

Investment under Risks and Uncertainty in Afghanistan

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Abstract

This paper investigates the state of low investment in Afghanistan by studying how investment decisions interact with risks and uncertainty in the presence of underdeveloped financial markets. The analysis shows that investing firms experience a higher probability of being affected by events related to crime and corruption and spend more on security arrangements. Firms that participate in the formal

financial sector are also subject to higher levels of risk and uncertainty. As more productive firms face higher risks and uncertainty, a model of resource allocation with heterogeneous firms is used to quantify the economic loss from crime and corruption. The estimated aggregate output loss of 12 percent is significantly higher than the 7 percent loss observed in the absence of the resource allocation channel.

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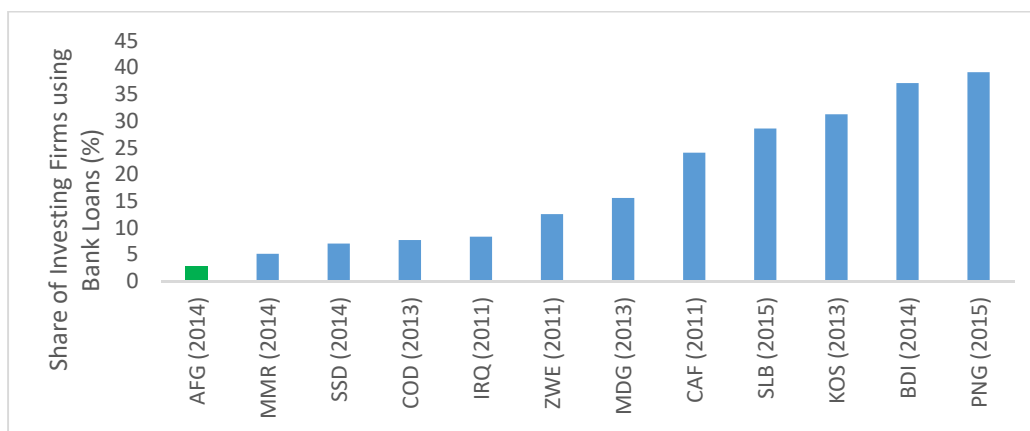
¹ Authors in alphabetical order of last names; the findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the International Bank for Reconstruction and Development/World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent. This paper is part of a larger research effort under the Saving and Investment under Uncertainty (P159317) ESW that is delivered under the AFG: Navigating Risk and Uncertainty (P157288) PA.

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1. Introduction

Afghanistan, like many countries affected by fragility, conflict and violence (FCV), represents an extreme case where firms face a plethora of business risks in a deeply uncertain environment together with largely undeveloped financial markets. Still, the state of investment in Afghanistan stands out among the fragile situations. According to the World Bank Enterprise Surveys, only 27.5 percent of the firms in the country reported undertaking any investment projects compared to 40 percent in Burundi, 43 percent in the Democratic Republic of Congo (DRC) and 36.5 percent in West Bank and Gaza (WBG).³ Concurrently, the standard of financial development in Afghanistan remains weak with humble financial intermediation. In 2015, only 3.7 percent of GDP was intermediated as loans from banks to the private sector. The weakness of the financial system is reflected in the fact that out of every five firms undertaking any investment, four rely exclusively on internal funds or retained earnings for any investment related expenditure. A paltry 3 percent of firms use bank loans to finance their investment. The almost complete reliance of firms on internal resources is remarkable even across fragile situations. In contrast, around 40 percent of firms report using bank loans for the median country in the broad FCV sample (figure 1). In addition to being burdened by the weak financial situation, firms in Afghanistan also navigate through a sea of business risks emanating from macroeconomic (for example price and exchange rate volatility), political and security-related uncertainties.

Figure 1: Share of Investing Firms Using Bank Loans: Fragile Situations⁴

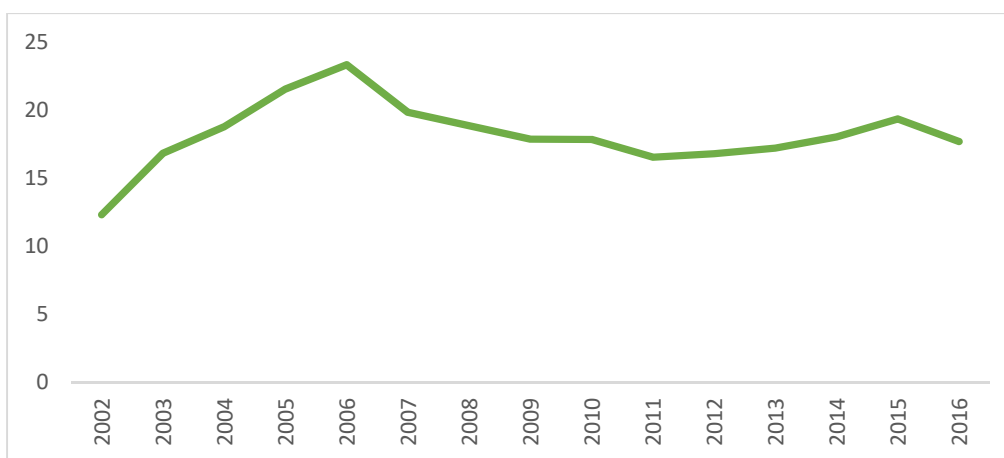


³ The aggregates correspond to 2014 for Afghanistan and Burundi, whereas in case of DRC and WBG they are computed using the 2013 data.

⁴ Sample contains 12 countries that feature in the World Bank's [List of Fragile Situations FY17](#) (World Bank (2017)) and for whom the Enterprise Survey data are available for any year beginning 2011. Our broad classification of all fragile situations under a common umbrella masks significant variation in level of fragility across this group. Many development measures, including economic development, vary across this group and can partially account for the variation in financial development observed within this group.

A depressed state of investment is arguably one of the primary factors keeping the Afghan economy from growing given the vast empirical literature documenting the strong correlation between economic growth and the investment share of GDP (Figure 2).⁵ More importantly, though, this relationship between investment and growth remains robust to the inclusion of other variables considered important for growth (Levine and Renelt (1992), Xala-i-Martin (1997)). Through its effect on economic growth, a healthy investment environment is potentially also important in delivering the development goals of poverty reduction and boosting shared prosperity as well. A pertinent question then is what causes such huge variation in investment rates across countries and what can be done to boost investment in economies that are plagued by low investment. The role of financial underdevelopment has been explored in various settings over the past few decades. Theoretical studies have argued that access to finance provides real services via reducing information frictions and transaction costs. Relatedly, empirical research has found evidence linking growth and financial development. A key mechanism highlighted in this context is the easing of financial constraints leading to eradication of barriers to firm growth and expansion.⁶ Uncertainty is another factor that has been examined in the literature. Yet, there does not exist a sound prediction about the nature of the relationship between uncertainty and investment due to opposing forces created by risk aversion, adjustment costs, production technology etc. (Caballero (1991), Dixit and Pindyck (1994), Abel and Eberly (1996) etc.). Though not entirely unanimous, the bulk of empirical investigations has found evidence of a negative relationship between the two (Serven and Solimano (1993), Aizenman and Marion (1996), Hausmann and Gavin (1998), Serven (1998) etc.).

Figure 2: Gross Fixed Capital Formation (percent of GDP)⁷



⁵ This literature includes studies that have considered cross-sectional data (Mankiw, Weil and Romer (1992), Barro and Sala-i-Martin (1995) etc.) as well as panel studies (Caselli, Esquivel and Lefort (1996), Bond, Hoeffler and Temple (2001) etc.).

⁶ See Levine (2005) for a survey of both the theoretical and the empirical literature.

⁷ Source: World Development Indicators.

Motivated by this literature, in this paper we investigate the state of low investment in Afghanistan by focusing on firms' investment decisions. Our intention in this paper is to understand how risks and uncertainties affect firms' investment decisions in the presence of low financial development. To this end, we employ the data from the World Bank Enterprise and Informal Enterprise Surveys that contain information on a wide range of variables that are potentially important for studying the state of low investment in the country. Critical to our analysis, the surveys comprise questions not only related to firms' access and participation in the financial sector, but also contain information that sheds light on the incidence of crime and corruption-related events together with firms' perceptions of such issues as being a significant obstacle to their operations. For taxonomic purposes, we bunch the outcome variables under the broad category of *risks* and the perception variables under *uncertainty*.

Our econometric exercise features a multivariate analysis in which we discern the interaction of numerous factors shaping the investment environment. We give attention to the hypothesis that whether instruments such as participation in the financial sector which are often considered important, if not necessary, for firm expansion act independently of risks and uncertainty faced by firms or not. In other words, does access to financial instruments and services expose the participating firms to newer or higher risks and uncertainty and take away some of the advantages reaped from using such instruments. There arise four main findings from our econometric analysis. First, we find that firms undertaking investments are more likely to experience risks associated with crime and corruption. In addition, this reflects in their perception underlying the uncertainty associated with operations. Though at the extensive margin, both investing and non-investing firms have the same likelihood of making payments for security, the investing firms allocate a larger share of their sales towards security arrangements. Second, we find a similar phenomenon with respect to firms' access to finance. Firms with bank accounts and loan applications face higher risks and uncertainty. This further lends credence to the thought that participation acts as a signal to expropriating parties that see these firms as better targets having larger surpluses from firm operations. Our third finding corresponds to the formal status of firms. While it is true for the Afghan case that formal firms are larger, both in terms of workforce and sales, they too are disproportionately affected by risks and uncertainty. All the above findings suggest that policy interventions in a volatile economic environment for a country like Afghanistan are not independent of consequent risks and uncertainty. In other words, some benefits of such policies are potentially seized via crime and corruption. Finally, we also find that a large segment of firms headed by female managers perceive crime, corruption, and political instability as being serious roadblocks to operation.

In our final analysis, we turn our attention towards estimating the economic loss from crime-related events. The World Bank enterprise survey reports firms' loss due to such events together with firms'

security expenditure that helps us quantify the aggregate loss. We find that on average, a firm loses approximately 4.5 percent of its output through these costs. More intriguing though, these losses are positively correlated with firm size. We view this considering our earlier findings where firms with arguably higher surpluses are disproportionately affected by risks and uncertainty. Based on a vast literature that proxies firm productivity by firm size, we posit that firms with higher productivity are more exposed to risks. As such, a naive calculation of aggregate loss above misses an important mechanism driving aggregate output – the allocation of resources across firms that have different productivity. The higher risks faced by more productive firms create relatively larger distortions for them and drive away resources towards less productive firms. To quantify the impact of allocation on output, we develop a model of resource allocation⁸ in an economy with heterogeneous firms and credit market imperfections. We find that abstaining from the allocation channel leads to severe underestimation of economic losses, and opening the channel more than doubles the impact of such risks. The allocation channel is particularly more active when credit markets are relatively underdeveloped as is the case in Afghanistan. We find that the economy loses around 12 percent of its output which is significantly higher than the 7 percent loss estimated in absence of the allocation mechanism.

The rest of the paper is organized as follows. We begin with a brief literature review followed by discussing the data used in our analysis. Following, we present some motivating facts before diving into our main econometric analysis and results. In the last analytical section, we develop a model of resource allocation to quantify the aggregate economic loss due to the size dependence of risks pertaining to crime-related events. We conclude the paper by discussing the relevance of our findings with respect to policy interventions.

2. Literature Review

There exists a vast literature, both theoretical and empirical, that has investigated the relationship between investment and uncertainty in various settings.⁹ The key insight that emerges from the theoretical literature is that the relationship between investment and uncertainty depends on opposing forces created by factors such as risk aversion, irreversibility of investment decisions, market structure etc. Hartman (1972) and Abel (1983, 1985) show that investment responds positively to uncertainty by raising the

⁸ We use resource allocation that is meant in the most general sense, i.e., all the resources that are used in production including both labor and capital. In our model, we abstract from government capital, hence all the capital (and as an extension, all investment) stands for private investment - one that is undertaken by private firms with an incentive of profit maximization.

⁹ Carruth, Dickerson and Henley (2000) provide a survey of the literature that evolved following Dixit and Pindyck (1994). For earlier reviews, see Jorgenson (1971) and Chirinko (1993).

marginal profitability of capital.¹⁰ However, when investment decisions are irreversible, an increase in uncertainty lowers investment (Bertola (1987), Pindyck (1988)). Yet, Caballero (1991) shows that asymmetric adjustment costs are not critical in delivering the negative relationship between the two variables in these models. The negative relationship is rather dependent on whether markets are competitive or not in addition to technology being characterized by decreasing returns to scale. The theoretical literature took a turn with Dixit and Pindyck (1994) which introduced option pricing theory in studying investment behavior. They show that the decision to invest is delayed when returns are more uncertain as investors hold out till more information is revealed lowering uncertainty. Nonetheless, there are price effects that provide incentives to invest under increased uncertainty and can potentially dominate the option value advantages of delaying investment.

This rich theoretical literature is complemented by an equally extensive empirical literature that has investigated the relationship in both macroeconomic and microeconomic settings. At the aggregate level, Ferderer (1993) finds a negative relationship between investment and uncertainty for the US. Driver and Moreton (1991) and Price (1996) report a similar relationship for the UK. In contrast, employing an instrumental variables approach Goldberg (1993) finds no impact of exchange rate volatility on aggregate investment in the US. On the other hand, focusing on Japanese FDI flows into the US, Campa (1993) shows that capital expenditures go down as exchange rate volatility increases. The macro-level empirical studies have also used cross-country data to shed light on the investment-uncertainty relationship. Using variation in uncertainty across a large sample of developing countries, Hausmann and Gavin (1995) find a negative relationship between the variables. In sharp contrast, no statistical relationship is found between aggregate investment and macroeconomic uncertainty in other studies (Ramey and Ramey (1995), Bleaney (1996)). Aizenmann and Marion (1995, 1996) discuss the importance of separating public and private investment and show that while public investment is unrelated to uncertainty, private investment is lower in countries that are associated with higher uncertainty. Few studies have also looked at cross-country evidence using panel data (Pindyck and Solimano (1993), Serven and Solimano (1993), Darby *et al.* (1999) etc.).¹¹ Though the strength of relationship varies across these studies, all find a negative association between aggregate investment and uncertainty.

Yet, it is possible that the forces that drive the relationship at the microeconomic level might not be observed at the aggregate. The microeconomic fluctuations might get cancelled at the aggregate if the

¹⁰ These environments feature symmetric convex adjustment costs under perfect competition given that the firm's profit function is convex.

¹¹ The sample of countries varies across these studies. Pindyck and Solimano (1993) use data from both developing and developed economies. In contrast, Serven and Solimano (1993) focus on developing countries only and Darby *et al.* (1999) study the relationship for five OECD countries.

fluctuations are not coincident.¹² For this very reason, it is important to look at how investment responds to uncertainty at the decision-making level where the relationship is expected to be more robust. Driven by this, there is a simultaneous effort to bring micro data into the analysis. Leahy and Whited (1996) use stock price volatility of US manufacturing firms to measure firm-specific uncertainty and find a weak negative correlation. Going a step further Driver, Yip and Dakhil (1996) bring plant-level data into analysis and document a significant negative association using volatility in market shares. On the other hand, Guiso and Parigi (1999) measure firm-specific uncertainty from firms' own perceptions and find that investment undertaken by a firm declines when it perceives its demand to be more uncertain. Demir (2009) also uses firm-level data to find a negative relationship for firms in the real sector in Argentina, Mexico and Turkey. More recently, the investigation has tried to highlight the short-term effects of uncertainty on investment which are potentially much larger than long-term effects (Bloom, Bond and Van Reenen (2001, 2007)).

Our investigation is motivated by the deep literature in the investment-uncertainty nexus. We posit that private investment in the FCV economies like Afghanistan remains depressed because of an extreme business environment where numerous risks abound. The main finding of our econometric exercise is that firms that make investment expenditures or participate in the formal financial sector are more likely to realize losses related to crime and corruption, as well as perceive them to be severe obstacle to operation. We interpret this relationship as evidence that returns to investment, as well as reaping benefits of other instruments, are reduced making firms less likely to operate efficiently. Within the theoretical literature this can be seen as persistent weakness in investment rate due to expected returns being lower than the threshold rate (Dixit (1989, 1992)). Rodrik (1991) is an early application of this approach where policy uncertainty has the potential to act as a "hefty tax on investment", thereby depressing investment. Though we model these *taxes* on firms' sales, it is isomorphic to levy them on capital expenditures. We also highlight the systematic variation of these *taxes* with firm size which we argue is a summary measure of firm productivity based on related research.

In the second part of our analysis, we aim to quantify the aggregate economic impact of business risks and uncertainty in Afghanistan. Our aim is to highlight the losses from the resource misallocation channel which often gets overlooked in quantitative exercises of this nature. There is a growing literature that argues that the distribution of available resources across heterogeneous production technology can have a sizeable impact on aggregate output (Hsieh and Klenow (2009), Restuccia and Rogerson (2008)). Building on this, many papers have documented a positive association between firm size and distortions in various settings.¹³ To the best of our knowledge though, Bah and Lang (2015) is the only paper that

¹² See Bernanke (1983) for a discussion on why microeconomic fluctuations might not cancel at the aggregate.

¹³ For an earlier application see Guner, Ventura and Xu (2008) and Gopinath *et. al.* (2017) for a more recent one. Restuccia and Rogerson (2013) present a survey of this emerging literature.

quantifies the impact of business risks pertaining to crime and corruption in a developing country setting. Similar to our study, Bah and Lang (2015) use Enterprise Survey data for countries in Sub-Saharan Africa and report a somewhat limited role of variation in business distortions in explaining cross-country variation in output per capita in their sample. However, the quantitative impact on output observed in Africa is close to what we obtain for Afghanistan.

3. Data

The main sources of data for this paper are the World Bank Enterprise Surveys (ES) and World Bank Informal Enterprise Surveys (IES). Crucial for our analysis, these surveys collect qualitative and quantitative data to evaluate the performance of business enterprises and identify constraints to doing business. The surveys which are conducted through interviews with firms in manufacturing, retail, and other services sectors cover a broad range of business environment topics including access to finance, corruption, infrastructure, crime, competition, and performance measures.

Specifically, we use data from 2014 and 2008, where the 2014 data were collected only on formal sector firms (ES) while the 2008 sample contains both formal and informal sector firms (both ES and IES). The format of both surveys is very similar to several overlapping questions. In general, the ES is designed such that it is representative of the formal private sector in a country. Given that the actual size and structure of informal sectors is difficult to ascertain, more so in developing countries and emerging economies, it is challenging to get a representative sample for the informal sector. As such, IES may not necessarily be representative at the national level. Despite this caveat, the IES is a reliable source of data on informal firms and presents an excellent opportunity to study these firms to increase our knowledge and understanding of the barriers they face and the business environment they operate in.

For ES2014, firms were selected using stratified random sampling at three various levels of stratification: industry, firm size, and region.¹⁴ Industry stratification consists of manufacturing, retail/wholesale, construction, and other services sectors. Firm size stratification is defined as small (5 to 19 employees), medium (20 to 99 employees), and large (more than 99 employees).¹⁵ Regional stratification includes five regions (Kabul, Herat, Kandahar, Mazar-e-Sharif, and Jalalabad) which include both the city and the surrounding business areas. The sample frame used is based on three different sources: list of manufacturing firms was obtained from the Afghanistan Investment Support Agency (AISA); list for retail firms was generated by the implementing contractor for the five cities of fieldwork and list for

¹⁴ More information can be found at <http://www.enterprisesurveys.org/Methodology>.

¹⁵ For stratification purposes, the number of employees was defined based on reported permanent full-time workers.

construction/other services sector firms was obtained from the implementing contractor and largely based on firms registered with AISA. The sample used in the paper is based on a total number of 410 firms, with 34% from manufacturing, 16% from retail, 18% from construction and remaining 33% from other sectors (see Table 1 for details). Around two-thirds of the firms in the sample are small (5 to 19 employees), another one-quarter being medium sized (20 to 99 employees) while the remaining are large (more than 99 employees) in size. Majority of firms are from Kabul representing almost a third of the sample. Mazar-e-Sharif has the second highest number of firms at 18%. The rest of the regions, Herat, Kandahar, and Jalalabad each have 17% of firms.

Table 1: Descriptive Statistics of Dataset

	ES2014 (Formal)	ES2008 (Formal)	IES2008 (Informal)
Total firms	410	647	419
Sector (share in percent)			
Manufacturing	34	19	25
Retail	16	16	25
Construction	18	28	11
Other Services	33	37	38
Size (share in percent)			
Less than 5	0	2	13
Small (5 – 19 employees)	69	62	78
Medium (20 – 99 employees)	25	26	8
Large (More than 99 employees)	6	10	2
Region (share in percent)			
Kabul	31	31	25
Kandahar	17	12	11
Herat	17	13	12
Jalalabad	17	11	14
Mazar-e-Sharif	18	14	13
Other	0	20	26

Source: World Bank Enterprise Surveys 2014, 2008 and World Bank Informal Enterprise Survey 2008.

Data from 2008 consist of firms from both the formal and informal sectors. Formal firms are defined as firms that are registered with a central government body i.e. AISA and/or any Government Ministry, such as the Ministry of Commerce, Ministry of Economy, Ministry of Education, and so on. Informal firms, on the other hand, are firms not registered with a central government body, or with any other organization except for local municipality, business association or union. The sample proposition was split between 60% formal enterprises and 40% informal enterprises. The sample of formal firms was sourced from AISA, list of firms interviewed in a previous ES and other local sources (e.g. NGOs, local AISA and/or ACCI (Afghanistan Chamber of Commerce and Industries)). For informal firms, local

organizations, including municipalities, local business associations, unions, and NGOs were used to obtain lists of informal enterprises. These were then used to conduct the informal interviews. In some cases, after a successful interview with an informal business, the owner was asked to identify other unregistered businesses that fit the sample criteria, in different locations across the city. Firms from manufacturing, retail, construction, and other services sectors from ten different cities were included in the sample. Manufacturing and retail sectors each represent a quarter of the sample while construction and other services constitute 11% and 38% respectively. In terms of firm size, there were no fixed quotas for company size, however preference was given to the larger companies from the AISA lists that were used to source formal companies. Data from 647 formal and 419 informal firms were eventually included in the sample used in the paper. Majority of the informal firms are small covering 80% of the sample. Medium and large firms are 8% and 2% of the sample respectively. Kabul has the highest number of firms representing a quarter of the sample. The rest of the firms are roughly equally distributed across the remaining four regions.

3.1 Stylized Facts of Afghan Enterprises

Before presenting the multivariate analysis that studies the relationship between risk and uncertainty and firm's characteristics, this section examines some salient features of firms in Afghanistan both in the formal and informal sectors.

Table 2 provides a summary of features of Afghan firms in the sample. The first panel looks at some of the more general firm characteristics. Starting with informal firms in 2008, the table shows that most of them are 10 years of age or younger (75% of the sample). A similar picture can be seen for formal sector firms, where 80% of the firms are reported to be less than 10 years of age. The sample for 2014, on the other hand, has a relatively lower age of firms that are less than 10 years of age with 40% of firms greater than or equal to 10 years. It is possible that the selectivity of larger firms from the AISA lists may be partly responsible for the high share of old firms in 2014. Regarding manager's years of experience, firms (both formal and informal) in 2008 and 2014 have on average 13 years of experience. Female ownership of businesses is very low in Afghanistan, with less than 1.5% informal firms being women-owned. In the formal sector, this ratio was around 4.5% and 2.7% in 2008 and 2014 respectively. Similarly, the share of firms with female managers is also very small, with no more than 2% in 2008 in both formal and informal sectors. The share is higher in 2014 at 4.2% but remains very low. In terms of investment undertaken by firms, the levels were higher in 2008 when 28% informal and 40% formal firms reported having undertaken investment. In 2014, only 28% formal firms indicated making investments.

The next panel highlights the level of access to finance by firms and shows that a little less than a quarter of informal firms have an account compared to 43% of formal firms that claim to have a bank

account. In 2014, the share of formal firms with bank accounts was higher at 53%. The share of firms having an overdraft facility is quite low in comparison. Only 6.4% of informal firms had access to an overdraft facility while 23% of their counterparts in the formal sector had such facility in 2008. In 2014, the ratio was lower at 6.4% among formal sector firms. An analogous situation with low levels of access to a line of credit by firms emerges. Only 6% of informal firms and 4% of formal firms had access to a line of credit in 2008. This ratio did not change by much in 2014 and only 4.4 % of formal firms reported having a line of credit.

Table 2: Salient Features of Afghan Firms

	ES2014 (Formal)	ES2008 (Formal)	IES2008 (Informal)
General Characteristics (share in percent)			
Age: 10 years or less	60.6	79.7	74.6
Manager's Years of Experience	13.1	13.2	13.8
Female Ownership	2.7	4.5	1.4
Head Manager Female	4.2	1.9	0.7
Investment	28	40.3	28
Access to Finance (share in percent)			
Account	52.6	43.4	21.7
Overdraft Facility	6.4	23.0	6.4
Line of Credit	4.4	4.0	6.0
Applied for Loan	1.7	8.5	6.5
Education of Principal Owner (share in percent)			
None	5.1	2.9	8.4
Primary School	13.2	8.5	26.7
Mid/High School	34.2	42.2	44.2
Vocational/Technical	6.6	3.1	5.5
University	39.9	40.5	15.0
Other	1.0	2.8	0.2
Legal Status (share in percent)			
Shareholding Company	0.2	4.8	2.1
Sole Proprietorship	70.2	66.6	81.4
Partnership	27.8	22.4	15.8
Limited Partnership	1.7	5.7	0.5
Other	0.0	0.5	0.2

Source: World Bank Enterprise Surveys 2014, 2008 and World Bank Informal Enterprise Survey 2008.

Looking at education levels of principle owners of firms, the data show the majority of firm owners both in the formal and informal sectors have some level of education. Not surprisingly, the majority of informal firm owners have mid/high school level of education, while in the formal sector university level

education is also very common. Most of the firms in both sectors of the economy are sole proprietorships, followed by partnerships.

For the sake of brevity, additional analysis based on the data documenting differences in levels of investment undertaken by Afghan firms, their use of finance, financing patterns and their experience in dealing with risk and uncertainties is presented in the Appendix (Section 1).

4. Regression Analysis of Risk and Uncertainty

The regression analysis presented attempts to study how differences in firms' experience of risks and uncertainties are associated with various firm-level characteristics. While we control for several firm characteristics we focus on four main ones: i) whether the firm undertook investment, ii) whether it has access to finance, iii) whether it is a female-headed firm and iv) whether it operates in the formal sector. The section below is divided into four parts, each presenting result associated with the characteristics identified above.

For the analysis, the following specification is used:

$$UR_{it} = a_{it} + b_1 Inv_{it} + b_2 Acc_{it} + b_3 For_{it} + b_4 Wom_{it} + b_5 Fm_{it} + e_{it}$$

where UR captures uncertainty or risk for firm i at time t . To capture uncertainty, we use three different indicators that highlight firms' perceptions towards i) political instability, ii) corruption and iii) crime. All these indicators are binary in nature and equal 1 if firms consider them as a major or very severe obstacle to their current operations and 0 otherwise. To account for risks faced by firms, we rely on 5 different indicators that capture i) occurrence of crime (equals 1 if a firm experienced losses as a result of crime and 0 otherwise), ii) occurrence of tax inspection (equals 1 if a firm was inspected by a tax official and 0 otherwise), iii) expectation of informal payments during tax inspection (equals 1 if a gift or informal payment was expected or requested and 0 otherwise), iv) payment for security (equals 1 if a firm paid for security and 0 otherwise) and v) expenditure on security (percentage of firm's total annual sales used to pay for security).

Among the explanatory variables included in the regression, Inv is a binary variable indicating whether firm i undertook investment at time t (equals 1 if firm invested and 0 otherwise). Acc indicators are binary variables used as a proxy for firms' access to and demand for finance and are represented by (i) firms with bank accounts (equals 1 if firm has an account and 0 otherwise), (ii) firms with an overdraft facility in addition to a bank account (equals 1 if firm has overdraft facility and a bank account and 0

otherwise), (iii) firms with line of credit (equals 1 if firm has a line of credit or a loan and 0 otherwise) and (iv) firms with a loan application (equals 1 if firm applied for a loan year before and 0 otherwise). *For* controls for whether a firm is formal and equals 1 if the firm belongs to the formal sector and 0 otherwise. *Wom* captures the ownership structure of the firm and two different indicators are used as the proxy: *female ownership*, equals 1 if the firm's largest owner is a female and 0 otherwise, *female manager*, equals 1 if the firm's manager is a woman and 0 otherwise. The rest of the firm-level control variables are represented by *Fm* and include *manager's experience* which is the logarithm of manager's years of experience in the field of business, firm *size* (small, medium or large, with micro (less than 5 employees) being the omitted category), *sector* (retail, construction or other services with manufacturing as the omitted sector), *regional location* (Kandahar, Herat, Jalalabad, or Mazar-e-Sharif, with Kabul as the omitted region), *education* level of the principle owner (primary, mid/high, university or vocational, with no education as the omitted category) and firm's *legal status* (sole proprietorship, partnership or limited partnership, with shareholding company as the omitted category). The regression also includes year fixed effects to control for any time-specific factors. Table A3 in the Appendix presents the detailed definitions and sources of variables used in the analysis.

4.1 Investment and Incidence of Risks and Uncertainty

We first investigate how determinants of firms' perceptions of the severity of uncertainty and risk vary across firms that invest compared to those that do not (Table 3, Row 1). Starting with measures of uncertainty (Columns 1-3), we find political instability as an important obstacle for firms undertaking investment. Our results show that firms that invest are 7% more likely to identify political instability as a major or very severe obstacle to their business compared to non-investing firms. The impacts of other indicators capturing uncertainty, namely corruption and crime, are equally disruptive for firms whether they invest or not.

Moving on to measures of risk, we first look at the incidence of crime-related events experienced by firms (Column 4). These include losses because of theft, robbery, vandalism or arson on the firm's premises. The results show that firms undertaking investments are more prone to experience crime on their premises vis-s-vis non-investing firms and are 7% more likely to suffer from theft, robbery, vandalism or arson. Moving on to the next risk indicator, the incidence of tax inspection (Column 5), we see that firms undertaking investment have a higher probability of being visited or inspected by a tax official and are also more likely to be asked for informal payments by tax officials (Column 6). Looking at whether firms pay for security to purchase equipment, personnel, or professional security services (Column 7), we find that

both investing and non-investing firms are equally likely to pay for security. However, firms that invest allocate a higher share of their sales to security expenditure (Column 8).

4.2 Access to Finance and Incidence of Risks and Uncertainty

This section studies how the perceptions of the severity of uncertainty and risk vary across firms that have access to finance vis-à-vis firms with no access (Table 3, Row 2-4). We use different indicators to proxy for access to finance, these include i) whether the firm has a bank account, ii) whether the firm has an overdraft facility, iii) whether firm has a line of credit and iv) whether firm applied for a loan. Looking at the results for uncertainty (Column 1-3), we see that firms that have access to finance proxied by having an overdraft facility are 10% more likely to feel that political instability severely affects their businesses in comparison to firms with no access to finance. This result also holds for firms that apply for a loan, whereby firms applying for a loan are 11% more likely to perceive political instability as a major cause of concern. This result is quite intuitive in that firms that apply for a loan could be considered as firms that have potential to grow and requiring additional resources to ensure expansion and hence are more sensitive to the overall political and macro instability around them. Looking at the next indicator of uncertainty (Column 2), we see that firms with access to finance (both through an account and overdraft facility) have a higher probability of experiencing corruption as a major obstacle to their operations. A similar picture can be seen for firms applying for a loan. The last indicator of uncertainty captures firms' perspective of crime as a severe impediment to their business (Column 3), and the results show that firms with access to an overdraft facility are more likely to find crime as a severe problem. Again, the results for the last two indicators of uncertainty are intuitive. Firms that have access to finance are firms that deal with financial institutions and hence work within the formal system existing in the country. This exposes them to potential corrupt practices existing in the system. Also, access to finance by a firm could be taken as a signal of potential growth for a firm and could make the firm vulnerable to crime, theft, and robbery and hence firms with access have a more negative view of the impact of crime on their business.

Looking at the impact of risk on firms' business (Columns 4-8), we see that firms have a similar probability of experiencing a crime related event whether they have access to finance or not. Reconciling with the result in the last section, what we see is that despite all firms being equally vulnerable to crime, it is the firms with access and potentially higher growth prospects that consider it as a bigger challenge. The probability that a tax inspector visited a firm is also same for both kinds of firms (Column 5). In terms of expectations of informal payments to tax inspectors and payment for security (Column 6 and 7), firms with access to finance (accounts and loan applications) are more likely to be asked for informal payments by tax officials and are more likely to purchase security compared to their peers with no financial access. Lastly,

the firms with financial access allocate a higher share of their sales to security expenditure and pay an additional 3% of their sales to obtain security compared to firms with no access to finance (Column 8).

4.3 Women Owned and Managed Firms and Incidence of Risks and Uncertainty

Next, we study how firms that are either owned by women or have a female manager are affected by uncertainty and risks (Table 4, Row 6 and 7). Firms headed by female managers are disproportionately affected by political instability and are 20% more likely to report it as a major or very severe obstacle to their business operations. They also have a higher probability (by 20%) of experiencing corruption as a major obstacle (Column 2) and are more likely to report crime as an important challenge for their operations (Column 3).

In terms of risk, the results show that both male and female-headed firms are equally vulnerable to crime, tax inspections, making informal payments during tax inspections and paying for security. Furthermore, the share of sales revenues spent on security is also not significantly different across male and female headed firms. The results above indicate that in general women managers/owners have a stronger perception of uncertainty. This has a negative impact on their business despite facing similar risks as faced by male headed firms. This negative perception is possibly acting as a deterrent for them to participate in business and economic activities.

4.4 Formal Firms and Incidence of Risks and Uncertainty

The last set of results we discuss focuses on the differences that exist between formal and informal sector firms in terms of the impact of risk and uncertainty on their operations. Within different indicators of uncertainty, the impact of corruption is found to be significantly different for firms operating in the formal sector (Column 2). The formal sector is 8% more likely to find corruption as a major impediment to its operations. This result is very intuitive (and resonates with results reported for firms with access to finance), since formal sector firms operate within the formal structure of the economy this exposes them to corrupt practices more than what is experienced by informal sector firms. As far as political turmoil and crime are concerned (Columns 1 and 3), it does not make a difference which sector firms operate in. Both formal and informal firms are similarly affected.

Moving on to risk indicators, not surprisingly, we find that formal sector firms are more likely to have a tax inspection (Column 5) and are also more likely to pay for security (Column 7). Also, compared to informal firms, firms operating in the formal sector are less likely to be asked for informal payments during tax inspections (Column 6). This result makes sense since informal sector firms have no legal

protection, they are an easy prey for corrupt tax officials and hence are more likely to be asked for informal gifts during inspections. As far as the possibility of experiencing crime is concerned (Column 4), both formal and informal firms are equally exposed to the risk of theft, robbery, vandalism or arson. They also allocate similar shares of their sales revenue on obtaining security (Column 8).

Table 3. Multivariate Analysis of Risk and Uncertainty

	1	2	3	4	5	6	7	8
	Uncertainty			Risk				
	Political Instability a Major/Very Severe Obstacle	Corruption a Major/Very Severe Obstacle	Crime a Major/Very Severe Obstacle	Incidence of Crime Related Event	Incidence of Tax Inspection	Expectation of Informal Gifts during Tax Inspection	Payment for Security	Security Expenditure as a % of Sales
Investment	0.068*** (0.025)	0.030 (0.028)	-0.013 (0.007)	0.071*** (0.019)	0.069** (0.027)	0.076** (0.034)	0.018 (0.025)	2.287** (0.999)
Account Only	0.024 (0.028)	0.084*** (0.031)	0.002 (0.030)	0.017 (0.020)	0.016 (0.029)	0.161*** (0.038)	0.099*** (0.028)	2.604** (1.052)
Overdraft	0.100*** (0.037)	0.127*** (0.043)	0.101** (0.041)	0.005 (0.028)	-0.004 (0.040)	0.035 (0.052)	0.016 (0.038)	2.321 (1.609)
Line of Credit	-0.092 (0.070)	-0.003 (0.069)	-0.057 (0.069)	0.037 (0.046)	0.043 (0.064)	-0.030 (0.068)	0.012 (0.057)	-1.587 (2.070)
Loan Applications	0.113** (0.050)	0.115** (0.058)	-0.028 (0.062)	0.029 (0.040)	0.063 (0.056)	0.103 (0.071)	0.099* (0.054)	1.570 (1.649)
Female Ownership	-0.053 (0.086)	0.033 (0.085)	-0.147* (0.089)	-0.037 (0.042)	0.067 (0.077)	-0.095 (0.097)	-0.092 (0.067)	1.142 (3.367)
Head Manager Female	0.207*** (0.056)	0.194* (0.109)	0.337*** (0.048)	0.089 (0.088)	-0.099 (0.101)	0.026 (0.143)	-0.010 (0.093)	6.717 (4.075)
Formal	0.046 (0.031)	0.079** (0.036)	0.007 (0.033)	0.015 (0.022)	0.076** (0.032)	-0.102** (0.049)	0.080*** (0.029)	-0.380 (1.115)
Log of Manager's Years of Experience	0.007 (0.016)	0.008 (0.018)	-0.025 (0.018)	0.006 (0.012)	0.025 (0.017)	-0.003 (0.023)	0.004 (0.016)	0.042 (0.728)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of	1417	1303	1421	1431	1432	752	1429	372
Pseudo R ²	0.119	0.144	0.086	0.100	0.152	0.113	0.169	0.161

*Note: Marginal effects from probit regressions are reported under panels 1-7. For panel 8 OLS estimates are reported. Robust z-statistics in parentheses. Statistical significance levels: ***p < 0:01, **p < 0:05, *p < 0:10. Data sources and definitions can be found in the Appendix, Table A1.*

The above findings suggest that firms' adoption of instruments and practices that are typically associated with better outcomes are not necessarily independent, and their adoption might expose them to added risks and uncertainty. Hence, policy interventions, such as expanding access to finance, should be cognizant of the dent made by these increased risks and uncertainty on the economic benefits of adoption, and simultaneously look for ways to alleviate the problem.

5. The Model

In this section, we aim to quantify the economic impact of crime-related events and show that the estimate that abstains from losses due to the resource allocation channel is considerably lower. Our empirical analysis has shown that successful firms experience higher risks and uncertainty. This finding

has important implications for resource allocation, as some resources flow from these more productive firms to less productive firms putting a further drag on output. To keep things tractable, we measure the asymmetric incidence of risks and uncertainty by looking at the firm size which has served as a summary measure of firm productivity in the literature that has focused on resource allocation under firm heterogeneity. In other words, instead of modeling the asymmetric impact of risks and uncertainty created by various factors (for example, access to finance), we assume that all such effects lead to variation in firm size and estimate the net effects by looking at the incidence of risks and uncertainty across firms of different sizes. Indeed, we do find that large firms are more prone to risks and uncertainty.

We use a model in which firms differ in their productivity and operate in the credit market that is characterized by limited enforcement (Amaral & Quintin (2010), Buera *et. al.* (2011)). We interact this heterogeneous firm model with different firms having different exposure to risks and model these risks as asymmetric taxes in the spirit of Restuccia & Rogerson (2008) and Hsieh & Klenow (2009). Both these factors – risks and imperfect credit markets are of first-order importance in the context of Afghanistan which observes risks to economic activity from a variety of sources together with having low levels of financial development.

The economy consists of discrete time periods in which mass one of two-period lived agents is born each period. The preferences of agents depend on consumption across the two time periods, c_1 and c_2 , and is represented by the life-time utility function

$$U(c_1, c_2) = \log(c_1) + \beta \log(c_2) \quad (1)$$

where $\beta \in (0,1)$ is the rate at which agents discount future consumption.

Each agent is endowed with a unit of time each period. In the first period, all agents supply this unit of time towards rendering labor services and earn a wage rate w . Apart from the time endowment, each agent receives a managerial ability draw from a distribution $\zeta(z)$ which is assumed to be identical across generations. The managerial ability of an agent is common knowledge. The managerial ability comes into play in the second period when an agent can choose to become a manager instead of supplying her labor services. In the event an agent chooses to become a manager, she is able to produce the consumption good using a decreasing returns to scale production technology that uses labor l and capital k which depreciates at a rate of δ each period. The production technology of a manager with ability z is given by

$$F(z, k, l) = zk^\alpha l^\theta \quad (2)$$

where $\alpha, \theta \in (0,1)$ and decreasing returns to scale requires $\alpha + \theta < 1$.

The production carried out by the managers is risky with the possibility of output loss due to a severe shock next period. We model these risks as the possibility of losing a fraction τ_s of the total output where $s \in \{1, \dots, S\}$ represents the various states associated with different levels of output loss. The probability of the occurrence of a state is given by p_s ($p_s \in [0,1], \sum_{s=1}^S p_s = 1$). A manager knows both the probability of occurrence of a state and the output loss associated with it and maximizes her expected income across all the possible states. To make the exposition simple, we replace the state dependent tax schedule with a single effective aggregate tax rate τ_A that occurs with certainty which is given by

$$1 - \tau_A = \sum_{s=1}^S p_s (1 - \tau_s) \quad (3)$$

Note that while we have not made the aggregate effective tax τ_A a function of any other characteristic associated with production, it is easy to introduce such specifications. For example, it is possible to consider a tax schedule in which managers with a high z face higher tax rates. A direct mapping of such a specification would mean that managers that employ more workers owing to their higher ability z face a higher effective aggregate tax rate τ_A . Such correlation between managerial ability z and tax τ_A introduces a channel for resource misallocation in which resources flow out of control of managers with the high ability to managers with low ability decreasing the aggregate productivity of the economy.

The managers can finance capital through two sources – credit markets and self-financing. The deposit of savings s when young and renting of capital k when old is done via a financial intermediary that offers a rate of return r on deposits and charges a rental rate of R on capital. The interaction of agents with the intermediary during the first period is restricted to a depository as agents are not allowed to borrow against their future income, i.e., $s \geq 0$. We also assume that the financial market is perfectly competitive so that the financial intermediary earns zero profit.

The credit markets are characterized by imperfect enforcement which makes it possible for a manager to renege on the rental contract. By renegeing on the contract, a manager is able to abandon her payment on the rented capital and keep the un-depreciated part of the capital to herself. As a way of punishment, she loses a fraction $\phi \in [0,1]$ of her profits and the un-depreciated capital. Let, $\Pi^C(z, s)$ and $\Pi^R(z|\phi)$ denote the total income of a manager with ability z and savings s when honoring and renegeing the contract respectively. Then,

$$\Pi^C(z, s) = \max_{k, l \geq 0} (1 - \tau_A) z k^\alpha l^\theta - w l - R k + (1 + r) s \quad (4)$$

$$\Pi^R(z|\phi) = \max_{k, l \geq 0} (1 - \phi) (z k^\alpha l^\theta - w l + (1 - \delta) k) \quad (5)$$

Given the common knowledge of managerial ability z , the above pay-off functions are known to the financial intermediary who decides whether to rent capital to the manager or not. Lending follows incentive compatibility and a manager with ability z and savings s is rented a level of capital k if

$$\max_{l \geq 0} (1 - \tau_A) z k^\alpha l^\theta - w l - R k + (1 + r) s \geq \max_{l \geq 0} (1 - \phi) (z k^\alpha l^\theta - w l + (1 - \delta) k) \quad (6)$$

The incentive compatibility constraint limits the level of capital k that can be rented by a manager with ability z and savings s which is denoted by $\bar{k}(z, s|\phi)$. It is straightforward to note that in the case that credit markets are perfect, i.e. $\phi = 1$, the incentive compatibility constraint limits the maximum level of capital that a manager can obtain at the unconstrained optimum. Moreover, the agent no longer requires having positive savings to finance the optimum level of capital as it can be rented directly from the intermediary. Hence, savings act as a mechanism to dampen the effect of imperfect credit markets. The maximum level of capital that is enforceable depends on the manager's ability and savings and increases with an increase in any of them. Moreover, any manager with the same level of ability and savings is able to rent more capital with a reduction in frictions present in credit markets. This is summarized in the proposition below.

Proposition 1: There exists a unique $\bar{k}(z, s|\phi) \geq 0$ such that any capital above $\bar{k}(z, s|\phi)$ is not enforceable by the financial intermediary. The unique upper bound on the enforceable level of capital $\bar{k}(z, s|\phi)$ increases with managerial ability z , savings s and level of financial development ϕ .

The income of an agent with managerial ability z and savings s conditional on becoming a manager is given by

$$\begin{aligned} \Pi^*(z, s|\mathbf{p}, \phi) = & \max_{k, l \geq 0} (1 - \tau_A) z k^\alpha l^\theta - w l - R k + (1 + r) s \\ & \text{such that } k \leq \bar{k}(z, s|\phi) \end{aligned} \quad (7)$$

where $\mathbf{p} \equiv \{w, r, R\}$ is the vector of prices.

The two-period optimization problem of an agent with managerial ability z is given by the following in which she chooses consumption when young c_1 , consumption when old c_2 , savings when young s , occupation when old, and level of capital k and labor l when choosing to become a manager when old to maximize two-period total utility

$$\begin{aligned} & \max_{c_1, c_2, s} \log(c_1) + \beta \log(c_2) \\ & \text{such that } c_1 = w - s \text{ and } c_2 = \max\{w + (1 + r)s, \Pi^*(z, s|\phi)\} \end{aligned} \quad (8)$$

The next proposition relates to the sorting of agents with different abilities into workers and managers.

Proposition 2: Given prices \mathbf{p} and level of financial development ϕ , there exists a threshold level of talent $\bar{z}(\mathbf{p}, \phi)$ such that all agents with ability above $\bar{z}(\mathbf{p}, \phi)$ choose to become managers and all with ability below choose to remain workers when old.

An equilibrium of the economy with level of financial development ϕ consists of agent choices $c_1^*(z|\phi), c_2^*(z|\phi), s^*(z|\phi), k^*(z|\phi), l^*(z|\phi)$ and $o^*(z|\phi)$ together with a price vector \mathbf{p}^* such that

- Given \mathbf{p}^* , $k^*(z|\phi)$ and $l^*(z|\phi)$ are solutions to (7)
- Given \mathbf{p}^* , $o^*(z|\phi) \in \{W, M\}$ is the occupational choice of the worker who chooses to become worker W or manager M when old
- Given \mathbf{p}^* , $c_1^*(z|\phi), c_2^*(z|\phi)$ and $o^*(z|\phi)$ are solutions to (8)
- Goods and labor markets clear period-by-period

In our quantitative exercises, we do not require capital markets to clear. As such, it is possible to have excess demand or excess supply of capital in the economy in equilibrium. This basically means that the financial intermediary has unlimited borrowing capacity together with an unlimited access to capital that it can supply to the economy.

5.1 Quantitative Exercises

On the aggregate level, two factors affect investment decisions in our model economy. First, economies with lesser aggregate tax will put in more capital for production driven by higher returns and second, economies with better financial markets also allocate more capital to production as it becomes easier to enforce larger credit offered to managers. However, aggregate output is also a function of how resources are allocated across firms with various levels of productivity. In the context of our model, the aggregate output loss will be higher if more productive firms faced larger taxes driving resources away from them to less productive technologies. Note that the more productive firms are also disproportionately affected by financial frictions, as their credit requirements are higher. The principal objective of our quantitative exercise will be to find out if aggregate output loss is significantly higher when we allow firms with higher productivity to be more adversely affected by the taxes.

To do this, we follow two alternative strategies. In the first strategy, we calibrate the model to match the key features of the Afghan economy. The calibrated model is then used for counterfactual experiments in which we estimate aggregate losses under two scenarios – taxes being independent of firm productivity and taxes being a function of firm productivity. Yet, there are concerns that other frictions may

plague the Afghan economy and there are measurement errors in this baseline calibration. To overcome this, we do a second calibration exercise in which we calibrate the model to the US economy which is likely to have much fewer distortions than most economies and serves as our proxy of the frictionless economy. We present the results of this alternative exercise in the Appendix (Section 2), and the quantitative findings are very similar to what we observe in the benchmark exercise in which we calibrate the model to the Afghan economy. In the two calibration exercises, we assume that the countries differ with respect to the level of credit market efficiency ϕ , aggregate taxes τ_A and the distribution of managerial ability $\zeta(\cdot)$. All other parameters are considered *global* and apply to both calibration strategies outlined above. For both the calibrations, we follow the standard procedures used in earlier research which we discuss now.

5.1.1 Calibrating the Model to the Afghan Economy

We first describe the calibration of the *global* parameters that apply to all economies and hence remain invariant across the two strategies. The model contains six *global* parameters – rate of interest r , depreciation rate δ , rental rate of capital R , discount rate β and production function parameters α and θ .

Calibrating Global Parameters

We begin by assuming that the work life of an agent comprises of 40 years with each period in our model mapping to one-half of an agent's working life, i.e., 20 years. We fix the yearly rate of interest at 4% which means that the model rate of interest $r = 1.04^{20} - 1$. The annual rate of depreciation is set at 8% which requires calibrated δ to equal $1 - (0.92)^{20}$. The no-profit condition for the financial intermediary requires that the rental rate of capital R equals the sum of r and δ .

To pin down the parameters of the production function: α and θ , we follow Atkinson *et al.* (1996), Atkinson & Kehoe (2001) and many others and assign $\alpha + \theta = 0.85$, and then set α to be one-third of 0.85 to capture the capital share of income observed in the US. The period discount rate β is set to match the ratio of excess savings over investment to investment as observed in the US. Amaral & Quintin (2010) report this ratio to be 40% which in our calibration requires a discount rate of 0.46.

Calibrating Country-Specific Parameters

To calibrate the taxes applicable in Afghanistan, we use the findings from the Enterprise Surveys. As documented in earlier sections, corruption, and crime-related losses are among the biggest concerns that Afghan firms face. Our discussion in the previous sections showed how the more productive firms in Afghanistan are more likely to be affected by both crime and corruption. The heterogeneity of the model

enables us to perform counterfactual exercises in which we administer different aggregate tax rates to different managers. In other words, we make the aggregate tax rate a function of the managerial ability z .

The next step is to estimate the aggregate tax function $\tau_A^{AFG}(z)$ for each size group that we observe in the Enterprise Surveys. We estimate the tax function $\tau_A^{AFG}(z)$ using the data from the 2008 cross-section as it covers twice as many firms as in 2014. Given that there is a huge variation in risks reported across years, our choice of 2008 cross-section provides a less noisy estimate of the tax function. The tax function encompasses both losses due to crime and corruption. For crime-related taxes, we aggregate the losses reported due to crime-related events (conditional on experiencing an event) and the expenditures on security arrangement. Losses due to corruption are inferred from the share of total sales lost as informal payments and gifts to public officials. The limited data we have means that we can quantify a small share of risks faced by firms in Afghanistan as they do not include the comprehensive impact of all factors. Figure 3 shows the crime-related taxes for the different size groups. The output losses due to crime-related events rise with firm size and decline for the largest firms. However, this decline is more than offset by the high security expenditures by them. In aggregate, we find that the computed taxes rise steadily with size, from 0.7% of sales for the smallest firms to 4.1% of sales for the largest firms in the Afghan economy.

Figure 3: Output Loss (Taxes) Due to Crime by Firm Size

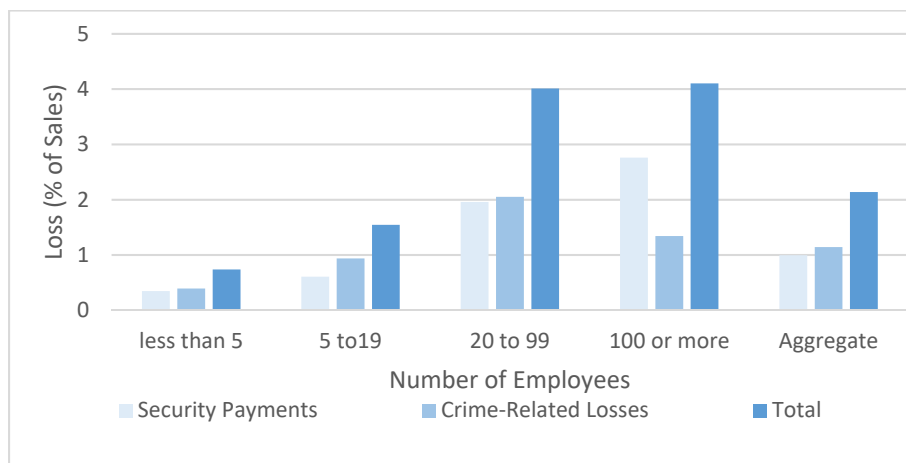
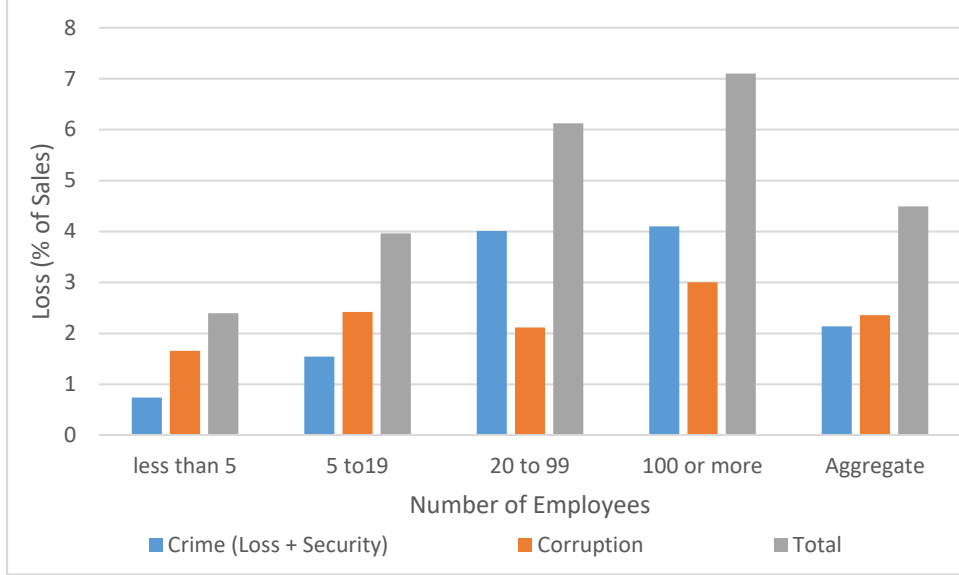


Figure 4 shows crime and corruption related taxes together with their sum. Corruption related taxes rise from 1.7% of sales for the smallest firms to 3 percent of sales for the largest firms, though the relationship is not strictly monotonic across firm size. However, the aggregate taxes rise steadily with firm size with the tax rate faced by the largest firms being almost three times as large as that faced by the smallest firms.

As the size of the firm maps directly to managerial ability, we map the appropriate aggregate tax rate to the corresponding managerial ability z . As the estimated tax rate is positively correlated with firm size, managers with higher ability are subjected to higher taxes compared to managers with low ability.

Figure 4: Output Loss (Taxes) Due to Crime and Corruption by Firm Size



This leaves us with calibrating the credit market parameter ϕ and the managerial distribution function $\zeta(\cdot)$. To do this, we adopt an approach that is similar to earlier research that considers heterogeneity in firm productivity and jointly calibrates them to match the moments discussed below.¹⁶ We assume the managerial ability function follows a log-normal distribution with location parameter μ and variance parameter σ . The three parameters (μ, σ, ϕ) are calibrated to match three moments that are important in the context of the model. The first two moments that we target are the size distribution of firms which ties to the distribution of managerial ability and hence pins down μ and σ . We use the information from the Enterprise Survey of 2014 to arrive at the size distribution of firms in Afghanistan which is shown in Figure 5.

Finally, we need a moment that captures the level of financial markets. Levine (2005) surveys the rich theoretical and empirical literature that has studied the relationship between financial development and growth. In the context of our model, we specifically want to measure the effect of frictions that create an obstacle for managers to borrow capital. As discussed in Amaral & Quintin (2010), *intermediated capital* which is defined as the capital raised by managers over their personal savings in the credit markets is closely related to the financial market parameter ϕ . A manager is able to borrow more capital at higher values of ϕ which essentially reduces his reliance on savings in the first period and there is more intermediated capital

¹⁶ For an early example see Restuccia and Rogerson (2008), Amaral and Quintin (2010) and Buera *et al.* (2011) who consider heterogeneity in firm productivity in the presence of financial frictions.

in the economy. Amaral & Quintin (2010) use the database compiled by Beck *et al.* (2000) and estimate an intermediated capital to output ratio of 2.2 for the US economy. This database does not contain financial market information for Afghanistan and hence we are unable to estimate the intermediated capital to output ratio for the country. In the absence of this estimate, we calibrate ϕ by matching the ratio to 1.1 which approximately corresponds to the estimated ratio for India. As the credit markets in India are likely to be much more efficient than those in Afghanistan, the chosen value of the intermediated capital to output ratio is a conservative estimate of the actual level of imperfections present in the country. Together with tax and ability parameters, a credit market efficiency ϕ^{AFG} of 0.27 pins this targeted value. Table 4 reports the values of the calibrated parameters and the targets used in the exercise.

Figure 5: Size Distribution of Firms in Afghanistan

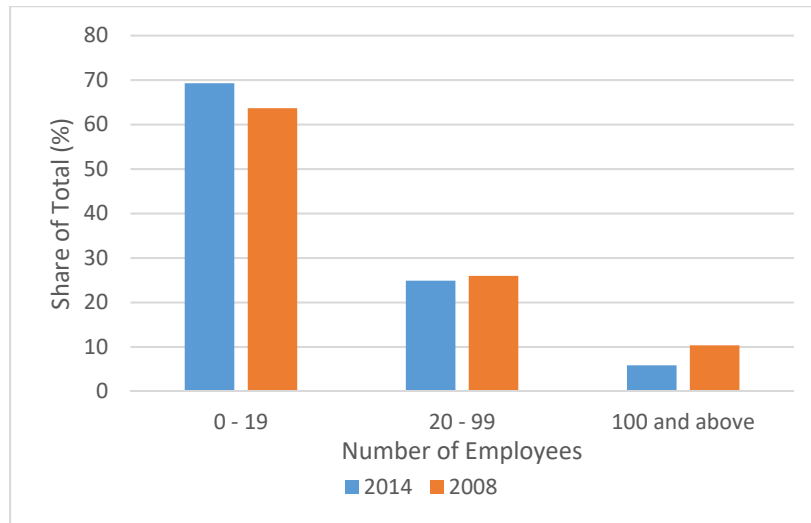


Table 4: Calibration to Afghanistan: Estimates and Targets

Parameter	Estimate	Target
Real rate of interest: r	3.66	Annual real rate = 4%
Depreciation rate: δ	0.81	Annual depreciation rate = 8%
Rental rate: R	4.47	$r + \delta$
Production function parameters: (α, θ)	(0.28, 0.57)	Capital share = 1/3 Concavity = 0.85
Discount rate: β	0.46	Excess savings to investment = 40%
Calibrated Jointly		
Ability distribution parameters: (μ, σ)	(-2.80, 1.1)	Labor share of firms < 20 workers = 69% Labor share of firms \geq 100 workers = 6%
Credit market efficiency: ϕ	0.27	Intermediated capital to output = 1.1

With the model calibrated to match the Afghan economy, we can now begin with our counterfactual exercises.

5.2 Counterfactual Experiments

Let $Y(\tau_A^{AFG})$ denote the output of the model when it is calibrated to the Afghan economy. To quantify the impact of aggregate taxes on output, we counterfactually change the level of taxes under two scenarios – first, when all the firms in the economy face the same level of taxes and second, when the level of taxes depends on the productivity parameter z . As a benchmark, we evaluate the losses relative to output when there are no taxes in the economy which represents an economy in which there are no risks associated with crime-related events. Table 5 shows the result of the exercise.

Table 5: Output Relative to No Aggregate Tax ($\tau_A = 0$)

	Tax Function	
	Single Tax	Correlated Taxes
	(1)	(2)
Relative Output	0.934	0.882

The table reports output relative to an economy in which aggregate taxes τ_A are set to zero, i.e., firms do not experience losses due to crime and corruption, Column (1) corresponds to the case when a single aggregate tax is levied on all firms whereas column (2) reports the relative output when aggregate tax depends of the firm size.

We find that output decreases by 12 percent which is more than double the single tax of 4.5 percent levied on all firms. The excess output loss over the tax levied captures the fact that firms endogenously reduce investment in light of declining returns, leading to a higher contraction in output than the loss due to taxes. However, we find that the output loss increases by 80 percent when we allow firms with different productivities to be impacted by different tax rates. Specifically, the output loss is 5 percentage points higher than the previous case. It is also interesting to note that this incremental loss is higher than the single tax rate. In essence, we find that abstaining from the allocation channel leads to severe underestimation of economic losses and opening the channel drastically increases the impact of such risks.

It is also important to note that our counterfactual experiments assign Afghanistan credit markets a level of efficiency which captures the state of credit markets in India. As Afghanistan is likely to have far worse credit markets, our results might provide a conservative estimate of the output losses generated if the level of financial development is inversely related to the aggregate output loss. To check the nature of this relationship, we perform the same counterfactual exercises with one change. We now conduct the exercises assuming an absence of financial friction, i.e., setting $\phi=1$. Table 6 summarizes the results of the exercise.

We find that the resource allocation channel in the presence of perfect credit markets is able to generate only 50% higher output loss compared to the 80 percent we obtain with imperfect credit markets.

Table 6: Aggregate Output Loss: No Financial Frictions

	Tax Function	
	Single Tax	Correlated Taxes
	(1)	(2)
Relative Output	0.941	0.910

The table reports output relative to an economy in which aggregate taxes τ_A are set to zero, i.e., firms do not experience losses due to crime and corruption, Column (1) corresponds to the case when a single aggregate tax is levied on all firms whereas column (2) reports the relative output when aggregate tax depends of the firm size.

Finally, we also note that our model assumes that credit markets and aggregate taxes operate independently of each other and this makes it possible for us to capture the marginal effects of aggregate taxes keeping the level of financial development unchanged. However, it is plausible that these factors affect each other and improvements in one may lead to improvements in the other. We hope to explore such interactions in the future.

The counterfactual exercises that we have considered till now quantify the economic impact on the Afghan economy if it was exposed to an environment of credit market inefficiency as observed in Afghanistan together with crime-related risks. To address concerns that other frictions may plague the Afghan economy and this may lead to measurement errors in this baseline calibration, in the Appendix (Section 2), we show that our main results remain essentially unchanged when we use an alternate strategy to calibrate the model to the frictionless US economy and give it the characteristics of the Afghan economy.

6. Conclusion

Even among countries and regions plagued by fragility, conflict, and violence, Afghanistan stands out with its low level of investment. Given the tight link between investment and economic growth documented in the literature, it is of utmost importance to look for reasons behind the state of low investment in Afghanistan. In this paper, we looked at the nexus between risks and uncertainty faced by Afghan firms and their investment decisions in the presence of the vastly underdeveloped financial markets.

The findings of our study can be classified into two main messages that are important for policy intervention. First, practices and policies that are often thought of as a driver towards increasing investment and growth - expanding access to finance, encouraging firms to graduate towards formality etc., might come with some strings attached. We find strong evidence of higher risks and uncertainties being faced by firms

that engaged in such practices or used such instruments. We hypothesize that the take-up of these instruments by firms acts as a signal to the appropriators of their productivity and the resultant surplus which makes them an attractive target. In this light, policy making should be cognizant of the fact that interventions in a volatile and weak environment like Afghanistan are not independent of additional risks and uncertainty. If due attention is not paid towards addressing the root causes that create such risks and uncertainty, then this may lead to a capture of a share of benefits generated by the interventions by the appropriators. More efforts are needed to develop instruments to enhance financial intermediation – particularly through digital means and to enhance firms’ ability to manage various risks. Scaling up risk-sharing facilities to facilitate firms’ access to finance and deepening the insurance market are key initial steps in this respect. Digital finance and facilitating access to electronic financial services can help reduce physical exposure to bank branches. This can also minimize targeting of account holders and their exposure to risks. This will also promote efficiency and outreach of financial services.

Second, as the more productive firms face higher risks and uncertainty, the already scarce resources move away from these firms to the less productive ones. This has serious implications for aggregate output as these resources could be better utilized at the more productive firms. As such, any cost-benefit analysis of a policy instrument should take into account the impact of the resource allocation mechanism. This can potentially deem certain interventions worthwhile which are otherwise thought of as reporting higher costs relative to the benefits. Setting up a clear and transparent de-risking mechanism and establishing a reliable framework for public-private partnerships can facilitate the crowding-in of private investments while creating an enabling legal and regulatory environment.

As a final note, we would also like to draw policy-making attention towards the gender-specific incidence of risks and uncertainty in light of our finding that women managed firms are likely to be more vulnerable to risks and uncertainty. As these firms report a much higher perception of crime, corruption, and political stability as being serious roadblocks to the operation, additional thoughts should be given towards protecting women owned/managed firms.

References

- Abel, A. B. (1983), "Optimal investment under uncertainty", *American Economic Review*, 73, 228- 233.
- Abel, A. B. (1985). "A Stochastic Model of Investment, Marginal q and the Market Value of the Firm." *International Economic Review*, 305-322.
- Abel, A. B. and Eberly J. C. (1996). "Optimal Investment with Costly Reversibility". *Review of Economic Studies* 63(4), pp. 581-593.
- Aizenman, J. and Marion, N. P. (1993). "Macroeconomic Uncertainty and Private Investment". *Economics Letters* 41, pp. 207-210.
- Aizenman, Joshua, and Nancy P. Marion (1996). "Volatility and the Investment Response", No. w5841. National Bureau of Economic Research.
- Amaral, P. S., & Quintin, E. (2010). "Limited Enforcement, Financial Intermediation, and Economic Development: A Quantitative Assessment." *International Economic Review*, 51(3), 785-811.
- Atkeson, A., Aubhik Khan, and Lee Ohanian (1996). "Are Data on Industry Evolution and Gross Job Turnover Relevant for Macroeconomics?" *Carnegie-Rochester Conference Series on Public Policy*. Vol. 44. North-Holland.
- Atkeson, A., and Kehoe, P.J. (2001). "The Transition to a New Economy after the Second Industrial Revolution", No. w8676. National Bureau of Economic Research.
- Bah, El-hadj, and Fang, Lei (2015). "Impact of Business Environment on Output and Productivity in Africa." *Journal of Development Economics* 114, pp. 159 – 171.
- Barro, Robert J., and Xavier Sala-i-Martin (1995). "Economic Growth", McGrawHill, New York.
- Beck, T., Demirgüç-Kunt, A., and Levine, R. (2000). "A New Database on the Structure and Development of the Financial Sector." *The World Bank Economic Review* 14.3, pp. 597-605.
- Bernanke, B. S. (1983). "Irreversibility, Uncertainty, and Cyclical Investment." *Quarterly Journal of Economics*, 98(1), 85-106.
- Bertola, G. (1987). "Dynamic Programming, Option Pricing and Irreversible Investment." mimeo, MIT.
- Bloom, N., Bond, S., & Van Reenen, J. (2001). "The Dynamics of Investment under Uncertainty" (WP 01/05). Institute for Fiscal Studies.
- Bloom, N., Bond, S., and Van Reenen, J. (2007). "Uncertainty and Investment Dynamics", *Review of Economic Studies* 74 (2) pp. 391-415.
- Bond, Stephen R., Anke Hoeffler, and Jonathan RW Temple (2001). "GMM Estimation of Empirical Growth Models".
- Buera, F. J., Kaboski, J. P., and Shin, Y. (2011). "Finance and Development: A Tale of Two Sectors." *American Economic Review* 101.5, pp. 1964-2002.
- Caballero, Ricardo J. (1991). "On the Sign of the Investment-Uncertainty Relationship", *American Economic Review*, 81(1), pp. 279-288.
- Campa, J. M. (1993). "Entry by Foreign Firms in the United States Under Exchange Rate Uncertainty." *Review of Economics and Statistics*, 614-622.
- Carruth, A., Dickerson, A. and Henley, A. (2000). "What do we know about investment under uncertainty?", *Journal of Economic Surveys*, 14 pp. 119–53.

- Caselli, Francesco, Gerardo Esquivel, and Fernando Lefort (1996). "Reopening the Convergence Debate: A New Look at Cross-Country Growth Empirics", *Journal of Economic Growth* 1(3), pp. 363-389.
- Carruth, A., Dickerson, A., & Henley, A. (2000). "What Do We Know About Investment Under Uncertainty?" *Journal of Economic Surveys*, 14(2), 119-154.
- Chirinko, R. S. (1993). "Business Fixed Investment Spending: Modeling Strategies, Empirical Results, and Policy Implications." *Journal of Economic literature*, 31(4), 1875-1911.
- Darby, J., Hallett, A. H., Ireland, J., & Piscitelli, L. (1999). "The Impact of Exchange Rate Uncertainty on the Level of Investment." *Economic Journal*, 109(454), 55-67.
- Demir, F. (2009). "Macroeconomic Uncertainty and Private Investment in Argentina, Mexico and Turkey", *Applied Economics Letters*, 16(6), pp.567-571.
- Dixit, A. (1989). "Entry and Exit Decisions Under Uncertainty." *Journal of Political Economy*, 97(3), 620-638.
- Dixit, A. (1992). "Investment and Hysteresis." *Journal of Economic Perspectives*, 6(1), 107-132.
- Dixit, A. and Pindyck, R. (1995). "The Options Approach to Capital Investment". *Long Range Planning*, 4(28), 129.
- Dixit, A. and Pindyck, R. (1994). "Investment under Uncertainty". Princeton, NJ: Princeton University Press.
- Driver, C., & Moreton, D. (1991). "The Influence of Uncertainty on UK Manufacturing Investment." *Economic Journal*, 101(409), 1452-1459.
- Driver, C., Yip, P., & Dakhil, N. (1996). "Large Company Capital Formation and Effects of Market Share Turbulence: Micro-Data Evidence from the PIMS Database." *Applied Economics*, 28(6), 641-651.
- Ferderer, J. P. (1993). "The Impact of Uncertainty on Aggregate Investment Spending: An Empirical Analysis." *Journal of Money, Credit and Banking*, 25(1), 30-48.
- Hartman R. (1972). "The Effects of Price and Cost Uncertainty on Investment", *Journal of Economic Theory*, 5, pp. 258-266.
- Gavin, M., and Hausmann, R. (1998). "Macroeconomic Volatility and Economic Development", *The Political Dimension of Economic Growth*. Palgrave Macmillan UK, pp. 97-116.
- Goldberg, L. S. (1993). "Exchange Rates and Investment in United States Industry." *Review of Economics and Statistics*, 575-588.
- Gopinath, G., Kalemli-Özcan, Ş., Karabarbounis, L., & Villegas-Sanchez, C. (2017). "Capital Allocation and Productivity in South Europe." *Quarterly Journal of Economics*, 132(4), 1915-1967.
- Goulas, E. and Zervoyianni, A. (2013). "Economic growth and crime: does uncertainty matter?" *Applied Economics Letters* 20(5) pp. 420-27.
- Guiso, L., & Parigi, G. (1999). "Investment and Demand Uncertainty." *Quarterly Journal of Economics*, 114(1), 185-227.
- Guner, N., Ventura, G., & Xu, Y. (2008). "Macroeconomic Implications of Size-Dependent Policies." *Review of Economic Dynamics*, 11(4), 721-744.
- Hsieh, Chang-Tai, and Peter J. Klenow. (2009). "Misallocation and Manufacturing TFP in China and India." *Quarterly Journal of Economics* 124.4, pp. 1403-1448.
- Jorgenson, D. W. (1971). "Econometric Studies of Investment Behaviour: A Survey", *Journal of Economic Literature*, 9, 1111-47.

- Leahy, J. V., & Whited, T. M. (1996). "The Effect of Uncertainty on Investment: Some Stylized Trends." *Journal of Money, Credit & Banking*, 28(1), 64-84.
- Levine, R. (2005). "Finance and Growth: Theory and Evidence." *Handbook of Economic Growth*, 1, 865-934.
- Levine, R., and David Renelt. (1992). "A Sensitivity Analysis of Cross-Country Growth Regressions", *American Economic Review*, pp. 942-963.
- Mankiw, N. Gregory, David Romer, and David N. Weil (1992). "A Contribution to the Empirics of Economic Growth", *Quarterly Journal of Economics* 107.2: pp. 407-437.
- Pindyck, R. S. (1988). "Irreversible Investment, Capacity Choice, and the Value of Firm." *American Economic Review*, 78(5), 969.
- Pindyck, R. S., & Solimano, A. (1993). "Economic Instability and Aggregate Investment." *NBER Macroeconomics Annual*, 8, 259-303.
- Price, S. (1996). "Aggregate Uncertainty, Investment and Asymmetric Adjustment in the UK Manufacturing Sector." *Applied Economics*, 28(11), 1369-1379.
- Restuccia, Diego, and Richard Rogerson. (2008). "Policy Distortions and Aggregate Productivity with Heterogeneous Establishments." *Review of Economic Dynamics* 11(4), 707-720.
- Restuccia, D., & Rogerson, R. (2013). "Misallocation and Productivity." *Review of Economic Dynamics*, 1(16), 1-10.
- Rodrik, D. (1991). "Policy Uncertainty and Private Investment in Developing Countries." *Journal of Development Economics*, 36(2), 229-242.
- Sala-i-Martin, Xavier X. (1997). "I Just Ran Two Million Regressions", *American Economic Review*, 178-183.
- Servén, Luis (1998). "Macroeconomic Uncertainty and Private Investment in Developing Countries: An Empirical Investigation". Policy Research Working Paper, The World Bank, Washington D.C.
- Servén, Luis, and Andrés Solimano (1993). "Striving for Growth After Adjustment: The Role of Capital Formation", World Bank Publications.
- US Department of Commerce (1997). *Census of Manufactures*.
- World Bank (2017). "Harmonized List of Fragile Situations", The World Bank, Washington, DC.

Appendix

Section 1: Bivariate Analysis of Risk and Uncertainty¹⁷

According to ES, around 28% of Afghan enterprises reported undertaking investments in 2014, showing a decline by 12% compared to investment levels reported by firms in 2008 (Figure 1A). While the observed decline can be an artifact of sample differences mentioned in the paper earlier, comparing declines across size groups helps us to control for size variations across ES. We find that the decline in investment is broad-based with declines observed for all size groups. However, the large firms saw the highest decline, decreasing from 66% to 29%. In 2014, medium-sized enterprises were most likely to have undertaken investment (46%) among small and large-sized firms.

The number of Afghan firms relying on bank loans to finance their investments is exceptionally low (Figure 2A). Firms in Afghanistan rely mostly on internal funds/retained earnings and in 2014 around 87% of firms that invested used internal funds to finance their entire purchase. A paltry 3% of firms used bank loans to finance a part of their investment. A similar situation existed in 2008. Not surprisingly, in 2014 around 1 in 20 firms in Afghanistan had a line of credit or a loan from a financial institution and less than 2% of firms reported having applied for a loan in the previous year (Table 2). Such low levels of external financing beg the question as to the quality and quantity of financing Afghan firms are obtaining at the moment.

In general Afghan firms that report undertaking investment are associated with better operational outcomes. Firms that invest show higher sale volumes than firms that do not invest. Figure 3A shows that both mean and median annual sales for firms that invest are more than 3 times larger than firms that did not invest. Firms that did not invest are more likely to be small in size. Three out of four firms that did not invest employed fewer than 20 employees. In contrast, nearly half of the firms that invest employ more than 20 employees (Figure 4A). The overall representation of women in ownership and managerial roles in firms is quite marginal. However, firms that invest have a better representation of women. Driven by a low base, women are almost 3 times more likely to be a head manager and 2 times more likely to have an ownership stake in an investing firm (Figure 5A). Firms that have access to finance, proxied by having a bank account are more likely to have invested and are also more likely to expand in the future. Firms with access to finance are 12% more likely to have invested and 6% more likely to expand (Figure 6A).

¹⁷ To keep things simple, data from 2014 and 2008 Enterprise Surveys are used for bivariate analysis (data on informal firms are not part of bivariate analysis).

Figure 1A: Firms undertaking Investment, 2008-2014 (%)

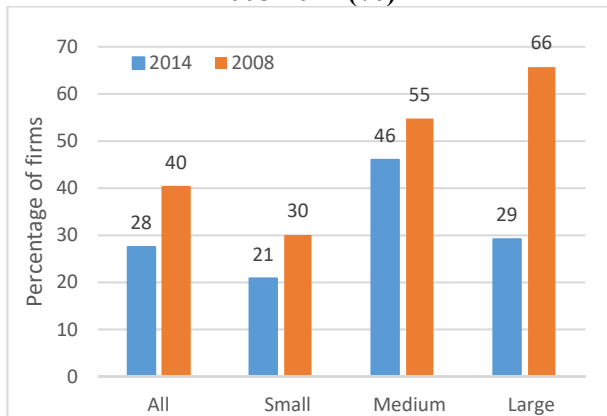


Figure 2A: Firms using a given source for Investment, 2008-2014 (%)

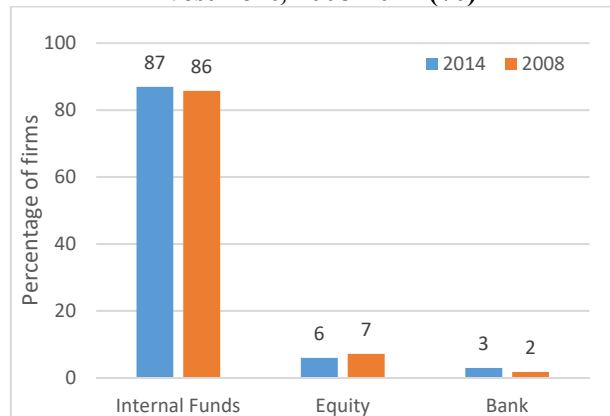


Figure 3A: Firm Annual Sales, 2014 (Million Afghanis)

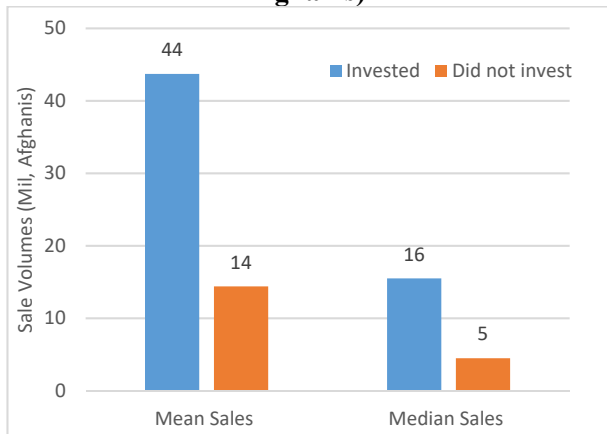


Figure 4A: Firm Size, 2014 (%)

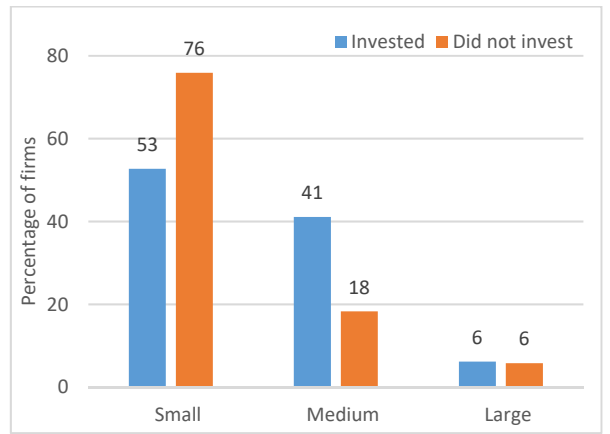


Figure 5A: Women Representation in Firms, 2014 (%)

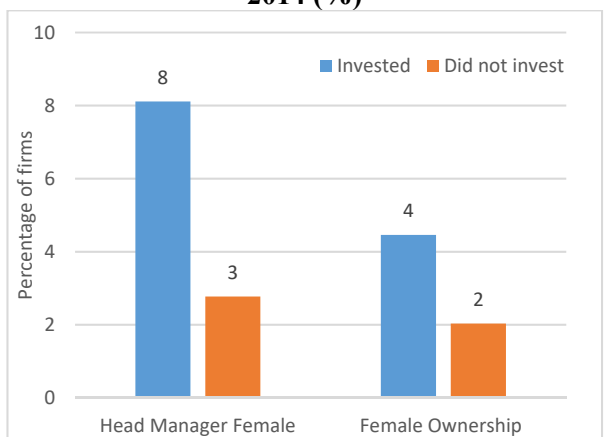
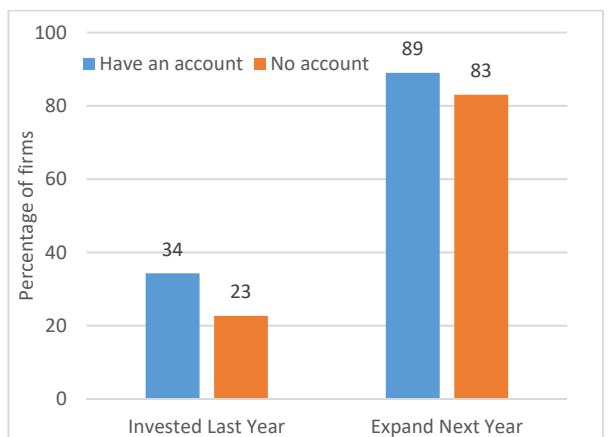


Figure 6A: Access to Finance, 2014 (%)



One of the main challenges affecting firms' operations in Afghanistan includes uncertainties arising from the poor business environment. In fact, corruption or informal gifts/payments given by firms to ease their operations which can be taken as an indicator of weak business climate is identified by Afghan firms as one of the biggest obstacle they face. Political instability is identified as the top obstacle by 21% of firms while corruption is the second biggest obstacle affecting firms' operations with 18% of the firms surveyed reporting it as their biggest obstacle to operations.¹⁸

Out of all the firms that identify political instability as a concern to their business operations, 3 out of 4 identify it as either a major or a very severe obstacle (Figure 7A). Furthermore firms that undertake investment and have access to finance/bank account are more likely to report political instability as a major/severe challenge. Among firms identifying corruption as an obstacle to their operations, 66% reported it to be either a major or a very severe obstacle (Figure 8A). Businesses that undertake investment are more likely to face corruption as a major or a very severe obstacle compared to non-investing firms, while on the other hand firms with access to a bank account are less likely to report corruption as major/severe concern.

Another factor affecting Afghan enterprises is the risk emanating from crime, theft, and disorder. Around 60% of enterprises report crime, theft, and disorder to be either a major or very severe obstacle for their business (Figure 9A). The proportion of firms, both in the formal and informal sector that identify risks associated with theft and crime as a major or severe obstacle to their operations is approximately the same. Female-headed firms are 16% more likely to associate crime-related risks to be major or very severe.

To mitigate the effects of poor business environment and weak security situation, Afghan firms must utilize their financial resources on informal gifts and security, which in a more investment friendly environment could potentially be used for other productive activities effectively adding to the return on the investment. Among the firms that make informal payments, on average 13% of their annual sales are allocated for informal gifts and payments. Looking at expectations of informal payments during tax inspection, Figure 10A shows that approximately 3 out of 10 firms expect to make informal payments or offer gifts to tax inspectors and this ratio is higher among firms undertaking investment and having access to finance. Similarly, to mitigate the impact of risks arising from crime and theft Afghan firms spend money to pay for security. Overall a quarter of firms report to pay for security in Afghanistan and on average spend 8% of their annual sales to buy security. In line with our earlier findings, firms that invest and have access to bank accounts are more likely to pay for security (Figure 11A).

¹⁸ Responses represent percentage of firms identifying from a list of potential obstacles the biggest obstacle affecting their operations.

Figure 7A: Political Instability Major/Very Severe Obstacle, 2014 (%)

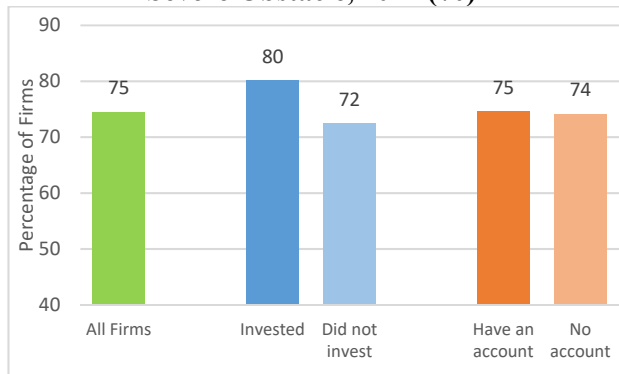


Figure 8A: Corruption Major/Very Severe Obstacle, 2014 (%)

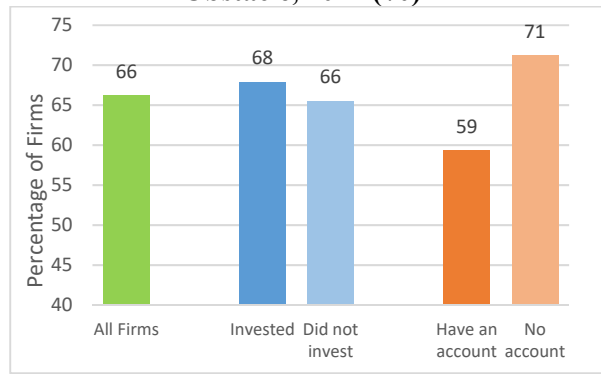


Figure 9A: Crime Major/Very Severe Obstacle, 2014 (%)

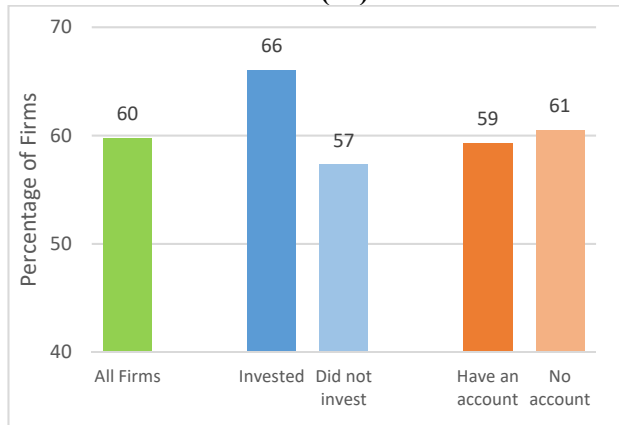


Figure 10A: Expectation of Informal Gifts during Tax Inspection, 2014 (%)

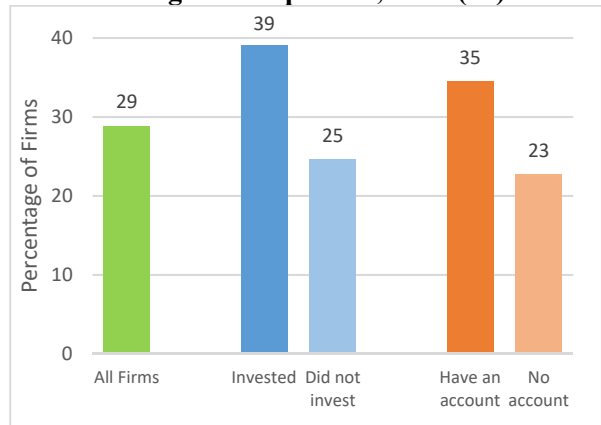
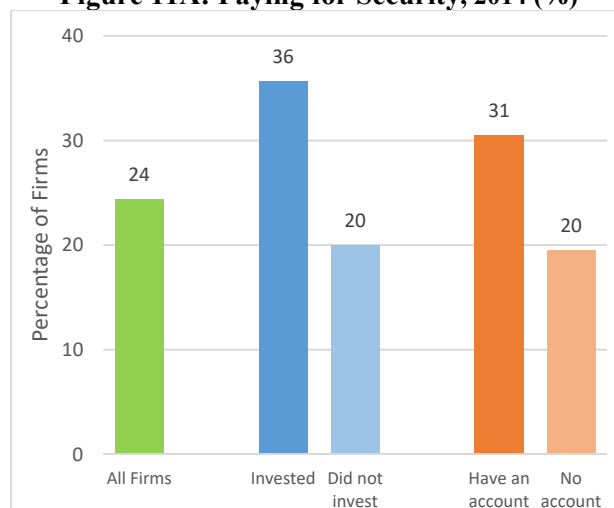


Figure 11A: Paying for Security, 2014 (%)



Section 2: Calibration to the US Economy and Counterfactual Experiments

In the context of our model, the Afghan economy differs from the US economy in two important respects. First, the credit markets in Afghanistan are much underdeveloped compared to the US which ties to the credit market efficiency parameter ϕ . Second, most of the firms in Afghanistan are small compared to the US. The size distribution of firms ties to the distribution of managerial ability which interacts closely with productivity. A manager with higher ability can produce more compared to a manager with low ability with the same level of resources. Hence, differences in size distribution across countries capture the differences in the set of technologies available to each country. To calibrate the model to the US economy, we jointly calibrate ϕ and the managerial ability parameters μ and σ so that we match an intermediated capital to output ratio of 2.2 and two moments from the size distribution of firms observed in the country. Specifically, we target the share of labor allocated to firms with 9 or fewer employees and 500 or more employees to equal 4% and 39% respectively. These moments are calculated using the US Department of Commerce (1997) and have been reported in Restuccia and Rogerson (2008). As in the benchmark calibration, we assume that the US economy faces no aggregate taxes and set $\tau_A^{USA} = 0$.

Table A1 reports the estimated values of the parameters. Apart from the parameters guiding the ability distribution and efficiency of credit markets, all other parameter values are left unchanged at the levels reported in Table A1.

Table A1: Calibration to United States: Estimates and Targets

Calibrated Jointly		
Ability distribution parameters: (μ, σ)	(-2.45, 0.80)	Labor share of firms < 10 workers = 4% Labor share of firms \geq 500 workers = 36%
Credit market efficiency: ϕ	0.53	Intermediated capital to output = 2.2

Table A2 reports the results of the counterfactual experiments when the model is calibrated to the US economy together with the benchmark results presented earlier in Table A1. Our quantitative findings reported earlier remain unaffected by this change in calibration strategy.

Table A2: Output Relative to No Aggregate Tax ($\tau_A = 0$)

	Tax Function	
	Single Tax	Correlated Taxes
	(1)	(2)
Benchmark: Calibrated to Afghanistan	0.934	0.882
Calibrated to United States	0.941	0.888

The table reports output relative to an economy in which aggregate taxes τ_A are set to zero, i.e., firms do not experience losses due to crime and corruption, Column (1) corresponds to the case when a single aggregate tax is levied on all firms whereas column (2) reports the relative output when aggregate tax depends of the firm size.

Table A3: Description of variables used in regression analysis

Variable	Definition
Crime Related Events	Dummy variable equal to 1 if a firm experienced losses as a result of theft, robbery, vandalism or arson on firm's premises and 0 otherwise.
Security Expenditure	Dummy variable equal to 1 if a firm paid for security, for example equipment, personnel, or professional security services and 0 otherwise.
Attitude towards Crime	Dummy variable equal to 1 if crime, theft and disorder is a major or very severe obstacle to the current operations of a firm and 0 otherwise.
Attitude towards Corruption	Dummy variable equal to 1 if corruption is a major or very severe obstacle to the current operations of a firm and 0 otherwise.
Attitude towards Political Instability	Dummy variable equal to 1 if political instability is a major or very severe obstacle to the current operations of a firm and 0 otherwise.
Incidence of Tax Inspection	Dummy variable equal to 1 if firm was visited or inspected by tax official and 0 otherwise.
Expectation of Gifts during Tax Inspection	Dummy variable equal to 1 if during tax inspections or meetings a gift or informal payment was expected or requested and zero otherwise.
Payment for Security	Dummy variable equal to 1 if firm paid for security (for example equipment, personnel, or professional security services), 0 otherwise.
Expenditure on Security (as percent of Sales)	percentage of firm's total annual sales used to pay for security (for example equipment, personnel, or professional security services).
Investment	Dummy variable equal to 1 if a firm purchased any fixed assets, such as machinery, vehicles, equipment, land or buildings and 0 otherwise.
Formal	Dummy variable equal to 1 if a firm belong to the formal sector (registered with a central government body i.e. AISA and/or any Government Ministry, such as the Ministry of Commerce, Ministry of Economy, Ministry of Education, and so on) and zero otherwise.
Log of Manager's Years of Experience	Logarithm of firm's manager's years of experience working in the relevant sector
Female Ownership	Dummy variable equal to 1 if females are amongst the owners of the firm, 0 otherwise.
Head Manager Female	Dummy variable equal to 1 if top manager at a firm is a woman, 0 otherwise.
Account Only	Dummy variable equal to 1 if a firm has a checking or savings account, 0 otherwise.
Overdraft	Dummy variable equal to 1 if a firm has an overdraft facility, 0 otherwise.
Line of Credit	Dummy variable equal to 1 if a firm has a line of credit or a loan from a financial institution, 0 otherwise.
Loan Applications	Dummy variable equal to 1 if a firm applied for any loans or lines of credit, 0 otherwise
Size	Variable capturing size of a firm: small (5 – 19 employees), medium (20 – 99 employees) and large (more than 100employees)
Sector	Variable capturing sector of a firm's operation: retail, construction, other services
Region	Variable capturing regional location of a firm: Kandahar, Herat, Jalalabad, Mazar-e-Sharif
Education of Principal Owner	Variable capturing education level of firm's principle owner: primary school, mid/high school, vocational/technical, university.
Legal Status	Variable capturing legal status of a firm: sole proprietorship, partnership, limited partnership