 100)	61.36	400	60.96	400	61.38	400	0.96	0.24	0.25

Source: Bagré Growth Pole Data Set, World Bank (2018).

Notes: N indicates the numbers of observations. p-values are from t-tests with equal variances. Formal loan is from a bank or microfinance institution. The calculation of profits and turnovers considered all products and services sold over the six months preceding the survey.

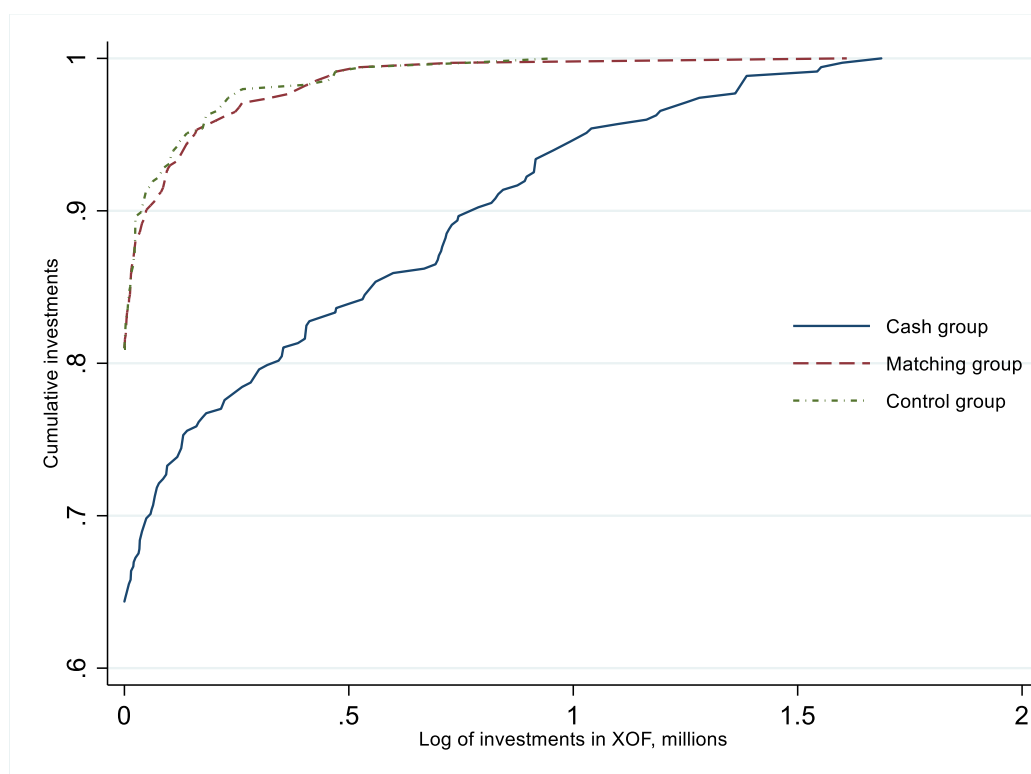
Table A.4.3: Intention-to-treat effects on total investment in physical capital and land (past 6 months), detailed regression results

Variables	Total investment (log)			
	Post		ANCOVA	
	All	Existing	All	Existing
Cash	0.159*** (0.014)	0.152*** (0.013)	0.149*** (0.011)	0.149*** (0.011)
Matching	0.004 (0.012)	0.007 (0.011)	0.009 (0.011)	0.009 (0.011)
Existing (=1)	-0.059 (0.034)			
Dependent variable (baseline value)			0.159** (0.066)	0.159** (0.066)
Industry (=1)	0.031 (0.024)	0.023 (0.019)	0.013 (0.015)	0.013 (0.015)
Services (=1)	0.040 (0.029)	0.032 (0.027)	0.027 (0.025)	0.027 (0.025)
Digitspan correct recalls (%)	0.001 (0.001)	0.001 (0.001)	0.000 (0.001)	0.000 (0.001)
Female (=1)	-0.027 (0.018)	-0.025 (0.019)	-0.025 (0.018)	-0.025 (0.018)
Age in 2018	0.000 (0.001)	-0.000 (0.001)	0.000 (0.001)	0.000 (0.001)
# work experience	0.000 (0.000)	0.001 (0.000)	0.000 (0.000)	0.000 (0.000)
Muslim (=1)	0.090** (0.034)	0.065** (0.020)	0.064** (0.020)	0.064** (0.020)
Christian (=1)	0.087* (0.044)	0.061 (0.036)	0.064 (0.035)	0.064 (0.035)
Bissa ethnic group (=1)	0.048*** (0.010)	0.041*** (0.011)	0.044*** (0.012)	0.044*** (0.012)
Mossi ethnic group (=1)	0.009 (0.012)	0.007 (0.009)	0.014 (0.010)	0.014 (0.010)
Read/write French and a local language (=1)	-0.015 (0.030)	-0.033 (0.026)	-0.024 (0.026)	-0.024 (0.026)
Read/write a local language only (=1)	-0.012 (0.039)	-0.008 (0.044)	-0.011 (0.043)	-0.011 (0.043)
Primary education (=1)	0.040 (0.024)	0.051 (0.028)	0.048* (0.025)	0.048* (0.025)
Secondary education (=1)	0.013 (0.031)	0.035 (0.037)	0.024 (0.037)	0.024 (0.037)
Other education (=1)	0.032* (0.017)	0.030 (0.023)	0.031 (0.021)	0.031 (0.021)
# household size	-0.002** (0.001)	-0.002* (0.001)	-0.002* (0.001)	-0.002* (0.001)
Household head (=1)	-0.013 (0.020)	-0.011 (0.019)	-0.015 (0.021)	-0.015 (0.021)
# household assets	0.002 (0.002)	0.001 (0.002)	0.000 (0.002)	0.000 (0.002)

Table A.4.3 *continued*

Variables	Total investment (log)			
	Post		ANCOVA	
	All	Existing	All	Existing
Community leader in household (=1)	-0.022 (0.020)	-0.021 (0.020)	-0.020 (0.018)	-0.020 (0.018)
Constant	-0.081 (0.064)	-0.084* (0.042)	-0.076* (0.039)	-0.076* (0.039)
S.E. clustered	Municipality	Municipality	Municipality	Municipality
R2	0.126	0.113	0.110	0.110
N	1,032	960	952	952

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Investment has been trimmed at the 99th percentile. All control variables come from the baseline survey. The list of controls include a dummy that equals one if the firm is already existing (vs. new); dummies for whether the firm's sector is industry or services, with agriculture being the reference; a share of correct recalls by the owner from a digit span memory test; a dummy that equals one if the owner is female; the age and number of years of professional experience of the owner; dummies for whether the owner is Christian or Muslim; dummies for whether the owner is of the two largest ethnic groups (Bissa or Mossi); dummies for whether the owner reads and writes French and a local language or reads and writes a local language only; dummies for whether the owner attained primary, secondary, or other education levels, with the excluded being no education level; the size of the owner household, the number of assets owned; and dummies for whether the owner is a household head, and whether a member in the owner household is a community leader.



Source: Bagré Growth Pole Data Set.

Figure A.4.1: Post-treatment CDFs of investment by treatment group

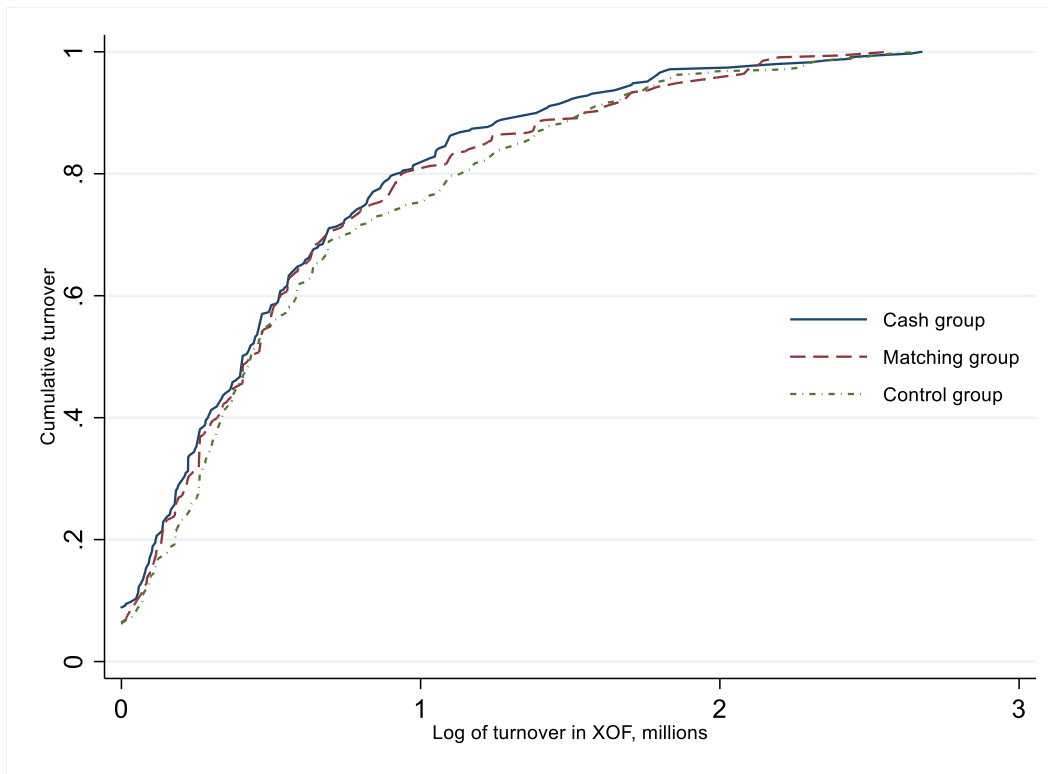
Table A.4.4: Intention-to-treat effects on profits (total profits on products and services), past 6 months

Variables	Profits			
	Post		ANCOVA	
	All	Existing	All	Existing
Cash	-0.070** (0.025)	-0.074** (0.027)	-0.057** (0.023)	-0.057** (0.023)
Matching	-0.062** (0.021)	-0.063** (0.023)	-0.048 (0.029)	-0.048 (0.029)
Existing (=1)	0.077** (0.028)			
Dependent variable (baseline value)			0.212*** (0.031)	0.212*** (0.031)
Industry (=1)	-0.113*** (0.024)	-0.128*** (0.030)	-0.103*** (0.026)	-0.103*** (0.026)
Services (=1)	-0.055 (0.049)	-0.058 (0.051)	-0.029 (0.048)	-0.029 (0.048)
Digitspan correct recalls (%)	0.002** (0.001)	0.002** (0.001)	0.002* (0.001)	0.002* (0.001)
Female (=1)	-0.066* (0.030)	-0.062* (0.030)	-0.051 (0.027)	-0.051 (0.027)
Age in 2018	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
# work experience	-0.003** (0.001)	-0.003** (0.001)	-0.002* (0.001)	-0.002* (0.001)
Muslim (=1)	0.071* (0.031)	0.057 (0.032)	0.038 (0.034)	0.038 (0.034)

Table A.4.4 *continued*

	Profits			
	Post		ANCOVA	
	All	Existing	All	Existing
Christian (=1)	0.055 (0.042)	0.043 (0.046)	0.023 (0.045)	0.023 (0.045)
Bissa ethnic group (=1)	-0.088** (0.031)	-0.094** (0.033)	-0.059* (0.029)	-0.059* (0.029)
Mossi ethnic group (=1)	-0.042 (0.042)	-0.048 (0.046)	-0.023 (0.031)	-0.023 (0.031)
Read/write French and a local language (=1)	-0.068 (0.045)	-0.059 (0.050)	-0.050 (0.051)	-0.050 (0.051)
Read/write a local language only (=1)	-0.063 (0.041)	-0.076* (0.040)	-0.058* (0.029)	-0.058* (0.029)
Primary education (=1)	0.071** (0.027)	0.062* (0.032)	0.055 (0.039)	0.055 (0.039)
Secondary education (=1)	0.021 (0.058)	0.009 (0.062)	0.019 (0.068)	0.019 (0.068)
Other education (=1)	0.055* (0.025)	0.051* (0.026)	0.045** (0.016)	0.045** (0.016)
# household size	0.001 (0.001)	0.001 (0.001)	-0.000 (0.001)	-0.000 (0.001)
Household head (=1)	0.030 (0.021)	0.026 (0.017)	0.011 (0.015)	0.011 (0.015)
# household assets	0.009** (0.003)	0.009** (0.003)	0.005 (0.003)	0.005 (0.003)
Community leader in household (=1)	0.005 (0.009)	-0.001 (0.011)	-0.006 (0.009)	-0.006 (0.009)
Constant	0.088 (0.101)	0.169 (0.101)	0.158 (0.097)	0.158 (0.097)
S.E. clustered	Municipality	Municipality	Municipality	Municipality
R2	0.111	0.113	0.155	0.155
N	1,024	952	940	940

Notes: *** p<0.01, ** p<0.05, * p<0.1. Profits are in XOF, millions (XOF 1 million = US\$1,820), detailed regression results. Profit has been trimmed at the 99th percentile. All control variables come from the baseline survey. The list of controls include a dummy that equals one if the firm is already existing (vs. new); dummies for whether the firm sector is industry or services, with agriculture being the reference; a share of correct recalls by the owner from a digit span memory test; a dummy that equals one if the owner is female; the age and number of years of professional experience of the owner; dummies for whether the owner is Christian or Muslim; dummies for whether the owner is of the two largest ethnic groups (Bissa or Mossi); dummies for whether the owner reads and writes French and a local language or reads and writes a local language only; dummies for whether the owner attained primary, secondary, or other education levels, with the excluded being no education level; the size of the owner household; the number of assets owned; and dummies for whether the owner is a household head and whether a member in the owner household is a community leader. The control group mean refers to the follow-up survey.



Source: Bagré Growth Pole Data Set.

Figure A.4.2: Post-treatment CDFs of turnover (log) by treatment group

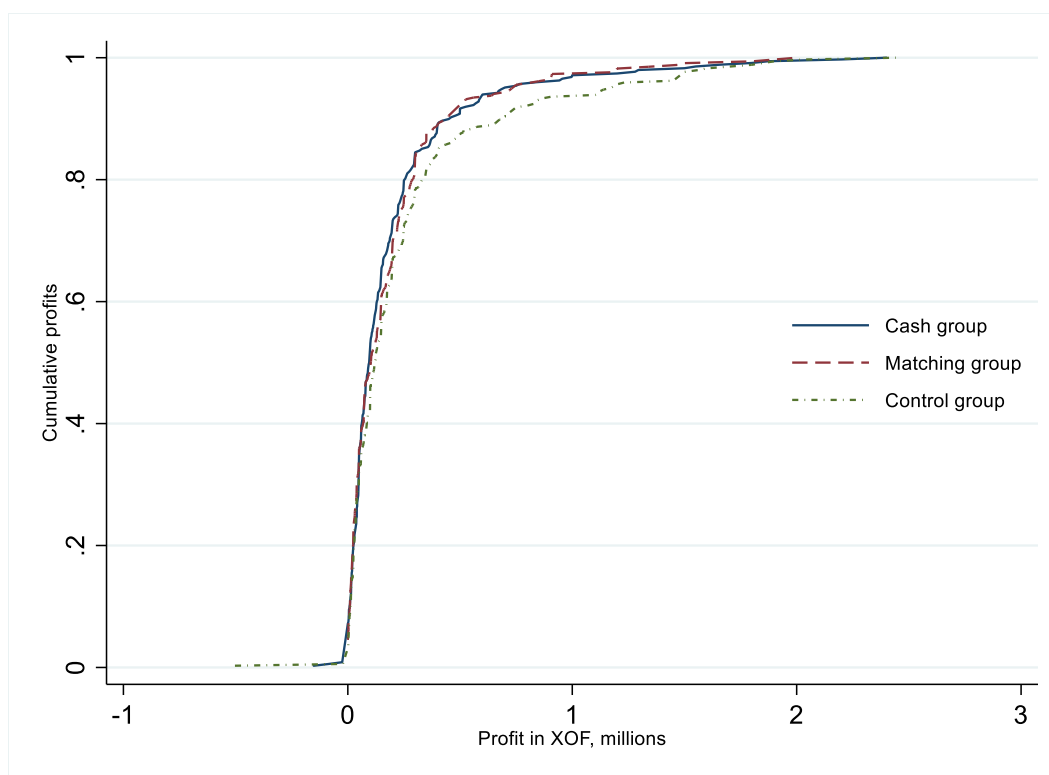
Table A.4.5: Intention-to-treat effects on turnover (total revenues on products and services), past 6 months

Variables	Turnover (log)			
	Post		ANCOVA	
	All	Existing	All	Existing
Cash	-0.080*	-0.070*	-0.059	-0.059
	(0.036)	(0.036)	(0.035)	(0.035)
Matching	-0.050	-0.047	-0.012	-0.012
	(0.028)	(0.033)	(0.036)	(0.036)
Existing (=1)	0.159**			
	(0.053)			
Dependent variable (baseline value)			0.388***	0.388***
			(0.046)	(0.046)
Industry (=1)	0.243***	0.224***	0.117**	0.117**
	(0.053)	(0.049)	(0.046)	(0.046)
Services (=1)	0.344**	0.340**	0.255*	0.255*
	(0.137)	(0.148)	(0.119)	(0.119)
Digitspan correct recalls (%)	0.003***	0.003***	0.001*	0.001*
	(0.001)	(0.001)	(0.001)	(0.001)
Female (=1)	-0.168*	-0.180**	-0.130**	-0.130**
	(0.080)	(0.078)	(0.042)	(0.042)
Age in 2018	-0.000	-0.000	-0.000	-0.000
	(0.002)	(0.002)	(0.002)	(0.002)
# work experience	-0.002	-0.002	-0.002	-0.002
	(0.001)	(0.002)	(0.002)	(0.002)
Muslim (=1)	0.222*	0.186	0.107	0.107
	(0.106)	(0.120)	(0.123)	(0.123)
Christian (=1)	0.121	0.090	0.072	0.072
	(0.098)	(0.116)	(0.116)	(0.116)
Bissa ethnic group (=1)	-0.271***	-0.278***	-0.171***	-0.171***
	(0.066)	(0.052)	(0.048)	(0.048)
Mossi ethnic group (=1)	-0.210***	-0.214***	-0.143**	-0.143**
	(0.050)	(0.054)	(0.057)	(0.057)
Read/write French and a local language (=1)	-0.133**	-0.144**	-0.107	-0.107
	(0.056)	(0.059)	(0.069)	(0.069)
Read/write a local language only (=1)	-0.042*	-0.071**	-0.054*	-0.054*
	(0.022)	(0.031)	(0.026)	(0.026)
Primary education (=1)	0.049	0.054	0.047	0.047
	(0.069)	(0.072)	(0.055)	(0.055)
Secondary education (=1)	0.083	0.077	0.076	0.076
	(0.079)	(0.078)	(0.082)	(0.082)
Other education (=1)	0.043	0.025	0.022	0.022
	(0.039)	(0.034)	(0.037)	(0.037)
# household size	-0.000	-0.001	-0.002	-0.002
	(0.002)	(0.002)	(0.001)	(0.001)
Household head (=1)	0.051	0.037	0.010	0.010
	(0.071)	(0.064)	(0.043)	(0.043)
# household assets	0.020***	0.020***	0.008	0.008
	(0.005)	(0.006)	(0.005)	(0.005)
Community leader in household (=1)	-0.001	0.010	0.027	0.027
	(0.027)	(0.026)	(0.022)	(0.022)

Table A.4.5 *continued*

Variables	Turnover (log)			
	Post		ANCOVA	
	All	Existing	All	Existing
Constant	0.275 (0.203)	0.486** (0.193)	0.350* (0.169)	0.350* (0.169)
S.E. clustered	Municipality	Municipality	Municipality	Municipality
R2	0.144	0.141	0.289	0.289
N	1,019	946	931	931

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Turnover in XOF, millions (XOF 1 million = US\$1,820) and in log. Turnover has been trimmed at the 99th percentile. All control variables come from the baseline survey. The list of controls include a dummy that equals one if the firm is already existing (vs. new); dummies for whether the firm sector is industry or services, with agriculture being the reference; a share of correct recalls by the owner from a digit span memory test; a dummy that equals one if the owner is female; the age and number of years of professional experience of the owner; dummies for whether the owner is Christian or Muslim; dummies for whether the owner is of the two largest ethnic groups (Bissa or Mossi); dummies for whether the owner reads and writes French and a local language or reads and writes a local language only; dummies for whether the owner attained primary, secondary, or other education levels, with the excluded being no education level; the size of the owner household; the number of assets owned and dummies for whether the owner is a household head, and whether a member in the owner household is a community leader. The control group mean refers to the follow-up survey.



Source: Bagré Growth Pole Data Set.

Figure A.4.3: Post-treatment CDFs of profits by treatment group

Table A.4.6: Intention-to-treat effects on total and paid wage employment, detailed regression results

Variables	Total employment				Paid wage employment			
	Post		ANCOVA		Post		ANCOVA	
	All	Existing	All	Existing	All	Existing	All	Existing
Cash	-0.248*	-0.212	-0.097	-0.097	-0.053	-0.008	-0.002	-0.002
	(0.109)	(0.129)	(0.143)	(0.143)	(0.087)	(0.097)	(0.079)	(0.079)
Matching	-0.056	-0.084	0.017	0.017	0.006	-0.002	0.045	0.045
	(0.231)	(0.263)	(0.283)	(0.283)	(0.115)	(0.122)	(0.124)	(0.124)
Existing (=1)	0.481**				0.235			
	(0.175)				(0.203)			
Dependent variable (baseline value)			0.363***	0.363***			0.426***	0.426***
			(0.048)	(0.048)			(0.064)	(0.064)
Industry (=1)	1.021***	1.029***	0.560**	0.560**	0.858***	0.853***	0.572***	0.572***
	(0.215)	(0.226)	(0.184)	(0.184)	(0.118)	(0.124)	(0.102)	(0.102)
Services (=1)	0.749***	0.720***	0.334*	0.334*	0.794***	0.781***	0.369	0.369
	(0.132)	(0.142)	(0.166)	(0.166)	(0.205)	(0.197)	(0.236)	(0.236)
Digitspan correct recalls (%)	0.007*	0.007	0.005	0.005	0.001	0.001	-0.003	-0.003
	(0.003)	(0.004)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
Female (=1)	0.100	0.083	0.177	0.177	-0.241	-0.246	-0.233	-0.233
	(0.178)	(0.225)	(0.220)	(0.220)	(0.142)	(0.174)	(0.153)	(0.153)
Age in 2018	0.008	0.007	-0.002	-0.002	0.006	0.008	0.003	0.003
	(0.009)	(0.011)	(0.010)	(0.010)	(0.006)	(0.006)	(0.003)	(0.003)
# work experience	0.003	0.006	0.007	0.007	-0.007	-0.006	-0.002	-0.002
	(0.009)	(0.010)	(0.008)	(0.008)	(0.005)	(0.005)	(0.004)	(0.004)
Muslim (=1)	-0.043	-0.287	0.223	0.223	-0.516	-0.667	-0.331	-0.331
	(0.445)	(0.448)	(0.525)	(0.525)	(0.475)	(0.533)	(0.551)	(0.551)
Christian (=1)	-0.250	-0.475	0.057	0.057	-0.542	-0.724	-0.325	-0.325
	(0.466)	(0.465)	(0.572)	(0.572)	(0.447)	(0.511)	(0.527)	(0.527)
Bissa ethnic group (=1)	-0.170	-0.152	0.229	0.229	-0.353	-0.313	-0.021	-0.021
	(0.194)	(0.187)	(0.227)	(0.227)	(0.299)	(0.299)	(0.339)	(0.339)
Mossi ethnic group (=1)	-0.091	-0.103	0.186	0.186	-0.394	-0.404	-0.088	-0.088
	(0.183)	(0.197)	(0.275)	(0.275)	(0.267)	(0.273)	(0.283)	(0.283)

Table A.4.6 *continued*

Variables	Total employment				Paid wage employment			
	Post		ANCOVA		Post		ANCOVA	
	All	Existing	All	Existing	All	Existing	All	Existing
Read/write French and a local language (=1)	-0.672*** (0.175)	-0.761*** (0.205)	-0.717*** (0.171)	-0.717*** (0.171)	-0.392** (0.133)	-0.460** (0.158)	-0.305 (0.171)	-0.305 (0.171)
Read/write a local language only (=1)	-0.105 (0.256)	-0.159 (0.264)	-0.301 (0.261)	-0.301 (0.261)	-0.031 (0.295)	-0.010 (0.328)	-0.095 (0.351)	-0.095 (0.351)
Primary education (=1)	0.470** (0.146)	0.551*** (0.147)	0.460** (0.153)	0.460** (0.153)	0.167* (0.073)	0.257** (0.097)	0.094 (0.163)	0.094 (0.163)
Secondary education (=1)	0.496 (0.280)	0.643* (0.341)	0.627* (0.314)	0.627* (0.314)	0.155 (0.155)	0.305 (0.181)	0.160 (0.168)	0.160 (0.168)
Other education (=1)	0.289 (0.237)	0.306 (0.245)	0.297 (0.211)	0.297 (0.211)	0.054 (0.128)	0.039 (0.149)	0.053 (0.157)	0.053 (0.157)
# household size	0.033*** (0.009)	0.034** (0.012)	0.018* (0.009)	0.018* (0.009)	0.013 (0.007)	0.014 (0.009)	0.003 (0.007)	0.003 (0.007)
Household head (=1)	0.417* (0.185)	0.392 (0.227)	0.300 (0.206)	0.300 (0.206)	0.072 (0.156)	0.041 (0.165)	-0.058 (0.157)	-0.058 (0.157)
# household assets	0.055*** (0.014)	0.060*** (0.014)	0.033** (0.012)	0.033** (0.012)	0.049*** (0.010)	0.052*** (0.011)	0.031* (0.016)	0.031* (0.016)
Community leader in household (=1)	0.137 (0.108)	0.140 (0.117)	0.157 (0.138)	0.157 (0.138)	0.050 (0.101)	0.063 (0.106)	0.074 (0.093)	0.074 (0.093)
Constant	-0.162 (0.814)	0.490 (0.884)	-0.249 (1.016)	-0.249 (1.016)	0.657 (0.678)	0.864 (0.742)	0.507 (0.802)	0.507 (0.802)
S.E. clustered	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality
R2	0.085	0.084	0.221	0.221	0.080	0.081	0.233	0.233
N	1,067	989	989	989	1,042	969	969	969

Notes: *** p<0.01, ** p<0.05, * p<0.1. The dependent variables are the total number of employees and the number of paid wage employees respectively. All control variables come from the baseline survey. The list of controls include a dummy that equals one if the firm is already existing (vs. new); dummies for whether the firm sector is industry or services, with agriculture being the reference; a share of correct recalls by the owner from a digit span memory test; a dummy that equals if the owner is female; the age and number of years of professional experience of the owner; dummies for whether the owner is Christian or Muslim; dummies for whether the owner is of the two largest ethnic groups (Bissa or Mossi); dummies for whether the owner reads and writes French and a local language or reads and writes a local language only; dummies for whether the owner attained primary, secondary, or other education levels, with the excluded being no education level; the size of the owner household; the number of assets owned; and dummies for whether the owner is a household head and whether a member in the owner household is a community leader.

Table A.4.7: Intention-to-treat effects on unpaid employment and the number of days worked, detailed regression results

Variables	Unpaid employment				Days worked	
	Post		ANCOVA		Post	
	All	Existing	All	Existing	All	Existing
Cash	-0.062 (0.090)	-0.047 (0.098)	-0.043 (0.099)	-0.043 (0.099)	0.161** (0.063)	0.086 (0.058)
Matching	0.145 (0.086)	0.149 (0.097)	0.138 (0.095)	0.138 (0.095)	-0.139 (0.096)	-0.178* (0.086)
Existing (=1)	0.099 (0.108)				0.302 (0.165)	
Dependent variable (baseline value)			0.170*** (0.034)	0.170*** (0.034)		
Industry (=1)	-0.145 (0.175)	-0.132 (0.174)	-0.148 (0.156)	-0.148 (0.156)	-0.598*** (0.147)	-0.631*** (0.175)
Services (=1)	-0.109 (0.213)	-0.099 (0.213)	-0.025 (0.211)	-0.025 (0.211)	-0.257 (0.152)	-0.227 (0.136)
Digitspan correct recalls (%)	0.005* (0.002)	0.004 (0.002)	0.004* (0.002)	0.004* (0.002)	-0.002 (0.002)	-0.003* (0.002)
Female (=1)	0.234 (0.153)	0.246 (0.173)	0.278 (0.168)	0.278 (0.168)	-0.430** (0.159)	-0.453** (0.139)
Age in 2018	-0.000 (0.005)	-0.002 (0.006)	-0.004 (0.006)	-0.004 (0.006)	-0.006 (0.005)	-0.002 (0.007)
# work experience	0.009* (0.004)	0.010* (0.005)	0.010* (0.004)	0.010* (0.004)	-0.004 (0.006)	-0.005 (0.007)
Muslim (=1)	0.285 (0.286)	0.212 (0.312)	0.405 (0.236)	0.405 (0.236)	-0.345 (0.539)	-0.331 (0.550)
Christian (=1)	0.105 (0.302)	0.067 (0.328)	0.210 (0.243)	0.210 (0.243)	-0.423 (0.526)	-0.419 (0.519)
Bissa ethnic group (=1)	0.050 (0.109)	0.012 (0.128)	0.072 (0.113)	0.072 (0.113)	-0.371** (0.115)	-0.317* (0.161)
Mossi ethnic group (=1)	0.161 (0.111)	0.157 (0.129)	0.166 (0.115)	0.166 (0.115)	-0.384** (0.141)	-0.350* (0.153)
Read/write French and a local language (=1)	-0.137 (0.124)	-0.126 (0.116)	-0.147 (0.125)	-0.147 (0.125)	-0.138 (0.149)	-0.097 (0.130)
Read/write a local language only (=1)	0.181 (0.108)	0.138 (0.101)	0.124 (0.129)	0.124 (0.129)	0.273 (0.165)	0.400** (0.166)
Primary education (=1)	0.027 (0.075)	0.008 (0.086)	0.015 (0.095)	0.015 (0.095)	0.295 (0.169)	0.299 (0.178)
Secondary education (=1)	0.208 (0.163)	0.192 (0.161)	0.220 (0.169)	0.220 (0.169)	0.079 (0.211)	0.096 (0.200)
Other education (=1)	0.014 (0.088)	0.020 (0.080)	0.010 (0.076)	0.010 (0.076)	0.101 (0.189)	-0.001 (0.177)
# household size	0.011 (0.007)	0.013 (0.007)	0.009 (0.006)	0.009 (0.006)	-0.001 (0.008)	-0.000 (0.009)
Household head (=1)	0.100 (0.145)	0.107 (0.160)	0.136 (0.158)	0.136 (0.158)	-0.181 (0.127)	-0.213 (0.122)
# household assets	0.010 (0.010)	0.011 (0.011)	0.013 (0.011)	0.013 (0.011)	-0.001 (0.014)	0.006 (0.014)
Community leader in household (=1)	0.024 (0.085)	0.013 (0.097)	0.028 (0.107)	0.028 (0.107)	-0.092 (0.130)	-0.099 (0.126)

Table A.4.7 *continued*

Variables	Unpaid employment				Days worked	
	Post		ANCOVA		Post	
	All	Existing	All	Existing	All	Existing
Constant	-0.477 (0.451)	-0.289 (0.402)	-0.548 (0.394)	-0.548 (0.394)	6.927*** (0.551)	7.028*** (0.593)
S.E. clustered	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality
R2	0.030	0.027	0.061	0.221	0.072	0.073
N	1,042	969	969	0.061	851	796

Notes: *** p<0.01, ** p<0.05, * p<0.1. The dependent variables are the total number of employees and the number of paid wage employees respectively. All control variables come from the baseline survey. The list of controls include a dummy that equals one if the firm is already existing (vs. new); dummies for whether the firm sector is industry or services, with agriculture being the reference; a share of correct recalls by the owner from a digit span memory test; a dummy that equals one if the owner is female; the age and number of years of professional experience of the owner; dummies for whether the owner is Christian or Muslim; dummies for whether the owner is of the two largest ethnic groups (Bissa or Mossi); dummies for whether the owner reads and writes French and a local language or reads and writes a local language only; dummies for whether the owner attained primary, secondary, or other education levels, with the excluded being no education level; the size of the owner household; the number of assets owned; and dummies for whether the owner is a household head and whether a member in the owner household is a community leader.

Table A.4.8: Intention-to-treat effects on formalization and banking, detailed regression results

Variables	Formalization				Banking			
	Post		ANCOVA		Post		ANCOVA	
	All	Existing	All	Existing	All	Existing	All	Existing
Cash	0.077** (0.031)	0.089** (0.032)	0.102** (0.034)	0.102** (0.034)	0.216*** (0.045)	0.204*** (0.047)	0.209*** (0.043)	0.198*** (0.046)
Matching	0.032 (0.026)	0.034 (0.024)	0.051* (0.024)	0.051* (0.024)	0.043 (0.047)	0.031 (0.050)	0.034 (0.045)	0.020 (0.051)
Existing (=1)	0.049 (0.031)				0.045 (0.042)			
Dependent variable (baseline value)			0.357*** (0.046)	0.357*** (0.046)			0.393*** (0.031)	0.385*** (0.033)
Industry (=1)	0.080* (0.041)	0.093* (0.041)	0.046 (0.025)	0.046 (0.025)	-0.005 (0.027)	0.006 (0.026)	0.002 (0.033)	0.020 (0.031)
Services (=1)	0.141** (0.051)	0.142** (0.056)	0.074 (0.056)	0.074 (0.056)	0.013 (0.023)	0.008 (0.022)	-0.009 (0.028)	-0.009 (0.020)
Digitspan correct recalls (%)	0.001 (0.001)	0.001 (0.001)	0.000 (0.001)	0.000 (0.001)	0.001* (0.001)	0.001 (0.001)	0.001 (0.000)	0.001 (0.000)
Female (=1)	-0.042 (0.032)	-0.045 (0.036)	-0.018 (0.024)	-0.018 (0.024)	-0.098* (0.044)	-0.093* (0.047)	-0.092** (0.036)	-0.081* (0.042)
Age in 2018	0.001 (0.001)	0.001 (0.001)	0.000 (0.001)	0.000 (0.001)	0.001 (0.001)	-0.000 (0.002)	-0.000 (0.001)	-0.001 (0.001)
# work experience	-0.000 (0.000)	-0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.002 (0.001)	-0.002 (0.001)
Muslim (=1)	0.100* (0.044)	0.080** (0.033)	0.107* (0.047)	0.107* (0.047)	0.041 (0.110)	0.011 (0.112)	0.053 (0.121)	0.029 (0.126)
Christian (=1)	0.078 (0.055)	0.052 (0.042)	0.082 (0.057)	0.082 (0.057)	0.066 (0.103)	0.050 (0.100)	0.087 (0.111)	0.076 (0.114)
Bissa ethnic group (=1)	-0.085 (0.069)	-0.091 (0.071)	-0.072 (0.063)	-0.072 (0.063)	0.004 (0.054)	0.014 (0.059)	0.035 (0.042)	0.039 (0.044)

Table A.4.8 continued

Variables	Formalization				Banking			
	Post		ANCOVA		Post		ANCOVA	
	All	Existing	All	Existing	All	Existing	All	Existing
Mossi ethnic group (=1)	-0.034 (0.091)	-0.048 (0.084)	-0.054 (0.077)	-0.054 (0.077)	-0.006 (0.064)	0.008 (0.073)	-0.008 (0.051)	-0.001 (0.063)
Read/write French and a local language (=1)	0.057 (0.041)	0.061 (0.043)	0.034 (0.038)	0.034 (0.038)	0.089** (0.038)	0.089** (0.038)	0.026 (0.037)	0.037 (0.032)
Read/write a local language only (=1)	-0.029 (0.031)	-0.024 (0.032)	-0.028 (0.035)	-0.028 (0.035)	0.066 (0.075)	0.074 (0.076)	0.041 (0.065)	0.055 (0.067)
Primary education (=1)	-0.020 (0.019)	-0.017 (0.022)	-0.009 (0.020)	-0.009 (0.020)	0.004 (0.051)	0.010 (0.051)	-0.017 (0.040)	-0.019 (0.038)
Secondary education (=1)	0.036 (0.030)	0.039 (0.039)	0.054 (0.044)	0.054 (0.044)	0.021 (0.056)	0.031 (0.060)	-0.008 (0.055)	-0.022 (0.059)
Other education (=1)	-0.006 (0.023)	-0.006 (0.023)	0.003 (0.026)	0.003 (0.026)	0.023 (0.035)	0.029 (0.040)	-0.001 (0.032)	0.003 (0.031)
# household size	-0.002 (0.001)	-0.001 (0.002)	-0.001 (0.001)	-0.001 (0.001)	-0.003 (0.002)	-0.003 (0.002)	-0.001 (0.001)	-0.000 (0.002)
Household head (=1)	0.053** (0.016)	0.048** (0.016)	0.045** (0.019)	0.045** (0.019)	0.027 (0.038)	0.050 (0.033)	-0.002 (0.024)	0.032 (0.020)
# household assets	0.010*** (0.002)	0.009*** (0.002)	0.006*** (0.002)	0.006*** (0.002)	0.022*** (0.002)	0.021*** (0.002)	0.012*** (0.002)	0.012*** (0.002)
Community leader in household (=1)	0.011 (0.020)	0.019 (0.019)	0.026 (0.018)	0.026 (0.018)	-0.011 (0.025)	-0.006 (0.027)	-0.021 (0.021)	-0.014 (0.026)

Table A.4.8 continued

Variables	Formalization				Banking			
	Post		ANCOVA		Post		ANCOVA	
	All	Existing	All	Existing	All	Existing	All	Existing
Constant	-0.231** (0.092)	-0.157 (0.100)	-0.161 (0.107)	-0.161 (0.107)	0.244* (0.123)	0.347** (0.126)	0.222 (0.134)	0.274* (0.136)
S.E. clustered	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality
R2	0.126	0.130	0.208	0.208	0.164	0.167	0.312	0.308
N	1,042	969	969	969	1,107	970	1,107	970

Notes: *** p<0.01, ** p<0.05, * p<0.1. Formalization and banking are dummies each equals one if the firm is formalized or owns a financial account. All control variables come from the baseline survey. The list of controls include a dummy that equals one if the firm is already existing (vs. new); dummies for whether the firm sector is industry or services, with agriculture being the reference; a share of correct recalls by the owner from a digit span memory test; a dummy that equals one if the owner is female; the age and number of years of professional experience of the owner; dummies for whether the owner is Christian or Muslim; dummies for whether the owner is of the two largest ethnic groups (Bissa or Mossi); dummies for whether the owner reads and writes French and a local language or reads and writes a local language only; dummies for whether the owner attained primary, secondary, or other education levels, with the excluded being no education level; the size of the owner household; the number of assets owned, and dummies for whether the owner is a household head and whether a member in the owner household is a community leader.

Table A.4.9: Intention-to-treat effects on book-keeping and innovation, detailed regression results

Variables	Bookkeeping				Innovation			
	Post		ANCOVA		Post		ANCOVA	
	All	Existing	All	Existing	All	Existing	All	Existing
Cash	0.101*	0.123**	0.130**	0.130**	0.181**	0.179**	0.193*	0.193*
	(0.045)	(0.047)	(0.047)	(0.047)	(0.060)	(0.077)	(0.090)	(0.090)
Matching	0.006	0.022	0.027	0.027	0.149*	0.158*	0.124	0.124
	(0.030)	(0.039)	(0.038)	(0.038)	(0.068)	(0.077)	(0.078)	(0.078)
Existing (=1)	0.044				0.125			
	(0.059)				(0.122)			
Dependent variable (baseline value)			0.178***	0.178***			0.214*	0.214*
			(0.043)	(0.043)			(0.096)	(0.096)
Industry (=1)	0.070**	0.076**	0.072**	0.072**	0.232	0.208	0.094	0.094
	(0.030)	(0.030)	(0.028)	(0.028)	(0.136)	(0.148)	(0.090)	(0.090)
Services (=1)	0.045	0.037	0.030	0.030	0.280**	0.257**	0.173	0.173
	(0.039)	(0.042)	(0.037)	(0.037)	(0.114)	(0.104)	(0.099)	(0.099)
Digitspan correct recalls (%)	0.002**	0.002**	0.002	0.002	0.005*	0.005*	0.003	0.003
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)
Female (=1)	-0.062	-0.073*	-0.066*	-0.066*	-0.072	-0.018	-0.006	-0.006
	(0.035)	(0.039)	(0.031)	(0.031)	(0.069)	(0.084)	(0.096)	(0.096)
Age in 2018	-0.002*	-0.002*	-0.002	-0.002	-0.005	-0.005	-0.006	-0.006
	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)	(0.004)	(0.004)
# work experience	-0.002	-0.003*	-0.003*	-0.003*	-0.001	-0.001	0.002	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)	(0.003)	(0.003)
Muslim (=1)	-0.187	-0.154	-0.188	-0.188	0.045	-0.007	0.014	0.014
	(0.120)	(0.107)	(0.112)	(0.112)	(0.224)	(0.251)	(0.261)	(0.261)
Christian (=1)	-0.161	-0.128	-0.155	-0.155	-0.112	-0.185	-0.186	-0.186
	(0.119)	(0.106)	(0.113)	(0.113)	(0.218)	(0.245)	(0.254)	(0.254)
Bissa ethnic group (=1)	-0.030	0.000	0.045	0.045	-0.042	-0.070	-0.024	-0.024
	(0.044)	(0.048)	(0.047)	(0.047)	(0.112)	(0.124)	(0.115)	(0.115)

Table A.4.9 continued

Variables	Bookkeeping				Innovation			
	Post		ANCOVA		Post		ANCOVA	
	All	Existing	All	Existing	All	Existing	All	Existing
Mossi ethnic group (=1)	0.044 (0.041)	0.071 (0.054)	0.101* (0.054)	0.101* (0.054)	-0.047 (0.119)	-0.115 (0.098)	-0.086 (0.083)	-0.086 (0.083)
Read/write French and a local language (=1)	0.167*** (0.038)	0.132** (0.046)	0.100** (0.042)	0.100** (0.042)	-0.005 (0.086)	-0.029 (0.097)	-0.023 (0.098)	-0.023 (0.098)
Read/write a local language only (=1)	0.090 (0.068)	0.095 (0.073)	0.068 (0.064)	0.068 (0.064)	0.028 (0.191)	0.053 (0.195)	0.087 (0.228)	0.087 (0.228)
Primary education (=1)	-0.023 (0.040)	0.006 (0.040)	0.004 (0.038)	0.004 (0.038)	0.163 (0.128)	0.204 (0.139)	0.165 (0.141)	0.165 (0.141)
Secondary education (=1)	0.042 (0.055)	0.064 (0.069)	0.056 (0.065)	0.056 (0.065)	0.231* (0.123)	0.291** (0.106)	0.208* (0.094)	0.208* (0.094)
Other education (=1)	0.026 (0.042)	0.016 (0.042)	0.007 (0.038)	0.007 (0.038)	0.052 (0.083)	0.054 (0.084)	-0.003 (0.083)	-0.003 (0.083)
# household size	-0.003 (0.002)	-0.003 (0.002)	-0.002 (0.002)	-0.002 (0.002)	-0.004 (0.003)	-0.003 (0.004)	-0.002 (0.004)	-0.002 (0.004)
Household head (=1)	0.050 (0.052)	0.057 (0.058)	0.052 (0.053)	0.052 (0.053)	0.048 (0.107)	0.055 (0.108)	-0.006 (0.096)	-0.006 (0.096)
# household assets	0.009** (0.003)	0.009** (0.003)	0.007* (0.003)	0.007* (0.003)	0.021** (0.006)	0.024*** (0.007)	0.021** (0.008)	0.021** (0.008)
Community leader in household (=1)	0.073* (0.034)	0.081* (0.037)	0.075* (0.037)	0.075* (0.037)	-0.043 (0.040)	-0.037 (0.041)	-0.028 (0.053)	-0.028 (0.053)

Table A.4.9 continued

Variables	Book-keeping				Innovation			
	Post		ANCOVA		Post		ANCOVA	
	All	Existing	All	Existing	All	Existing	All	Existing
Constant	0.345*	0.335**	0.311**	0.311**	-0.416	-0.320	-0.199	-0.199
	(0.154)	(0.136)	(0.133)	(0.133)	(0.339)	(0.294)	(0.302)	(0.302)
S.E. clustered	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality
R2	0.153	0.148	0.172	0.172	0.081	0.085	0.123	0.123
N	1,042	969	969	969	1,009	937	913	913

Notes: *** p<0.01, ** p<0.05, * p<0.1. Book-keeping is a dummy that equals one if the firm keeps books on sales and purchases. Innovation is an index, i.e. the first component from a principal component analysis applied on 15 dummies each taking the value 1 if the firm introduced either of the 15 listed innovations. All control variables come from the baseline survey. The list of controls include a dummy that equals one if the firm is already existing (vs. new); dummies for whether the firm sector is industry or services, with agriculture being the reference; a share of correct recalls by the owner from a digit span memory test; a dummy that equals if the owner is female; the age and number of years of professional experience of the owner; dummies for whether the owner is Christian or Muslim; dummies for whether the owner is of the two largest ethnic groups (Bissa or Mossi); dummies for whether the owner reads and writes French and a local language or reads and writes a local language only; dummies for whether the owner attained primary, secondary, or other education levels, with the excluded being no education level; the size of the owner household; the number of assets owned; and dummies for whether the owner is a household head and whether a member in the owner household is a community leader.

Table A.4.10.1: Spillover effects on profits stemming from cash beneficiaries, detailed regression results

Variables	500 m				2 km			
	Post		ANCOVA		Post		ANCOVA	
	All	Existing	All	Existing	All	Existing	All	Existing
Cash	-0.053 (0.031)	-0.055 (0.032)	-0.027 (0.028)	-0.027 (0.028)	-0.065 (0.045)	-0.062 (0.050)	-0.031 (0.040)	-0.031 (0.040)
Cash*#Cash within a radius of ...	-0.003 (0.001)	-0.003 (0.002)	-0.004** (0.002)	-0.004** (0.002)	-0.000 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Matching	-0.053* (0.028)	-0.055* (0.028)	-0.032 (0.039)	-0.032 (0.039)	-0.073** (0.028)	-0.076* (0.033)	-0.056 (0.046)	-0.056 (0.046)
Matching*#Cash within a radius of ...	-0.002 (0.002)	-0.001 (0.002)	-0.002 (0.002)	-0.002 (0.002)	0.000 (0.001)	0.001 (0.001)	0.000 (0.001)	0.000 (0.001)
#Cash within a radius of ...	-0.001 (0.001)	-0.001 (0.001)	-0.000 (0.001)	-0.000 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.000 (0.001)	-0.000 (0.001)
Dependent variable (baseline value)			0.214*** (0.030)	0.214*** (0.030)			0.213*** (0.031)	0.213*** (0.031)
Industry (=1)	-0.111*** (0.023)	-0.127*** (0.030)	-0.101*** (0.026)	-0.101*** (0.026)	-0.110*** (0.022)	-0.125*** (0.029)	-0.101*** (0.025)	-0.101*** (0.025)
Services (=1)	-0.052 (0.051)	-0.057 (0.053)	-0.029 (0.050)	-0.029 (0.050)	-0.051 (0.050)	-0.055 (0.051)	-0.028 (0.049)	-0.028 (0.049)
Digitspan correct recalls (%)	0.002* (0.001)	0.002** (0.001)	0.002* (0.001)	0.002* (0.001)	0.002* (0.001)	0.002* (0.001)	0.002* (0.001)	0.002* (0.001)
Female (=1)	-0.069* (0.031)	-0.068* (0.030)	-0.056* (0.027)	-0.056* (0.027)	-0.063* (0.030)	-0.064* (0.028)	-0.052* (0.025)	-0.052* (0.025)
Age in 2018	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
# work experience	-0.003** (0.001)	-0.003** (0.001)	-0.002* (0.001)	-0.002* (0.001)	-0.003** (0.001)	-0.003** (0.001)	-0.002* (0.001)	-0.002* (0.001)
Muslim (=1)	0.071* (0.032)	0.052* (0.027)	0.034 (0.028)	0.034 (0.028)	0.068* (0.035)	0.046 (0.028)	0.030 (0.031)	0.030 (0.031)

Table A.4.10.1 continued

Variables	500 m				2 km			
	Post		ANCOVA		Post		ANCOVA	
	All	Existing	All	Existing	All	Existing	All	Existing
Christian (=1)	0.054 (0.042)	0.039 (0.041)	0.019 (0.039)	0.019 (0.039)	0.053 (0.042)	0.034 (0.041)	0.015 (0.043)	0.015 (0.043)
Bissa ethnic group (=1)	-0.082** (0.031)	-0.094** (0.035)	-0.059* (0.028)	-0.059* (0.028)	-0.087** (0.030)	-0.099** (0.035)	-0.062** (0.027)	-0.062** (0.027)
Mossi ethnic group (=1)	-0.036 (0.039)	-0.048 (0.046)	-0.024 (0.032)	-0.024 (0.032)	-0.033 (0.038)	-0.044 (0.045)	-0.020 (0.031)	-0.020 (0.031)
Read/write French and a local language (=1)	-0.067 (0.045)	-0.057 (0.051)	-0.049 (0.051)	-0.049 (0.051)	-0.070 (0.044)	-0.060 (0.050)	-0.051 (0.050)	-0.051 (0.050)
Read/write a local language only (=1)	-0.066 (0.042)	-0.076* (0.040)	-0.056* (0.029)	-0.056* (0.029)	-0.069 (0.043)	-0.079* (0.041)	-0.060* (0.031)	-0.060* (0.031)
Primary education (=1)	0.071** (0.027)	0.059* (0.031)	0.052 (0.038)	0.052 (0.038)	0.077** (0.026)	0.065* (0.030)	0.057 (0.037)	0.057 (0.037)
Secondary education (=1)	0.019 (0.059)	0.008 (0.062)	0.019 (0.067)	0.019 (0.067)	0.024 (0.060)	0.014 (0.062)	0.022 (0.068)	0.022 (0.068)
Other education (=1)	0.058* (0.026)	0.053* (0.027)	0.047** (0.016)	0.047** (0.016)	0.058* (0.027)	0.054* (0.029)	0.047** (0.019)	0.047** (0.019)
# household size	0.001 (0.001)	0.001 (0.001)	-0.000 (0.001)	-0.000 (0.001)	0.001 (0.001)	0.001 (0.001)	-0.000 (0.001)	-0.000 (0.001)
Household head (=1)	0.033 (0.022)	0.024 (0.017)	0.009 (0.015)	0.009 (0.015)	0.035 (0.023)	0.026 (0.018)	0.010 (0.015)	0.010 (0.015)
# household assets	0.009** (0.003)	0.009** (0.003)	0.005 (0.003)	0.005 (0.003)	0.009** (0.003)	0.010** (0.003)	0.005 (0.003)	0.005 (0.003)
Community leader in household (=1)	0.003 (0.008)	-0.003 (0.010)	-0.008 (0.008)	-0.008 (0.008)	0.005 (0.008)	-0.001 (0.010)	-0.006 (0.008)	-0.006 (0.008)

Table A.4.10.1 continued

Variables	500m				2km			
	Post		ANCOVA		Post		ANCOVA	
	All	Existing	All	Existing	All	Existing	All	Existing
Constant	0.163 (0.095)	0.187 (0.103)	0.169 (0.098)	0.169 (0.098)	0.164 (0.102)	0.193 (0.112)	0.166 (0.106)	0.166 (0.106)
S.E. clustered	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality
R2	0.113	0.119	0.161	0.161	0.109	0.115	0.312	0.157
N	1,024	952	940	940	1,024	952	1,107	940

Notes: *** p<0.01, ** p<0.05, * p<0.1. Profit has been trimmed at the 99th percentile. All control variables come from the baseline survey. The list of controls include a dummy that equals one if the firm is already existing (vs. new); dummies for whether the firm sector is industry or services, with agriculture being the reference; a share of correct recalls by the owner from a digit span memory test; a dummy that equals if the owner is female; the age and number of years of professional experience of the owner; dummies for whether the owner is Christian or Muslim; dummies for whether the owner is of the two largest ethnic groups (Bissa or Mossi); dummies for whether the owner reads and writes French and a local language or reads and writes a local language only; dummies for whether the owner attained primary, secondary, or other education levels, with the excluded being no education level; the size of the owner household; the number of assets owned; and dummies for whether the owner is a household head and whether a member in the owner household is a community leader.

Table A.4.10.2: Spillover effects on profits stemming from cash beneficiaries, detailed regression results

Variables	5 km			
	Post		ANCOVA	
	All	Existing	All	Existing
Cash	-0.137*** (0.032)	-0.133*** (0.032)	-0.106*** (0.026)	-0.106*** (0.026)
Cash*#Cash within a radius of 5km	0.002*** (0.001)	0.002*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
Matching	-0.096** (0.029)	-0.096** (0.032)	-0.080 (0.047)	-0.080 (0.047)
Matching*#Cash within a radius of 5km	0.001** (0.000)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
#Cash within a radius of 5km	-0.001 (0.001)	-0.001 (0.001)	-0.000 (0.001)	-0.000 (0.001)
Dependent variable (baseline value)			0.212*** (0.029)	0.212*** (0.029)
Industry (=1)	-0.114*** (0.023)	-0.128*** (0.029)	-0.104*** (0.025)	-0.104*** (0.025)
Services (=1)	-0.053 (0.049)	-0.056 (0.050)	-0.029 (0.047)	-0.029 (0.047)
Digitspan correct recalls (%)	0.002* (0.001)	0.002* (0.001)	0.002* (0.001)	0.002* (0.001)
Female (=1)	-0.065* (0.033)	-0.064* (0.032)	-0.053* (0.028)	-0.053* (0.028)
Age in 2018	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
# work experience	-0.003** (0.001)	-0.003** (0.001)	-0.002* (0.001)	-0.002* (0.001)
Muslim (=1)	0.075* (0.034)	0.056 (0.032)	0.041 (0.034)	0.041 (0.034)
Christian (=1)	0.058 (0.044)	0.043 (0.044)	0.025 (0.045)	0.025 (0.045)
Bissa ethnic group (=1)	-0.080** (0.035)	-0.094* (0.042)	-0.051 (0.030)	-0.051 (0.030)
Mossi ethnic group (=1)	-0.036 (0.036)	-0.045 (0.042)	-0.022 (0.031)	-0.022 (0.031)
Read/write French and a local language (=1)	-0.068 (0.045)	-0.058 (0.050)	-0.050 (0.051)	-0.050 (0.051)
Read/write a local language only (=1)	-0.069 (0.043)	-0.078* (0.041)	-0.058* (0.031)	-0.058* (0.031)
Primary education (=1)	0.078** (0.025)	0.067** (0.028)	0.056 (0.037)	0.056 (0.037)
Secondary education (=1)	0.024 (0.058)	0.015 (0.061)	0.021 (0.068)	0.021 (0.068)
Other education (=1)	0.059* (0.026)	0.054* (0.027)	0.047** (0.017)	0.047** (0.017)
# household size	0.001 (0.001)	0.001 (0.001)	-0.000 (0.001)	-0.000 (0.001)

Table A.4.10.2 continued

Variables	5km			
	Post		ANCOVA	
	All	Existing	All	Existing
Household head (=1)	0.034 (0.024)	0.026 (0.019)	0.011 (0.016)	0.011 (0.016)
# household assets	0.009** (0.003)	0.010** (0.003)	0.005 (0.003)	0.005 (0.003)
Community leader in household (=1)	0.005 (0.009)	-0.001 (0.012)	-0.004 (0.010)	-0.004 (0.010)
Constant	0.176 (0.096)	0.205* (0.108)	0.169 (0.105)	0.169 (0.105)
S.E. clustered	Municipality	Municipality	Municipality	Municipality
R2	0.111	0.116	0.157	0.208
N	1,024	952	940	969

Notes: *** p<0.01, ** p<0.05, * p<0.1. Profit has been trimmed at the 99th percentile. All control variables come from the baseline survey. The list of controls include a dummy that equals one if the firm is already existing (vs. new); dummies for whether the firm sector is industry or services, with agriculture being the reference; a share of correct recalls by the owner from a digit span memory test; a dummy that equals if the owner is female; the age and number of years of professional experience of the owner; dummies for whether the owner is Christian or Muslim; dummies for whether the owner is of the two largest ethnic groups (Bissa or Mossi); dummies for whether the owner reads and writes French and a local language or reads and writes a local language only; dummies for whether the owner attained primary, secondary, or other education levels, with the excluded being no education level; the size of the owner household; the number of assets owned; and dummies for whether the owner is a household head and whether a member in the owner household is a community leader.

Table A.4.10: Effects of COVID-19 on decline of production, sales, investment, employment, and general performance, detailed regression results

Variables	Production		Sales		Investments		Employment		Performance	
	All	Existing	All	Existing	All	Existing	All	Existing	All	Existing
Cash	-0.125*	-0.084	-0.109	-0.066	-0.281***	-0.272***	0.036	0.047	-0.197*	-0.186**
	(0.066)	(0.059)	(0.093)	(0.086)	(0.093)	(0.075)	(0.230)	(0.242)	(0.106)	(0.090)
Matching	0.071	0.099	0.076	0.080	-0.028	0.010	0.089	0.061	-0.034	-0.015
	(0.075)	(0.078)	(0.094)	(0.096)	(0.118)	(0.117)	(0.180)	(0.145)	(0.107)	(0.105)
Existing (=1)	0.637***		0.867***		0.591***		0.226		0.495***	
	(0.108)		(0.136)		(0.147)		(0.305)		(0.122)	
Industry (=1)	0.559***	0.550***	0.383***	0.372***	0.119	0.101	0.676***	0.713***	0.170	0.155
	(0.073)	(0.060)	(0.054)	(0.052)	(0.137)	(0.149)	(0.247)	(0.256)	(0.158)	(0.167)
Services (=1)	0.429***	0.415***	0.364***	0.351***	0.232*	0.225	0.882***	0.832***	0.122	0.088
	(0.125)	(0.126)	(0.081)	(0.088)	(0.134)	(0.141)	(0.249)	(0.252)	(0.124)	(0.116)
Digitspan correct recalls (%)	0.009***	0.007***	0.006***	0.005***	0.004	0.002	-0.002	-0.001	0.004***	0.003**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.006)	(0.006)	(0.001)	(0.001)
Female (=1)	-0.097	-0.040	-0.038	-0.039	0.049	0.048	0.162	0.289	0.103	0.088
	(0.084)	(0.077)	(0.098)	(0.057)	(0.142)	(0.137)	(0.303)	(0.381)	(0.112)	(0.106)
Age in 2018	-0.001	-0.005	0.001	-0.002	0.003	0.003	-0.002	-0.006	0.001	-0.001
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.010)	(0.011)	(0.004)	(0.004)
# work experience	-0.001	0.003	-0.007*	-0.004	0.002	0.001	0.003	0.010	-0.004	-0.005
	(0.005)	(0.005)	(0.004)	(0.003)	(0.006)	(0.006)	(0.009)	(0.009)	(0.004)	(0.005)
Muslim (=1)	1.312**	1.301**	1.350**	1.332**	4.102***	3.909***	3.608***	3.858***	4.035***	4.252***
	(0.544)	(0.574)	(0.589)	(0.611)	(0.151)	(0.162)	(0.328)	(0.432)	(0.210)	(0.246)
Christian (=1)	1.258**	1.214**	1.257**	1.240**	4.187***	4.001***	3.656***	3.871***	4.093***	4.333***
	(0.521)	(0.543)	(0.556)	(0.578)	(0.190)	(0.207)	(0.298)	(0.389)	(0.238)	(0.255)
Bissa ethnic group (=1)	-0.344***	-0.423***	-0.412***	-0.455**	-0.291**	-0.266	-0.034	0.076	-0.279**	-0.286**
	(0.075)	(0.118)	(0.138)	(0.204)	(0.132)	(0.173)	(0.138)	(0.168)	(0.110)	(0.122)
Mossi ethnic group (=1)	-0.197*	-0.247	-0.081	-0.102	-0.411***	-0.404**	-0.097	-0.030	-0.299*	-0.314**
	(0.109)	(0.152)	(0.114)	(0.161)	(0.149)	(0.162)	(0.250)	(0.302)	(0.163)	(0.158)

Table A.4.11 continued

Variables	Production		Sales		Investments		Employment		Performance	
	All	Existing	All	Existing	All	Existing	All	Existing	All	Existing
Read/write French and a local language (=1)	-0.239*	-0.301***	-0.221	-0.271***	-0.174	-0.183	0.502***	0.379*	-0.123	-0.143
	(0.134)	(0.096)	(0.146)	(0.089)	(0.154)	(0.135)	(0.185)	(0.208)	(0.117)	(0.117)
Read/write a local language only (=1)	-0.013	-0.110	0.340***	0.248*	0.162	0.216	-0.207	-0.141	0.284	0.234
	(0.181)	(0.163)	(0.101)	(0.131)	(0.233)	(0.245)	(0.442)	(0.458)	(0.294)	(0.291)
Primary education (=1)	0.056	0.116	0.200	0.245*	0.354***	0.369***	-0.493***	-0.344**	0.361**	0.408***
	(0.158)	(0.167)	(0.126)	(0.139)	(0.104)	(0.082)	(0.183)	(0.173)	(0.148)	(0.153)
Secondary education (=1)	0.016	0.184	0.152	0.276*	0.426***	0.483***	-0.435	-0.183	0.291*	0.366**
	(0.183)	(0.169)	(0.178)	(0.166)	(0.127)	(0.125)	(0.313)	(0.270)	(0.166)	(0.145)
Other education (=1)	0.116	0.165	0.061	0.079	-0.024	0.005	0.106	0.078	-0.180	-0.126
	(0.092)	(0.117)	(0.115)	(0.099)	(0.146)	(0.149)	(0.202)	(0.183)	(0.136)	(0.153)
# household size	-0.009	-0.009	-0.001	-0.003	0.016**	0.013**	0.007	0.008	0.019**	0.018**
	(0.007)	(0.007)	(0.009)	(0.010)	(0.007)	(0.007)	(0.009)	(0.009)	(0.009)	(0.009)
Household head (=1)	-0.024	-0.001	0.025	0.006	0.126	0.111	0.003	0.025	0.211	0.193
	(0.065)	(0.072)	(0.102)	(0.115)	(0.161)	(0.154)	(0.163)	(0.216)	(0.178)	(0.166)
# household assets	0.006	0.003	0.013	0.007	0.001	-0.004	-0.003	0.010	-0.006	-0.015**
	(0.006)	(0.008)	(0.011)	(0.012)	(0.008)	(0.008)	(0.017)	(0.020)	(0.006)	(0.007)
Community leader in household (=1)	0.077	0.116*	0.017	0.054	0.010	0.002	-0.070	-0.041	0.105	0.134
	(0.059)	(0.070)	(0.101)	(0.106)	(0.105)	(0.108)	(0.197)	(0.203)	(0.099)	(0.085)
Constant	-1.803***	-0.989	-1.978***	-0.885	-5.850***	-4.926***	-6.162***	-6.539***	-5.465***	-4.963***
	(0.622)	(0.655)	(0.673)	(0.668)	(0.429)	(0.286)	(0.835)	(0.786)	(0.349)	(0.266)
S.E. clustered	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality
Pseudo R2	0.066	0.055	0.077	0.051	0.048	0.034	0.108	0.111	0.046	0.036
N	1,107	970	1,107	970	1,107	970	1,107	970	1,107	970

Notes: *** p<0.01, ** p<0.05, * p<0.1. Each of the dependent variables, production, sales, investment, employment, and general performance is a dummy that equals one if it decreased for the firm due to COVID-19. The list of controls include a dummy that equals one if the firm is already existing (vs. new); dummies for whether the firm sector is industry or services, with agriculture being the reference; a share of correct recalls by the owner from a digit span memory test; a dummy that equals one if the owner is female; the age and number of years of professional experience of the owner; dummies for whether the owner is Christian or Muslim; dummies for whether the owner is of the two largest ethnic groups (Bissa or Mossi); dummies for whether the owner reads and writes French and a local language or reads and writes a local language only; dummies for whether the owner attained primary, secondary, or other education levels, with the excluded being no education level; the size of the owner household, the number of assets owned; and dummies for whether the owner is a household head and whether a member in the owner household is a community leader.

5. Expert judgment vs. algorithm: How to best target growth-oriented entrepreneurs?

With Michael Weber

5.1 Introduction

Every year, a large cohorts of young people enter the labor market in developing countries where industrial sectors are nascent and low productivity jobs are dominant. To tackle unemployment and underemployment and accelerate structural change, policymakers seek to support gazelles⁶² or growth-oriented entrepreneurs (Santarelli and Vivarelli, 2007; Acs et al., 2008; Shane, 2009; Olafsen and Cook, 2016; Grover et al., 2019). Contrary to entrepreneurs that start a venture out of necessity, evidence shows that growth-oriented entrepreneurs enter markets to exploit opportunities, which can make them important agents of economic growth, job creation and innovation (Carree and Thurik, 2010). Hence, to be effective, entrepreneurship policies should be selective and specifically target growth-oriented entrepreneurs (Henrekson and Stenkula, 2009; Stam and Bosma, 2015). Such support is necessary whenever entrepreneurs are hold back by market failures such as for example credit constraints, limited market access or a lack of public goods such as water, electricity or telecommunication (Cantner and Kösters, 2012; Grimm, 2012). Hence, a central element of interventions targeted at growth-oriented entrepreneurs is the targeting mechanism used to decide among a group of eligible entrepreneurs those who deserve support (Stam et al., 2009; Mason and Brown, 2013; Johansson et al., 2021).⁶³

Increasingly in developing countries, public interventions use business plan competitions (BPCs) to select growth-oriented firms, for example to support them with cash grants often combined with training (McKenzie, 2015; Fafchamps and Woodruff, 2017; Fafchamps and Quinn, 2017; McKenzie and Sansone, 2019). In these competitions, entrepreneurs are assessed through a mechanism whereby experts rate each business plan to attribute it a score that is then used to rank entrepreneurs and pick the winners. Yet, many studies show that this strategy of picking the winners is difficult even for business experts as it is uncertain that selected entrepreneurs will be the most successful (Henrekson and Stenkula, 2009; Shane, 2009; Cantner and Kösters, 2012; Autio and Rannikko, 2016). In addition, experts are found to deliver biased judgments due to reliance on heuristics and due to overconfidence, inaccuracy, and cognitive illusions (Kahneman 1991; Shanteau and Stewart, 1992; Bruce et al., 2008). Other studies thus question the validity and reliability of expert judgments, and rather suggest using models or deterministic rules to pick winners (see e.g. Meehl, 1954; Shanteau and Stewart, 1992; Kahneman and Klein, 2009; Åstebro and Elhedhli, 2006). Hence, learning about effective

⁶² In this paper, we consider growth-oriented firms as gazelles, i.e. firms that have very high marginal return to capital and show potential or actual fast growth in turnover or employment.

⁶³ We mean by the term ‘targeting’ the mechanism of screening and identifying firms for providing them with a public support such as skills development or financial capital. The objective is to direct resources to firms which “need them most and can make the most use of it and generate positive externalities on society”. Typically, such selection can be done by thematic experts or following a statistical procedure or an algorithm using indicators based on characteristics of the firms and their owners (see Grover et al., 2019; and for general discussions on targeting see Akerlof, 1978; Ravallion and Chao, 1989; Besley and Kanbur, 1991; Kanbur et al., 1994; Deshpande and Li, 2019; Hillebrecht et al., 2020).

targeting mechanisms to pick growth-oriented entrepreneurs remains of particular interest for private sector support programs (Grover et al., 2019).

In this paper, we examine a targeting mechanism based on expert judgments. This mechanism was used with a BPC conducted in the framework of the cash and matching grants program implemented by a public agency⁶⁴ in Burkina Faso. For the same competition, we analyze another targeting mechanism that could be an alternative or a complement to the mechanism based on expert judgments. We use information on the business plans and the entrepreneurs to build this alternative metric based on a principal component analysis (PCA), a non-parametric approach. This metric is calculated using characteristics of the entrepreneurs and their businesses, which we identify by analyzing the association between the scores attributed to the entrepreneurs by the experts and variables from the business plans and the survey of the entrepreneurs before the program started. We evaluate these associations using different estimators, i.e. ordinary least squares, ordered-logit, and least absolute shrinkage and selection operator (LASSO). In particular, we are interested to answer two questions: Do the two targeting mechanisms (expert judgment and algorithm-based) yield similar rankings of the competing entrepreneurs? Given measures of the performance of the entrepreneurs, which targeting mechanism identifies with the highest precision the best performing entrepreneurs? To shed light on these questions, we analyze two data sources. First information on the business plans submitted by participating entrepreneurs at the start of the competition, and second, survey data on the entrepreneurs collected 10 and 34 months after the competition started.

The results suggest that for the BPC, expert subjectivity in scoring the business plans may have biased these scores used for ranking the entrepreneurs. This, for example, becomes apparent through inconsistencies between the heuristics that the experts followed in scoring the business plans, the experts own perceptions of the important criteria that must be used to score the plans, and the weights on the predefined criteria for scoring the plans.

Comparing the ranking of the entrepreneurs based on the experts-score and the algorithm-score, we find that both targeting metrics perform well for picking high-ranked or talented entrepreneurs. Considering groups defined by the quartile of a ranking of the entrepreneurs based on the experts-score, we find that 18% to 44% of these entrepreneurs preserve their group membership when they are ranked based on the algorithm-score instead of the experts-score. In addition, with the ranks based on the algorithm scores, the percentage of entrepreneurs who stay in these groups increases as the group size enlarges. This conclusion is only interesting when the order of the entrepreneur in the ranking is unimportant than his or her classification into a group of selected entrepreneurs. Otherwise, the two targeting mechanisms perform very differently when the exact order of each in the ranking of all entrepreneurs is important for distributing the awards to the selected entrepreneurs.

Finally, we find that the experts-score as well as the algorithm-score significantly predict four firm-level outcomes: the number of hours worked, the number of expected employees in three years, innovations, and a performance index. This conclusion is unchanged whether these

⁶⁴ The Maison de l'Entreprise du Burkina Faso (MEBF). MEBF represented the Government of Burkina Faso and carried out the cash and matching grants program. MEBF collected the business plans, relied on expert judges to score the business plans, and finally selected 1200 entrepreneurs of which 800 were randomly chosen as the winners.

four outcomes are measured 10 or 34 months after the competition started or when we consider other 13 firm outcomes only measured 34 months after the competition started.⁶⁵

For any of the outcomes considered, the prediction power is higher for the algorithm-score. The regression coefficients which are statistically significant range from 0.01 to 4.45 for the experts-scores, but 0.01 to 7.26 for the algorithm-scores. Most coefficients on the experts-score are either statistically insignificant or significant at the 5% or 1% levels, while nearly all coefficients on the algorithm-score are statistically significant at the 1% level. When the p-values are adjusted for multiple hypothesis testing, many coefficients on the experts-scores become insignificant while most coefficients on the algorithm-scores remain statistically significant at the 1% level. When both types of scores are considered in the same regression, the coefficients on the experts-scores are rarely significant while those on the algorithm-scores remain mostly significant. This result suggests that experts' judgment is less accurate, but performs well for targeting growth-oriented entrepreneurs. Given existing evidence on human aversion to algorithm output (see Logg et al., 2019) and the usefulness of expert judgments at least through panel interviews of contestants (see Fafchamps and Quinn, 2017; Fafchamps and Woodruff, 2017), combining it with an algorithm such as the PCA employed in this paper could improve the selection precision and efficiency. For a government welfare program in Burkina Faso, Hillebrecht et al. (2020) compare the performance of a targeting based on an econometric proxy means test with that based on community judgment for selecting consumption-poor households. Their findings suggest that the statistical targeting is more accurate and cost-effective than the community-based targeting especially for programs with large benefits.

We contribute to the literature that contrasts the performance of decision-making mechanisms based on expert judgments to that based on statistical procedures or algorithms. The literature on "Heuristics and Biases" claims that in situations where experts should decide based on their judgment, it proved that experts rely on heuristics and so the outcomes are biased (Tversky and Kahneman, 1974). Laboratory experiments show that experts usually make their judgment based a small set of the disposable information. In line with this reasoning, for example, two expert judges are likely to give very different scores to the same business plan (see Fafchamps and Quinn, 2017), which can change the ranking of entrepreneurs or business plans if the pool of experts or the way the tasks are assigned to them change (e.g. Mason and Stark, 2004). Similarly, these studies show that when used to take a decision, models often yield more precise and desirable outcomes than expert judgments in several cases (Meehl, 1954; Goldberg, 1968; Shanteau and Stewart, 1992; Kahneman and Klein, 2009; Logg et al., 2019). Yet, in parallel, the "Naturalistic Decision-Making" literature tries to show that experts are competent and make accurate decisions in their specialized domains (Libby, 1975; Shanteau, 1992; Shanteau and Stewart, 1992; Devine and Heckman, 1996; Shanteau et al., 2002).

In addition, a growing but still small literature examines the performance of targeting mechanisms based on expert's judgments on picking winners in BPCs. McKenzie (2015) and McKenzie and Sansone (2019) find that expert scoring of entrepreneurs participating in a BPC does not have much predictive power for firm growth as measured by changes in job creation or revenues. McKenzie (2015) finds that the predictive power is even lower for start-ups relative

⁶⁵ These outcomes are the firms' turnover, profit, physical investments (measured in amount m, at least one innovation over the last six months, and two indices measuring innovations and business practices, calculated by PCA.

to already existing firms. For a BPC in Ghana, Fafchamps and Woodruff (2017) find that scores on business plans and entrepreneurs pitches as well as scores on entrepreneur ability calculated by applying PCA on survey variables, both significantly predict firm growth, and that the experts-score add predictive power over the PCA score on ability. Yet, the PCA score is better to explain the variability in firm growth.

The remainder of the paper is organized as follows. Section 2 discusses the theoretical background. Section 3 presents the cash and matching grants program under which the BPC was carried out. Section 4 explains the data used and the method of analysis. Section 5 presents the results. Section 6 concludes.

5.2 Theoretical and empirical background

In this section, we introduce our definition of a growth-oriented entrepreneur, the target beneficiary identified through a BPC. Then we discuss how information from business plans can be best processed to make this selection effective and efficient. Specifically, we answer whether this selection is better made by experts or by algorithms, or a mix of both. We then discuss the empirical literature that compares the performance of such mechanisms.

5.2.1 The kind of entrepreneur a BPC should pick

In developing countries, individuals applying to a BPC constitute a heterogeneous group of potential entrepreneurs. Many of them may already own small businesses (Banerjee et al., 2019), while others may want to start new businesses. They are different in two respects. First, most businesses may desire to remain small or become self-employed with no ambition of expanding their business. Second, few of them may be willing to invest in the types of production technologies and the skills that can push them into high-growth entrepreneurship. Yet, these applicants typically have one thing in common: they have low level of initial wealth and, hence, lack collateral to get credit from formal financial institutions. They are therefore equally trapped in subsistence and self-employment occupations (see Banerjee and Newman, 1993; Banerjee and Duflo, 2011).

Evidence show that the capital investment, the training, both, and other types of support that come with BPCs can yield larger impacts in terms of job creation, innovation, and growth if the support is targeted at those individuals who aspire to become growth-oriented entrepreneurs (McKenzie, 2017; Fafchamps and Quinn, 2017; Grover et al., 2019). Grimm et al. (2012) show empirically that even among informal businesses in Sub-Saharan Africa, there are constrained gazelles that are characterized by their low levels of capital but their high marginal returns to capital, which indicate their potential to become high-growth entrepreneurs. For Olafsen and Cook (2016) high-growth entrepreneurs display willingness to take risks, and stand out by their high expectations and ambition (see also Autio et al., 2007). Banerjee et al. (2019) show for India that easing credit constraints for Gung-ho entrepreneurs enhances entrepreneurship, profits, business scale, turnover, and employment. Gung-ho entrepreneurs are examples of high-growth entrepreneurs and are identified as having access to high return-high fixed cost technology, a larger target business size and being able to make good use of additional credit. Hence, a central question becomes how governments can best pick these growth-oriented entrepreneurs.

5.2.2 On the optimal design of a selection mechanism

Public agencies seeking to target growth-oriented entrepreneurs confront a problem similar to that of a venture capitalist when trying to pick the best investment opportunities. Both the venture capitalist and the agency want to select the most profitable investment projects.⁶⁶ Yet the differences between the two is that the objective of venture capitalists is to maximize profits (see Amit et al., 1990) while the objective of the agency is to maximize social returns, i.e. pick projects that will generate jobs, innovations, and economic growth (see Leleux and Surlemont, 2003; Cumming and MacIntosh, 2006; Standaert and Manigart, 2018; Abrardi, Croce, Ughetto, 2019; Johansson et al., 2021; Grover et al., 2019). In the same respect, Robalino et al. (2020) show that jobs impacts of investment projects can be maximized when public agencies managing BPCs select projects that on top of their financial rate of return demonstrate higher jobs-linked externalities.⁶⁷ Hence, like venture capitalists, when evaluating business plans, the agency must assess the perceived risk and expected financial and social rates of return on investments. To do so, the agency analyses the entrepreneur's characteristics such as his or her ability⁶⁸, jobs-linked externalities, and the history of the business performance when such information is available (Tyevjee and Bruno, 1984; Amit et al., 1990).

However, problems of moral hazard and adverse selection arise since the public agency do not observe the ability of the entrepreneurs. Amit et al. (1990) explore information asymmetries and show that when entrepreneurs can invest in costly signals such as business plans, the targeting can be partially based on the quality of these signals. Yet, this may not apply to competitions where entrepreneurs receive public support to write business plans. Moreover, other problems relate to the governance of the public agency itself. For example, the agency might be politically controlled and hence political motives or corruption rather than efficiency motives might determine the selection outcomes (see e.g. McCubbins et al., 1987; Ravallion, 1993; Webster, 1998; Bergström, 2000; Lerner, 2002; Autio et al., 2007; Jourdan and Kivleniece, 2014; Hillebrecht et al., 2020).

An efficient targeting mechanism must then address several aspects. First, through these competitions governments seek to mitigate market failures such as the presence of jobs-linked externalities or credit market imperfections of the applicants, in particular those who have only little own resources.⁶⁹ Hence, although some applicants may show a high potential to grow and create jobs, they should be screened if their investments can be financed through the credit market, i.e. to avoid that the support program leads to free-riding by financing investments that

⁶⁶ The public agency may even choose projects that show low levels of expected private returns or projects that may be rejected by a private venture capitalist, but that show high levels of social returns (see Buzzacchi et al., 2013; Abrardi et al., 2019; Johansson et al., 2019; Robalino et al., 2020).

⁶⁷ According to Robalino et al. (2020), jobs-linked externalities emerge when wages exceed the opportunity cost of labor (labor externalities), or when there are social gains from creating better jobs for some classes of worker, such as women or youth (social externalities).

⁶⁸ Ability here includes technical skill, experience, ability to craft strategies for entering the market and developing a competitive advantage, as well as overall managerial skills, leadership ability, personality, and so on (see Amit et al., 1990).

⁶⁹ Note that rather than the per capita income, wealth or assets of applicants may be used to discriminate between the poor vs. the wealthy. For instance, the case of the business plan completion run in Nigeria (see McKenzie, 2017) shows that targeted entrepreneurs are not necessarily poor with respect to their per capita income but can be well-educated entrepreneurs who lack capital to start or expand their businesses. In his experiment, more than 60% of applicants had university education and 94% owned a computer.

do not need government assistance (see Lerner, 2002). Second, there is a risk that beneficiaries abandon in mid-course their projects or ‘flee’ with the funds, hence the screening must focus on this aspect as well. Both issues explain why competitions often involve pitches of contestant entrepreneurs before a panel of expert judges (see Fafchamps and Quinn, 2017; Fafchamps and Woodruff, 2017). Other competitions introduced performance milestones that entrepreneurs should meet while receiving public support (Autio and Rannikko, 2016; McKenzie, 2017).

In sum, the decision to select one business plan and not the other hinges on fixing a host of potential issues (see Johansson et al., 2019), which calls for an optimized design of a targeting mechanism. For public BPCs, the typical targeting mechanism is based on experts’ judgments. In most cases, a public agency starts by selecting a pool of experts tasked with ranking participating entrepreneurs based on their business plans, and in other cases, the ranking may also be based on the performance of the entrepreneurs in pitches before a panel of expert judges. In this case, the agency must decide how to identify and choose the experts (see Libby, 1975; Abdolmohammadi and Shanteau, 1992; Olafsen and Cook, 2016). It must then define the set of criteria that the pool of experts must use to produce a general ranking of the entrepreneurs (Grover et al., 2019).⁷⁰ Defining targeting criteria may be relatively easy given the general objective of the BPC. Yet, Freel (1998) argues such criteria can be arbitrary because they do not predict well the performance of ‘winner entrepreneurs’ or the number of criteria employed may affect the accuracy of experts’ predictions (see also Stewart 1988; Besley and Kanbur, 1991; Zacharakis and Meyer, 2000; Åstebro and Elhedhli, 2006). In particular, Robalino et al. (2020) show that when the objective is to maximize jobs impacts of investment projects, a key selection criterion should be the evaluated jobs-linked externalities of each project. Moreover, the agency must ensure that the general ranking of entrepreneurs does not change considerably if new experts are considered or the business plans are reshuffled among the individual experts (Payne et al., 1993; Zacharakis and Meyer, 2000). If reshuffling the plans changes the ranking considerably (Åstebro and Elhedhli, 2006), then it suggests that the winning entrepreneurs will be growth-oriented only by chance (see Goldberg, 1968; Wren, 2003).

As Shepherd and Zacharakis (2002) suggest for venture capitalists, the public agency may improve targeting using decision mechanisms based on statistical models. There is a large strand of literature on heuristics and biases on expert’s judgments (Shanteau and Stewart, 1992; Kahneman and Klein, 2009) that supports that targeting mechanism based on expert judgments can identify growth-oriented entrepreneurs only by chance (see Zacharakis and Meyer, 2000). Experts are found to be influenced by recent events, overconfident, not necessarily accurate, not immune to cognitive illusions, and seek only confirmatory information (Dawes et al. 1989; Kahneman 1991; Shanteau and Stewart, 1992; Åstebro and Elhedhli, 2006; Bruce et al., 2008). Thus, others suggest using a targeting mechanism based on a modeling or an algorithm (see Hammond and Summers, 1965; Goldberg, 1968; Dawes et al. 1989; Shanteau, 1992; Logg et al., 2019; World Bank, 2021).

Model-based targeting has the advantage of fairness in the sense that conditional on the selected variables, entrepreneurs are compared on the same basis. Even when such equal comparisons are not desired because the public agency wants to favor a particular sector of

⁷⁰ Johansson et al. (2019) discuss a governmental venture capitalist case where one expert is tasked of gathering from applicant entrepreneurs the relevant information on e.g., market, product and productions, finances, and human capital, and then analyzing and discussing findings in a meeting where investment decisions are taken.

activity for instance, weights can be defined prior to calculating the ranking scores. Yet, in few cases (see e.g. Åstebro and Koehler 2004; Åstebro and Elhedhli, 2006), expert judges relying on simple decision heuristics performed better than a model in picking successful ventures.⁷¹ Moreover, modeling poses the problem of the pre-identification of variables that characterize the entrepreneurs and their business plans, since these variables are necessary to calculate ranking scores (Freel 1998; Shanteau et al., 2002; Grover et al., 2019). Such variables may be drawn from the literature, though there is no guarantee that important variables may still not be omitted (see Hillebrecht et al., 2020). In addition, when model-based targeting is used, data on the identified variables need to be collected, which may be costly if a large survey should be conducted. However, following Besley and Kanbur (1991) and Åstebro and Elhedhli (2006) using few variables yield better predictions.

5.2.3 Empirical evidence on the performance of alternative selection mechanisms

So far, for BPCs, only few studies have compared the targeting mechanism based on expert's judgments with mechanisms based on an algorithm. Roure and Keeley (1990) show that successful entrepreneurs can be identified using a model based on prediction factors drawn from business plans. Analyzing a large BPC conducted in Nigeria, McKenzie (2015) compared the power of business plan scores from expert judges to the power of a range of entrepreneur's characteristics in predicting firm's performance in terms of job creation and profits. As characteristics, McKenzie considers "gender, age, education, experience abroad, risk attitude, ability (measured as a first principal component of the Raven test and Digitspan recall scores), the grit measure of Duckworth et al. (2007), a household wealth index (the first principal component of 20 durable assets)," activity sector dummies, and dummies for residential region of the entrepreneurs. He finds that neither the scores from the expert judges nor the entrepreneur's characteristics significantly predict firm's growth. For the same competition, McKenzie and Sansone (2019) also compare the performance of different approaches in predicting firm's growth. They find that neither machine learning techniques, an ad hoc model using survey data, nor scores from expert judges significantly predict the performance of firms. However, they find that few entrepreneur's characteristics such as gender, age, ability, and business sector have some predictive power for the performance of firms.

Similarly, in a BPC in Ghana, Fafchamps and Woordruff (2017) compared a targeting mechanism based on expert's judgments with one based on a model that uses survey data on firm's and entrepreneur's characteristics. They intuitively select a limited set of characteristics including indices of ability and attitude calculated by discriminant analysis, measures of management practices and access to credit. They find that even after taking into account survey measures of firm's and entrepreneur's characteristics, scores from expert judges predict firm's growth in sales, profits, jobs, and investment. In particular, they find that measures for entrepreneur ability and management practices predict firm's growth well.⁷² Table S.5.14 in the Supplemental Material summarizes this literature.

⁷¹ Noteworthy is that contrary to most BPCs where expert judges receive low financial incentives, in (Åstebro and Elhedhli, 2006) experts were highly paid and had enough time to issue judgments. In addition, the difference between the predictive power of the experts and that of the model was not statistically significant.

⁷² The measure for ability is an index calculated by principal component analysis on survey data on nonverbal reasoning tests, a numeracy test, years of formal schooling and financial literacy.

5.3 Burkina Faso cash and matching grants program

5.3.1 The program

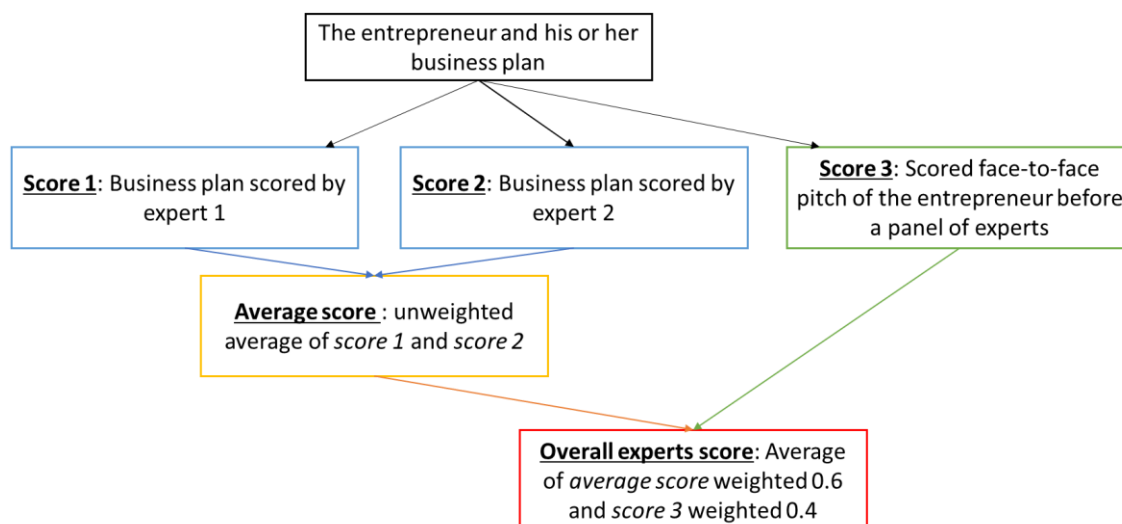
The cash and matching grants program is a component of the larger Bagré Growth Pôle Project that the Government of Burkina Faso and the World Bank deployed to attract agribusiness investors and to develop high growth value chains. The program intervened in nine municipalities in the country's Centre-Est region. It offered cash, training, and technical support to growth-oriented entrepreneurs engaged in activities ranging from business development services, staple crops production, horticulture, livestock, fish farming, to the transformation of agricultural products. These entrepreneurs were applicants to a BPC carried out through a dedicated targeting mechanism. With the technical support of the World Bank and a team of researchers, the Maison de l'Entreprise du Burkina Faso (MEBF), a public utility service designed and executed the BPC.

5.3.2 The targeting mechanism

The mechanism used to target growth-oriented entrepreneurs was designed in seven stages. It started from the collection of business plans and ended with public lotteries that randomly selected the winners among those entrepreneurs that were deemed eligible based on the score of their business plan. Applicants were required to submit simplified business plans, a document of seven pages averaging less than 3,000 words. Since some applicants were illiterate or with a low education level, trained external consultants helped them fill out their business plans. 2,279 plans were collected. To evaluate the plans, MEBF established a committee of 20 expert judges, of which 10 were staff of MEBF and 10 were designated representatives of different public and private services collaborating with MEBF. A pair of experts scored each business plan giving it two scores. On average, each expert scored 233 business plans and was not paid for this task.⁷³ It took an expert one hour on average to score a business plan. For the assessment of the business plans, MEBF and the researchers defined a set of six principal criteria: the profile of the applicant, the project's market feasibility, technical and organizational feasibility, profitability, innovation, and anticipated impact in terms of job creation and value added.⁷⁴ These principal criteria were decomposed into 25 subcriteria. For a business plan, an expert's score was defined as the weighted sum of the scores on the principal criteria. The weights reflected the overall objectives of the competition. The weights were defined prior to starting the scoring. Then, for each business plan, an unweighted average score was calculated by averaging the scores from the pair of experts. This process ended with the shortlisting of 1,612 entrepreneurs. Figure 5.1 below illustrates the targeting mechanism and the calculation of the scores.

⁷³ The experts representing public entities were not paid because as part of their duties, they could provide supports to MEBF, for example scoring business plans. For experts from private entities, these are former contractors who provided services to MEBF and who are interested in continuing this collaboration in the future.

⁷⁴ See Robalino et al. (2020) for a discussion on selecting entrepreneurs using jobs-linked externalities among the criteria.



Source: Illustration by the authors.

Figure 5.1: Effects of COVID-19 on decline of production, sales, investment, employment, and general performance, detailed regression results

The next stage was a standard and simplified five-day training on business management delivered to the shortlisted entrepreneurs.⁷⁵ Four panels of two experts each organized face-to-face pitches with each entrepreneur, which resulted into a third score given to the entrepreneur.⁷⁶ A set of criteria were used to score these pitches. There were three principal criteria: entrepreneur command of the business activity, experience and financial literacy, eligibility to receive a grant and foreseen utilization of the grant. These criteria were decomposed into 15 subcriteria. In calculating the overall score for each entrepreneur, unequal weights were used on the principal criteria. In the overall score, business plans were weighted three-fifths and pitches were weighted two-fifths (see Figure 5.1). Again, these weights were defined prior to starting the scoring and pitches. After scoring the business plans and the pitches, a selection committee shortlisted 1,300 entrepreneurs. It took 10 months from the collection of the business plans to the final shortlisting of the entrepreneurs. The final stage was a public lottery organized in each of the nine program municipalities in which from 1,200 entrepreneurs 800 were drawn as winners. The lottery served to allocate winners into two alternative support mechanisms, matching grants and cash grants, and to obtain a control group. The randomized design was implemented in view of a rigorous impact evaluation of the program. Each entrepreneur in the two treatment groups was granted US\$3,420 on average. The lowest grant was US\$628 and the highest was US\$11,659.

The targeting mechanism was designed to address the agency problems discussed in Section 2. First, the risk of corruption was reduced by including in the panel of experts judges internal and external to MEBF. Most of the external experts were from private firms. Moral hazard was addressed by having face-to-face pitches of the entrepreneurs before the panel of experts.

⁷⁵ The training delivered is a level one version of the Start and Improve Your Business (SIYB) training package, which is adapted to illiterate trainees. This training extensively uses pictures and illustrations. The training modules included: the businessman/business woman and his or her activity, business and family, marketing strategy, procurement, costs calculation, cash handling, developing business ideas, developing a business.

⁷⁶ Among the eight experts who conducted the pitches with the entrepreneurs, two did not participate in scoring the business plans.

Adverse selection was mitigated by conditioning the access to the grants on the satisfactory realization of the investments specified in the business plans or those agreed upon with MEBF. The conditions were laid out in a written agreement between MEBF and the entrepreneur.

5.4 Data and methods

5.4.1 Data

For our empirical analysis, we combine four datasets – the first from the business plans, the second and third from the baseline survey and the midline survey administered to the 1,300 entrepreneurs, and the fourth from a survey of the expert judges. The data from the business plans were collected in the beginning of the competition in January 2017. Surveyors who had expertise in developing business plans helped the applicants to fill out the template. These surveyors also advised the applicants on estimating the cost of their planned investments in capital and training. These business plans contained information pertaining to the candidates such as their residential location and age as well as information specific to their already existing or new business such as the product market, production technology, physical and financial capital, employees, business performance, and future costs of capital and training.

On the other hand, the baseline survey data were collected 10 months and the midline survey data were collected 34 months after applicants submitted their business plans. Noteworthy is that the baseline survey was conducted before the random allocation of firms into the treatments and control groups, while the midline survey was conducted roughly six months after treated firms started to invest their cash or matching grants.⁷⁷ Innovations for Poverty Action (IPA) collected the data through face-to-face interviews with the entrepreneurs. The data are on the entrepreneurs' age, gender and location as well as the socio-demographic characteristics and assets of their households, the entrepreneurs' education and management skills, the characteristics of their firms as well as their production, sales and investments in physical, financial and human capital, business practices, innovations, and entrepreneurial trait. Table A.5.1 in the Appendix shows summary statistics on the variables of interest.

We match these data with other data from interviews with the expert judges who assessed and scored the business plans. The survey among the experts collected information on their individual characteristics such as their age, gender, marital status, religious and ethnic group, socio-professional occupation, training received on scoring business plans, experience with BPCs, perceptions of methods for targeting entrepreneurs, criteria used to screen entrepreneurs, time allocated and time taken to score the business plans, use of subjective weights, difficulties encountered, and financial incentives.

5.4.2 Method

We follow a method that unfolds in six steps to study which of two mechanisms, one based on experts' judgment and the other based on an algorithm, is best for ranking and selecting entrepreneurs in a BPC. First, we introduce the scores calculated by the experts from their judgment on the business plans and pitches of the entrepreneurs before expert panels. Second,

⁷⁷ Note that the disbursements of the cash grants to the beneficiary firms were faster than that of the disbursements of the matching grants due to differences in the disbursement procedures for each type of grant.

we analyze the experts' judgment mechanism to show how useful it was to have a pair of experts to score each business plan, and to have each entrepreneur pitch before a panel of experts. This analysis also shows the presence of expert subjectivity bias in calculating the ranking scores. Third, we conduct regression analysis to identify which observable characteristics of the experts, the entrepreneurs and their businesses are statistically significantly associated with the overall experts score. Fourth, using the identified characteristics we apply a PCA on them to get an overall PCA score. Fifth, we assess the extent to which the overall PCA score achieves a ranking of the entrepreneurs comparable to the ranking based on the overall experts score. And sixth, we conduct regression analysis to compare the performance of the overall experts and PCA scores in predicting the growth of the businesses as measured at baseline and midline, i.e. at 10 months and 34 months respectively after the business plans were collected. Given the timing of these surveys, the prediction exercise considers four business performance outcomes from both surveys, and thirteen more outcomes from the midline survey only. Using data from both surveys for predicting firm performance is advantageous in that we can assess the short and medium-terms predictive power for the experts and PCA ranking scores. More details on each of these steps are discussed below and illustrated in Figure A.5.1 in the Appendix.

In the competition, each entrepreneur received two separate scores based on the judgments made by the pair of experts on his or her business plan. One score comes from a first expert, 'expert 1' hereafter, and the other score is from a second expert, 'expert 2' hereafter. The unweighted average of both scores gives the 'average score.' The 'overall experts score' is obtained by averaging the average score with a weight of 60% and the score from a pitch of the entrepreneur before a panel of two experts with a weight of 40% (see Figure 5.1). By construction, each of these scores, i.e. the score by expert 1, the score by expert 2, the average score, and the overall experts score bear some peculiarities. We consider all four scores in our analysis. Yet, it is worth noting that only the overall expert scores were used to rank and select entrepreneurs for the program.

In this analysis, we first examine descriptively the judgments made by the experts on the business plans in order to draw key qualitative features. Indeed, we examine the extent to which having a pair of experts instead of one expert assessing each business plan affects the general ranking of the entrepreneurs; and whether the entrepreneurs' face-to-face pitches also affect this ranking. Indeed, for the YouWin! competition in Nigeria which McKenzie and Sansone (2019) analyzed each business plan was scored by one expert even though all experts had the possibility to discuss with their peers on difficulties in marking the plans. In contrary for the much smaller competition in Ghana which Fafchamps and Woodruff (2017) analyzed each business plan was given an overall score by a panel of three experts.⁷⁸ It is important to note that in our case each expert independently decided on the score for each business plan, but each pair of experts had the possibility to discuss among themselves issues on marking the plans.

We also test how the scores from the pair of experts are correlated with that from the pitches. A small correlation would indicate that these pitches influenced the final ranking of the entrepreneurs and hence fine-tuned the selection. Checking this correlation is important because for the Nigerian competition face-to-face pitches were not organized in order to guarantee the impartiality of the selection (see McKenzie and Sansone, 2019), while for the Ghanaian

⁷⁸ The number of business plans scored by experts was 141 in Ghana and 4517 in Nigeria.

competition each entrepreneur gave a presentation before a panel of three experts (see Fafchamps and Woodruff, 2017).

We then try to pin down the heuristics followed by the experts in scoring the entrepreneurs and their business plans. To do so, we check whether when assessing the criteria for calculating the scores the experts applied subjective weights and whether these weights align with the predefined objective weights.⁷⁹ If the two categories of weights are inconsistent, we think an argument can be made to go beyond expert scoring and consider algorithm-based scoring for selecting the entrepreneurs to reduce the arbitrariness of the process.

We next identify characteristics of the entrepreneurs and the businesses that are statistically significantly associated with at least one of the four expert scores. These identified characteristics would be those that influenced the experts' judgement of the business plans. Hence, we could combine the characteristics of the entrepreneurs and their businesses using a PCA to obtain an alternative overall score for ranking the entrepreneurs. This overall score is hence the predicted scores of the first principal component from the PCA. This means that both the ranking score from the experts and that from the PCA approach are calculated by combining the same factors.⁸⁰ Yet, these factors are assessed following two different mechanisms, one based on a human expert judgment and the other based on an automated algorithm.

To identify the common factors, we estimate a parametric model of the expert score as a linear combination of the characteristics of the entrepreneurs and their businesses. To begin with we considered all characteristics available in the dataset. The model can be written as:

$$S_{ij} = X_i' \alpha_1 + X_j' \alpha_2 + \epsilon_{ij}, (1)$$

where i stands for the entrepreneur, j for the expert, S_{ij} for the dependent variable which is the score given to the entrepreneur i by the expert j , X_i stands for a vector of characteristics of the entrepreneur and his or her business, X_j stands for a vector of characteristics of the expert, α_1 and α_2 are vectors of parameters to be estimated, and ϵ_{ij} is the error term.

When estimated, parameters that are statistically significant indicate that the associated variable significantly predicts the score. For identifying the significant characteristics of the entrepreneurs and their businesses, we estimate model (1) controlling for expert fixed-effects.

We first estimate this model by ordinary least squares (OLS). Then, since entrepreneurs are selected by rank ordering the scores, we transform the model into an ordered-logistic model and estimate it by maximum likelihood (see Cameron and Trivedi, 2005). This procedure is relevant in this setting because above the value of a score its order is important (see McCullagh, 1980). Furthermore, given the large number of characteristics considered, and because we aim to identify those characteristics that are the most important, we use the least absolute shrinkage and selection operator (LASSO), a machine learning approach. The LASSO allows selecting the most important predictors through a procedure that "minimizes the residual sum of squares

⁷⁹ Subjective weights are here defined as the relative importance that each expert subjectively attributed to each criterion when making their assessment. These weights differ from the predefined weights because the former vary among the experts while the latter are the same for all experts.

⁸⁰ If we had followed an ad hoc approach for selecting the factors that we think are relevant for calculating the score for ranking the entrepreneurs, then this score will be different than the experts score at two levels, the first level being that the factors are likely to be different and the second level being that the assessment mechanisms are different (expert's judgment vs. algorithm). This will hence blur the comparison of the performance of the two scores in ranking entrepreneurs and predicting firm outcomes.

subject to the sum of the absolute value of the coefficients than a constant” (see Tibshirani, 1996).

Now using the identified characteristics of the entrepreneurs and their businesses, we build an algorithm-based metric, which we use to assess its performance. As algorithm for computing the metric, we rely on a PCA, a common approach to reduce data of large dimensionality. For example, Fafchamps and Woodruff (2017) and McKenzie (2015) calculate measures of ability, attitude, and financial literacy by combining sets of survey variables using a PCA and discriminant analysis. In this paper, instead of building different subindices we combine 15 survey variables using a PCA to calculate an overall PCA score for ranking the entrepreneurs.

We proceed to compare the performance of the overall PCA vs. the overall experts score in ranking entrepreneurs, i.e. we measure the gap between two rankings one based on the PCA scores and the other based on the expert scores (see Section B in the Appendix). We then define groups or clusters of entrepreneurs, delimited by the quartiles of the rank ordering based on the overall experts score. Doing so, we assess the proportion of preservation of group membership when entrepreneurs in a delimited group are in a second time rank ordered based on the overall PCA score instead (see Section C in the Appendix).

Finally, over the 10-month and 34-month periods from their application to the competition to the baseline and midline surveys respectively, 87% of entrepreneurs that were already running firms pursued their business activities, and 6.5% new entrepreneurs started over and hence achieved certain performance. We use 17 outcomes in order to measure the performance of the firms over these two periods. Among these outcomes only four are from the baseline survey while all 17 outcomes are from the midline survey. From the baseline survey, the first outcome is the number of hours worked in a normal week over the six months preceding the survey. For already existing firms, we believe that this outcome captures the extent to which the firm is motivated and demonstrated pro-activity while waiting to receive a grant from the program. Firms with a high number of hours worked per week might as well be successful businesses as they enjoy high demand. The second outcome is the number of jobs that the entrepreneurs expected to create three years after the survey. Although there will certainly in many cases be a gap between these expectations and the actual number of jobs created, we believe that this outcome is important given that the entrepreneurship literature identifies high-growth entrepreneurs as those demonstrating ambition and high expectations (Vivarelli, 2004; Stam et al., 2009; Santarelli and Vivarelli, 2007; Kösters, 2010; Olafsen and Cook, 2016; Grover et al., 2019). The third outcome is a dummy equals one if over the six months preceding the survey, the entrepreneur introduced one or more of ten innovations listed at the time of the survey.⁸¹ Finally, the firm performance index is the first component of a PCA applied on the three outcomes. Higher values of the index indicate higher performance of the firm. When using the midline survey, we consider 13 more outcomes measuring the firms’ turnover, profit, physical investments, number of workers, in particular wage workers, number of hours worked last week, the average monthly wage, whether the firm owner keeps a book on sales and

⁸¹ The innovations include whether the entrepreneur introduced new products or services, improved significantly an existing product or service, introduced a new or modified an operational process, introduced a new design or packaging of products, introduced a new channel for selling products, introduced a new method of pricing products, introduced a new way of promoting or advertising products, introduced new quality control standards for suppliers and subcontractors, opened a new shop or a new production site.

purchases, whether the owner introduced at least one innovation over the last six months, and two indices measuring innovations and business practices, calculated by PCA.

We hence assess the performance of the overall PCA score vs. the overall experts score in predicting these outcomes. To do so, we regress each of the four outcomes on each of these two scores, and then we regress each outcome on both scores to check whether prediction improves when both scores are used. The models are specified as follows:

$$perform_i = \beta_1 Experts_Score_i + X_j' \beta_2 + \mu_i, \quad (2)$$

$$perform_i = \gamma_1 PCA_Score_i + X_j' \gamma_2 + \omega_i, \quad (3)$$

$$perform_i = \delta_1 Experts_Score_i + \delta_2 PCA_Score_i + X_j' \delta_3 + \varphi_i, \quad (4)$$

where i stands for the entrepreneur, $perform_i$ for one of the 17 performance outcomes of the business of entrepreneur i , $Experts_Score_i$ for the average experts score or the overall experts score for entrepreneur i , PCA_Score_i for the overall PCA score for entrepreneur i , X_j for a vector of fixed-effects for the municipalities where the businesses are located, the β s, α s, and γ s are parameters to be estimated and μ_i , ω_i , and φ_i are error terms. The average and overall experts scores and the PCA score are all standardized with mean 0 and standard deviation 1. We are interested in the statistical significance and the magnitude of the parameters β_1 , γ_1 , δ_1 and δ_2 . Since multiple outcomes are considered, we also calculate Romano-Wolf p-values, which adjust for familywise error rate in a stepdown multiple hypothesis testing.⁸² If any of these parameters is significant, it means that the associated experts or PCA score significantly predicts the corresponding performance outcome of the firm. In addition, larger magnitude of this parameter indicates a higher prediction power of this expert or the PCA score.

We run these regressions by OLS including municipality fixed-effects and clustering the standard errors at municipality levels. Through this analysis, we can identify which of the two mechanisms, expert judgment, algorithm or both is best for targeting growth-oriented entrepreneurs in this setting.

5.5 Results

For the analysis in this paper, we would like to emphasize that the objective of using an algorithm is to reduce an expert's subjectivity bias in assessing business plans and attributing scores for the selection of entrepreneurs. Hence, the idea is to propose an approach that uses both expert scores and an algorithm to pick winners of a BPC. In the same vein, McKenzie and Sansone (2019) argue that "human experts and algorithm may provide complementary information. Therefore, combining these methods may potentially lead to superior performance." Yet their analysis shows that such combination does not add systematic performance gains. We follow here a method which can help inform a blended approach that takes advantages of both the expertise and experience of experts while reducing any bias common with standard expert ratings. Based on the method described in Section 4, we present below the findings from our analysis deployed for the BPC in Burkina Faso.

5.5.1 Qualitative insights on the experts' judgments on the business plans

⁸² We use the Stata's command `rwolf` (see Clarke, Romano, and Wolf, 2019).

The experts see the entrepreneurs largely as a homogeneous group. The scores from the experts' judgments yield many ties in the ranking of the entrepreneurs, i.e. many entrepreneurs with the same score. Out of the 1,613 entrepreneurs, only 14 (0.87%) are judged by the experts as having unique qualities, that is, entrepreneurs with untied scores, while the majority of the entrepreneurs are in groups of 10 to more than 100 members sharing similar qualities or identical scores (see Table S.5.1 and Figure S.5.1 in the Supplemental Material). On the other hand, when we compare the scores from the group of expert 1 and expert 2, we find that the second score permitted to reclassify 47% of the entrepreneurs into different groups within which the entrepreneurs share comparable qualities. Hence, the cross-validation through the assessment by the second expert had a significant effect on the targeting of the entrepreneurs. Our survey of the experts provides evidence that the quality of the business plans themselves was not at play, rather it is the own judgment of the experts that qualifies the entrepreneurs largely a homogenous group.⁸³

The scores from expert 1 and those from expert 2 appear to complement each other in determining the final ranking of the entrepreneur. The pairwise correlation coefficient between the two scores is 27%, which indicates that the two scores capture different qualities of the entrepreneur and his or her business (see Table 5.1). Therefore, for this competition, using a pair of experts to score each business plan was useful in capturing the full quality of the projects and having overall a fair assessment. However, noteworthy is that the scores from expert 2 are less correlated with the pitches' scores than the scores from expert 1. In addition, we note that the correlation between the business plan scores and the pitches scores is very low and insignificant, which also indicates that the business plan and pitches scores capture different qualities of the entrepreneur and his or her business. Hence, the pitches influenced the targeting of the entrepreneurs, which supports that these pitches were useful in this setting.

⁸³ Note that the large number of ties could result from the mere fact that the business plans are of the same quality, leading the experts to attribute the same scores to the entrepreneurs. However, from our survey of the experts, we find that among the 20 experts who scored the business plans, five reported that many of these plans were of poor quality because they contained nearly the same information. Yet, two experts hailed the overall good quality of the plans. Therefore, since the business plans were found to be of relatively good quality by the experts, then the large number of tied scores should result from the own assessment of these plans by the experts, rather than that the plans were of the same quality.

Table 5.1: Pairwise correlations between the scores on the business plans and the pitches

	Expert 1 scores	Expert 2 scores	Average scores	Weighted scores	Pitches scores
Expert 1 scores	1				
Expert 2 scores	0.270*	1			
Average scores	0.747*	0.842*	1		
Weighted scores	0.594*	0.651*	0.790*	1	
Pitches scores	0.040	-0.004	0.019	0.628*	1

Source: Own calculations using data from MEBF.

In particular, the scores from expert 1 and those from expert 2 show higher correlation for highly qualified entrepreneurs than for the weakly qualified. The pairwise correlations between these scores are also higher in the third and fourth quartiles than in the first two quartiles (see Figure S.5.2 and S.5.3 in the Supplemental Material) of these scores.

In addition, we find that the experts applied subjective weights when assessing the scoring criteria.⁸⁴ These subjective weights also differed from the objective weights predefined before the scoring started (see Table 5.2). Experts who were first to assess the plans (expert 1) gave the highest subjective weights to innovative projects while for that criterion the predefined weight was the lowest, i.e. 1. The second experts (expert 2) gave the highest weights to projects that demonstrated high technical and organizational feasibility followed by projects that were expected to yield social impacts. Hence, expert 2 were closer to applying the predefined weights on the principal criteria than were expert 1.

To summarize, we find inconsistencies between the heuristics on which the experts assessed the business plans, the experts own perceptions of the important criteria that must be used to score the plans, and the predefined weights for scoring the plans. Indeed, when interviewed, 75% of the 20 experts reported that in scoring the plans they applied subjective weights. Yet, among those who used subjective weights, 87% said that their subjective weights were in accordance with the predefined weights. Nevertheless, by comparing the pairwise correlation between the experts' scores and the scores on each principal criterion, we find that the order of importance of these criteria changes whether the subjective or the predefined weights are used (see Table 5.2).

On the other hand, when asked what important criteria should be used to score the business plans, the experts reported the existence of a product market followed by a sound knowledge of that market, the concurrence therein, and the marketing strategy of the entrepreneur (see Figure S.5.4 in the Supplemental Material). This is not in the order of the subjective weights nor in that of the predefined weights. This result reinforces the evidence that expert 1 and expert 2 complemented each other by subjectively weighting differently the scoring criteria, yet since objective weights were predefined to be used to calculate the scores, precision may be lost in having both objective and subjective weights. We next analyze what characteristics of the experts determine their judgments of the business plans and the entrepreneurs.

⁸⁴ Subjective weights are here defined as the relative importance that each expert subjectively attributed to each criterion when making their assessment. These weights differ from the predefined weights because the former vary among the experts while the latter are the same for all experts.

Table 5.2: Pairwise correlation between expert 1 and expert 2 scores and subscores on the principal criteria

Principal criteria	Expert 1	Expert 2
Innovations (1)	0.664	0.649
Technical and organizational feasibility (5)	0.659	0.726
Market feasibility (3)	0.637	0.664
Profile of the entrepreneur (3)	0.610	0.650
Social impact (3)	0.597	0.689
Profitability (5)	0.585	0.674
Expert's score	1.000	1.000

Notes: To help read the table, an example is that expert 1 placed higher subjective weight on innovative projects (coef. 0.664) than on projects with higher profitability (coef. 0.585). In other words, expert 1's score is more closely related to the innovation criterion than to the profitability criterion. The predefined weights are shown in parentheses.

Source: Own calculations using data from MEBF (2018).

Regarding the experts themselves, through a regression analysis, we assessed the correlation between each of the experts' average scores and weighted scores and a range of socio-demographic characteristics of the experts, whether they were trained in entrepreneurship, and their perceptions of the role of financial incentives and the importance of expert judgments as well as their experiences in scoring business plans and interviewing entrepreneurs. Since the experts' scores were calculated by assessing the business plans, we also run regressions controlling for the characteristics of the entrepreneurs and their businesses. The results are presented in Table A.5.7. We find a negative correlation between both the average and weighted scores and the expert's age, perceived high importance of expert judgment, and whether his or her professional occupation is a consultant, an assistant manager, or a support staff. The scores are only positively correlated with the expert's work experience, experiences in scoring business plans and interviewing entrepreneurs, and whether his or her professional occupation is a counsellor in business management.

5.5.2 Identifying the characteristics of the entrepreneurs and their businesses correlated with the experts' judgments on the business plans and pitches

In this section we identify the characteristics of the entrepreneurs and their businesses that are statistically significantly associated with the scores from experts' judgments on the entrepreneurs' business plans and pitches. These characteristics are needed for the calculation of our algorithm-based score, which we will also use for ranking the entrepreneurs. Since we use the identified characteristics to calculate the algorithm-based score, then the calculation of this score and the experts score are based on the same factors, hence they differ only on the ground that the first score is generated from expert judgment while the second score is generated from an algorithm.

To identify these characteristics, we conduct regression analysis of the four expert scores (scores by expert 1, scores by expert 2, average score, and overall experts score), using data from the business plans and the baseline survey. All relevant characteristics available in these data, and particularly characteristics related to the pre-defined selection criteria are considered, which the experts used to assess the plans. The baseline survey makes available a broader range

of characteristics not in the business plans and hence was not directly considered in scoring them. Therefore, our analysis separately uses data from the business plans, from the baseline survey, and from both as combined. We split the sample randomly into two parts using one-half for identifying the characteristics and the other half for an out-of-sample validation.

Table 5.3: Summary of entrepreneur and business characteristics determining the expert scores

Predictor	(1)	(2)	(3)	(4)	(5)
	OLS	Pooled OLS	Ordered logit	Lasso	Data source: business plan or baseline survey
Agriculture (=1)	Ref.	Ref.	Ref.	Ref.	Both
Industry (=1)	+	+	+	+	Both
Services (=1)	+	+	+	+	Both
# permanent jobs	+	+	+	+	Both
# temporary jobs	+	+	+	+	Both
Material investments (amount)	+	+	+	+	Business plan
Immaterial investments (amount)	-		-		Business plan
Total revenues (last six months)			+	+	Baseline survey
Total profits (last six months)			+		Baseline survey
Own a bank account (=1)	+	+	+	+	Both
Got credit (=1)			+		Both
Book-keeping (=1)			+		Baseline survey
Formalized (=1)	+	+	+	+	Both
Business practices and innovations*				+	Baseline survey
Member of a business association (=1)	+	+	+		Baseline survey
No schooling (=1)	Ref.	Ref.	Ref.	Ref.	Both
Primary school (=1)			+		Both
Secondary school (=1)	+	+	+	+	Both
Male entrepreneur (=1)		+	+		Both
Age	+		+		Both
# years of experience	-	-	-		Baseline survey

Notes: Table 5.3 shows variables that are significant predictors of the four expert scores, i.e. scores by expert 1, scores by expert 2, average scores, and overall experts score. These variables have shown statistically significant at the 1%, 5%, or 10% for at least one of the four scores. The regressions were conducted using characteristics drawn from the business plans or the baseline survey, though some variables are available in both sources. All regressions included fixed effects for the experts who calculated the scores. Heterogeneity-robust standard errors were calculated and clustered at the expert level where appropriate. Pooled OLS (col. (2)) indicates that the business plan scores calculated by expert 1 and expert 2 were pooled together before the OLS estimation. For all other regressions (cols. (1), (3), and (4)) either the scores by experts 1, experts 2, average scores, or overall experts scores were used. * indicates an index calculated as the first component of a principal component analysis (PCA) on 31 variables describing business practices and innovations by entrepreneurs. (=1) indicates a dummy variable. (+) or (-) indicates a positive or a negative correlation of the characteristic with the score used as the dependent variable.

Source: Own representation.

We find that the experts gave higher scores to entrepreneurs in the industry and services sectors more than to those in the agricultural sector. Similarly, they gave higher scores to entrepreneurs with a higher number of temporary or permanent employees, those with larger

amounts of physical capital investments, higher turnover and profits recorded over the six months preceding the baseline survey, those owning a bank account, having an experience with bank credit, entrepreneurs that practice book-keeping, have formalized firms, innovate and apply standard business practices, and entrepreneurs in business networks. As compared to entrepreneurs without formal education, those having primary or secondary education got higher scores. Male and older entrepreneurs also got higher scores. We find that the experts gave lower scores to entrepreneurs with larger amounts of capacity building investments as well as those with more years of professional experiences.

In particular, this analysis further supports the idea that the experts followed different heuristics in calculating the scores. Except for the LASSO regressions, we included in all other regressions dummy variables for each of the experts, i.e. expert fixed-effects to account for the heterogeneity relative to differences in scoring among the experts.⁸⁵ We find that these heterogeneity-effects are strongly statistically significant and vary in size (see Tables S.5.8 and S.5.9 in the Supplemental Material). This result suggests that beyond the criteria provided to the experts for scoring the business plans, each expert considered undefined or unobservable factors specific to him or her when assessing the business plans. It might also be that all the experts made different but systematic errors when appreciating the criteria for scoring the business plans. As found above, doing so introduces an expert's subjectivity bias in the business plan scores calculated by the experts. The bias may be reduced by selecting highly qualified experts or by training the selected experts so that they do not introduce unobservable factors in calculating the business plan scores. Yet, how best to select the experts and what training should be provided to reduce the expert's subjectivity bias remain open questions that may be difficult to address in situations where the offer of the desired expertise is rare. Hence, this adds evidence to the relevance of considering an algorithm-based scoring of the business plans.

5.5.3 Comparing entrepreneurs ranking based on the experts-score vs. the algorithm-score

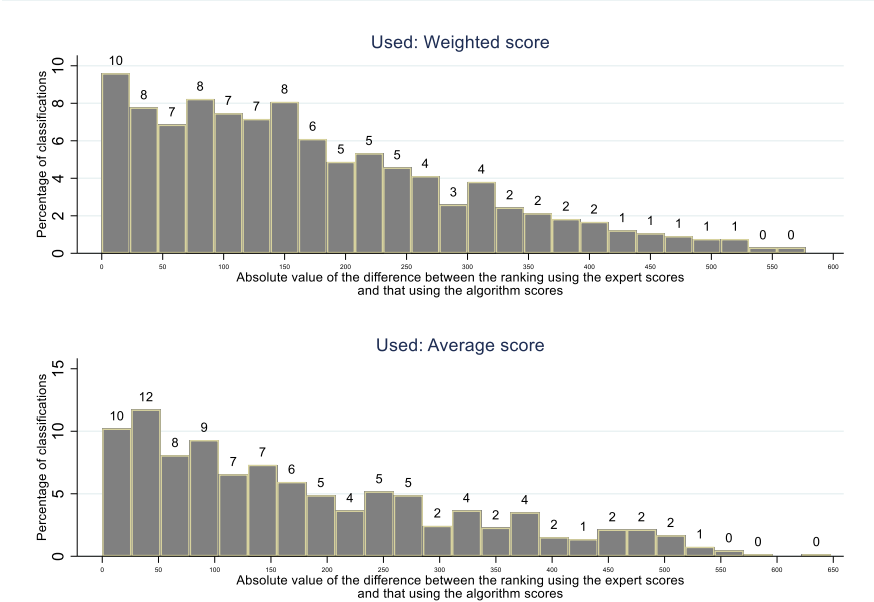
We now turn to assess the extent to which the overall score from experts' judgment and that from the algorithm yield comparable rankings of the entrepreneurs. We compute our algorithm-score by applying a PCA on the identified characteristics of the entrepreneurs and their businesses. These scores are then used to evaluate their performance in targeting entrepreneurs in a competition. The scores are calculated using the part of the sample that was not used for identifying the relevant characteristics. Given that some characteristics have missing values, using them reduces the size of the sample. Therefore, we calculate three different overall PCA scores where for some characteristics missing values have been removed. We show results for the overall PCA score calculated with the larger sample size (PCA score₁₃), and results for the other two overall PCA scores (PCA score₁₆ and PCA score₁₇) are shown in the Supplemental Material.

To check the targeting accuracy of the overall PCA scores, we follow two approaches discussed in Section 4 and detailed in the Appendix. We first show a graph of the absolute value of the magnitude of the gap between a ranking of entrepreneurs based on the experts-score and that based on the PCA-score. Second, considering entrepreneurs' groups delimited using the

⁸⁵ Expert-fixed effects are considered for OLS and ordered-logit regressions, but not for the LASSO.

quartiles of ranks based on the experts-score, we calculate the percentage of entrepreneurs who stay in the same group if they are ranked based on the PCA-score instead (see Figure A.5.1 in the Appendix). Figure 5.2 and Table 5.5 show the results.

We find that the gap between the two rankings is less than 50 places for 18% to 22% of nearly 600 entrepreneurs (see Figure 5.2). The gap is less than 100 places for about 40%, and less than 200 places for 60% to 66% of the same group of entrepreneurs. Hence, if entrepreneurs receive larger support as they rank better, then using the PCA scores instead of the experts' scores would result in a different allocation of support such as cash or matching grants across all entrepreneurs. Yet, this result also suggests that the experts-scores as well as the PCA-scores could be used to select entrepreneurs if the support intended to be provided is not tied to their rank order, which is the case of the studied Burkina's BPC. We obtained qualitatively similar results using the PCA-scores calculated with data from the business plans only (see Figure S.5.5 in the Supplemental Material).



Notes: Characteristics used to calculate the PCA scores are from the business plans and the baseline survey.

Source: Own representation using data from MEBF (2018), and the World Bank (2018).

Figure 5.2: Misclassifications between rankings based on the experts and PCA scores

To elaborate on this result, Table 5.5 shows the percentage of entrepreneurs who preserve their group membership if the PCA-scores are used instead of the experts-scores. Again, the groups were initially delimited based on the ranks of the experts-scores. Consider entrepreneurs in the first quartile (Rank $\leq p25$), i.e. the best ranked, or those below the second quartile (Rank $\leq p50$), or those above the second quartile (Rank $\geq p50$), or those at the bottom of the ranking (Rank $\geq p75$). Whether it is the overall score, the average score, the expert 1 or expert 2's scores that is considered, the group contains 255 to 268 entrepreneurs, or 466 to 478 entrepreneurs, or 459 to 491 entrepreneurs, or 269 to 296 entrepreneurs respectively. Now if the entrepreneurs are ranked based on the PCA-score instead of the experts-score, we find that 23% to 30% of these entrepreneurs stay in the first group, 36% to 42% stay in the second group, 39% to 44%

stay in the third group, and 18% to 23% stay in the fourth group (see also Figure A.5.1 in the Appendix). This result shows that instead of the experts-score, when the PCA-score are used to rank entrepreneurs, the number of entrepreneurs who stay in the groups defined by the quartile of the experts-score ranking increases as the group size enlarges. In addition, best ranked entrepreneurs, i.e. those at the top of the ranking preserve more their group membership than entrepreneurs at the bottom of the ranking. When the same analysis is done using PCA scores calculated using a larger number of characteristics, the results are qualitatively similar (see Tables S.5.10, S.5.11, and S.5.12 in the Supplemental Material).

To summarize, we find that the experts-score and PCA-score lead to quite similar results at the upper end of the rankings and to rather different results at the lower end. In other words, to some extent both methods are adapted to identify the best-ranked entrepreneurs. Hence, if we assume that these best-ranked entrepreneurs are those that are growth-oriented or talented, then the PCA scores agree better with the experts-scores in targeting talented entrepreneurs than the poorly qualified ones. The extent of agreement is larger when fewer relevant entrepreneur and business characteristics are used to calculate the PCA-score. Åstebro and Elhedhli (2006) also find that better prediction is achieved with a relatively small number of predictors used in a model for forecasting the success of young business ventures.

Table 5.4: Classification of entrepreneurs based on the experts-scores and PCA-scores

Group delimited based on the quartile of expert scores	(1)		(2)		(3)		(4)	
	Overall score		Average score		Expert 1 score		Expert 2 score	
	Group size (#)	Matched ranking (%)	Group size (#)	Matched ranking (%)	Group size (#)	Matched ranking (%)	Group size (#)	Matched ranking (%)
Rank \leq p25	255	30	262	26	257	26	268	23
Rank \leq p50	466	42	472	40	473	40	478	36
Rank \geq p50	459	43	469	40	479	44	491	39
Rank \geq p75	269	21	283	18	297	23	296	18
p25	165		160		153		162	
p50	331		327		315		318	
p75	497		492		477		485	

Notes: Table 5.4 shows the performance of the ranking of entrepreneurs based on the PCA-score calculated with 13 characteristics taken from the business plans and the baseline survey. Entrepreneurs were first rank ordered based the experts-scores, i.e. scores by expert 1, scores by expert 2, average scores, and overall scores. For each of these scores, groups were defined based on the first, second, or third quartiles of the experts-scores ranking. Then the quartiles were used to define groups based on the ranking of the entrepreneurs using the PCA-score. Finally, entrepreneurs appearing in the group defined by the experts-scores and the group defined by the PCA-score were identified by matching these groups. For example, in column (1), the ranking based on the PCA-score can identify 30% of entrepreneurs ranked below the first quartile of the ranking based the overall experts score. p25, p50, and p75 indicate the first, second, and third quartiles of the ranking based on the experts-scores.

Source: Own calculations using data from MEBF (2018), and the World Bank (2018).

5.5.4 Performance of the experts-scores vs. the algorithm-scores in predicting business outcomes

We now assess which of the scores obtained by experts' judgment or those by PCA predicts best the performance of the firms at the time of the baseline survey, that is 10 months after

collection of the business plans, and at the time of the midline survey, that is 34 months after collection of the business plans. It is important to remind that for calculating these scores, only characteristics from the business plans were considered, i.e. measured at the very beginning of the competition and before the baseline survey. Hence, our predictors are exogenous to the business outcomes considered. I proceed in two ways whether the outcome is from the baseline or the midline dataset. For predicting outcomes from the baseline dataset, I use two-thirds of the baseline dataset that was not used in identifying the characteristics that enter the calculation of the PCA-scores. For predicting outcomes from the midline dataset, I use the full midline dataset.

Table 5.5: Experts and PCA scores performance in predicting firm's outcomes 34 months after application started

Covariates	<i>Panel A: # hours worked in a normal week over the six months preceding the baseline survey</i>			<i>Panel B: # expected new jobs in three years after the baseline survey</i>		
	(1)	(2)	(3)	(4)	(5)	(6)
Average experts score	2.789* (1.215) [0.198]			0.521*** (0.144) [0.038]		
Overall experts score		4.122** (1.347) [0.075]			0.556*** (0.111) [0.025]	
Overall PCA score_13			6.172* (2.679) [0.02]			1.441** (0.573) [0.001]
Overall PCA score_16			7.116*** (1.565) [0.001]			1.197** (0.388) [0.001]
Overall PCA score_17			7.269*** (1.292) [0.001]			0.999*** (0.291) [0.001]
R-squared	0.038	0.047	0.082	0.050	0.051	0.099
Observations	1047	1047	1034	1102	1102	1087

Notes: Each panel shows the results for one outcome. Each row shows coefficients from one regression not including any control variables. PCA scores_13 is calculated by principal component analysis (PCA) on 13 attributes such as business sector dummies (agriculture, industry, and services), education dummies (no schooling, primary, secondary, and other education levels), dummies for gender and ownership of a financial account, the number of permanent workers, and the amounts of planned investments in physical and human capital. PCA score_16 is calculated on 16 attributes made of the 13 above and three additional attributes which are working capital, formality, and a dummy variable equals one if the entrepreneur ever got a credit from a financial institution. PCA score_17 is calculated on 17 attributes made of the 16 above and one additional attribute which is the number of temporary workers. The average, weighted, and PCA scores as well as the firm performance index are standardized with mean 0 and standard deviation 1. All regressions include municipality fixed effects. Robust standard errors clustered at municipality level in parentheses. Romano-Wolf p-value adjusted for multiple hypothesis testing in brackets. *** significant at the 1% level. ** significant at the 5% level. * significant at the 10% level.

To learn whether the experts-score or the PCA-score better predict the performance of the firms, we regress each outcome on each of these scores. On the other hand, one may think that the two types of scores complement each other so that combining them yield better predictions (see Fafchamps and Woodruff, 2017; McKenzie and Sansone, 2019). We therefore regress each outcome on both types of scores, and show the results in the Supplemental Material.

We do this analysis without including controls for exogenous observable characteristics of the entrepreneurs and their firms because both the experts and PCA scores were calculated by considering the significant characteristics of the entrepreneurs and their businesses as described in the business plans. In addition, to account for the fact that we test the prediction performance of the scores for 17 different outcomes, we calculated Romano-Wolf p-values, which adjust for familywise error rate in a stepdown multiple hypothesis testing. Here we present the results for the four outcomes available in both the baseline and midline datasets. These results are also those obtained using the midline dataset (see Tables 5.5 and 5.6). The results obtained using the baseline dataset and those for the remaining 13 outcomes are presented in Tables A.5.2, A.5.3, and A.5.4, A.5.5, and A.5.6 in the Appendix.

We find that the overall experts and PCA scores show significant positive associations with the number of hours worked in a normal week over the six months preceding the survey. The coefficients on the PCA scores are particularly large and significant at the 1% and 5% levels whether the p-value is adjusted or not for multiple hypothesis testing. The coefficient on the average score is weakly statistically significant whether this outcome is measured at midline or baseline and whether p-value is adjusted or not (see Table 5.6 and Table A.5.2 in the Appendix). Since for each entrepreneur the overall score is calculated based on the average score and the score from the pitch, this result may suggest that the pitches contributed to pick more motivated and proactive entrepreneurs.

The average, overall, and PCA scores all show significant positive associations with the number of new jobs expected in three years after the midline survey (see Table 5.5). The result is the same when the outcome is measured at the baseline survey (see Table A.5.2 in the Appendix). The PCA scores show again larger coefficients significant at the 1% level for the adjusted p-values. The coefficient on the average score becomes less significant or insignificant when the p-value is adjusted for multiple hypothesis testing and whether the outcome is from the midline or baseline survey. This may again suggest that the pitches helped in picking ambitious entrepreneurs with high expectations in creating new jobs.

We find that the overall and PCA scores are significantly associated with higher probability that the entrepreneur introduced at least one innovation over the six months preceding the baseline or the midline survey (see Table 5.6 and Table A.5.3 in the Appendix). The PCA scores also show larger coefficients significant at the 1% level. Concerning the pitches, the evidence here again supports that, they played a role in picking innovation-oriented entrepreneurs.

Looking at the index of firm performance, we find robust evidence that the PCA-scores are significantly positively associated with higher performance than are the experts-scores. The average and overall scores are significant at the 1% level, but the average score becomes less significant or insignificant whether the outcome is from the midline or baseline surveys and when the p-values are adjusted for multiple hypothesis testing (see Table 5.6, and Table A.5.3 in the Appendix).

Table 5.6: Experts and PCA scores performance in predicting firm's outcomes 34 months after application started

Covariates	<i>Panel A: Dummy = 1 if the entrepreneur introduced at least one innovation over the six months preceding the baseline survey</i>			<i>Panel B: Firm performance index</i>		
	(1)	(2)	(3)	(4)	(5)	(6)
Average experts score	0.014 (0.009) [0.213]			0.164*** (0.046) [0.028]		
Overall experts score		0.025** (0.011) [0.172]			0.220*** (0.055) [0.003]	
Overall PCA score_13			0.081*** (0.018) [0.017]			0.422*** (0.058) [0.001]
Overall PCA score_16			0.061*** (0.010) [0.002]			0.392*** (0.046) [0.001]
Overall PCA score_17			0.069*** (0.008) [0.003]			0.373*** (0.042) [0.001]
Pseudo R-squared	0.023	0.025	0.043	0.064	0.081	0.161
Observations	1047	1047	1034	1037	1037	1024

Notes: Each panel shows the results for one outcome. Each row shows coefficients from one regression not including any control variables. PCA scores_13 is calculated by principal component analysis (PCA) on 13 attributes such as business sector dummies (agriculture, industry, and services), education dummies (no schooling, primary, secondary, and other education levels), dummies for gender and ownership of a financial account, the number of permanent workers, and the amounts of planned investments in physical and human capital. PCA score_16 is calculated on 16 attributes made of the 13 above and three additional attributes which are working capital, formality, and a dummy variable equals one if the entrepreneur ever got a credit from a financial institution. PCA score_17 is calculated on 17 attributes made of the 16 above and one additional attribute which is the number of temporary workers. The average, weighted, and PCA scores as well as the firm performance index are standardized with mean 0 and standard deviation 1. All regressions include municipality fixed effects. Robust standard errors clustered at municipality level in parentheses. Romano-Wolf p-value adjusted for multiple hypothesis testing in brackets. *** significant at the 1% level. ** significant at the 5% level. * significant at the 10% level.

Furthermore, we find that the PCA scores are positively associated with the firm's turnover, profit, capital investments, total and wage employees, hours worked in the last week, monthly wage, bookkeeping and business practices index as well as the index and dummy measures of innovations. The coefficients on the PCA scores are significant at the 1% level and become larger in size as the number of firm and entrepreneur attributes used in calculating these scores increases. Yet, the average and overall experts scores are uncorrelated with the firm profit, capital investments, monthly wage, and innovations, but positively associated with the firm turnover, number of total and wage employees, hours worked in the last week, and business practices. The outcomes considered here are from the midline survey only (Tables A.5.4, A.5.5, and A.5.6 in the Appendix).

As already discussed, we repeated the analysis for the four outcomes but now including both the experts and PCA-scores in each of our regressions (see Tables S.5.13a1, S.5.13a2, S.5.13b1, and S.5.13b2 in the Supplemental Material). Doing so, we find that the average and overall

expert scores are weakly associated with the outcomes whether measured at the baseline or the midline survey. Only for the number of expected new jobs and for the firm performance index that the coefficients on the expert scores are significant at the 10% level. In contrast, for all outcomes, i.e. hours worked, number of expected new jobs, innovations, and the performance index, the PCA-scores are positive and significant at the 1% level. In addition, for outcomes from the midline survey only, we find that the expert scores are significantly associated with only the firm's turnover, number of wage employees and hours worked last week, while the PCA scores are significantly predictive of all outcomes, i.e. turnover, profits, capital investments, number of total and wage employees, business practices, and innovations.⁸⁶

To summarize, we find that the expert scores as well as the PCA-scores significantly predict the firms' number of hours worked, the number of total and wage employees, the number of employees expected in three years, turnover, and business practices. Yet, only the PCA scores are predictive of the firms' profits, capital investments, monthly wage, and innovations. In addition, for any of the outcomes considered, the regression coefficients on the PCA scores are larger and mostly statistically significant at the 1% level as compared with the coefficients on the expert scores. Whether multiple hypothesis testing is considered and whether the outcome is from the baseline or the midline survey, the prediction power is higher for the PCA scores. Similarly, when both the expert scores and the PCA scores are included in the same regression, the prediction power remains higher for the PCA scores. Given that the expert judgments were based on the same factors as those used for calculating the PCA scores, the higher prediction power for the PCA scores could be explained by the fact that the PCA algorithm performs better than the human judgment in this setting.

5.6 Conclusion

Many studies find that firm performance is very difficult to predict because most observable factors on firms and entrepreneurs do not explain firm growth. Nevertheless, the literature suggests a range of factors predictive of firm success such as entrepreneur demographic characteristics (age, gender, education level), business sector and prior work experience, personality trait, and cognitive abilities (Grover et al., 2019; McKenzie and Sansone, 2019). Policymakers seeking to screen and select growth-oriented firms can use these success factors to define selection criteria. Yet, this only partially solves the core issue of finding the targeting mechanism which can rely on criteria to process data on firms and entrepreneurs for picking growth-oriented firms among a pool of applicants to a BPC. For such targeting, most competitions rely on expert judgments, but with mixed results due to limitations pertaining to the costs of the procedure, the identification and selection of the experts, and the general issues of heuristics and biases. On the other hand, data on firms are becoming more available and easier to collect using digital tools and the Internet. Hence, algorithms may stand as an alternative or a complementary targeting mechanism (see Logg et al., 2019; Word Bank, 2021). In this paper we shed light on the comparative accuracy of two different targeting mechanisms: expert judgment and an algorithm.

⁸⁶ These results are not shown, but could be accessed on request from the authors.

The context of the paper is a large BPC program in Burkina Faso, which relied on expert judgment to select top-scoring entrepreneurs. Our assessment of this targeting mechanism based on expert judgment on the business plans and the entrepreneurs shows that the resulting screening scores were affected by subjectivity biases. We indeed find inconsistencies between the heuristics on which basis the experts assessed the business plans, the experts' own perceptions of the important criteria that must be used to score the plans, and the predefined weights on criteria used to score the plans.

We then calculated an algorithm metric by applying a PCA on relevant factors of the firms and their owners. We used different econometric estimators to identify the factors which are statistically significantly associated with the screening scores from the expert judgments, which were also based on criteria defined by the program. This procedure ensured that the screening scores from the expert judgment and the scores from the algorithm are based on the same firm and owner factors. Hence the scores differed only on the ground that one is generated from expert judgment and the other from an algorithm. We compared the accuracy of the two types of screening scores in picking growth-oriented entrepreneurs and predicting the performance of the selected firms. We find that both the scores from the expert judgment and those from the algorithm pick relatively the same talented entrepreneurs, but for predicting firm growth the accuracy is higher for the algorithm as compared to the expert judgment. Even when the expert and algorithm scores are used jointly, the prediction power is higher for the algorithm scores.

Despite the statistical superiority of the algorithm, expert judgment e.g. through pitches of applicant entrepreneurs may be useful in some contexts for addressing issues related to risks of misuse of public funds or free-riding behavior. Therefore, our results suggest that targeting of growth-oriented entrepreneurs could be made more precise and efficient by a reasoned combination of expert judgment and the use of an algorithm. Moreover, the accuracy of such a mixed approach might improve if selected firms are carefully monitored/mentored in the post-selection stage in order to maximize the cost-effectiveness of the public subsidies.

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Appendix

A. Summary statistics

Table A.5.1: Summary statistics on expert and algorithm scores and firm outcomes

	Obs.	Mean	Std. Dev.	Min.	Max.
<i>Factors used to calculate the algorithm scores</i>					
Male (=1)	1200	0.59	0.49	0	1
Age	1200	42.66	11.34	20	78
No schooling (=1)	1200	0.34	0.47	0	1
Primary school (=1)	1200	0.24	0.42	0	1
Secondary school (=1)	1200	0.21	0.41	0	1
Other school (=1)	1200	0.21	0.41	0	1
Agriculture (=1)	1200	0.63	0.48	0	1
Industry (=1)	1200	0.18	0.39	0	1
Services (=1)	1200	0.19	0.39	0	1
Formal business (=1)	1169	0.05	0.23	0	1
Own a bank account (=1)	1200	0.64	0.48	0	1
Got a credit (=1)	1166	0.20	0.40	0	1
Working capital amount (Mios XOF)	1195	0.89	0.93	0	15.40
Material investments (Mios XOF)	1200	2.34	2.17	0.09	45.62
Immaterial investments (Mios XOF)	1198	0.68	0.44	0.03	6.50
# Permanent jobs	1191	2.82	2.51	0	40
# Temporary jobs	1066	1.99	3.67	0	80
<i>Experts and algorithm scores</i>					
Average experts score	1200	0.04	0.99	-1.57	5.37
Overall experts score	1200	0.08	0.96	-1.40	3.97
Overall PCA score_13	1184	0.03	1.01	-1.82	6.92
Overall PCA score_16	1120	0.03	1.01	-1.70	9.02
Overall PCA score_17	997	0	1	-1.48	16.93
<i>Outcomes</i>					
# hours worked in a normal	1047	42.90	29	0	140
# expected new jobs three years after baseline survey	1102	3.64	3.70	0	60
Dummy = 1 if the entrepreneur introduced at least one innovation over the last six months	1047	0.23	0.42	0	1
Firm performance index	1037	0	1	-1.55	6.89
Turnover over the last six months (IHS)	1033	0.79	0.81	0	6.74
Profit over the last six months (trimmed at 99th percentile)	1029	0.22	0.33	-0.50	2.44
Profit in the best month of sales in 2020 (trimmed at the 99th percentile)	1029	0.24	0.34	0	2.70
Dummy=1 if firm bought physical capital over the last six months	1047	0.26	0.44	0	1
Capital investment over the last six months (IHS)	1037	0.13	0.46	0	4.40
Number of firm total employees	1072	2.16	2.21	0	21
Number of firm wage employees	1047	1.09	1.67	0	20
Number of hours worked in the firm last week	1046	30.94	24.38	0	140
Average of average monthly wage	852	16.41	23.63	0	300

Table A.5.1 continued

	Obs.	Mean	Std. Dev.	Min.	Max.
Keeps a book on sales and purchases (=1)	1047	0.34	0.47	0	1
Index of business practices	868	0	2.06	-2.98	4.87
Index of firm innovations	1014	0	1.74	-0.81	15.92
Introduced at least one of 15 listed innovations (=1)	1044	0.54	0.50	0	1

Notes: Table A.5.1 shows the number of observations, mean, standard deviation (std. Dev.), minimum (min.) and maximum (max.) of the factors used to calculate the algorithm scores, the experts and algorithm scores, and the firm performance outcomes. (=1) indicates a dummy variable.

Source: Own calculations using data from MEBF (2018), and the World Bank (2018, 2020).

B. Regression tables

Table A.5.2: Experts and PCA scores performance in predicting firm's outcomes 10 months after application started

	<i>Panel A: # hours worked in a normal week over the six months preceding the baseline survey</i>			<i>Panel B: # expected new jobs in three years after the baseline survey</i>		
	(1)	(2)	(3)	(4)	(5)	(6)
Covariates						
Average experts score	1.216 (0.848) [0.106]			1.261** (0.489) [0.106]		
Overall experts score		3.994** (1.196) [0.047]			1.013*** (0.202) [0.047]	
Overall PCA score_13			8.596*** (1.055) [0.076]			3.190*** (0.866) [0.076]
Overall PCA score_16			7.061*** (0.775) [0.044]			3.726*** (0.735) [0.044]
Overall PCA score_17			5.067*** (1.145) [0.001]			3.972*** (0.398) [0.001]
R-squared	0.036	0.051	0.092	0.055	0.044	0.098
Observations	555	555	550	434	434	430

Notes: Each panel shows the results for one outcome. Each row shows coefficients from one regression not including any control variables. PCA scores_13 is calculated by principal component analysis (PCA) on 13 attributes such as business sector dummies (agriculture, industry, and services), education dummies (no schooling, primary, secondary, and other education levels), dummies for gender and ownership of a financial account, the number of permanent workers, and the amounts of planned investments in physical and human capital. PCA score_16 is calculated on 16 attributes made of the 13 above and three additional attributes which are working capital, formality, and a dummy variable equals one if the entrepreneur ever got a credit from a financial institution. PCA score_17 is calculated on 17 attributes made of the 16 above and one additional attribute which is the number of temporary workers. The average, weighted, and PCA scores as well as the firm performance index are standardized with mean 0 and standard deviation 1. All regressions include municipality fixed effects. Robust standard errors clustered at municipality level in parentheses. Romano-Wolf p-value adjusted for multiple hypothesis testing in brackets. *** significant at the 1% level. ** significant at the 5% level. * significant at the 10% level.

Table A.5.3: Experts and PCA scores performance in predicting firm's outcomes 10 months after application started

Covariates	<i>Panel A: Dummy = 1 if the entrepreneur introduced at least one innovation over the six months preceding the baseline survey</i>			<i>Panel B: Firm performance index</i>		
	(1)	(2)	(3)	(4)	(5)	(6)
Average experts score	0.091 (0.077) [0.149]			0.169*** (0.048) [0.106]		
Overall experts score		0.253*** (0.084) [0.047]			0.227*** (0.049) [0.001]	
Overall PCA score_13			0.767*** (0.127) [0.076]			0.553*** (0.079) [0.060]
Overall PCA score_16			0.747*** (0.122) [0.044]			0.599*** (0.060) [0.038]
Overall PCA score_17			0.812*** (0.164) [0.001]			0.699*** (0.080) [0.001]
Pseudo R-squared	0.0270	0.0356	0.0842	0.072	0.093	0.246
Observations	555	555	550	383	383	379

Notes: Each panel shows the results for one outcome. Each row shows coefficients from one regression not including any control variables. PCA scores_13 is calculated by principal component analysis (PCA) on 13 attributes such as business sector dummies (agriculture, industry, and services), education dummies (no schooling, primary, secondary, and other education levels), dummies for gender and ownership of a financial account, the number of permanent workers, and the amounts of planned investments in physical and human capital. PCA score_16 is calculated on 16 attributes made of the 13 above and three additional attributes which are working capital, formality, and a dummy variable equals one if the entrepreneur ever got a credit from a financial institution. PCA score_17 is calculated on 17 attributes made of the 16 above and one additional attribute which is the number of temporary workers. The average, weighted, and PCA scores as well as the firm performance index are standardized with mean 0 and standard deviation 1. All regressions include municipality fixed effects. Robust standard errors clustered at municipality level in parentheses. Romano-Wolf p-value adjusted for multiple hypothesis testing in brackets. *** significant at the 1% level. ** significant at the 5% level. * significant at the 10% level.

Table A.5.4: Experts and PCA scores performance in predicting firm's outcomes 34 months after application started

Outcome	(1) Average experts score	(2) Overall experts score	(3) Overall PCA score_13	(4) Overall PCA score_16	(5) Overall PCA score_17
Turnover over the last six months (IHS)	0.137*** (0.019) [0.022]	0.111*** (0.020) [0.062]	0.186*** (0.043) [0.001]	0.245*** (0.040) [0.001]	0.345*** (0.041) [0.001]
<i>R-squared</i>	<i>0.042</i>	<i>0.032</i>	<i>0.115</i>	<i>0.088</i>	<i>0.058</i>
<i>Observations</i>	<i>1033</i>	<i>1033</i>	<i>866</i>	<i>975</i>	<i>1021</i>
Profit over the last six months (trimmed at the 99th percentile)	0.014 (0.011) [0.198]	0.004 (0.012) [0.568]	-0.026** (0.010) [0.03]	-0.002 (0.008) [0.758]	0.063*** (0.018) [0.02]
<i>R-squared</i>	<i>0.016</i>	<i>0.014</i>	<i>0.037</i>	<i>0.015</i>	<i>0.020</i>
<i>Observations</i>	<i>1029</i>	<i>1029</i>	<i>861</i>	<i>971</i>	<i>1017</i>
Profit in the best month of sales in 2020 (trimmed at the 99th percentile)	0.019** (0.008) [0.198]	0.008 (0.008) [0.361]	-0.012* (0.006) [0.699]	0.014* (0.007) [0.028]	0.085*** (0.021) [0.005]
<i>R-squared</i>	<i>0.023</i>	<i>0.020</i>	<i>0.054</i>	<i>0.021</i>	<i>0.021</i>
<i>Observations</i>	<i>1029</i>	<i>1029</i>	<i>860</i>	<i>970</i>	<i>1016</i>
Dummy=1 if firm bought physical capital over the last six months	-0.000 (0.009) [0.951]	0.008 (0.008) [0.568]	0.061*** (0.010) [0.004]	0.057*** (0.010) [0.007]	0.043* (0.019) [0.093]
<i>R-squared</i>	<i>0.017</i>	<i>0.017</i>	<i>0.028</i>	<i>0.034</i>	<i>0.034</i>
<i>Observations</i>	<i>1047</i>	<i>1047</i>	<i>877</i>	<i>987</i>	<i>1034</i>
Capital investment over the last six months (IHS)	0.007 (0.014) [0.561]	0.010 (0.012) [0.544]	0.037** (0.014) [0.013]	0.044** (0.013) [0.007]	0.059** (0.023) [0.02]
<i>R-squared</i>	<i>0.006</i>	<i>0.006</i>	<i>0.022</i>	<i>0.019</i>	<i>0.014</i>
<i>Observations</i>	<i>1047</i>	<i>1047</i>	<i>877</i>	<i>987</i>	<i>1034</i>

Notes: Each of the four outcomes – turnover (IHS), profit (trimmed at the 99th percentile), dummy=1 if firm bought physical capital, and capital investment over the last six months, and profit in the best month of sales in 2020 – is regressed on each of the five experts or PCA scores in cols. 1, 2, 3, 4, and 5 in turn by ordinary least squares and not including any control variables. For each outcome, the regression R-squared and the number of observations are shown in italics. PCA scores_13 is calculated by principal component analysis (PCA) on 13 attributes such as business sector dummies (agriculture, industry, and services), education dummies (no schooling, primary, secondary, and other education levels), dummies for gender and ownership of a financial account, the number of permanent workers, and the amounts of planned investments in physical and human capital. PCA score_16 is calculated on 16 attributes made of the 13 above and three additional attributes which are working capital, formality, and a dummy variable equals one if the entrepreneur ever got a credit from a financial institution. PCA score_17 is calculated on 17 attributes made of the 16 above and one additional attribute which is the number of temporary workers. The average, weighted, and PCA scores are standardized with mean 0 and standard deviation 1. All regressions include municipality fixed effects. Robust standard errors clustered at municipality level in parentheses. Romano-Wolf p-value adjusted for multiple hypothesis testing in brackets. *** significant at the 1% level. ** significant at the 5% level. * significant at the 10% level.

Table A.5.5: Experts and PCA scores performance in predicting firm's outcomes 34 months after application started

Outcome	(1) Average experts score	(2) Overall experts score	(3) Overall PCA score_13	(4) Overall PCA score_16	(5) Overall PCA score_17
Number of firm total employees	0.188 (0.103) [0.198]	0.250** (0.099) [0.126]	0.385** (0.138) [0.003]	0.509*** (0.149) [0.001]	0.719*** (0.186) [0.001]
<i>R-squared</i>	<i>0.031</i>	<i>0.035</i>	<i>0.081</i>	<i>0.066</i>	<i>0.050</i>
<i>Observations</i>	<i>1072</i>	<i>1072</i>	<i>899</i>	<i>1011</i>	<i>1059</i>
Number of firm wage employees	0.292*** (0.069) [0.028]	0.268*** (0.065) [0.052]	0.387*** (0.081) [0.001]	0.486*** (0.093) [0.001]	0.611*** (0.131) [0.001]
<i>R-squared</i>	<i>0.071</i>	<i>0.065</i>	<i>0.120</i>	<i>0.112</i>	<i>0.091</i>
<i>Observations</i>	<i>1047</i>	<i>1047</i>	<i>877</i>	<i>987</i>	<i>1034</i>
Number of hours worked in the firm last week	3.177*** (0.840) [0.053]	4.455*** (0.666) [0.013]	7.053*** (0.827) [0.001]	6.820*** (1.039) [0.001]	5.812*** (1.327) [0.007]
<i>R-squared</i>	<i>0.032</i>	<i>0.046</i>	<i>0.050</i>	<i>0.080</i>	<i>0.085</i>
<i>Observations</i>	<i>1046</i>	<i>1046</i>	<i>876</i>	<i>986</i>	<i>1033</i>
Average of average monthly wage	1.682 (1.501) [0.198]	1.789 (1.680) [0.172]	2.556* (1.189) [0.013]	3.244** (1.248) [0.007]	5.552*** (1.121) [0.017]
<i>R-squared</i>	<i>0.034</i>	<i>0.034</i>	<i>0.069</i>	<i>0.047</i>	<i>0.045</i>
<i>Observations</i>	<i>852</i>	<i>852</i>	<i>714</i>	<i>801</i>	<i>841</i>

Notes: Each of the four outcomes – number of firm total employees, wage employees, number of hours worked in the firm last week, and the average of average monthly wage – is regressed on each of the five experts or PCA scores in cols. 1, 2, 3, 4, and 5 in turn by ordinary least squares and not including any control variables. For each outcome, the regression R-squared and the number of observations are shown in italics. PCA scores_13 is calculated by principal component analysis (PCA) on 13 attributes such as business sector dummies (agriculture, industry, and services), education dummies (no schooling, primary, secondary, and other education levels), dummies for gender and ownership of a financial account, the number of permanent workers, and the amounts of planned investments in physical and human capital. PCA score_16 is calculated on 16 attributes made of the 13 above and three additional attributes which are working capital, formality, and a dummy variable equals one if the entrepreneur ever got a credit from a financial institution. PCA score_17 is calculated on 17 attributes made of the 16 above and one additional attribute which is the number of temporary workers. The average, weighted, and PCA scores are standardized with mean 0 and standard deviation 1. All regressions include municipality fixed effects. Robust standard errors clustered at municipality level in parentheses. Romano-Wolf p-value adjusted for multiple hypothesis testing in brackets. *** significant at the 1% level. ** significant at the 5% level. * significant at the 10% level.

Table A.5.6: Experts and PCA scores performance in predicting firm's outcomes 34 months after application started

Outcome	(1) Average experts score	(2) Overall experts score	(3) Overall PCA score_13	(4) Overall PCA score_16	(5) Overall PCA score_17
Dummy = 1 if entrepreneur keeps a book on sales and purchases	0.036 (0.027) [0.198]	0.043* (0.021) [0.126]	0.112*** (0.012) [0.001]	0.119*** (0.014) [0.001]	0.151*** (0.024) [0.001]
<i>R-squared</i>	<i>0.053</i>	<i>0.055</i>	<i>0.099</i>	<i>0.096</i>	<i>0.093</i>
<i>Observations</i>	<i>1047</i>	<i>1047</i>	<i>877</i>	<i>987</i>	<i>1034</i>
Index of business practices	0.160* (0.076) [0.198]	0.204** (0.080) [0.114]	0.362*** (0.072) [0.001]	0.385*** (0.085) [0.001]	0.576*** (0.107) [0.001]
<i>R-squared</i>	<i>0.159</i>	<i>0.162</i>	<i>0.180</i>	<i>0.178</i>	<i>0.176</i>
<i>Observations</i>	<i>868</i>	<i>868</i>	<i>725</i>	<i>818</i>	<i>857</i>
Index of firm innovations	0.152 (0.106) [0.198]	0.198 (0.116) [0.126]	0.374*** (0.082) [0.001]	0.388*** (0.081) [0.001]	0.508*** (0.092) [0.003]
<i>R-squared</i>	<i>0.037</i>	<i>0.041</i>	<i>0.076</i>	<i>0.070</i>	<i>0.068</i>
<i>Observations</i>	<i>1014</i>	<i>1014</i>	<i>849</i>	<i>955</i>	<i>1001</i>
Dummy=1 if firm introduced at least one of 15 listed innovations	0.009 (0.015) [0.213]	0.019 (0.011) [0.172]	0.057*** (0.011) [0.003]	0.056*** (0.011) [0.002]	0.085*** (0.011) [0.017]
<i>R-squared</i>	<i>0.043</i>	<i>0.044</i>	<i>0.059</i>	<i>0.053</i>	<i>0.054</i>
<i>Observations</i>	<i>1044</i>	<i>1044</i>	<i>872</i>	<i>981</i>	<i>1030</i>

Notes: Each of the four outcomes – dummy=1 if entrepreneur keeps a book on sales and purchases, index of business practices, index of firm innovations, and dummy=1 if firm introduced at least of 15 listed innovations – is regressed on each of the five experts or PCA scores in cols. 1, 2, 3, 4, and 5 in turn by ordinary least squares and not including any control variables. For each outcome, the regression R-squared and the number of observations are shown in italics. PCA scores_13 is calculated by principal component analysis (PCA) on 13 attributes such as business sector dummies (agriculture, industry, and services), education dummies (no schooling, primary, secondary, and other education levels), dummies for gender and ownership of a financial account, the number of permanent workers, and the amounts of planned investments in physical and human capital. PCA score_16 is calculated on 16 attributes made of the 13 above and three additional attributes which are working capital, formality, and a dummy variable equals one if the entrepreneur ever got a credit from a financial institution. PCA score_17 is calculated on 17 attributes made of the 16 above and one additional attribute which is the number of temporary workers. The average, weighted, and PCA scores are standardized with mean 0 and standard deviation 1. All regressions include municipality fixed effects. Robust standard errors clustered at municipality level in parentheses. Romano-Wolf p-value adjusted for multiple hypothesis testing in brackets. *** significant at the 1% level. ** significant at the 5% level. * significant at the 10% level.

Table A.5.7: Expert characteristics correlated with the business plan scores

Covariates	Average score		Weighted score	
	No controls (1)	With controls (2)	No controls (3)	With controls (4)
Age in 2018	-0.564*** (0.072)	-0.565*** (0.108)	-0.414*** (0.057)	-0.347*** (0.058)
# years of experience	0.136* (0.077)	0.100 (0.123)	0.085 (0.062)	0.056 (0.076)
# times scored business plans	0.465*** (0.132)	0.509** (0.184)	0.380*** (0.114)	0.366*** (0.117)
# times interviewed entrepreneurs	0.135 (0.106)	0.187 (0.146)	0.057 (0.092)	0.183** (0.082)
# times in a selection committee	-1.989*** (0.309)	-2.250*** (0.486)	-1.307*** (0.254)	-1.361*** (0.251)
Trained in entrepreneurship (=1)	-9.327*** (1.827)	-10.903*** (2.882)	-5.798*** (1.510)	-6.301*** (1.565)
Scoring business plans is a little important	Ref.	Ref.	Ref.	Ref.
Scoring business plans is fairly important (=1)	-2.375* (1.299)	-3.049 (1.862)	-2.228** (1.134)	-1.873 (1.184)
Scoring business plans is very important (=1)	1.613** (0.741)	1.834* (0.956)	-1.064 (0.707)	0.450 (0.522)
Financial incentives is needed (=1)	-5.822*** (0.777)	-6.637*** (1.434)	-3.106*** (0.632)	-3.592*** (0.687)
<i>Occupation</i>				
Manager (=1)	Ref.	Ref.	Ref.	Ref.
Counsellor (=1)	1.457* (0.862)	1.784 (1.498)	0.773 (0.733)	0.995 (0.948)
Consultant (=1)	-2.285*** (0.860)	-3.226** (1.449)	-1.648** (0.710)	-2.258*** (0.695)
Auditor (=1)	-5.470*** (1.388)	-6.812*** (2.111)	-2.618** (1.170)	-3.492*** (1.199)
Assistant manager (=1)	-2.190*** (0.653)	-2.783** (1.063)	-1.029* (0.539)	-1.682*** (0.567)
Support staff (=1)	-0.408 (0.483)	-0.265 (0.753)	-1.281*** (0.462)	-0.572 (0.404)
Constant	91.305*** (4.169)	89.824*** (5.731)	83.060*** (3.404)	78.241*** (3.192)
R-squared	0.127	0.285	0.078	0.274
Observations	3,226	2,390	2,760	2,030
Standard error clustered	No	Yes	No	Yes

Notes: Each column corresponds to one regression by ordinary least squares (OLS). The first dependent variable is the average score that is the average of the scores from expert 1 and expert 2. The second dependent variable is the weighted scores. Where indicated, the regression controls for the entrepreneur and firm characteristics namely dummies for the sector of activity, formalization status, gender, ownership of a financial account, experience with bank credit, education, as well as the number of permanent and temporary firm employees, the amount of material and immaterial investments, and the age of the entrepreneur. Where indicated, the standard errors in parentheses are clustered at the level of the experts or are only robust to heterogeneity. *** significant at the 1% level. ** significant at the 5% level. * significant at the 10% level.

C. The method

Step 1	Step 2	Step 3
<p>Introduction to the five scores obtained from judgment made by the experts on the business plans and the pitches of the entrepreneurs</p>	<p>Analysis of the scoring of the business plans by the experts</p>	<p>Identifying the characteristics of entrepreneurs and their businesses statistically significantly associated with the business plan scores</p>
<p><u>The five scores are:</u></p> <ol style="list-style-type: none"> 1. Scores by expert 1; 2. Scores by expert 2; 3. Average score by expert 1 and expert 2; 4. Scores from pitches; 5. Overall experts score 	<p><u>Questions answered are:</u></p> <ul style="list-style-type: none"> - Was it useful to have two different experts score the same business plan? - Did the pitches' scores significantly affect the overall ranking of the entrepreneurs? - Did the experts follow different heuristics by 	<p><u>Questions answered are:</u></p> <ul style="list-style-type: none"> - What are the characteristics of the entrepreneurs that are significantly associated with one or all of the four expert scores? - What are the characteristics of the businesses that are significantly associated with
Step 4	Step 5	Step 6
<p>Calculating the overall PCA score</p>	<p>Comparing the ranking of the entrepreneurs using the overall experts score vs. using the overall PCA score</p>	<p>Comparing the performance of the overall experts score vs. the overall PCA score in predicting the performance of firms 10 & 34 months after application</p>
<p><u>Overall PCA score:</u></p> <p>This score is calculated by applying a principal component analysis (PCA) on characteristics of the entrepreneurs and their businesses identified in Step 3.</p>	<p><u>Questions answered are:</u></p> <ul style="list-style-type: none"> - Given the ranking of the entrepreneurs based on the overall experts score, to what extent these entrepreneurs keep their rank order or stay in predefined groups if they are ranked based on the overall PCA score instead? 	<p><u>Questions answered are:</u></p> <ul style="list-style-type: none"> - Does the overall experts score statistically significantly predict the performance of existing firms? - Does the overall PCA score statistically significantly predict the performance of existing firms?

Source: Authors

Figure A.5.1: The different steps of the research method and questions addressed

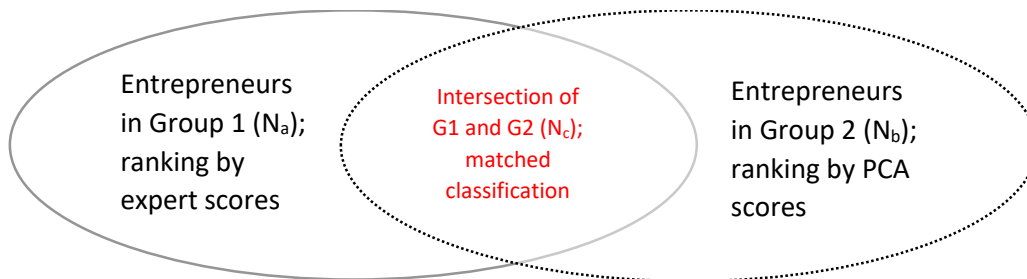
D. Comparing the ranking performance of the experts and PCA scores

Consider entrepreneur i with $i = 1, 2, \dots, E$. E is the total number of entrepreneurs. Write R_i^{Expert} , the rank order of entrepreneur i based on the expert scores; and write R_i^{PCA} , the rank order of entrepreneur i based on the PCA scores. Hence, $Gap(i) = Abs(R_i^{Expert} - R_i^{PCA})$, is the absolute value of the gap between the two rankings. The magnitude of $Gap(i)$ tells whether the ranking of entrepreneur i is matched using the two metrics, i.e. $Gap(i) = 0$, or whether she or he is misclassified $Gap(i) \neq 0$. Figure 5.2 in the main text illustrates the percent density of this gap for the average and weighted scores. PCA scores_13 calculated using 13 characteristics of the entrepreneurs and their businesses is used. The more skewed toward the origin of the axis the density is the less misclassified are the entrepreneurs when PCA scores are used instead.

Now write $p_x^{R^{Expert}}$, the x quartile of the ranking based on the experts' scores; write A^x , the set of entrepreneurs with rankings based on the experts' scores and which ranking is less or equal to the x quartile, i.e. all entrepreneur i so that $R_i^{Expert} \leq p_x^{R^{Expert}}$; write a the number of entrepreneurs in the set A^x ; write B^x , the set of entrepreneurs with rankings based on the PCA scores and which ranking is less or equal to the x quartile, i.e. all entrepreneur j so that $R_j^{PCA} \leq p_x^{R^{Expert}}$.

The intersection between A^x and B^x gives the number of entrepreneurs who stay in the group of entrepreneurs below quartile x of the ranking based on the experts' scores when the entrepreneurs are in a second time ranked based on the PCA scores instead; write this number $c = A^x \cap B^x$. Table 5.5 in the main text as well as similar tables in the Supplemental Material show the percentage calculated as $c/a * 100$. And p_{25} , p_{50} , and p_{75} correspond to the quartiles $p_{25}^{R^{Expert}}$, $p_{50}^{R^{Expert}}$, and $p_{75}^{R^{Expert}}$.

E. Identifying entrepreneurs correctly classified when ranked by the experts and PCA scores



Notes: The procedure is as following: (i) the entrepreneurs are first ranked based on the scores calculated by the experts and in a second time they are ranked based on the scores calculated by PCA; (ii) consider the ranking based on the expert scores and calculate p_{25} the first quartile of this ranking; (iii) the entrepreneurs in group 1 of size N_a are those ranked based on the expert scores and whose ranks are below p_{25} ; (iv) the entrepreneurs in group 2 of size N_b are those ranked based on the PCA scores and whose ranks are below p_{25} ; (v) the entrepreneurs in the intersection of group 1 and group 2, of size N_c , are those who stay in group 1 when they are ranked based on the PCA scores instead. N_c is the number of correctly classified entrepreneurs, and $N_c / N_a * 100$ gives the percentage of entrepreneurs correctly classified as shown in Table 5 in the main text. The same procedure can be repeated by considering p_{50} or p_{75} , respectively the second and third quartiles of the ranking based on the expert scores and by calculating the percentages of entrepreneurs who stay in group 1 when they are ranked based on the PCA scores instead. Source: Own representation.

Figure A.5.2: Comparing the ranking of entrepreneurs based on the experts and PCA scores

F. Detailed regression tables for identifying the significant attributes of the entrepreneurs and their businesses

Table A.5.7: Business and entrepreneur characteristics from the business plans and the baseline survey predicting the *overall experts score*

Attributes	OLS	Ordered logit	Lasso	
	(1)	(2)	(3)	(4)
Industry (=1)	3.558*** (0.907)	1.428*** (0.405)	3.746	3.626
Services (=1)	4.922*** (1.288)	1.969*** (0.555)	4.643	4.450
# permanent jobs	-0.018 (0.180)	0.010 (0.078)		
# temporary jobs	0.277 (0.216)	0.125 (0.119)		
Total revenues (last six months)	0.061 (0.130)	0.009 (0.061)	0.126	0.132
Total profits (last six months)	-0.057 (0.226)	0.031 (0.104)		
Total production costs (last cycle)	-0.020 (0.220)	-0.009 (0.147)		
Material investments ^(a)	0.284* (0.139)	0.106 (0.071)	0.276	
Immaterial investments ^(a)	-0.484 (0.570)	-0.253 (0.277)		
Working capital ^(a)	0.095 (0.140)	0.052 (0.052)		
Formalized (=1)	3.415* (1.668)	1.259 (0.811)	3.683	4.055
Book-keeping (=1)	0.784 (0.479)	0.330* (0.173)		
Trained in business management (=1)	0.486 (0.813)	0.077 (0.290)		
Member of a business association (=1)	0.799 (0.680)	0.226 (0.273)		
Own a bank account (=1)	1.475** (0.463)	0.508*** (0.192)	1.707	1.716
Got credit (=1)	0.065 (0.422)	0.063 (0.183)		
# years of experience	-0.035 (0.024)	-0.011 (0.010)		
Primary school (=1)	0.530 (0.573)	0.352 (0.244)		
Secondary school (=1)	1.262 (0.946)	0.554 (0.444)	1.244	1.362
Other school level (=1)	0.080 (0.638)	0.021 (0.257)		

Table A.5.7 *continued*

Attributes	OLS	Ordered logit	Lasso	
	(1)	(2)	(3)	(4)
Age	0.036 (0.030)	0.015 (0.014)		
Business practices and innovations index	0.074 (0.205)	0.019 (0.086)		0.149
Grit: personality and entrepreneurial index	0.037 (0.068)	0.006 (0.031)		
Male entrepreneur (=1)	0.090 (0.638)	-0.037 (0.264)		
Constant	53.870*** (2.189)		56.751	57.369
R-squared	0.351	0.039		
Observations	318	318	835	835
Expert-score-clusters	10	10		

Notes: Table A.5.1 shows OLS, ordered logit, and LASSO regressions of the overall experts score on attributes of the entrepreneurs and their businesses as in their business plans and as collected at the baseline survey. Col. (3) show attributes selected by the OLS of the standard LASSO, while col. (4) show the attributes selected by rigorous LASSO. Except for the LASSO regressions, all other regressions include expert fixed-effects. Robust standard errors clustered at experts level in parentheses*** significant at the 1% level. ** significant at the 5% level. * significant at the 10% level.

Table A.5.8: Business and entrepreneur characteristics from the business plans and the baseline survey predicting the average experts score from the experts

Attributes	OLS	Ordered logit	Lasso	
	(1)	(2)	(3)	(4)
Industry (=1)	3.115** (1.309)	0.941** (0.427)	2.749	4.165
Services (=1)	5.034*** (1.107)	1.740*** (0.357)	4.259	
# permanent jobs	0.086 (0.190)	0.038 (0.057)		
# temporary jobs	0.569* (0.271)	0.193** (0.084)	0.460	0.718
Total revenues (last six months)	0.126 (0.230)	0.052 (0.076)	0.151	
Total profits (last six months)	-0.319 (0.486)	-0.067 (0.131)		
Total production costs (last cycle)	-0.255 (0.489)	0.003 (0.125)		
Material investments ^(a)	0.473* (0.245)	0.148* (0.086)	0.443	0.544
Immaterial investments ^(a)	-0.890 (0.984)	-0.478* (0.251)		
Working capital ^(a)	0.009 (0.252)	-0.023 (0.057)		
Formalized (=1)	3.434* (1.783)	1.440** (0.692)	3.728	

Table A.5.8 *continued...*

Attributes	OLS	Ordered logit	Lasso	
	(1)	(2)	(3)	(4)
Book-keeping (=1)	0.951 (0.664)	0.373* (0.210)		
Trained in business management (=1)	1.632 (1.324)	0.418 (0.429)		
Member of a business association (=1)	1.269 (0.855)	0.244 (0.262)		
Own a bank account (=1)	0.741 (0.486)	0.144 (0.221)		
Got credit (=1)	-0.346 (0.846)	0.051 (0.263)		
# years of experience	-0.064 (0.039)	-0.017 (0.011)		
Primary school (=1)	0.379 (0.733)	0.282 (0.252)		
Secondary school (=1)	1.219 (1.350)	0.516 (0.447)		
Other school level (=1)	-0.171 (0.508)	-0.002 (0.204)		
Age	0.050 (0.043)	0.020* (0.012)		
Business practices and innovations index	0.069 (0.234)	0.008 (0.077)	0.259	0.352
Grit: personality and entrepreneurial index	0.103 (0.163)	0.025 (0.059)		
Male entrepreneur (=1)	0.438 (0.849)	0.014 (0.269)		
Constant	52.784*** (2.720)		59.166	59.571
R-squared	0.317	0.044		
Observations	318	318	835	835
Expert-score-clusters	10	10		

Notes: Table A.5.2 shows OLS, ordered logit, and LASSO regressions of the average experts score on attributes of the entrepreneurs and their businesses as in their business plans and as collected at the baseline survey. Col. (3) show attributes selected by the OLS of the standard LASSO, while col. (4) show the attributes selected by rigorous LASSO. Except for the LASSO regressions, all other regressions include expert fixed-effects. Robust standard errors clustered at experts level in parentheses*** significant at the 1% level. ** significant at the 5% level. * significant at the 10% level.

Table A.5.9: Business and entrepreneur characteristics from the business plans and the baseline survey predicting the scores given to the entrepreneurs by each of the expert groups

Attributes	Pooled	OLS		Ordered-logit	
	OLS Expert 1&2 (1)	Expert 1 (2)	Expert 2 (3)	Expert 1 (4)	Expert 2 (5)
Industry (=1)	3.113** (1.145)	3.180* (1.542)	3.050 (1.830)	0.891** (0.408)	0.587 (0.418)
Services (=1)	5.025*** (0.884)	5.437*** (1.045)	4.631** (1.506)	1.475*** (0.319)	1.145*** (0.393)
# permanent jobs	0.084 (0.199)	0.148 (0.216)	0.024 (0.320)	0.022 (0.065)	-0.007 (0.080)
# temporary jobs	0.562** (0.251)	0.248 (0.368)	0.890** (0.311)	0.099 (0.117)	0.191*** (0.065)
Total revenues (last six months)	0.124 (0.195)	0.396 (0.327)	-0.144 (0.235)	0.130 (0.080)	-0.016 (0.048)
Total profits (last six months)	-0.314 (0.477)	-0.548 (0.496)	-0.090 (0.851)	-0.076 (0.134)	-0.042 (0.180)
Total production costs (last cycle)	-0.256 (0.368)	-0.542 (0.467)	0.032 (0.515)	-0.109 (0.115)	0.078 (0.150)
Material investments ^(a)	0.475** (0.194)	0.547 (0.348)	0.398 (0.228)	0.092 (0.091)	0.088 (0.057)
Immaterial investments ^(a)	-0.894 (0.760)	-0.687 (0.892)	-1.093 (1.303)	-0.139 (0.280)	-0.392* (0.215)
Working capital ^(a)	0.011 (0.217)	0.209 (0.326)	-0.191 (0.257)	0.000 (0.063)	-0.060 (0.054)
Formalized (=1)	3.451* (1.666)	2.426 (2.093)	4.442 (2.851)	0.724 (0.647)	1.284 (0.815)
Book-keeping (=1)	0.944 (0.639)	0.444 (0.767)	1.458 (0.967)	0.104 (0.188)	0.397* (0.226)
Trained in business management (=1)	1.618 (1.284)	1.417 (1.721)	1.847 (2.038)	0.418 (0.504)	0.363 (0.343)
Member of a business association (=1)	1.275* (0.728)	1.935* (0.885)	0.603 (1.208)	0.404** (0.190)	0.057 (0.254)
Own a bank account (=1)	0.750 (0.670)	0.093 (0.989)	1.389 (0.855)	-0.038 (0.266)	0.269 (0.219)
Got credit (=1)	-0.354 (0.763)	-1.281 (0.923)	0.589 (1.070)	-0.374 (0.239)	0.421* (0.250)
# years of experience	-0.063** (0.030)	-0.072 (0.046)	-0.055 (0.041)	-0.020* (0.012)	-0.010 (0.008)
Primary school (=1)	0.366 (0.785)	0.278 (1.033)	0.481 (1.366)	0.212 (0.307)	0.021 (0.315)
Secondary school (=1)	1.194 (1.150)	1.163 (1.428)	1.275 (2.054)	0.315 (0.385)	0.187 (0.484)
Other school level (=1)	-0.186 (0.840)	1.092 (0.929)	-1.434 (1.012)	0.398 (0.269)	-0.343 (0.240)
Age	0.050 (0.043)	0.116* (0.057)	-0.017 (0.055)	0.030** (0.015)	0.000 (0.012)

Table A.5.9 *continued...*

Attributes	Pooled	OLS		Ordered-logit	
	OLS Expert 1&2	Expert 1	Expert 2	Expert 1	Expert 2
	(1)	(2)	(3)	(4)	(5)
Business practices and innovations index	0.079 (0.178)	0.224 (0.178)	-0.087 (0.338)	0.049 (0.043)	-0.035 (0.078)
Grit: personality and entrepreneurial index	0.078 (0.160)	0.380* (0.202)	-0.173 (0.239)	0.096 (0.062)	-0.047 (0.057)
Male entrepreneur (=1)	0.439 (0.777)	0.284 (1.089)	0.593 (1.168)	0.111 (0.326)	0.083 (0.225)
Constant	53.210*** (2.239)	50.718*** (3.991)	54.849*** (1.917)		
R-squared	0.228	0.272	0.237	0.048	0.027
Observations	636	318	318	318	318
Expert-score-clusters	20	10	10	10	10

Notes: Table A.5.3 shows Pooled OLS, OLS, and ordered-logit regressions of the experts 1 and experts 2'scores on attributes of the entrepreneurs and their businesses as in their business plans and as collected at the baseline survey. All regressions include expert fixed-effects. Robust standard errors clustered at experts level in parentheses. *** significant at the 1% level. ** significant at the 5% level. * significant at the 10% level.

Supplemental Material

A. Qualitative insights on the experts' judgments on the business plans

The experts see the entrepreneurs as largely a homogeneous group. Entrepreneurs in the sample constitute largely a homogenous group with very few disparities. Only 14 (0.87%) entrepreneurs are identified as having unique qualities, i.e. the same aggregated scores (Table S.5.1). For instance, 37 entrepreneurs are in groups of two or three entrepreneurs identified as having comparable qualities, i.e. having the same business plan scores. 408 entrepreneurs are in groups of 10 to 30 entrepreneurs identified as having comparable qualities. 270 entrepreneurs are in groups of more than 110 entrepreneurs identified as having comparable qualities.

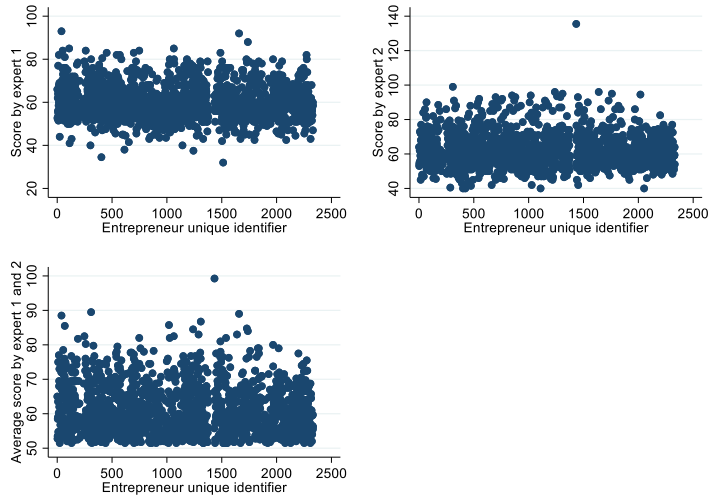
Table S.5.1: Clustering entrepreneurs with comparable quality based on the scores of their business plans

(1)	(2)	(3)	(4)
Group number	# entrepreneurs with equal business plan scores	Expert 1's scores	
		# entrepreneurs in the group	# entrepreneurs in the group
1	1	14	16
2	2 to 3	37	38
3	4 to 5	35	0
4	6 to 7	33	52
5	8 to 9	75	73
6	10 to 29	408	84
7	30 to 49	330	320
8	50 to 69	241	527
9	70 to 109	170	242
10	110 and more	270	261
Sample	-	1,613	1,613

Notes: Column 1 shows the order of the groups each containing entrepreneurs with equal business plan scores. Col. (2) shows the number of equal scores in each group. Group #1 contains entrepreneurs with unique scores while group #2 contains entrepreneurs with 2 to 3 equal scores. Col. (3) and (4) show the number of entrepreneurs in each group based on the scoring of expert 1 and expert 2 respectively.

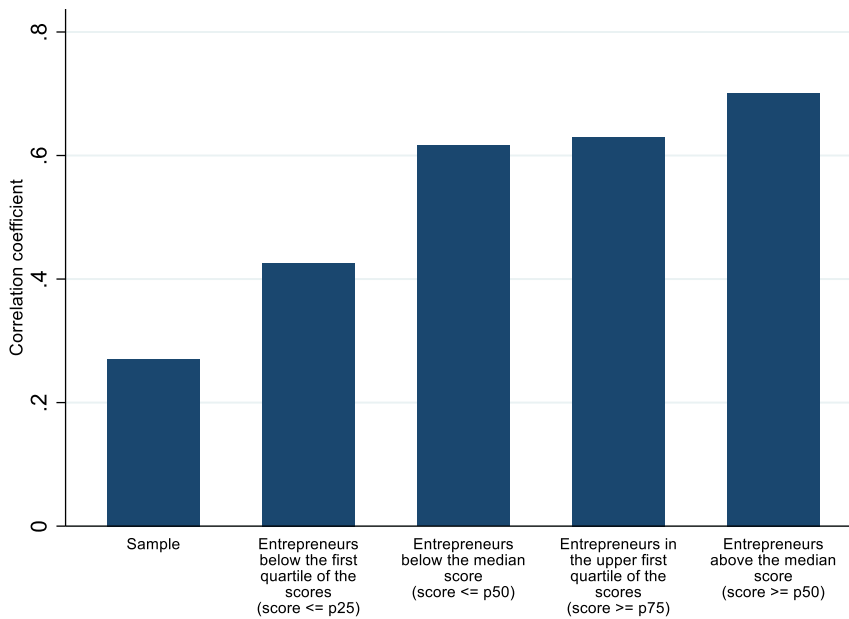
Source: Own calculations using data from MEBF (2018).

When we compare the scoring made on each business plan by the pair of experts, we find that following the scoring by expert 1, the scoring by expert 2 permitted to reclassify 47% of the entrepreneurs into different groups within which the entrepreneurs share comparable qualities. Hence, the cross-validation through the assessment by expert 2 noticeably influenced the final ranking and the selection of the entrepreneurs. Among the 20 experts who scored the business plans, five reported that many of these plans were of poor quality because they contained nearly the same information. Yet, two experts hailed the overall good quality of the business plans. Therefore, the fact that experts attributed comparable qualities to many entrepreneurs is not necessarily due to the quality of the business plans themselves, rather the scores reflect the own judgments of the experts on the business plans. Figure S.5.1 also shows that the experts' scores are mostly confounded and clustered.



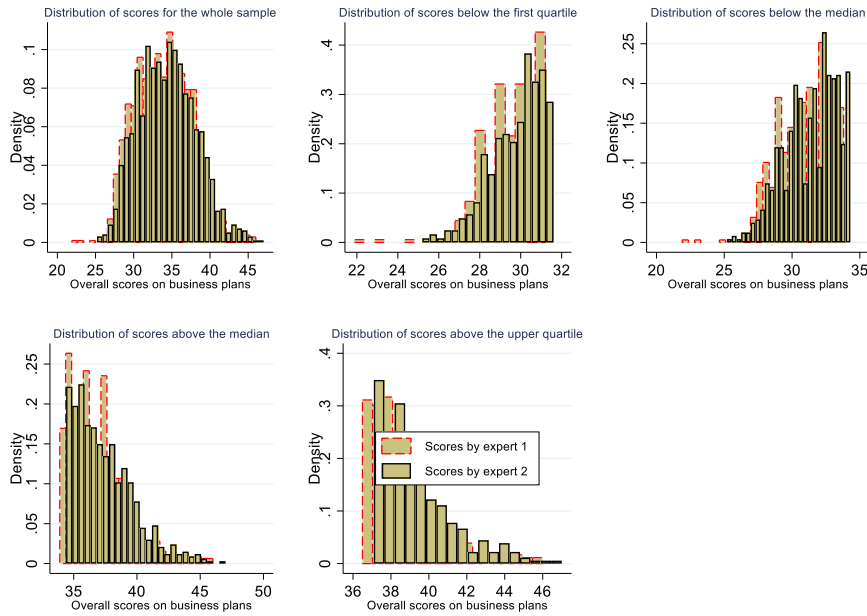
Source: Own representation using data from MEBF (2018).

Figure S.5.1: Business plan scores for the entrepreneurs



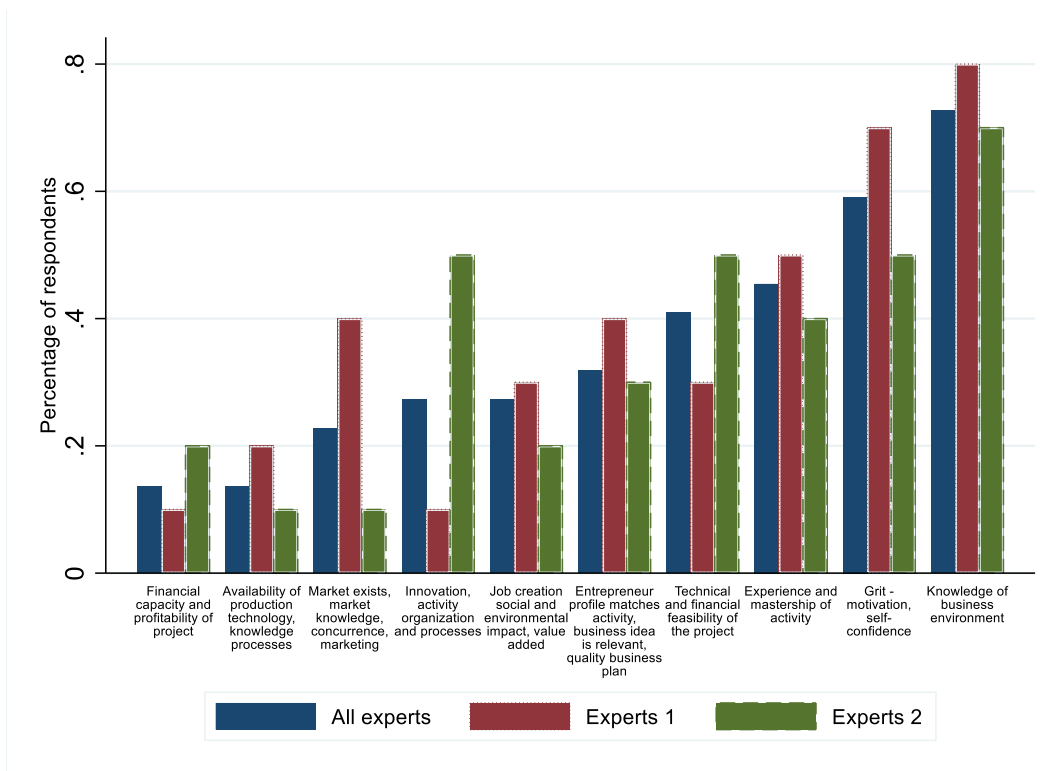
Notes: Figure S.5.2 shows the pairwise coefficient of correlation between the business plan scores from experts 1 and experts 2. The correlation is calculated for different groups, first for all entrepreneurs in the sample, and second for entrepreneurs below or above a percentile threshold based on the experts' scores. Source: Own representation using data from MEBF (2018).

Figure S.5.2: Pairwise correlation between expert 1 and expert 2 scores across different quartiles of these scores



Notes: Figure S.5.3 illustrates the distributions of two weighted scores. The first is calculated by averaging the experts 1’s scores weighted for 60% and the pitches scores weighted for 40%, and the second is calculated by averaging the experts 2’s scores weighted for 60% and the pitches scores weighted for 40%. Each figure shows the distribution for the same percentiles of these weighted score. Source: Own representation using data from MEBF (2018).

Figure S.5.3: Distributions across quartiles of weighted business plan scores



Source: Own representation using data from MEBF (2018).

Figure S.5.4: Most important criteria for scoring business plans according to the experts

B. Characteristics of the entrepreneurs and their businesses associated with the experts' judgments on the business plans and pitches

Table S.5.2: Business plan's entrepreneurs and businesses' characteristics associated with the *weighted scores*

Independent variable	OLS	Ordered logit	Lasso	
	(1)	(2)	(3)	(4)
Industry (=1)	3.696*** (0.500)	1.540*** (0.259)	3.284	3.284
Services (=1)	3.015*** (0.870)	1.253*** (0.340)	3.447	3.447
# permanent jobs	0.172** (0.062)	0.059** (0.027)	0.167	0.167
# temporary jobs	0.031 (0.095)	0.014 (0.035)		
Material investments(a)	0.164 (0.106)	0.047 (0.048)		
Immaterial investments(a)	-0.750** (0.254)	-0.325*** (0.108)		
Formalized (=1)	2.825*** (0.593)	1.077*** (0.171)	2.417	2.417
Own a bank account (=1)	1.551*** (0.376)	0.589*** (0.186)	1.852	1.852
Got credit (=1)	-0.103 (0.508)	0.090 (0.221)		
Primary school (=1)	0.393 (0.298)	0.175 (0.135)		
Secondary school (=1)	1.130 (0.632)	0.354 (0.252)	2.426	2.426
Other school level (=1)	-1.501 (2.055)	-0.542 (1.093)		
Age	-0.008 (0.020)	-0.005 (0.009)		
Male entrepreneur (=1)	0.474 (0.347)	0.242* (0.141)		
Constant	56.386*** (0.869)		58.444	58.444
R-squared	0.329	0.040		
Observations	513	335	764	914
Expert-score-clusters	10	10		

Notes: Table S.5.2 shows OLS, ordered logit, and LASSO regressions of the weighted scores on attributes of the entrepreneurs and their businesses as in the business plans. Col. (3) shows attributes selected by the OLS of the standard LASSO, while col. (4) shows the attributes selected by rigorous LASSO. Except the LASSO regressions, all other regressions include expert fixed-effects. Robust standard errors clustered at expert level in parentheses. *** significant at the 1% level. ** significant at the 5% level. * significant at the 10% level.

Table S.5.3: Baseline survey's entrepreneur and business characteristics associated with the *weighted scores*

VARIABLES	OLS	Ordered-logit	Lasso	
	(1)	(2)	(3)	(4)
Industry (=1)	2.930*** (0.878)	1.171*** (0.369)	3.438	3.407
Services (=1)	4.719*** (1.230)	1.870*** (0.514)	4.525	4.425
# permanent jobs	0.035 (0.185)	0.023 (0.081)		
# temporary jobs	0.389 (0.290)	0.158 (0.149)		
Total revenues (last six months)	0.039 (0.115)	0.002 (0.053)	0.136	0.118
Total profits (last six months)	0.198 (0.175)	0.135** (0.059)		
Total production costs (last cycle)	0.008 (0.240)	0.006 (0.153)		
Formalized (=1)	3.799** (1.401)	1.466** (0.655)	4.358	4.224
Bookkeeping (=1)	0.812 (0.465)	0.343** (0.173)		
Trained in business management (=1)	0.445 (0.753)	0.025 (0.236)		
Member of a business association (=1)	0.615 (0.659)	0.134 (0.257)		
Own a bank account (=1)	1.505** (0.552)	0.511** (0.224)	1.656	1.607
Primary school (=1)	0.584 (0.519)	0.379* (0.226)		
Secondary school (=1)	1.615 (0.950)	0.682 (0.429)	1.472	1.377
Other school level (=1)	0.090 (0.659)	0.010 (0.280)		
# years of experience	-0.033 (0.024)	-0.011 (0.010)		
Age	0.036 (0.028)	0.015 (0.012)		
Business practices and innovations index	0.048 (0.198)	0.007 (0.083)		0.135
Grit: personality and entrepreneurial index	0.052 (0.078)	0.020 (0.034)		
Male entrepreneur (=1)	-0.110 (0.690)	-0.103 (0.281)		

Table S.5.3 *continued.*

VARIABLES	OLS	Ordered-logit	Lasso	
	(1)	(2)	(3)	(4)
Constant	53.983*** (2.167)		57.392	57.503
R-squared	0.334	0.038		
Observations	322	322	862	862
Expert-score-clusters	10	10		

Notes: Table S.5.3 shows OLS, ordered logit, and LASSO regressions of the weighted scores on attributes of the entrepreneurs and their businesses as collected at the baseline survey. Col. (3) show attributes selected by the OLS of the standard LASSO, while col. (4) show the attributes selected by rigorous LASSO. Except the LASSO regressions, all other regressions include expert fixed-effects. Robust standard errors clustered at expert level in parentheses*** significant at the 1% level. ** significant at the 5% level. * significant at the 10% level.

Table S.5.4: Business plans' entrepreneur and business characteristics associated with the *average scores*

Independent variable	OLS	Ordered logit	Lasso	
	(1)	(2)	(3)	(4)
Industry (=1)	4.817*** (0.655)	1.551*** (0.223)	4.131	4.131
Services (=1)	3.561*** (0.999)	1.196*** (0.265)	3.593	3.593
# permanent jobs	0.183* (0.092)	0.061** (0.025)		
# temporary jobs	0.053 (0.077)	0.018 (0.022)		
Material investments(a)	0.153 (0.125)	0.052 (0.049)		
Immaterial investments(a)	-0.798 (0.734)	-0.384* (0.214)		
Formalized (=1)	4.533*** (0.961)	1.287*** (0.260)	4.023	4.023
Own a bank account (=1)	1.341** (0.582)	0.421** (0.200)	2.079	2.079
Got credit (=1)	-0.342 (0.926)	-0.041 (0.269)		
Primary school (=1)	0.250 (0.535)	0.116 (0.183)		
Secondary school (=1)	1.391** (0.539)	0.505*** (0.168)	2.784	2.784
Other school level (=1)	-0.432 (1.699)	-0.214 (0.533)		
Age	0.017 (0.019)	0.006 (0.007)		
Male entrepreneur (=1)	1.021 (0.605)	0.316* (0.167)		

Table S.5.4 *continued.*

Independent variable	OLS	Ordered logit	Lasso	
	(1)	(2)	(3)	(4)
Constant	53.624*** (1.036)		59.289	59.289
R-squared	0.336	0.060		
Observations	596	382	764	764
Expert-score-clusters	10	10		

Notes: Table S.5.4 shows OLS, ordered logit, and LASSO regressions of the weighted scores on attributes of the entrepreneurs and their businesses as in the business plans. Col. (3) show attributes selected by the OLS of the standard LASSO, while col. (4) show the attributes selected by rigorous LASSO. Except the LASSO regressions, all other regressions include expert fixed-effects. Robust standard errors clustered at experts level in parentheses*** significant at the 1% level. ** significant at the 5% level. * significant at the 10% level.

Table S.5.5: Baseline survey's entrepreneur and business characteristics associated with the *average scores*

VARIABLES	OLS	Ordered-logit	Lasso	
	(1)	(2)	(3)	(4)
Industry (=1)	2.615* (1.305)	0.725* (0.432)	2.435	4.248
Services (=1)	4.968*** (1.181)	1.649*** (0.363)	4.096	
# permanent jobs	0.162 (0.185)	0.055 (0.054)		
# temporary jobs	0.728* (0.373)	0.215** (0.104)	0.648	0.882
Total revenues (last six months)	0.092 (0.195)	0.049 (0.058)	0.173	
Total profits (last six months)	0.051 (0.461)	0.040 (0.107)		
Total production costs (last cycle)	-0.208 (0.511)	0.021 (0.112)		
Formalized (=1)	3.859** (1.472)	1.589*** (0.513)	4.345	
Book-keeping (=1)	0.968 (0.683)	0.391* (0.216)		
Trained in business management (=1)	1.768 (1.305)	0.497 (0.415)		
Member of a business association (=1)	0.953 (0.722)	0.168 (0.234)		
Own a bank account (=1)	0.968 (0.597)	0.232 (0.211)		
Primary school (=1)	0.597 (0.703)	0.371 (0.248)		
Secondary school (=1)	1.843 (1.365)	0.665 (0.461)	1.872	

Table S.5.5 *continued.*

VARIABLES	OLS	Ordered-logit	Lasso	
	(1)	(2)	(3)	(4)
Other school level (=1)	-0.007 (0.567)	0.026 (0.219)		
# years of experience	-0.058 (0.039)	-0.014 (0.011)		
Age	0.046 (0.038)	0.018 (0.011)		
Business practices and innovations index	0.030 (0.209)	-0.005 (0.069)	0.188	
Grit: personality and entrepreneurial index	0.087 (0.162)	0.018 (0.061)		
Male entrepreneur (=1)	0.246 (0.864)	-0.096 (0.269)		
Constant	52.489*** (2.847)		59.728	60.627
R-squared	0.303	0.042		
Observations	322	322	644	644
Expert-score-clusters	10	10		

Notes: Table S.5.5 shows OLS, ordered logit, and LASSO regressions of the weighted scores on attributes of the entrepreneurs and their businesses as collected at the baseline survey. Col. (3) show attributes selected by the OLS of the standard LASSO, while col. (4) show the attributes selected by rigorous LASSO. Except the LASSO regressions, all other regressions include expert fixed-effects. Robust standard errors clustered at expert level in parentheses*** significant at the 1% level. ** significant at the 5% level. * significant at the 10% level.

Table S.5.6: Business plans' entrepreneur and business characteristics associated with the expert' scores

Independent variable	Pooled OLS	OLS		Ordered logit	
	Experts 1&2	Expert 1	Expert 2	Expert 1	Expert 2
	(1)	(2)	(3)	(4)	(5)
Industry (=1)	4.817*** (0.671)	4.990*** (0.657)	4.644*** (1.192)	1.363*** (0.142)	1.017*** (0.254)
Services (=1)	3.561*** (1.192)	4.169** (1.727)	2.953 (1.757)	1.102** (0.434)	0.797** (0.354)
# permanent jobs	0.183* (0.091)	0.166 (0.161)	0.199* (0.091)	0.030 (0.040)	0.049*** (0.018)
# temporary jobs	0.053 (0.126)	-0.095 (0.151)	0.201 (0.203)	-0.019 (0.041)	0.038 (0.036)
Material investments(a)	0.153 (0.138)	0.266 (0.240)	0.041 (0.160)	0.045 (0.050)	0.009 (0.039)
Immaterial investments(a)	-0.798 (0.626)	-0.499 (0.930)	-1.098 (0.961)	-0.102 (0.259)	-0.313* (0.164)
Formalized (=1)	4.533*** (1.050)	4.972*** (1.443)	4.093** (1.499)	1.212*** (0.316)	1.034*** (0.320)
Own a bank account (=1)	1.341** (0.553)	1.172* (0.625)	1.510 (0.923)	0.253 (0.188)	0.336 (0.220)
Got credit (=1)	-0.342 (0.792)	0.339 (0.950)	-1.022 (1.215)	0.094 (0.265)	-0.121 (0.241)

Table S.5.6 *continued.*

Independent variable	Pooled OLS	OLS		Ordered logit	
	Experts 1&2	Expert 1	Expert 2	Expert 1	Expert 2
	(1)	(2)	(3)	(4)	(5)
Primary school (=1)	0.250 (0.452)	0.234 (0.610)	0.266 (0.690)	0.078 (0.158)	-0.005 (0.150)
Secondary school (=1)	1.391*** (0.456)	1.490* (0.674)	1.293* (0.659)	0.458*** (0.177)	0.290 (0.186)
Other school level (=1)	-0.432 (1.790)	-1.605 (2.080)	0.740 (2.800)	-0.454 (0.498)	-0.031 (0.601)
Age	0.017 (0.023)	0.039 (0.033)	-0.005 (0.033)	0.010 (0.007)	0.001 (0.007)
Male entrepreneur (=1)	1.021* (0.496)	0.802 (0.706)	1.241 (0.744)	0.251 (0.190)	0.291* (0.152)
Constant	53.060*** (1.134)	51.890*** (1.532)	55.358*** (1.630)		
R-squared	0.265	0.245	0.273	0.030	0.052
Observations	1192	596	596	382	382
Expert-score-clusters	20	10	10	10	10

Notes: Table S.5.6 shows Pooled OLS, OLS, and ordered-logit regressions of the experts 1 and experts 2's scores on attributes of the entrepreneurs and their businesses as in their business plans. All regressions include expert fixed-effects. Robust standard errors clustered at expert level in parentheses. *** significant at the 1% level. ** significant at the 5% level. * significant at the 10% level.

Table S.5.7: Baseline survey's entrepreneur and business characteristics associated with the experts' scores

Independent variables	Pooled OLS	OLS		Ordered logit	
	Experts 1&2	Expert 1	Experts 2	Expert 1	Expert 2
	(3)	(1)	(2)	(4)	(5)
Industry (=1)	2.615** (1.131)	2.294 (1.504)	2.936 (1.782)	0.685* (0.366)	0.585 (0.418)
Services (=1)	4.968*** (0.924)	5.452*** (1.128)	4.485** (1.533)	1.495*** (0.328)	1.052*** (0.354)
# permanent jobs	0.162 (0.187)	0.237 (0.206)	0.087 (0.290)	0.039 (0.057)	0.003 (0.074)
# temporary jobs	0.728** (0.307)	0.482 (0.548)	0.975** (0.370)	0.125 (0.127)	0.198** (0.078)
Total revenues (last six months)	0.092 (0.171)	0.337 (0.293)	-0.153 (0.197)	0.127** (0.064)	-0.011 (0.036)
Total profits (last six months)	0.051 (0.458)	0.014 (0.403)	0.087 (0.822)	0.027 (0.090)	0.002 (0.158)
Total production costs (last cycle)	-0.208 (0.381)	-0.473 (0.520)	0.058 (0.509)	-0.089 (0.114)	0.075 (0.134)
Formalized (=1)	3.859** (1.412)	2.928* (1.431)	4.789 (2.619)	0.911* (0.473)	1.200* (0.695)
Book-keeping (=1)	0.968 (0.626)	0.377 (0.723)	1.559 (0.990)	0.105 (0.184)	0.372* (0.206)
Trained in business management (=1)	1.768 (1.252)	1.375 (1.655)	2.160 (2.014)	0.484 (0.487)	0.409 (0.350)
Member of a business association	0.953	1.352	0.554	0.274	0.057

	(=1)	(0.681)	(0.751)	(1.148)	(0.181)	(0.259)
Table S.5.7 continued.						
Independent variables	Pooled OLS	OLS		Ordered logit		
	Experts 1&2 (3)	Expert 1 (1)	Experts 2 (2)	Expert 1 (4)	Expert 2 (5)	
Member of a business association (=1)	0.953 (0.681)	1.352 (0.751)	0.554 (1.148)	0.274 (0.181)	0.057 (0.259)	
Own a bank account (=1)	0.968 (0.710)	0.192 (1.099)	1.744* (0.833)	-0.078 (0.253)	0.451** (0.200)	
Primary school (=1)	0.597 (0.775)	0.464 (1.091)	0.730 (1.384)	0.276 (0.312)	0.084 (0.326)	
Secondary school (=1)	1.843 (1.153)	2.018 (1.350)	1.667 (2.123)	0.480 (0.359)	0.275 (0.502)	
Other school level (=1)	-0.007 (0.846)	1.418 (1.040)	-1.432 (0.961)	0.461 (0.289)	-0.328 (0.226)	
# years of experience	-0.058* (0.031)	-0.061 (0.049)	-0.055 (0.041)	-0.017 (0.012)	-0.010 (0.007)	
Age	0.046 (0.042)	0.106* (0.055)	-0.013 (0.054)	0.026* (0.014)	0.001 (0.012)	
Business practices and innovations index	0.030 (0.159)	0.156 (0.165)	-0.095 (0.290)	0.035 (0.039)	-0.035 (0.066)	
Grit: personality and entrepreneurial index	0.087 (0.163)	0.410 (0.228)	-0.235 (0.231)	0.098 (0.069)	-0.063 (0.056)	
Male entrepreneur (=1)	0.246 (0.782)	0.079 (1.062)	0.413 (1.155)	0.013 (0.320)	0.000 (0.229)	
R-squared	0.219	0.255	0.228	0.044	0.024	
Observations	322	322	322	322	322	
Expert-score-clusters	20	10	10	10	10	

Notes: Each column shows the results from one regression of business plan scores on characteristics of the entrepreneur and the firm using either an OLS or an Ordered-logit estimator. The dependent variable is the scores calculated by the first expert to score each business plan (col. (1)) or the second expert (col. (2)) or the unweighted average of the two scores or the overall score weighted 60% for the plans and 40% for the scores from pitches of each entrepreneur before a panel of two experts. In parentheses robust standard errors clustered at the level of the pairs of experts. *** significant at the 1% level. ** significant at the 5% level. * significant at the 10% level.

Table S.5.8: Ordered logit regression of business plan scores on entrepreneur and business characteristics

Independent variable	(1)	(2)	(3)	(4)
	Expert 1 score	Expert 2 score	Average score	Weighted score
Industry (=1)	1.363*** (0.142)	1.017*** (0.254)	1.551*** (0.223)	1.540*** (0.259)
Services (=1)	1.102** (0.434)	0.797** (0.354)	1.196*** (0.265)	1.253*** (0.340)
# permanent jobs	0.030 (0.040)	0.049*** (0.018)	0.061** (0.025)	0.059** (0.027)
# temporary jobs	-0.019 (0.041)	0.038 (0.036)	0.018 (0.022)	0.014 (0.035)
Material investments ^(a)	0.045 (0.050)	0.009 (0.039)	0.052 (0.049)	0.047 (0.048)
Immaterial investments ^(a)	-0.102 (0.259)	-0.313* (0.164)	-0.384* (0.214)	-0.325*** (0.108)

Table S.5.8 *continued.*

Independent variable	(1) Expert 1 score	(2) Expert 2 score	(3) Average score	(4) Weighted score
Formalized (=1)	1.212*** (0.316)	1.034*** (0.320)	1.287*** (0.260)	1.077*** (0.171)
Own a bank account (=1)	0.253 (0.188)	0.336 (0.220)	0.421** (0.200)	0.589*** (0.186)
Got credit (=1)	0.094 (0.265)	-0.121 (0.241)	-0.041 (0.269)	0.090 (0.221)
Primary school (=1)	0.078 (0.158)	-0.005 (0.150)	0.116 (0.183)	0.175 (0.135)
Secondary school (=1)	0.458*** (0.177)	0.290 (0.186)	0.505*** (0.168)	0.354 (0.252)
Other school level (=1)	-0.454 (0.498)	-0.031 (0.601)	-0.214 (0.533)	-0.542 (1.093)
Age	0.010 (0.007)	0.001 (0.007)	0.006 (0.007)	-0.005 (0.009)
Male entrepreneur (=1)	0.251 (0.190)	0.291* (0.152)	0.316* (0.167)	0.242* (0.141)
Expert 1	-0.146*** (0.053)	-0.133** (0.067)	-0.306*** (0.082)	0.114 (0.076)
Expert 2	0.705*** (0.170)	0.052 (0.094)	0.215** (0.097)	-0.129 (0.141)
Expert 3	1.620*** (0.157)	0.861*** (0.115)	1.702*** (0.135)	0.780*** (0.058)
Expert 4	2.234*** (0.217)	0.973*** (0.109)	2.121*** (0.173)	1.248*** (0.101)
Expert 5	0.851*** (0.162)	0.669*** (0.125)	1.122*** (0.131)	1.001*** (0.084)
Expert 6	0.638*** (0.093)	0.534*** (0.080)	0.932*** (0.074)	0.009 (0.078)
Expert 7	1.350*** (0.140)	0.648*** (0.104)	1.289*** (0.114)	0.790*** (0.081)
Expert 8	0.925*** (0.106)	2.985*** (0.382)	2.931*** (0.240)	2.024*** (0.172)
Expert 9	0.960*** (0.142)	0.894*** (0.160)	1.302*** (0.170)	1.590*** (0.161)
Observations	596	596	596	513
Expert-score-clusters	10	10	10	10

Notes: Each column shows the results from one ordered logistic regression of business plan scores on characteristics of the entrepreneur and the firm. The dependent variable is the scores calculated by the first expert to score each business plan (col. (1)) or the second expert (col. (2)) or the unweighted average of the two scores or the overall score weighted 60% for the plans and 40% for the scores from pitches of each entrepreneur before a panel of two experts. In parentheses robust standard errors clustered at the level of the pairs of experts. *** significant at the 1% level. ** significant at the 5% level. * significant at the 10% level.

Table S.5.9: OLS regression of business plan scores on entrepreneur and business characteristics

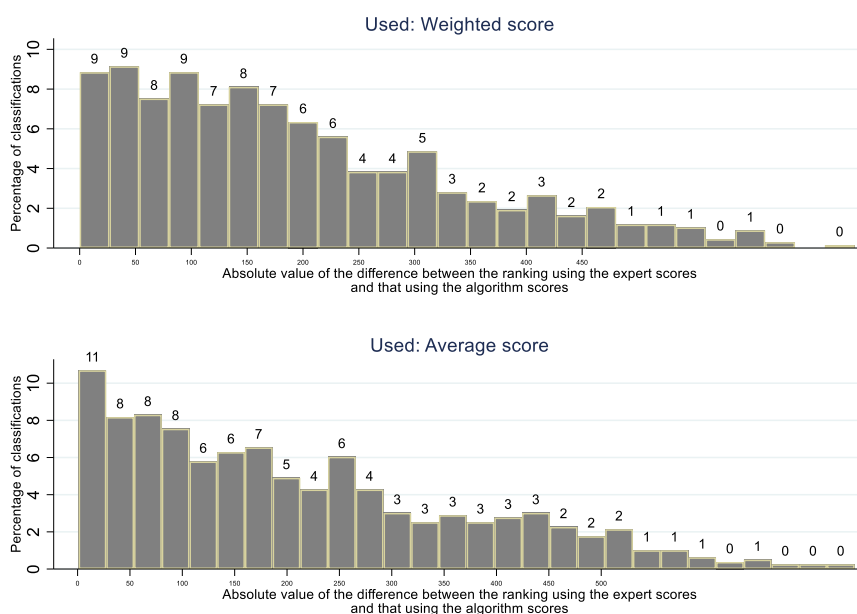
VARIABLES	(1) Expert 1 score	(2) Expert 2 score	(3) Average score	(4) Weighted score
Industry (=1)	4.990*** (0.657)	4.644*** (1.192)	4.817*** (0.655)	3.696*** (0.500)
Services (=1)	4.169** (1.727)	2.953 (1.757)	3.561*** (0.999)	3.015*** (0.870)
# permanent jobs	0.166 (0.161)	0.199* (0.091)	0.183* (0.092)	0.172** (0.062)
# temporary jobs	-0.095 (0.151)	0.201 (0.203)	0.053 (0.077)	0.031 (0.095)
Material investments ^(a)	0.266 (0.240)	0.041 (0.160)	0.153 (0.125)	0.164 (0.106)
Immaterial investments ^(a)	-0.499 (0.930)	-1.098 (0.961)	-0.798 (0.734)	-0.750** (0.254)
Formalized (=1)	4.972*** (1.443)	4.093** (1.499)	4.533*** (0.961)	2.825*** (0.593)
Own a bank account (=1)	1.172* (0.625)	1.510 (0.923)	1.341** (0.582)	1.551*** (0.376)
Got credit (=1)	0.339 (0.950)	-1.022 (1.215)	-0.342 (0.926)	-0.103 (0.508)
Primary school (=1)	0.234 (0.610)	0.266 (0.690)	0.250 (0.535)	0.393 (0.298)
Secondary school (=1)	1.490* (0.674)	1.293* (0.659)	1.391** (0.539)	1.130 (0.632)
Other school level (=1)	-1.605 (2.080)	0.740 (2.800)	-0.432 (1.699)	-1.501 (2.055)
Age	0.039 (0.033)	-0.005 (0.033)	0.017 (0.019)	-0.008 (0.020)
Male entrepreneur (=1)	0.802 (0.706)	1.241 (0.744)	1.021 (0.605)	0.474 (0.347)
Expert 1	-1.173*** (0.247)	0.262 (0.275)	-0.456* (0.212)	0.185 (0.173)
Expert 2	2.032*** (0.397)	-0.730** (0.245)	0.651** (0.279)	0.117 (0.296)
Expert 3	5.714*** (0.263)	4.076*** (0.175)	4.895*** (0.161)	2.021*** (0.175)
Expert 4	7.897*** (0.278)	4.374*** (0.219)	6.135*** (0.182)	2.990*** (0.212)
Expert 5	2.761*** (0.358)	4.503*** (0.353)	3.632*** (0.245)	2.579*** (0.149)
Expert 6	1.573*** (0.254)	2.174*** (0.181)	1.874*** (0.179)	0.171 (0.210)
Expert 7	4.567*** (0.172)	3.637*** (0.159)	4.102*** (0.125)	2.343*** (0.166)
Expert 8	3.962*** (0.187)	14.148*** (0.154)	9.055*** (0.158)	5.159*** (0.226)
Expert 9	3.349*** (0.359)	4.404*** (0.235)	3.877*** (0.268)	3.835*** (0.265)

Table S.5.9 *continued.*

VARIABLES	(1) Expert 1 score	(2) Expert 2 score	(3) Average score	(4) Weighted score
Constant	51.890*** (1.532)	55.358*** (1.630)	53.624*** (1.036)	56.303*** (0.866)
R-squared	0.245	0.273	0.336	0.329
Observations	596	596	596	513
Expert-score-clusters	10	10	10	10

Notes: Each column shows the results from one ordinary least squares (OLS) regression of business plan scores on characteristics of the entrepreneur and the firm. The dependent variable is the scores calculated by the first expert to score each business plan (col. (1)) or the second expert (col. (2)) or the unweighted average of the two scores or the overall score weighted 60% for the plans and 40% for the scores from pitches of each entrepreneur before a panel of two experts. In parentheses robust standard errors clustered at the level of the pairs of experts. *** significant at the 1% level. ** significant at the 5% level. * significant at the 10% level.

C. Comparing entrepreneurs ranking based on the experts' scores vs. the algorithm scores



Notes: The PCA scores are calculated using data only from the business plans.

Figure S.5.5: Misclassification between the rankings based on the experts and PCA scores based on 13 attributes

Table S.5.10: Classification of entrepreneurs based on the experts and PCA scores based on 13 attributes using the plans data

Group by quartile of score	(1)		(2)		(3)		(4)	
	Weighted score		Average score		Expert 1 score		Expert 2 score	
	Group size (#)	Matched ranking (%)	Group size (#)	Matched ranking (%)	Group size (#)	Matched ranking (%)	Group size (#)	Matched ranking (%)
Rank \leq p25	267	29	321	27	298	29	328	24
Rank \leq p50	483	43	562	44	593	43	588	42
Rank \geq p50	564	42	558	45	579	45	580	43
Rank \geq p75	373	23	364	23	352	20	337	19
p25	170		197		183		201	
p50	343		397		384		388	
p75	513		579		592		602	

Notes: Table S.5.10 shows the performance of the ranking of entrepreneurs based on scores calculated by principal component analysis (PCA) on the entrepreneurs and their businesses characteristics taken from the business plans. Entrepreneurs were first rank ordered based on the score determined by the experts, i.e. the scores from the first or second group of experts (expert 1 or expert 2), the average of both, or the score weighted 60% for the average score and 40% for scores from pitches of the entrepreneurs before panels of experts. For each of these scores, groups were defined based on their first, second, or third quartiles. Then the quartiles were used to define groups based on the ranking of the entrepreneurs using the PCA scores. Finally, entrepreneurs appearing in the group defined by the expert score and the group defined by the PCA scores were identified by matching these groups. For example, in column (1), the ranking based on the PCA scores can identify 28% of entrepreneurs ranked below the first quartile of the ranking based on the weighted score, p25, p50, and p75 indicate the first, second, and third quartiles of the ranking based on the expert score.

Table S.5.11: Classification of entrepreneurs based on the experts and PCA scores based on 16 attributes using the plans data

Group bz quartile of score	(1)		(2)		(3)		(4)	
	Weighted score		Average score		Expert 1 score		Expert 2 score	
	Group size (#)	Matched ranking (%)	Group size (#)	Matched ranking (%)	Group size (#)	Matched ranking (%)	Group size (#)	Matched ranking (%)
Rank \leq p25	272	27	318	28	300	28	329	23
Rank \leq p50	493	40	564	43	591	43	588	42
Rank \geq p50	526	37	526	40	546	39	545	38
Rank \geq p75	313	22	313	18	297	16	283	14
p25	170		197		183		201	
p50	343		397		384		388	
p75	513		579		592		602	

Notes: Table S.5.11 shows the performance of the ranking of entrepreneurs based on scores calculated by principal component analysis (PCA) on the entrepreneurs and their businesses characteristics taken from the business plans. Entrepreneurs were first rank ordered based on the score determined by the experts, i.e. the scores from the first or second group of experts (expert 1 or expert 2), the average of both, or the score weighted 60% for the average score and 40% for scores from pitches of the entrepreneurs before panels of experts. For each of these scores, groups were defined based on their first, second, or third quartiles. Then the quartiles were used to define groups based on the ranking of the entrepreneurs using the PCA scores. Finally, entrepreneurs appearing in the group defined by the expert score and the group defined by the PCA scores were identified by matching these groups. For example, in column (1), the ranking based on the PCA scores can identify 28% of entrepreneurs ranked below the first quartile of the ranking based on the weighted score, p25, p50, and p75 indicate the first, second, and third quartiles of the ranking based on the expert score.

Table S.5.12: Classification of entrepreneurs based on the experts and PCA scores based on 17 attributes using the plans data

Group bz quartile of score	(1)		(2)		(3)		(4)	
	Weighted score		Average score		Expert 1 score		Expert 2 score	
	Group size (#)	Matched ranking (%)	Group size (#)	Matched ranking (%)	Group size (#)	Matched ranking (%)	Group size (#)	Matched ranking (%)
Rank \leq p25	275	25	320	27	303	27	328	24
Rank \leq p50	491	41	557	45	589	44	577	45
Rank \geq p50	500	20	496	23	506	26	507	24
Rank \geq p75	243	6	233	6	218	1	205	0
p25	170		197		183		201	
p50	343		397		384		388	
p75	513		579		592		602	

Notes: Table S.5.12 shows the performance of the ranking of entrepreneurs based on scores calculated by principal component analysis (PCA) on the entrepreneurs and their businesses characteristics taken from the business plans. Entrepreneurs were first rank ordered based on the score determined by the experts, i.e. the scores from the first or second group of experts (expert 1 or expert 2), the average of both, or the score weighted 60% for the average score and 40% for scores from pitches of the entrepreneurs before panels of experts. For each of these scores, groups were defined based on their first, second, or third quartiles. Then the quartiles were used to define groups based on the ranking of the entrepreneurs using the PCA scores. Finally, entrepreneurs appearing in the group defined by the expert score and the group defined by the PCA scores were identified by matching these groups. For example, in column (1), the ranking based on the PCA scores can identify 28% of entrepreneurs ranked below the first quartile of the ranking based on the weighted score, p25, p50, and p75 indicate the first, second, and third quartiles of the ranking based on the expert score.

D. Prediction performance of the experts and PCA scores

a. For firm outcomes measured 34 months after application started

Table S.5.13a1: Regression of outcomes on both the experts and PCA scores

Covariates	<i>Panel A: # hours worked in a normal week over the six months preceding the baseline survey</i>						<i>Panel B: # expected new jobs in three years after the baseline survey</i>					
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
Average scores	1.222 (1.054)	1.122 (1.131)	1.909 (1.219)				0.286** (0.119)	0.219 (0.133)	0.167 (0.152)			
Weighted scores				1.672 (1.254)	1.723 (1.388)	2.991 (1.656)				0.132 (0.192)	0.056 (0.242)	0.066 (0.250)
PCA scores_13	6.959*** (1.261)			6.610*** (1.363)			0.927** (0.287)			0.949** (0.346)		
PCA scores_16		6.797*** (1.575)			6.414*** (1.740)			1.135** (0.398)			1.175** (0.470)	
PCA scores_17			5.713* (2.673)			5.172 (2.852)			1.402** (0.586)			1.420* (0.638)
R-squared	0.083	0.083	0.065	0.084	0.084	0.070	0.105	0.130	0.132	0.100	0.127	0.131
Observations	1034	987	877	1034	987	877	1087	1030	918	1087	1030	918

Notes: Each panel shows the results for one outcome. Each column shows coefficients from one regression not including any control variables. PCA scores_13 is calculated by principal component analysis (PCA) on 13 attributes such as business sector dummies (agriculture, industry, and services), education dummies (no schooling, primary, secondary, and other education levels), dummies for gender and ownership of a financial account, the number of permanent workers, and the amounts of planned investments in physical and human capital. PCA score_16 is calculated on 16 attributes made of the 13 above and three additional attributes which are working capital, formality, and a dummy variable equals one if the entrepreneur ever got a credit from a financial institution. PCA score_17 is calculated on 17 attributes made of the 16 above and the number of temporary workers as an addition. The average, weighted, and PCA scores as well as the firm performance index are standardized with mean 0 and standard deviation 1. All regressions include municipality fixed effects. Robust standard errors clustered at municipality level in parentheses. Romano-Wolf p-value adjusted for multiple hypothesis testing in brackets. *** significant at the 1% level. ** significant at the 5% level. * significant at the 10% level.

Table S.5.13a2: Regression of outcomes on both the experts and PCA scores

Covariates	<i>Panel A: Dummy = 1 if the entrepreneur introduced at least one innovation over the six months preceding the baseline survey</i>						<i>Panel B: Firm performance index</i>					
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
Average scores	-0.002 (0.009)	-0.004 (0.010)	-0.006 (0.012)				0.077** (0.033)	0.067* (0.034)	0.077* (0.040)			
Weighted scores				-0.003 (0.010)	-0.001 (0.011)	-0.005 (0.015)				0.077* (0.034)	0.070* (0.037)	0.101* (0.045)
PCA scores_13	0.069*** (0.008)			0.070*** (0.008)			0.354*** (0.036)			0.343*** (0.031)		
PCA scores_16		0.062*** (0.010)			0.062*** (0.011)			0.373*** (0.039)			0.363*** (0.039)	
PCA scores_17			0.082*** (0.018)			0.082*** (0.020)			0.404*** (0.053)			0.388*** (0.055)
R-squared	0.043	0.041	0.048	0.043	0.040	0.048	0.166	0.175	0.151	0.165	0.175	0.154
Observations	1034	987	877	1034	987	877	1024	978	870	1024	978	870

Notes: Each panel shows the results for one outcome. Each column shows coefficients from one regression not including any control variables. PCA scores_13 is calculated by principal component analysis (PCA) on 13 attributes such as business sector dummies (agriculture, industry, and services), education dummies (no schooling, primary, secondary, and other education levels), dummies for gender and ownership of a financial account, the number of permanent workers, and the amounts of planned investments in physical and human capital. PCA score_16 is calculated on 16 attributes made of the 13 above and three additional attributes which are working capital, formality, and a dummy variable equals one if the entrepreneur ever got a credit from a financial institution. PCA score_17 is calculated on 17 attributes made of the 16 above and the number of temporary workers as an addition. The average, weighted, and PCA scores as well as the firm performance index are standardized with mean 0 and standard deviation 1. All regressions include municipality fixed effects. Robust standard errors clustered at municipality level in parentheses. Romano-Wolf p-value adjusted for multiple hypothesis testing in brackets. *** significant at the 1% level. ** significant at the 5% level. * significant at the 10% level.

b. For firm outcomes measured 10 months after application started

Table S.5.13b1: Regression of outcomes on both the experts and PCA scores

	<i>Panel A: # hours worked in a normal week over the six months preceding the baseline survey</i>						<i>Panel B: # expected new jobs in three years after the baseline survey</i>					
Covariates	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
Average scores	-0.644 (0.897)	-0.745 (0.791)	-1.625 (0.943)				0.622** (0.213)	0.463* (0.204)	0.569 (0.336)			
Weighted scores				1.482 (1.401)	2.076 (1.243)	1.236 (1.475)				0.007 (0.131)	-0.067 (0.119)	0.141 (0.212)
PCA scores_13	8.788*** (1.164)			7.930*** (1.344)			3.038*** (0.824)			3.187*** (0.902)		
PCA scores_16		7.305*** (0.882)			6.161*** (1.018)			3.608*** (0.708)			3.747*** (0.749)	
PCA scores_17			5.602*** (1.314)			4.638** (1.480)			3.864*** (0.411)			3.949*** (0.417)
R-squared	0.092	0.069	0.051	0.094	0.073	0.050	0.198	0.243	0.245	0.192	0.240	0.241
Observations	550	528	447	550	528	447	635	596	498	635	596	498

Notes: Each panel shows the results for one outcome. Each column shows coefficients from one regression not including any control variables. PCA scores_13 is calculated by principal component analysis (PCA) on 13 attributes such as business sector dummies (agriculture, industry, and services), education dummies (no schooling, primary, secondary, and other education levels), dummies for gender and ownership of a financial account, the number of permanent workers, and the amounts of planned investments in physical and human capital. PCA score_16 is calculated on 16 attributes made of the 13 above and three additional attributes which are working capital, formality, and a dummy variable equals one if the entrepreneur ever got a credit from a financial institution. PCA score_17 is calculated on 17 attributes made of the 16 above and the number of temporary workers as an addition. The average, weighted, and PCA scores as well as the firm performance index are standardized with mean 0 and standard deviation 1. All regressions include municipality fixed effects. Robust standard errors clustered at municipality level in parentheses. Romano-Wolf p-value adjusted for multiple hypothesis testing in brackets. *** significant at the 1% level. ** significant at the 5% level. * significant at the 10% level.

Table S.5.13b2: Regression of outcomes on both the experts and PCA scores

Covariates	<i>Panel A: Dummy = 1 if the entrepreneur introduced at least one innovation over the six months preceding the baseline survey</i>						<i>Panel B: Firm performance index</i>					
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
Average scores	-0.076 (0.091)	-0.129 (0.088)	-0.120 (0.090)				0.048 (0.037)	0.025 (0.044)	0.021 (0.054)			
Weighted scores				0.029 (0.096)	0.033 (0.097)	0.076 (0.081)				0.055 (0.035)	0.054 (0.040)	0.064 (0.050)
PCA scores_13	0.791*** (0.131)			0.754*** (0.145)			0.538*** (0.075)			0.528*** (0.081)		
PCA scores_16		0.792*** (0.130)			0.732*** (0.138)			0.591*** (0.055)			0.575*** (0.061)	
PCA scores_17			0.855*** (0.165)			0.784*** (0.158)			0.692*** (0.077)			0.676*** (0.084)
R-squared	0.085	0.083	0.067	0.084	0.081	0.066	0.248	0.276	0.243	0.249	0.278	0.245
Observations	550	528	447	550	528	447	548	526	445	548	526	445

Notes: Each panel shows the results for one outcome. Each column shows coefficients from one regression not including any control variables. PCA scores_13 is calculated by principal component analysis (PCA) on 13 attributes such as business sector dummies (agriculture, industry, and services), education dummies (no schooling, primary, secondary, and other education levels), dummies for gender and ownership of a financial account, the number of permanent workers, and the amounts of planned investments in physical and human capital. PCA score_16 is calculated on 16 attributes made of the 13 above and three additional attributes which are working capital, formality, and a dummy variable equals one if the entrepreneur ever got a credit from a financial institution. PCA score_17 is calculated on 17 attributes made of the 16 above and the number of temporary workers as an addition. The average, weighted, and PCA scores as well as the firm performance index are standardized with mean 0 and standard deviation 1. All regressions include municipality fixed effects. Robust standard errors clustered at municipality level in parentheses. Romano-Wolf p-value adjusted for multiple hypothesis testing in brackets. *** significant at the 1% level. ** significant at the 5% level. * significant at the 10% level.

Table S.5.14: Grouping discussion points on identification of growth-oriented entrepreneurs in BPC

Topic	Reference	Point
Characteristics of growth-oriented entrepreneurs	Grimm et al. (2012)	Constrained gazelles characterized by low levels of capital but high marginal return to capital have potential to become high-growth entrepreneurs.
	Olafsen and Cook (2016); Autio et al. (2007)	High-growth entrepreneurs display willingness to take risks, and stand out by their high expectations and ambition.
	Banerjee et al. (2019)	Gung-ho entrepreneurs are example of growth-oriented entrepreneurs. They have access to high return-high fixed cost technology, a larger target business size and are able to make good use of additional credit.
The objective function and constraints of the public agency managing BPC	Amit et al. (1990); Leleux and Surlmont (2003); Cumming and MacIntosh (2006); Standaert Manigart (2018); Abrardi Croce Ughetto (2019); Robalino et al. (2020)	<p>Venture capitalists (VC) determine their investment level, the entrepreneur's activity level (ability), and the entrepreneur's share of the ultimate profits, so to maximize profits of their investments.</p> <p>Public agencies such as governmental venture capitalist seeking to target growth-oriented entrepreneurs also want to select the most profitable investment projects but seek primarily to maximize social return such as job creation, innovations, and economic growth.</p> <p>For investment projects that receive public subsidies, maximizing jobs impacts should be part of the objective function of public agency managing BPCs.</p> <p>The quality of business plans can be used as a signal for the level of ability of the entrepreneur participating in a BPC.</p> <p>Both the public agencies and private venture capitalist face moral hazards and adverse selections problems when seeking to select high-growth entrepreneurs. Public agencies also face governance problems such as political influence and corruption.</p>
Choosing experts to assess business plans and defining assessment criteria	Lerner (2002); Standaert and Manigart (2018); Johansson et al. (2019) ; Robalino et al. (2020)	<p>Governmental venture capitalists (GVCs) investment decision may be based on criteria such as venture market, product and production, finances, and human capital. Yet, GVCs are found to rely on less measurable criteria than private venture capitalist do in taking investment decisions. To maximize jobs impacts of investment projects, BPCs should target projects that demonstrate higher jobs-linked externalities.</p> <p>There is a risk that public experts are less skilled than their private counterparts are in selecting high-growth firms. Best performing experts self-select into the private sector.</p> <p>The selection of expert judges need take into account how acquaintance or proximity between experts can influence the selection of winner entrepreneurs in a BPC. For Lerner (2002) programs where a group of acquainted experts picks winner entrepreneurs, "the dangers of political distortions are likely to be higher."</p>

Topic	Reference	Point
The limits of targeting based on experts' judgments	Shanteau and Stewart (1992); Kahneman and Klein (2000); Zacharakis and Meyer (2000); Åstebro and Elhedhli (2006); Johansson et al. (2019)	<p>Governmental venture capitalists may not follow objective, regulative, and normative logic procedures such as formal guidelines and behavior in targeting high-growth firms rather they may follow cognitions and heuristics.</p> <p>There is little evidence on the efficacy of the decision-making processes of governmental venture capitals.</p> <p>When selection is based on expert judgments, ranking of entrepreneurs may be importantly swayed by whom assesses which business plan.</p> <p>Targeting mechanism based on expert judgments can identify growth-oriented entrepreneurs only by chance.</p>
Targeting based on statistical models	Hammond and Summers (1965); Goldberg (1968); Dawes et al. (1989); Shanteau (1992); Shepherd and Zacharakis (2002); Åstebro and Elhedhli (2006); Hammitt and Zhang (2013)	<p>The public agency may improve targeting using decision mechanisms based on statistical models.</p> <p>Model-based targeting has the advantage of fairness in the sense that conditional on the selected variables, entrepreneurs are compared on the same basis.</p> <p>Yet modeling poses the problem of pre-identification of variables that characterize the entrepreneurs and their business plans, and that can predict future success. Important characteristic variables may be omitted. Yet it was shown that few variables yield better predictions.</p> <p>When model-based targeting is used, data on the identified variables need to be collected, which may be costly if a large survey should be conducted.</p>
Empirical evidence on the performance of alternative targeting mechanisms for BPC	Roure and Keeley (1990); McKenzie (2015); Fafchamps and Wooldruff (2017); Mckenzie and Sansone (2019)	<p>Successful entrepreneurs can be identified using a model based on prediction factors drawn from business plans</p> <p>For a large BPC, McKenzie (2015) finds that neither scores from expert judges nor entrepreneur's characteristics significantly predict firm's growth.</p> <p>Mckenzie and Sansone (2019) find neither machine learning techniques, an ad hoc model using survey data, nor scores from expert judges significantly predict the performance of firms.</p> <p>Mckenzie and Sansone (2019) find that few entrepreneur's characteristics such as gender, age, ability, and business sector have some predictive power for the performance of firms.</p> <p>Fafchamps and Wooldruff (2017) find that even after taking into account survey measures of firm's and entrepreneur's characteristics, scores from expert judges predict firm's growth in sales, profits, jobs, and investment.</p>

Source: Authors.