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BANDAOGO, Brahima

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Determinants of private sector financing in Sub-Saharan Africa: case study of Burkina Faso

Thesis presented by
Brahima BANDAOGO

Supervisor
Professor Romain HOUSSA, Université de Namur

Tutor
Modeste DAYÉ, Université de Namur

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Département des Sciences économiques/UNamur • Rempart de la Vierge 8 • 5000 Namur
Ecole d'économie de Louvain/UCL • Place Montesquieu 3 • 1348 Louvain-la-Neuve

"To my wife, Colette
and our son Imrane"

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Abstract

The aim of this thesis was to identify the determinants of firm access to finance in Burkina Faso. For this purpose, we employ an ordered logit model to analyze data coming from the World Bank enterprise survey collected in 2009 on the activities of non-agricultural formal firms in the country. By using an objective measure of access to finance proposed by Kuntchev et al. (2013), our findings suggest that firm's access to finance is determined by factors like firm's size, firm's legal status, firm's export status and firm's performance measured by labor productivity. Indeed, firm's size and performance have positive effect on the likelihood of having access to finance. Also, being a firm which exports its production compared to firms that produce only for the national market increases the likelihood of having access to finance. Sole proprietor firms meet also difficulties in having access finance compared to firms belonging to several owners.

Besides, robustness analysis that uses a subjective measure of firm's access to finance (based on their perception) confirms partially our findings in a sense that the positive and significant effect of firm's size and legal status on the likelihood of having access to finance are robust. However, firm's performance and export status become not significant in explaining firm's access to finance while foreign ownership of the firm becomes significant with a positive effect on firm's likelihood of having access to finance.

Finally, we recommend that SMEs should join Business Associations and seek credit schemes. This association should promote credit information among potential borrowers as a way of reducing information asymmetry in the credit market. Second, sole proprietor firms need to look for partnership in order to change their legal status and create for instance, partnership companies or shareholding companies, so that they could have a better access to financing. Third, low performing firms need to increase their performance if they want to be less credit constraint. Fourth, non-exporting firms need to learn from exporting firms so that they will know how to position themselves for institutional borrowing.

1. Introduction

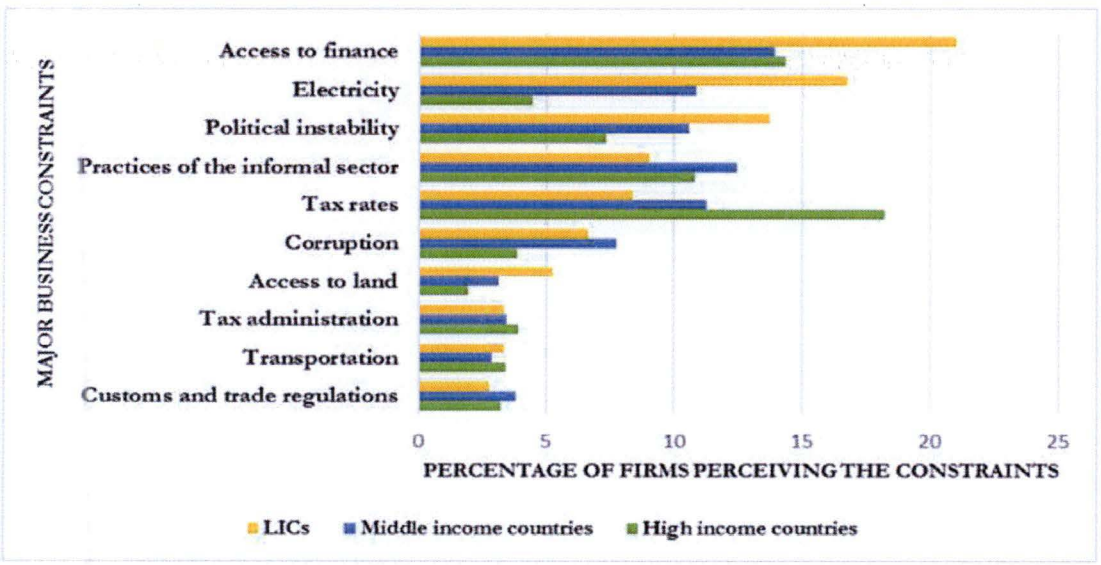
Private sector is believed to play an important role in economic development of Africa. For instance, Stampini et al., (2011) analyzing data from African Economic Outlook on fifty[1] African countries, pointed that private sector accounted for over 80 % of production, two-thirds of investment, three-fourths of credit to the economy and fourth-five of consumption over the period 1996-2008. In the same way, the African Development Report[2] in 2011 indicates that the private sector (informal sector included) contributes to about 90 % of jobs for the employed working age population in Africa.

In Burkina Faso, the important role played by private sector in its economy is also well established. Indeed, private sector investment in Burkina Faso increased from 43% of total investment during the period 1996-2002 to 61% over the period 2003-2008 (Stampini et al, 2011). Besides, this sector is dominated by the micro, small and medium-sized enterprises (MSMEs). According to the World Bank (2015), MSMEs represented approximately 84.3% of total firms in 2009.

Despite the important role played by the private sector in SSA economies, this sector has been facing many constraints. Indeed, during the period 2007-2013, the five main constraints to the growth of private sector in Low Income Countries (LICs) are difficulties to access to external finance, electricity supply shortage, political instability, practices of informal sector, high tax rates and corruption. In particular, access to finance was particularly problematic for the private sector in these economies as we can observe in figure 1.

[1] The sample of Stampini et al., 2011 covered 50 African countries (all but Zimbawe, Somalia and Eritrea).
[2] Chapter 1 : The Role of the Private Sector in Africa's Economic Development, P.21

Figure 1: Access to finance as a major Constraint to the growth of firms in Low Income Countries

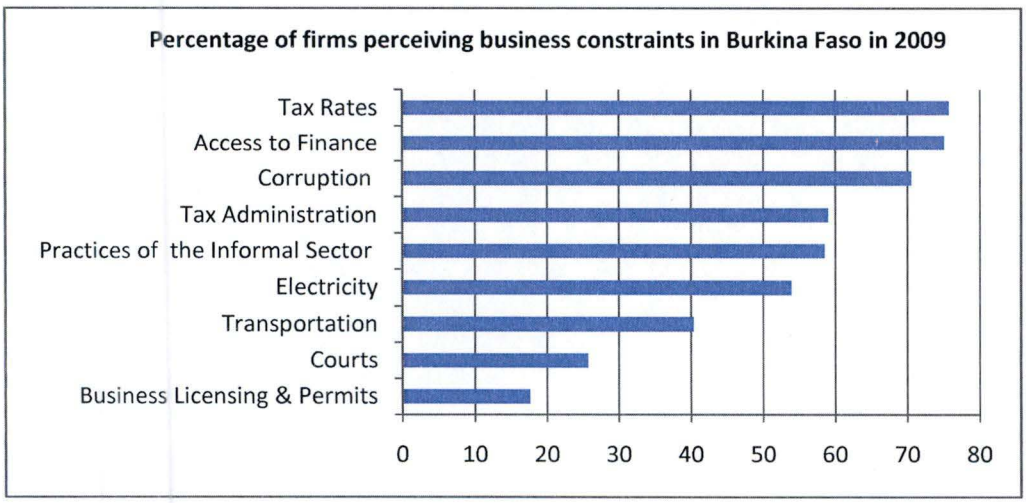


Source: World Bank enterprise surveys 2007-2013 (cross-country average proportions of firms).

Note: This graph is from Dayé et al. (2016), page 12.

In Burkina Faso, tax rates, access to finance and corruption are the first three major business constraints to growth of firms in 2009 (see figure 2). Indeed, according to the World Bank data, 75.7%, 75% and 70.5% of the firms in Burkina Faso in 2009, perceived respectively tax rates, access to finance and corruption as a constraint to their growth in 2009 (see figure 2).

Figure 2: Major business constraints in Burkina Faso in 2009



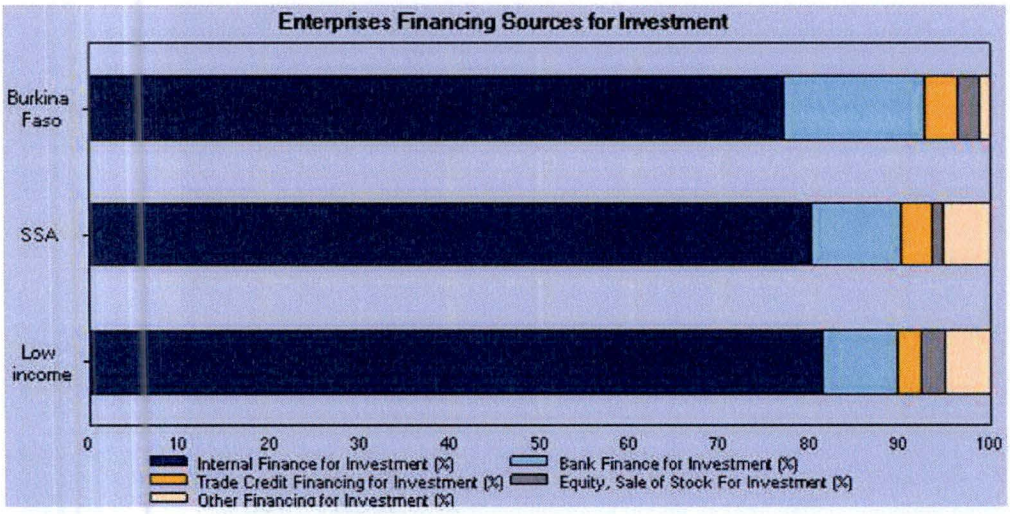
Source: Author based on World Bank data (Africa Development Indicators)

This high proportion of firms perceiving "access to finance" as their second major constraint in Burkina Faso represent one of the highest proportion among West African Economic and Monetary Union (WAEMU) countries. For instance, the proportion of firms that perceived "access

to finance" as a major constraint in 2009 was 66.6%, 48.1% and 58.6% respectively for Cote d'Ivoire, Mali[3] and Togo (World Bank, enterprise survey 2009 and 2010). In the same period, the average for SSA was 44.9%. In addition, according to the World Bank enterprise survey firms in Burkina Faso face serious credit rationing. Indeed, out of 85% of firms having expressed needs for financing only 28% reported having a loan or credit line.

To satisfy their financial needs firms may have the choice between two sources of financing which are internal financing and external financing. Among those sources of financing, external financing is less accessible for MSMEs than internal financing in developing countries and particularly in Burkina Faso. Figure 3 shows that the main source of financing for enterprises in LICs or SSA as well as in Burkina Faso is internal financing. It represented in 2009 respectively for non-agricultural formal firms from Burkina Faso, SSA, and LICs more than 75%, 80% and 81% of their financing needs (World Bank, 2009). Not only, the excessive use of internal financing by firms shows a sign of potentially inefficient financial intermediation, but also a sign that firms are externally credit-constraint in Burkina Faso. Indeed, the percentage of non-agricultural formal firms with bank loans or line of credit in 2009 was only 28.4% compared to 21.6% for SSA (World Bank, 2009).

Figure 3: Enterprises financing sources



Source: World Bank (2009), Burkina Faso Country profile, enterprise Survey. Page 11

Moreover, the share of working capital financed by external financing for non-agricultural formal firms in 2009 represented 25.8% whereas it was 26.5% and 25.1% respectively for SSA and LICs (World Bank, 2009). The lower share of external financing in 2009, could be explained in part by

[3] For Mali the proportion is measured in 2010.

the high value of collateral needed (as a share of the loan amount) which represented 175.5% and was higher than the average for SSA which was 142.6% (World Bank, 2009).

The existence of financing gap for the private sector in Africa for MSMEs has been shown by Sowa et al. (1992) for Ghana and Daniels and Ngwira, (1993) for Malawi. For instance, for Daniels and Ngwira (1993), reports that access to credit since start-up operation is low in the MSME sector and more than 80% of all MSMEs have never received any loans in Malawi. Moreover, only 1.2% of MSMEs have received loans from a formal credit institution. Aryeetey et al. (1994) observed that 38% of SMEs surveyed mention credit as a constraint while Hansen et al. (2012) found that about 39.9%, 18.3% and 8.5% of small firms in Ghana, Kenya and South Africa cited access to finance as a barrier for their growth. For Bani, (2003) most of SMEs loan applicants in Africa are not granted. Bigsten et al. (2000) reported that 90% of small firms are denied credit from the formal financial sector due to their inability to fulfill conditions such as collateral security. Working on six African countries, Bigsten et al. (2003) among those firms which applied for a loan, small firms are unlikely to have a loan from banks. More recently, Berg and Fuchs (2013) reported that the share of SME lending in the overall portfolios of banks in five Sub-Saharan African countries (Kenya, Nigeria, Rwanda, South Africa and Tanzania) is between 5% and 20%.

As outlined above, not only private sector has been playing an important role in SSA economies in general and particularly in Burkina Faso but also faces mainly the constraint of access to finance that impairs its contribution to the economy. These stylized facts motivate to study the determinants of private sector access to finance in Burkina Faso. Specifically, the thesis aims to address the following research questions:

- do firms' characteristics like age, size, performance, legal status and ownership status affect their likelihood of having access to external financing?
- do the characteristics of the top manager (education, gender and experience) affect firms' likelihood of having access to external financing?

The contribution of the current thesis is to help fill the gap of the lack of papers dealing with private sector's access to finance in Burkina on one hand, and to use an innovative approach of measuring firm's "access" to finance developed by Kuntchev et al. (2013) on the other hand. Moreover, not only it is important to study the determinants of private sector access to finance for the sake of a better understanding of this issue, but also for its policies implications related to the alleviation of this constraint in order to improve the contribution of private sector to economic growth in the country.

To examine the determinants of private sector "access to finance", we estimate an ordered logit regression model using the World Bank enterprise survey data on private non-agricultural formal firms. In particular, our dependent variable takes up to four modalities according to the measure proposed by Kuntchev et al. (2013).

Our findings suggest that firm's access to finance is determined by factors like firm's size, firm's legal status, firm's export status and firm's performance measured by labor productivity. Indeed, firm's size and performance have positive effect on the likelihood of having access to finance. Also, being a firm which exports its production compared to firms that produce only for the local market increases the likelihood of having access to finance. Sole proprietors meet also difficulties in accessing finance compared to firms belonging to several owners. Besides, robustness analysis that uses a subjective measure of firm's access to finance (based on their perception) supports partially our findings in a sense that the positive and significant effect of firm's size and legal status on the likelihood of having access to finance are robust. However, firm's performance and export status become not significant in explaining firm's access to finance while foreign ownership of the firm becomes significant with a positive effect on firm's likelihood of having access to finance.

The rest of the thesis is organized as follows. Section 2 reviews both the theoretical and empirical literature on private firms' access to finance. Section 3 presents the methodology used to investigate the determinants of firms' access to finance in Burkina Faso, but also discusses the data and variables used in the regression analysis. Section 4 discusses empirical results. Finally, Section 5 includes conclusions and policy recommendations.

2. Literature review

2.1. Theoretical review

The theoretical literature dealing with access to finance can be divided into two sides. On one hand, we have theories explaining access to finance on the supply-side and on the other hand, theories explaining access to finance on the demand-side.

On the supply-side, information asymmetry theory and credit rationing theory, help to understand the mechanisms behind the issue of private sector's access to external finance.

The reluctance of lenders to provide finance to the private sector could be explained by information asymmetry theory by Akerlof, (1970). The decisions of lenders rely more on the quality of information needed to fund the firm's project. This information includes firm's financial statements, and the project's riskiness. The lower the quality of this information the more reluctant the lenders will be about financing the project and the higher will be the cost of the loan. This

situation leads to the issue of "adverse selection" in which only most risky and bad quality projects will be funded instead of less risky and good quality projects. Therefore, to minimize the risk of selecting bad borrowers, lenders use a set of coping strategies that include screening mechanisms (Milde and Riley, 1988), collateral requirements, monitoring and incentives compatible debt contracts (Holmtrom and Tirole, 1997), and credit rationing (Stiglitz and Weiss, 1981). Moreover, the centralization of information at public credit registries and with private credit bureaus is a way to minimize the cost of information acquisition (Triki and Gajigo, 2003). Recently, this institution which did not exist before has been set up within the WAEMU countries in 2015.

Despite the fact that financial institutions are guided by profit maximization objective, not all the firms who apply for financing are granted access. Thus the supply for credits does not adjust itself to the demand through the price mechanism. Firms may be denied credits even if they are willing to pay arbitrarily high interest rates. This phenomenon is known as credit rationing and it has been addressed theoretically by Stiglitz and Weiss (1981), who defined credit rationing as a situation in which there is an excess demand for commercial loans at the prevailing commercial loan rate. De Meza and Webb (1987) argue that the credit market is not like the normal market where demand is equivalent to supply as the borrowers who are willing to pay higher interest rates may find it difficult when it comes to repayments. Not only banks making loans are concerned about the interest rate they receive on the loan but also the riskiness of the loan. However, the interest rate a bank charges may itself affect the riskiness of the pool of loans by either: i) sorting potential borrowers which is "the adverse selection effect" or ii) affecting the actions of borrowers which is "the incentive effect" Stiglitz and Weiss (1981).

Another factor that can explain private sector access to external finance on the supply-side is the structure of the credit market. The relationship between access to finance and the structure of the credit market is explained through two theories: market power theory and the information hypothesis theory. According to the market power theory, the effect of higher bank competition is double. On one hand, high bank concentration leads to lower costs and better access to finance (Besanko and Thakor, 1992; Guzman, 2000). On the other hand, in the presence of information asymmetries and agency costs, however, competition can reduce access by depriving banks of the incentive to build lending relationships (Petersen and Rajan, 1995). Other contributions point out that the quality of screening (Broecker, 1990; Marquez, 2002) and banks' incentives to invest in information acquisition technologies (Hauswald and Marquez, 2006) are higher in less competitive markets. Therefore, the information hypothesis theory shows that access to credit for

opaque borrowers (most of the time MSMEs) can decrease when competition becomes tougher (Petersen and Rajan, 1995).

On the demand-side, private sector access to external finance is explained by the relationship between the life cycle of the firm and its financial needs [Weinberg, (1994); Berger and Udell, (1998)]. During their life cycle, firms may experience three main stages of growth: start-up, growth and maturity. At the early stage of their growth, start-up firms are heavily dependent on initial insider finance, trade credit, and angel finance [see Sahlman (1990) and Wetzel, (1994)] because startup firms are arguably the most informationally opaque and, therefore, have the most difficulty in obtaining intermediated external finance. Moreover, life-cycle pattern assumes that the ability of the manager which is low and uncertain for start-up firms is a relevant determinant of productivity and growth. However, over the time, as the firm survives and grows not only the ability of the manager improves by experience and becomes less uncertain, but also the quality of financial information statements improves. This pattern may explain why MSMEs have difficulties in accessing external finance but at a later stage of their growth the use of external financing by larger firms is not evident as at this stage they have ample internal funds that can be used to finance their investment needs.

2.2. Empirical review

The issue of firms' access to financing has been widely analyzed in the empirical economic literature. However, papers dealing only with a country case study are very sparse. To our knowledge, we didn't find any academic paper dealing with the problem of private sector's access to financing in Burkina Faso. Thus, our review of the empirical literature is focused mostly on the papers dealing with SSA countries.

To investigate the issue of the private sector access to finance, some papers made just an analyzing of both the supply side and the demand side of the problem based on the financial data available whereas some conducted more rigorous analysis by using qualitative econometric models.

According to Aryeetey et al. (1994), Gockel and Akoena (2002), MSMEs access to finance in SSA is undermine by several factors belonging both to the supply side and the demand side such as inadequate finance, lack of managerial skills, equipment and technology, poor access to capital market, among others. The methodology used by these two papers was just based on an analyzing of the data of the financial system of Ghana. In the same vein using the same methodology, Sacerdoti, (2005) found that the inability to provide adequate financial statements and quality collateral reduce the chance of SMEs of accessing financial institutions. In addition to that the absence of credible credit reference bureaus in most countries in SSA and its attendant effect of

interest rates could explain the chances of SMEs gaining access to finance (see Bass and Schrooten, 2005). Moreover, Buatsi, (2002) pointed out that Small and Medium-sale exporters in Ghana meet difficulties in accessing to finance because of the high level of interest rate, collateral and maladjustment of financial institutions financing products. Indeed, financial institutions prefer granting short-term credit to medium or long-term credit, and investing in government treasury bills and bonds rather than lending to SMEs firms. More recently, Ghandi and Amissah, (2014) examining the different options of financing for SMEs in Nigeria showed that inadequate collateral by SMEs operators, weak demand for the products of SMEs as a result of the dwindling purchasing power of Nigerians, lack of patronage of locally produced goods, poor management practices by SMEs operators and Undercapitalization explain why financial institutions are reluctant to extend credit to SMEs.

The major issue encountered in the empirical literature is the one of measurement of firms' "access" to finance. We meet two types of measurement in the empirical literature: subjective measures and objective measures. The subjective measures are based on firms' perceptions of "access to finance" whilst the objective measures are derived from financial statements like for instance the shares of internal and external financial resources of working capital, and also from hard data instead of perceptions data. Objective measures in developing countries are almost impossible because financial data is limited. Indeed, in developing countries SMEs are not required to file detailed financial reports as they don't raise equity or debt from public markets. Moreover, the use of aggregate measures of financial development is problematic as they do not provide the distribution of financing among such firms. That is why for Claessens and Tzioumis (2006) "*the only way to investigate firms' problems accessing finance is trough tailored firm-level surveys directly addressing the issue of financing constraint*" (page 6). Consequently, this explains the use of the World Bank Enterprises survey data for the current study.

Kuntchev et al. (2013), using data from the World Bank's Enterprise Survey for 119 countries worldwide developed a new measure of credit-constrained status for firms using hard data instead of perceptions data. The paper classifies firms into four ordinal categories: Not Credit Constrained (NCC), Maybe Credit Constrained (MCC), Partially Credit Constrained (PCC), and Fully Credit Constrained (FCC) to understand the characteristics of the firms that fall into each group. The paper first showed by using both statistical and econometrical (ordered logit and simple logit) methods, that SMEs are more likely to be credit constrained (either partially or fully) than large firms. Moreover, SMEs tend to finance their working capital and investment using trade credit and informal sources of finance more frequently than large firms. Second, size is a significant predictor of the probability of being credit constrained, firm age is not. Third, high-performing

firms, as measured by labor productivity, are less likely to be credit constrained. Fourth, countries with high private credit-to-gross domestic product ratios, firms are less likely to be credit constrained. Finally, according to their findings, in developing countries access to credit is inversely related to firm size but positively related to productivity and the country's financial deepening.

Wang (2016) showed by using the Enterprise Survey data from the World Bank which covers data from 119 developing countries that SMEs perceive access to finance as the most significant obstacle which hinders their growth. The determinants among firms' characteristics (demand-side theory factors) are size, age and growth rate of firms as well as the ownership of the firm. This paper used an ordered probit model and a subjective measure of access to financing based on firm's perception of the severity of access to financing. From the supply-side theory the paper pointed out that the main barriers to external financing are high costs of borrowing and a lack of consultant support.

More recently, Quartey et al. (2017), using data from the World Bank's Enterprises Survey on the ECOWAS countries, examines the determinants of SMEs' access to finance both at the at the Sub-regional level and at the country-level. This paper used the two different measures of "access" to finance for the sake of robustness checking. They found that access to finance at the sub-regional level is strongly determined by factors such as firm size, ownership, strength of legal rights, depth of credit information, firm export orientation and experience of the top manager. At the country level, they found important differences in the correlates of firms' access to finance. It is worth noting that these findings at the country level took into account only six countries that are Ghana, Mali, Senegal, Gambia, Guinea and Cote d'Ivoire. Burkina Faso as many others countries has been excluded because of data suitability and the 2014 ranking of "getting credit" distance to the frontier index of the countries in West Africa in 2014 according to the authors.

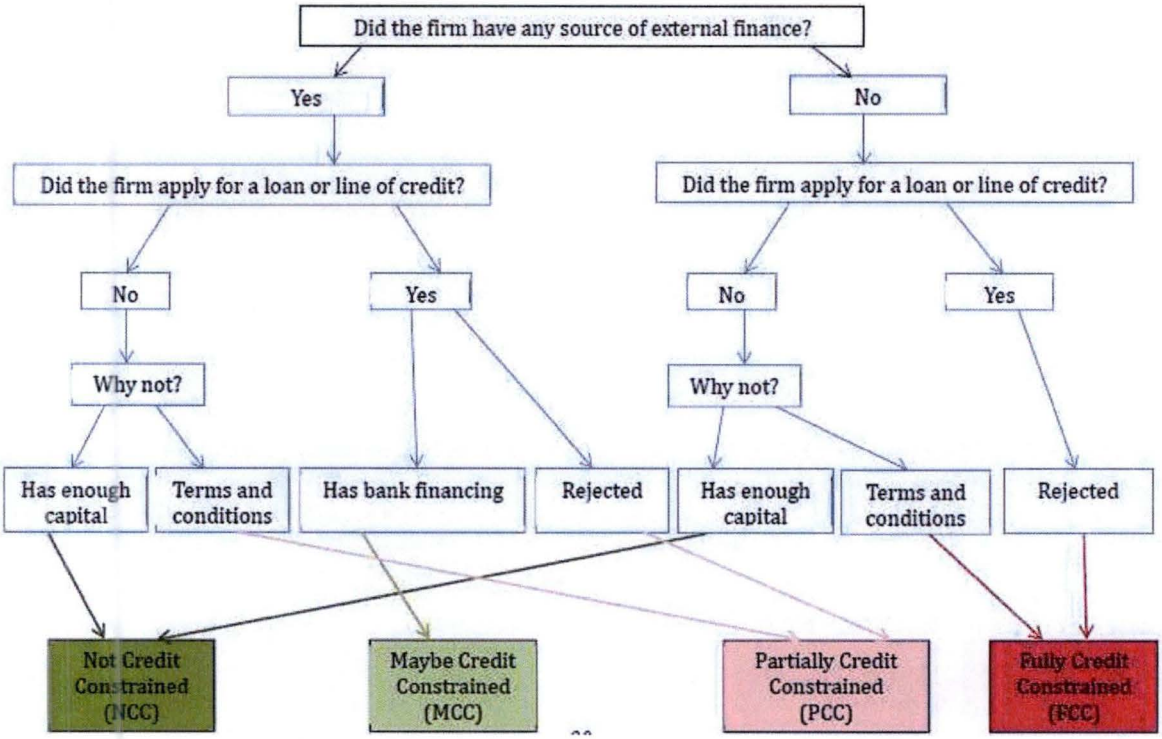
As we can noticed the issue of access to finance has been widely discussed in the empirical literature. Most of the studies were interested in SMEs that is why they focused on the difficulties that SMEs face in their daily operations. Moreover, these studies used both objective and subjective measure of access to financing and analyzed the determinants of access to finance by using multinomial choice models like Ordered logit or ordered probit. In this thesis, in order to investigate the determinants of firm's access to financing, the objective measure proposed by Kuntchev et al. (20013) is used to estimate an ordered logit model. For robustness check, a subjective measure of firm's access to finance based on their perception is used.

3. Methodology

3.1. Empirical model

As mentioned in the empirical literature review, the main issue in assessing the determinants of private firms' access to finance is how to construct the access to finance variable. We use here the measure developed by Kuntchev et al. (2013). This paper classified firms into four ordinal categories: i) Not Credit Constrained (NCC), ii) Maybe Credit Constrained (MCC), iii) Partially Credit Constrained (PCC), and iv) Fully Credit Constrained (FCC) in order to understand the characteristics of the firms that fall into each group. The conditions to be fulfilled by each firm are summarized in the following Figure 4.

Figure 4: Correspondence between Credit-Constrained Groups and Questions in Enterprise Surveys



Source: Kuntchev et al. (2013), Page 20

We can also summarize the description of each category in the following table 1.

Table 1: measurement of access to finance measure as proposed by Kuntchev et al. (2013)

Measure of "access to finance"	Description of the categories
NCC=1	A. Did not apply for a loan during the previous fiscal year B. The reason for not applying for a loan was having enough capital for the firm's needs.
MCC=2	A. Used external sources of finance for working capital and/or investments during the previous fiscal year and/or have a loan outstanding at the time of the survey B. Applied for and obtained a loan during the previous fiscal year
PCC=3	A. Used external sources of finance for working capital and/or investments during the previous fiscal year and/or have a loan outstanding at the time of the survey, and either: 1. Did not apply for a loan during the previous fiscal year and the reason for not applying for a loan was other than having enough capital for the firm's needs. Some of these reasons may indicate that firms may self-select out of the credit market due to prevailing terms and conditions, thus some degree of rationing is assumed or; 2. Applied for a loan but was rejected. However, firms in this group manage to find some other forms of external finance and, consequentially, they are only partially credit constrained.
FCC=4	A. Did not use external sources of finance for both working capital and investments during the previous fiscal year; B. Applied for a loan during the previous fiscal year; C. Do not have a loan outstanding at the time of the survey which was disbursed during the last fiscal year or later.
	A. Did not use external sources of finance for both working capital and investments during the previous fiscal year; B. Did not apply for a loan during the previous fiscal year; C. Do not have an outstanding loan at the time of the survey; D. The reason for not applying for a loan was other than having enough capital for the firm's needs. Some characteristics of the potential loan's terms and conditions deterred these firms from applying. It is thus concluded that they were rationed out of the market.

Source: Kuntchev et al. (2013), pages 9-11

By defining access to finance in such a way, the empirical models that fit to analyze the determinants of private firms' access to finance in Burkina Faso are obviously ordinal choice models. The structural form of these models can be written as follows:

$$Y_i^* = \beta' X_i + \varepsilon_i$$

Where Y_i^* is a latent variable measuring access to finance for the firm i, X_i represents a vector of variables that capture firm's characteristics and those of the top manager. β is a vector of parameters to be estimate and ε_i stands for the error term. As Y_i^* is unobservable, we defined Y_i that takes the values 1, 2, 3 and 4 respectively when the firm falls in the NCC category, MCC category, PCC category and FCC category. Thus, we can define the choice rule as:

$$Y_i = 1 \quad if \quad Y_i^* \leq u_1$$

$$Y_i = 2 \quad if \quad u_1 \leq Y_i^* \leq u_2$$

$$Y_i = 3 \quad if \quad u_2 \leq Y_i^* \leq u_3$$

$$Y_i = 4 \quad if \quad Y_i^* \geq u_3$$

Hence, the probability of observing the event of access to finance is defined for each value of the dependant variableY_i:

- For $Y_i = 1$

$$\begin{aligned} P(Y_i = 1 \,/\, X_i) &= p(Y_i^* \leq u_1 / X_i) \\ &= p(\beta' X_i + \varepsilon_i \leq u_1 / X_i) \\ &= p(\varepsilon_i \leq u_1 - \beta' X_i / X_i) \\ &= F(u_1 - \beta' X_i) \end{aligned}$$

- For $Y_i = 2$

$$\begin{aligned} P(Y_i = 2 \,/\, X_i) &= p[(u_1 \leq Y_i^* \leq u_2) / X_i] \\ &= p[(u_1 \leq \beta' X_i + \varepsilon_i \leq u_2 / X_i)] \\ &= p[(u_1 - \beta' X_i \leq \varepsilon_i \leq u_2 - \beta' X_i / X_i)] \\ &= F(u_2 - \beta' X_i) - F(u_1 - \beta' X_i) \end{aligned}$$

- For $Y_i = 3$

$$\begin{aligned} P(Y_i = 3 \,/\, X_i) &= p[(u_2 \leq Y_i^* \leq u_3) / X_i] \\ &= p[(u_2 \leq \beta' X_i + \varepsilon_i \leq u_3 / X_i)] \\ &= p[(u_2 - \beta' X_i \leq \varepsilon_i \leq u_3 - \beta' X_i / X_i)] \\ &= F(u_3 - \beta' X_i) - F(u_2 - \beta' X_i) \end{aligned}$$

- For $Y_i = 4$

$$P(Y_i = 4 \,/\, X_i) = p(Y_i^* \geq u_3/X_i)$$
$$= p(\beta' X_i + \varepsilon_i \geq u_3/X_i)$$
$$= p(\varepsilon_i \geq u_3 - \beta' X_i/X_i)$$
$$= 1 - F(u_3 - \beta' X_i)$$

where F(.) is the Cumulative Distribution Function (CDF) of the error term ε_i. If we assume that ε_i is normally distributed then we run an ordered probit model. On the contrary, if we assume that the distribution of ε_i is the logistics one, then we run an ordered logit model. In this thesis, logistics distribution is assumed.

As explained in the theoretical review, firm's access to financing is explained both by the demand-side and supply-side factors. In our case, firm's access to financing is a function of its own characteristics and those of the top manager. Firm's characteristics and those of the top manager capture the demand-side factors that can explain their access to financing. Due to the nature of our data (cross section) it is not possible to include in our model the supply-side variables that can affect firm's access to financing. Since the business environment and the financial market in Burkina Faso are common for every firm, it does not really matters not to take them into account in our model. Then the expression of our model is as follows:

$$y_i = \beta_0 + \beta_1 \log(Firm\ age) + \beta_2 \log(Firm\ size) + \beta_3 Sector + \beta_4 gender +$$
$$\beta_5 Legal\ status + \beta_6 Top\ manager\ education + \beta_7 \log(top\ manger\ experience) +$$
$$\beta_8 export\ status + \beta_9 Foreign\ ownership + \beta_{10} labor\ productivity + \varepsilon_i$$

Where y_i is the dependant variable measuring access to finance for the firm i and taking the values, 1 for NCC, 2 for MCC, 3 for PCC and 4 for FCC. The dependent variable y_i is a function of firm's characteristics (*Firm's age, Firm's size, legal status, sector of activity, export status labor productivity and Foreign ownership*), and those of the top manager (*Top manger education, Top manger experience and gender*). The parameters to be estimated are β_i with i= 1, 2, 3… 10. The error term is represented by ε_i.

3.2. Data and summary statistics

Data are from the World Bank Enterprises Survey. This survey has been conducted in Burkina Faso from 15 May 2008 to 10 October 2009. The database contains information on 394 non-agricultural formal firms observed during this period of time. The whole population, or the universe, covered in the Enterprise Surveys is the non-agricultural economy. It comprises all manufacturing sectors according to the ISIC Revision 3.1 group classification (group D),

construction sector (group F), services sector groups G and H), and transport, storage, and communications sector (group I). Note that this population definition excludes financial intermediation (group J), real estate and renting activities (group K, except sub-sector 72, IT, which was added to the population under study), and all public or utilities-sectors.

Our sample shows that SMEs dominates in Burkina Faso. Indeed, the proportion of Small, Medium and Large firms among non agricultural private firms in Burkina Faso represented respectively 59.14%, 30.96% and 9.9% (see appendix 1). SMEs represented 90.1% of non agricultural private firms and this is consistent with the general figure (84.3%) we gave above in section 1.

Formal non agricultural firms in Burkina Faso were operating in 2009 mostly in the service sector especially in the retail sector (31.73%). The second sector is the whole sale sector with 13.96%. Construction, other manufacturing, hotel and restaurant, and transport represent respectively 9.64%, 8.12%, 6.35% and 6.09%. Information about the sectors in which these firms are operating are summarized in appendix 2.

Appendix 3 indicates the major business constraints for our sample on 394 private non-agricultural firms in Burkina Faso. Access to finance is perceived as the major constraints for these firms before tax rates and practices of competitors in informal sectors.

According to the methodology of Kuntchev et al. (2013), the proportions of firms considered to be PCC, FCC, NCC and MCC are respectively 48.22%, 28.87%, 15.99% and 10.91% (see appendix 4).

There are three main reasons why some firms did not apply for a loan are: (i) they don't need because they have enough capital (25.65%), (ii) collateral requirements are too high (19.92%), (iv) interest rates are not favorable (17, 89%) and (v) application procedures for loans or line of credit are complex (14.23%) (See appendix 5). According to these figures, the reasons why firms in Burkina Faso don't apply for a loan or credit line are mainly due to the financial system.

Table 2 summarizes the description of each variable of the empirical model. It shows how each of them is measured and also gives the category of variables into which each variable falls.

Table 2: Description of the variables

Dependent and Independent Variables	Description
Access to finance	Multinomial variable: 1="NCC"; 2="MCC"; 3="PCC" and 4="FCC"
Firm's age	logarithm of firm's age measured in years (in logarithm)
Firm's size	Number of firm's full-time employees (in logarithm)
Sector	Dummy variable: Sector of activity in which the firm operates, 1= "service (retail)" and 0 = "other"
Gender of the top manager	Dummy variable: gender of the top manager 0 = "male" and 1= "female"
Foreign ownership	Dummy variable: 0 = "national owner" and 1="foreign owner"
Top manager experience	Top manager's years of working experience in the sector (in logarithm)
Top manager education	Dummy variable: Top manager education 1 = "no education" and 0= "educated"
Sole proprietor	Dummy variable: legal status of the firm, 1="sole proprietor" and 0 = "not sole proprietor"
Labor productivity	Average labor productivity of the firm (in logarithm)
Export status	Dummy variable: 1 = if the firm export its production and 0 = if the firm produce only for the local market.

Source: Author

4. Empirical Results

4.1. Determinants of firm's access to finance in Burkina Faso

The results of the regression shows that firm's size, firm's legal status, firm's performance measured by labor productivity and firm's export status have a negative and significant effect on the non agricultural private firms' likelihood to be credit constraint in Burkina Faso. Indeed, the bigger the firm most likely it is to be "non credit constraint" (NCC) and have access to finance. Moreover, the high performing the firm is most likely it is to be "non credit constraint" and have access to finance. Also, Firms that produce for exportation are more likely to have access to finance compared to firms that produce only for the national market. Besides, sole proprietor firms are most likely to be fully credit constraints (FCC) and to meet difficulties in having access to finance.

Our results on the effect of the firm's size and firm's performance are consistent with the findings of Quartey et al. (2016) for Ghana and Mali and also with those of Kuntchev et al. (2013) for sub-

Saharan Africa. These finding are also consistent with the theory of firm's life cycle [see Weinberg, (1994); Berger and Udell, (1998)]. On the contrary, while firm's legal status has a significant effect on the likelihood of firms to have access to finance Kuntchev et al. (2013) found no significant effect of this variable. The same is true for the export status of the firm. Quartey et al. (2016) did not find any significant effect of the export status on firm's access to finance at the regional level in ECOWAS. The results are summarized in the following table 3.

Table 3: ordered logit (dependent variable: Access to finance, credit constraint status)

Regressors	Coef.	Marginal effects (dy/dx)			
		Outcome (1)	Outcome (2)	Outcome (3)	Outcome (4)
Firm's age	0.2235	-0.0276	-0.0143	0.0047	0.0372
	(0.1699)	(0.0211)	(0.0112)	(0.0059)	(0.0281)
Firm's size	**-0.2088****	**0.0258***	**0.0134***	-0.0044	**-0.0348****
	(0.1066)	(0.0136)	(0.0071)	(0.0049)	(0.0176)
Sector (retail service)	0.3191	-0.0377	-0.0202	0.0029	0.0551
	(0.2423)	(.0275)	(0.0152)	(0.0063)	(0.0434)
Gender top manager (Female)	0.0977	-0.0118	-0.0062	0.0014	0.0166
	(0.2731)	(0.0323)	(.01733)	(0.0029)	(0.0473)
Top manager education	0.0235	-0.0029	-0.0015	0.0004	0.0039
	(0.4501)	(0.0548)	(0.0288)	(0.0076)	(0.0759)
Foreign ownership (foreign)	0.0483	-0.0059	-0.0031	0.0008	0.0081
	(0.5512)	(0.0659)	(0.0352)	(0.0071)	(0.0941)
Top manager years of experience	- 0.1426	0.0176	0.0091	-0.0030	-0.0238
	(0.1609)	(0.0199)	(0.0104)	(0.0045)	(0.0267)
Legal status (sole proprietorship)	**0.5657****	**-0.0724****	**-0.0359****	0.0164	**0.0918****
	(0.2368)	(0.0304)	(0.0160)	(0.0129)	(0.0381)
Labor productivity	**-0.1894*****	**0.0234*****	**0.0121*****	-0.0039	**-0.0315*****
	(0.0667)	(0.0084)	(0.0046)	(0.0039)	(0.0112)
Export status (exporter)	**-0.4927***	**0.0690***	**0.0313***	-0.0265	**-0.0737****
	(0.2620)	(0.0409)	(0.0167)	(0.0226)	(0.0361)

observations = 356
Wald chi2(10) = 46.86
Prob > chi2 = 0.0000
Pseudo R2 = 0.0582

Dependent variable: access to finance (NCC=1, MCC=2, PCC=3, FCC=4).
Robust standard errors in parentheses.
*** indicates significance at 1% ($p < 0.01$)
** indicates significance at 5% ($p < 0.05$)
* indicates significance at 10% ($p < 0.10$)

In terms of magnitude, an increase of 10 percent of the firm size increases the likelihood of the firm to be Non Credit Constraint "NCC" by 0.26 percentage point, ceteris paribus. Similarly, an increase of 10 percent of the firm size decreases the probability of the firm to be Fully Credit Constraint "FCC" by 0.35 percentage point, ceteris paribus.

Being a sole proprietor firm decreases the likelihood of the firm to be NCC by 7.2 percentage point. Sole proprietor firms are 9.2 percent more likely to be Fully Credit Constraint compared to the others, ceteris paribus.

An increase of 10 percent of firm's performance increases the likelihood for this firm to be Non Credit Constraint by 0.23 percentage point. Also, an increase of 10 percent of the firm performance decreases the likelihood of the firm to be Fully Credit Constraint by 0.32 percentage point, ceteris paribus.

Being an exporter firm increases the likelihood to be credit constraint by 6.9 percentage points, ceteris paribus. It also, decreases the likelihood of being Fully Credit Constraint by 7.4 percentage point.

In a nutshell, our results have identify four determinants of access to finance for non agricultural formal firms in Burkina Faso that are firm's size, firm's legal status, firm's performance and firm's export status. We found those results by using an objective measure of access to finance proposed by Kuntchev et al. (2013). Are those findings in the case of Burkina Faso robust if we use a subjective measure of firm's access to finance based on their perception? In the following part of this section we make a robustness analysis.

4.2. Robustness checks

For the robustness check, we estimate another ordered logit model on the same independent variables but we replaced the dependent variable by a subjective measure of firm's access to finance which is based on their perception. The subjective measure of access to finance is taking 5 modalities representing firm's perception of whether access to finance is an obstacle or not. Then the variable will take the values: 0 =No obstacle, 1= Minor obstacle, 2 = Moderate obstacle, 3 = Severe obstacle, 4 = Very severe obstacle.

Firm's size matters for access to finance. Indeed, the effect is positive and statistically significant (see table 4). Compared to SMEs, large firms do not perceive access to finance as an obstacle because it is easier for them to raise money for their working capital and/or investment. This finding is consistent with the demand-side theory on firm's life cycle and robust in a sense that it confirms also our previous finding.

Table 4: ordered logit (dependent variable: degree of firm's perception of access to finance as a constraint)

egressors	Coef.	Marginal effects (dy/dx)				
		Outcome (0)	Outcome (1)	Outcome (2)	Outcome (3)	Outcome (4)
irm's age	-0.1000	0.0019	0.0054	0.0129	0.0031	-0.0233
	(0.1569)	(0.0030)	(0.0085)	(0.0203)	(0.0051)	(0.0365)
irm's size	**-0.2302****	**0.0043***	**0.0123****	**0.0297****	0.0072	**-0.0535****
	(0.1081)	(0.0025)	(0.0062)	(0.0143)	(0.0049)	(0.0251)
ector (retail service)	0.0527	- 0.0010	- 0.0028	- 0.0068	- 0.0017	0.0123
	(0.2308)	(0.0043)	(0.0122)	(0.0297)	(0.0079)	(0.0540)
ender top manager Female)	0.0862	- 0.0016	- 0.0045	- 0.0111	- 0.0031	0.0202
	(0.3009)	(0.0054)	(0.0153)	(0.0383)	(0.0123)	(0.0711)
op manager education	-0.5660	0.0138	0.0371	0.0745	- 0.0046	-0.1207
	(0.4352)	(0.0142)	(0.0346)	(0.0564)	(0.0217)	(0.0834)
oreign ownership foreign)	**-1.0736****	0.0329	**0.0824***	**0.1335*****	- 0.0406	**-0.2082*****
	(0.4299)	(0.0220)	(0.0456)	(0.0459)	(0.0444)	(0.06475)
op manager years of xperience	-0.0597	0.0011	0.0032	0.0077	0.0019	-0.0139
	(0.1621)	(0.0031)	(0.0087)	(0.0209)	(0.0051)	(0.0377)
egal status (sole roprietorship)	**0.4016***	- 0.0079	- 0.0221	**- 0.0520***	-0.0104	**0.0924***
	(0.2400)	(0.0055)	(0.0141)	(0.0314)	(0.0079)	(0.0544)
abor productivity	-0.0539	0.0010	0.0029	0.0070	0.0017	- 0.01254
	(0.0604)	(0.0012)	(0.0033)	(0.0078)	(0.0021)	(0.0141)
xport status (exporter)	0.0815	- 0.0015	- 0.0043	- 0.0105	-0.0029	0.0191
	(0.3061)	(0.0055)	(0.0156)	(0.0390)	(0.0123)	(0.0722)

observations = 355
R chi2(10) = 30.50
rob > chi2 = 0.0007
seudo R2 = 0.0326

Dependent variable: access to finance (No obstacle = 0, Minor obstacle = 1, Moderate obstacle = 2, Severe obstacle = 3, Very severe obstacle = 4).
Robust standard errors in parentheses.
*** indicates significance at 1% ($p < 0.01$)
** indicates significance at 5% ($p < 0.05$)
* indicates significance at 10% ($p < 0.10$)

Besides, firm's legal status is also statistically significant in explaining access to finance in a sense that sole proprietor firms are most likely to declare access to finance as very severe obstacle compared to partnership or shareholding firms. This result is also robust since it confirms previous finding.

On the contrary, firm's performance does not have a significant effect on their perception on access to finance. Export status of the firm here has not a significant effect on the perception of firm access to finance as it was the case in the previous regression (table3). Moreover, a new finding here is that foreign owned firms are less likely to perceive access to finance as an obstacle.

In terms of magnitude, an increase of 10 percent of the firm's size increases the likelihood of perceiving access to finance as not an obstacle by 0.043 percentage point. Similarly, an increase of the firm's size by 10 percent lead to a decrease in the likelihood of perceiving access to finance as very severe obstacle by 0.54 percentage point. Being a sole proprietor firm increases the likelihood of perceiving access to finance as a very severe obstacle by 9.24 percentage points. Also, being a foreign owned firm decreases the likelihood of perceiving access to finance as a very severe obstacle by about 21 percentage points.

5. Conclusion and policy implications

The objective of this thesis was to identify the determinants of firm access to finance in Burkina Faso. For this purpose, we employ an ordered logit model to analyze data on the activities of non-agricultural formal firms in the country. By using an objective measure of access to finance proposed by Kuntchev et al. (2013), our findings suggest that firm's access to finance is determined by factors like firm's size, firm's legal status, firm's export status and firm's performance measure by the labor productivity. Indeed, firm's size and performance have positive effect on the likelihood of having access to finance. Also, being a firm which exports its production compared to firms that produce only for the local market increases the likelihood of having access to finance. Sole proprietors meet also difficulties in accessing finance compared to firms belonging to several owners.

Besides, robustness analysis that uses a subjective measure of firm's access to finance (based on their perception) confirms partially our findings in a sense that the positive and significant effect of firm's size and legal status on the likelihood of having access to finance are robust. However, firm's performance and export status become not significant in explaining firm's access to finance while foreign ownership of the firm becomes significant with a positive effect on firm's likelihood of having access to finance.

Our findings have some implications for policy. First, given that firm's size is important in accessing to finance, SMEs should join Business Associations and seek credit schemes. This association should promote credit information among potential borrowers as a way of reducing information asymmetry in the credit market. Second, sole proprietor firms need to look for partnership in order to change their legal status and create for instance, partnership companies or

shareholding companies, so that they could have a better access to financing. Third, low performing firms (in terms of labor productivity) need to increase their performance if they want to be less credit constraint. Fourth, as export status matters in terms of accessing to finance, non-exporting firms need to learn from exporting firms so that they will know how to position themselves for institutional borrowing.

Finally, one limitation of this thesis is that findings cannot be extrapolated to the whole economy since it concerns only the non-agricultural formal and private firms. Moreover, the thesis analyzed only the demand-side factors that could affect firm's access to financing. Future studies should work on a better representative sample of firms which will include all types of firms in the country (formal, informal, agricultural, non-agricultural, small, medium and large firms). Besides, in order to analyze the effects of supply-side factors on the likelihood of having access to finance, future studies should also use data from more than one country so that it will be possible to analyze the effects of variables capturing for instance the effects of financial deepening and business environment.

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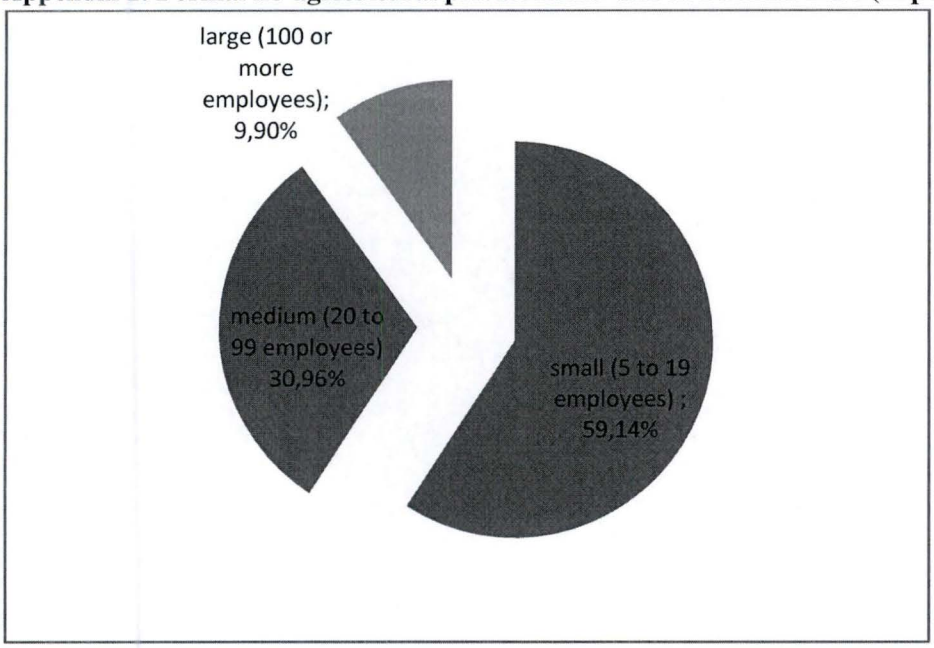
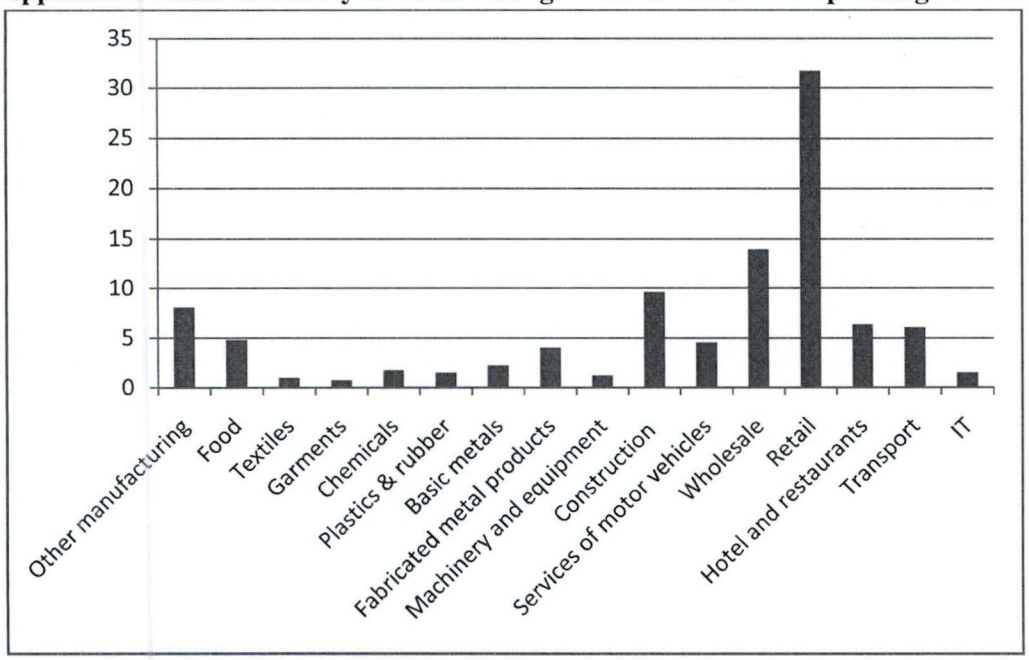
Appendix

Appendix 1: Formal no-agricultural private firms' size in Burkina Faso (in percentage)



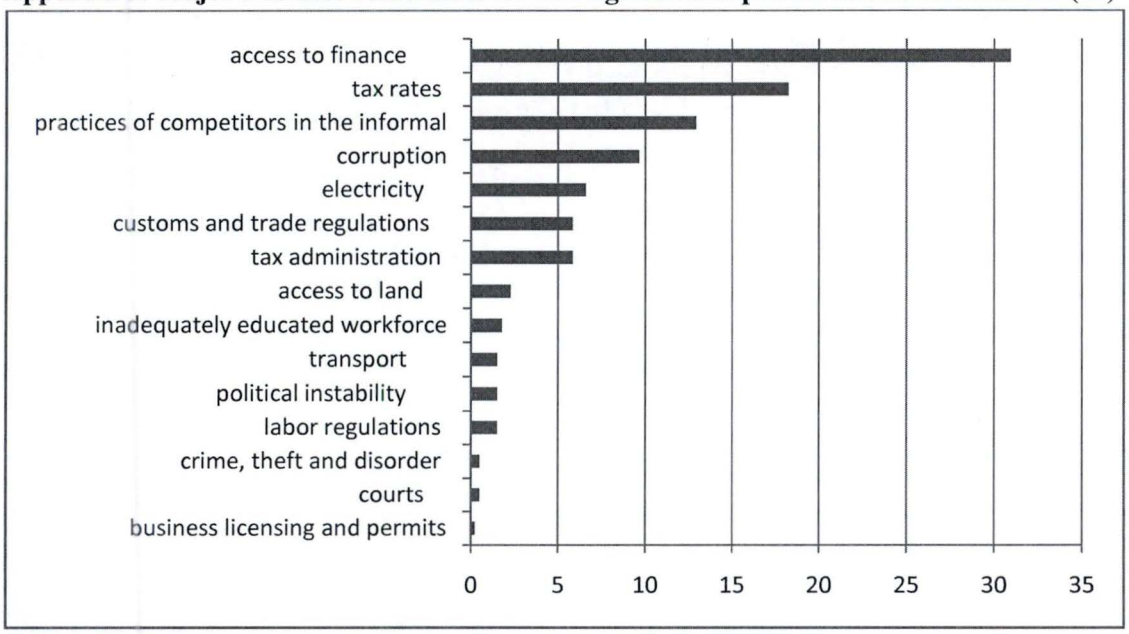
Source: Author based on World Bank enterprise survey 2009

Appendix 2: sector of activity in which non agricultural firms were operating in 2009



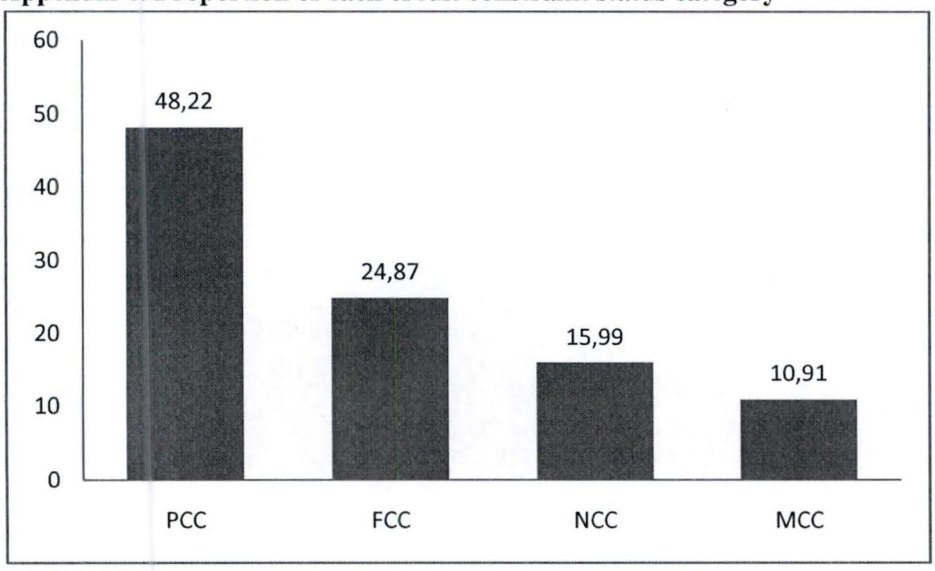
Source: Enterprise survey data

Appendix 3: Major Business constraints for non-agricultural private formal firms in BF (%)



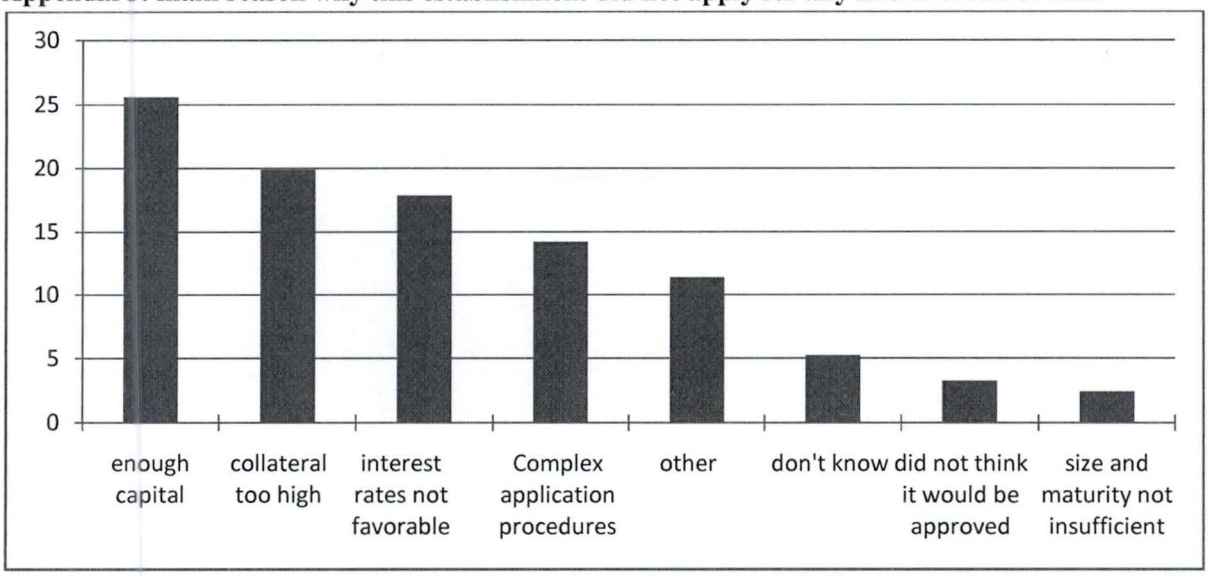
Source: Author based on World Bank enterprise survey 2009

Appendix 4: Proportion of each credit constraint status category



Source: Author based on World Bank enterprise survey 2009

Appendix 5: main reason why this establishment did not apply for any line of credit or loan



Source: Author based on World Bank enterprise survey 2009

Appendix 6: Stata outputs

Ordered logit for objective measure

```
. ologit DP lnage lnsize sector gender mnger_ed for_owner lnyear_exp sole_prop lnlabor_prod export
> , robust

Iteration 0:   log pseudolikelihood = -436.98508
Iteration 1:   log pseudolikelihood = -411.97844
Iteration 2:   log pseudolikelihood = -411.53914
Iteration 3:   log pseudolikelihood = -411.53796
Iteration 4:   log pseudolikelihood = -411.53796

Ordered logistic regression                     Number of obs   =        356
                                                Wald chi2(10)   =      46.86
                                                Prob > chi2     =     0.0000
Log pseudolikelihood = -411.53796               Pseudo R2       =     0.0582
```

DP	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
lnage	.2235562	.1699933	1.32	0.188	-.1096244	.5567369
lnsize	-.2088676	.1066674	-1.96	0.050	-.4179319	.0001967
sector	.3191952	.242305	1.32	0.188	-.1557138	.7941042
gender	.0977506	.2731979	0.36	0.720	-.4377075	.6332086
mnger_edu	.0234985	.450124	0.05	0.958	-.8587284	.9057253
for_owner	.0483018	.5512877	0.09	0.930	-1.032202	1.128806
lnyear_exp	-.1426117	.1609456	-0.89	0.376	-.4580592	.1728359
sole_prop	.5656717	.2367867	2.39	0.017	.1015783	1.029765
lnlabor_prod	-.1894062	.0666608	-2.84	0.004	-.3200589	-.0587534
export	-.4926998	.2620285	-1.88	0.060	-1.006266	.0208666
/cut1	-4.831596	1.139463			-7.064902	-2.59829
/cut2	-4.150124	1.134606			-6.37391	-1.926338
/cut3	-1.734386	1.117612			-3.924864	.4560926

```
. mfx, predict(outcome(1))

Marginal effects after ologit
      y  = Pr(DP==1) (predict, outcome(1))
         =  .14443832
```

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
lnage	-.0276262	.0211	-1.31	0.190	-.068975	.013722	2.40157
lnsize	.025811	.0136	1.90	0.058	-.00084	.052462	2.80691
sector*	-.0377514	.02755	-1.37	0.171	-.091755	.016252	.303371
gender*	-.011781	.03219	-0.37	0.714	-.074868	.051306	.140449
mnger_~u*	-.002882	.0548	-0.05	0.958	-.110279	.104515	.047753
for_ow~r*	-.0058796	.06597	-0.09	0.929	-.135185	.123426	.061798
lnyear~p	.0176234	.01989	0.89	0.376	-.02136	.056607	2.56235
sole_p~p*	-.0723551	.03038	-2.38	0.017	-.131898	-.012812	.578652
lnlabo~d	.023406	.00837	2.80	0.005	.007	.039812	15.9027
export*	.0689554	.04096	1.68	0.092	-.011325	.149236	.13764

(*) dy/dx is for discrete change of dummy variable from 0 to 1

```
. mfx, predict(outcome(2))

Marginal effects after ologit
      y  = Pr(DP==2) (predict, outcome(2))
         =  .10578272
```

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
lnage	-.0143153	.01117	-1.28	0.200	-.036207	.007576	2.40157
lnsize	.0133748	.0071	1.88	0.060	-.000548	.027297	2.80691
sector*	-.0202197	.01524	-1.33	0.185	-.050092	.009652	.303371
gender*	-.006234	.01733	-0.36	0.719	-.040209	.027741	.140449
mnger_~u*	-.0015032	.02875	-0.05	0.958	-.057849	.054842	.047753
for_ow~r*	-.0030862	.03517	-0.09	0.930	-.072012	.065839	.061798
lnyear~p	.0091321	.01049	0.87	0.384	-.011426	.02969	2.56235
sole_p~p*	-.0358957	.01605	-2.24	0.025	-.067351	-.00444	.578652
lnlabo~d	.0121285	.00464	2.61	0.009	.003033	.021224	15.9027
export*	.0312561	.01668	1.87	0.061	-.001427	.06394	.13764

(*) dy/dx is for discrete change of dummy variable from 0 to 1

```
. mfx, predict(outcome(3))

Marginal effects after ologit
      y  = Pr(DP==3) (predict, outcome(3))
         =  .53867841
```

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
lnage	.0047111	.00587	0.80	0.422	-.006786	.016208	2.40157
lnsize	-.0044015	.00489	-0.90	0.368	-.01399	.005187	2.80691
sector*	.0028952	.00633	0.46	0.647	-.009515	.015305	.303371
gender*	.0014054	.00293	0.48	0.631	-.004329	.00714	.140449
mnger_~u*	.0004477	.00768	0.06	0.954	-.014609	.015504	.047753
for_ow~r*	.0008234	.00711	0.12	0.908	-.013107	.014754	.061798
lnyear~p	-.0030053	.00454	-0.66	0.508	-.011909	.005898	2.56235
sole_p~p*	.0164375	.01289	1.28	0.202	-.008827	.041702	.578652
lnlabo~d	-.0039914	.00392	-1.02	0.309	-.011675	.003692	15.9027
export*	-.0265043	.02266	-1.17	0.242	-.070909	.0179	.13764

(*) dy/dx is for discrete change of dummy variable from 0 to 1

```
. mfx, predict(outcome(4))

Marginal effects after ologit
      y  = Pr(DP==4) (predict, outcome(4))
         =  .21110056
```

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
lnage	.0372304	.02806	1.33	0.185	-.017768	.092229	2.40157
lnsize	-.0347842	.01758	-1.98	0.048	-.069247	-.000321	2.80691
sector*	.0550759	.04339	1.27	0.204	-.029967	.140119	.303371
gender*	.0166095	.04728	0.35	0.725	-.076051	.10927	.140449
mnger_~u*	.0039374	.07587	0.05	0.959	-.144773	.152648	.047753
for_ow~r*	.0081424	.09409	0.09	0.931	-.176272	.192557	.061798
lnyear~p	-.0237501	.02667	-0.89	0.373	-.076017	.028517	2.56235
sole_p~p*	.0918134	.03809	2.41	0.016	.017168	.166459	.578652
lnlabo~d	-.0315432	.01122	-2.81	0.005	-.053538	-.009548	15.9027
export*	-.0737072	.03607	-2.04	0.041	-.144398	-.003017	.13764

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Ordered logit for subjective measure

```
. ologit DP1 lnage lnsize sector gender mnger_ed for_owner lnyear_exp sole_prop lnlabor_prod expor
> t if DP1!=-9

Iteration 0:   log likelihood = -468.04676
Iteration 1:   log likelihood = -452.91105
Iteration 2:   log likelihood =  -452.7971
Iteration 3:   log likelihood = -452.79704
Iteration 4:   log likelihood = -452.79704

Ordered logistic regression                     Number of obs   =        355
                                                LR chi2(10)     =      30.50
                                                Prob > chi2     =     0.0007
Log likelihood = -452.79704                     Pseudo R2       =     0.0326
```

DP1	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lnage	-.1000411	.156927	-0.64	0.524	-.4076125	.2075302
lnsize	-.2302468	.1080763	-2.13	0.033	-.4420724	-.0184212
sector	.0527316	.2308442	0.23	0.819	-.3997148	.5051779
gender	.08624	.3009022	0.29	0.774	-.5035175	.6759975
mnger_edu	-.5659974	.4352217	-1.30	0.193	-1.419016	.2870215
for_owner	-1.073691	.4298543	-2.50	0.012	-1.91619	-.2311918
lnyear_exp	-.0596575	.1621126	-0.37	0.713	-.3773925	.2580774
sole_prop	.4016466	.2400231	1.67	0.094	-.06879	.8720833
lnlabor_prod	-.0539265	.0604283	-0.89	0.372	-.1723639	.0645109
export	.0815136	.3060748	0.27	0.790	-.518382	.6814091
/cut1	-5.649804	1.210824			-8.022975	-3.276633
/cut2	-4.181488	1.165186			-6.465211	-1.897766
/cut3	-2.665126	1.148842			-4.916816	-.4134361
/cut4	-1.177917	1.143289			-3.418722	1.062888

```
. mfx, predict(outcome(0))

Marginal effects after ologit
      y  = Pr(DP1==0) (predict, outcome(0))
         =  .01925124
```

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
lnage	.0018888	.00302	0.62	0.532	-.004036	.007813	2.40834
lnsize	.0043472	.00249	1.75	0.080	-.000525	.009219	2.80863
sector*	-.0009859	.00429	-0.23	0.818	-.009391	.00742	.304225
gender*	-.0015809	.00537	-0.29	0.769	-.012111	.008949	.140845
mnger_~u*	.0138051	.01417	0.97	0.330	-.013964	.041574	.047887
for_ow~r*	.0329654	.02203	1.50	0.134	-.010204	.076135	.061972
lnyear~p	.0011264	.00309	0.36	0.715	-.004922	.007175	2.56113
sole_p~p*	-.0078685	.00554	-1.42	0.155	-.018724	.002987	.580282
lnlabo~d	.0010182	.00119	0.86	0.390	-.001305	.003341	15.9018
export*	-.0014963	.00548	-0.27	0.785	-.012246	.009253	.138028

(*) dy/dx is for discrete change of dummy variable from 0 to 1

```
. mfx, predict(outcome(1))

Marginal effects after ologit
      y  = Pr(DP1==1) (predict, outcome(1))
         =  .05928344
```

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
lnage	.0053508	.00844	0.63	0.526	-.011193	.021894	2.40834
lnsize	.0123151	.00616	2.00	0.046	.000243	.024388	2.80863
sector*	-.0027973	.01215	-0.23	0.818	-.026611	.021017	.304225
gender*	-.0044999	.01532	-0.29	0.769	-.034519	.025519	.140845
mnger_~u*	.0370676	.03465	1.07	0.285	-.030848	.104983	.047887
for_ow~r*	.0823735	.04564	1.80	0.071	-.007081	.171828	.061972
lnyear~p	.0031909	.0087	0.37	0.714	-.013858	.02024	2.56113
sole_p~p*	-.022107	.01411	-1.57	0.117	-.04977	.005556	.580282
lnlabo~d	.0028843	.00327	0.88	0.378	-.003524	.009293	15.9018
export*	-.0042582	.01564	-0.27	0.785	-.034908	.026392	.138028

(*) dy/dx is for discrete change of dummy variable from 0 to 1

```
. mfx, predict(outcome(2))

Marginal effects after ologit
      y  = Pr(DP1==2) (predict, outcome(2))
         =  .20114265
```

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
lnage	.0129144	.0203	0.64	0.525	-.02688	.052708	2.40834
lnsize	.0297228	.01428	2.08	0.037	.001738	.057708	2.80863
sector*	-.0067913	.02967	-0.23	0.819	-.064939	.051356	.304225
gender*	-.0110531	.03827	-0.29	0.773	-.086057	.063951	.140845
mnger_~u*	.0744685	.05643	1.32	0.187	-.036134	.185071	.047887
for_ow~r*	.1334576	.04593	2.91	0.004	.043428	.223487	.061972
lnyear~p	.0077012	.02093	0.37	0.713	-.033327	.04873	2.56113
sole_p~p*	-.0519554	.03138	-1.66	0.098	-.113451	.00954	.580282
lnlabo~d	.0069614	.00784	0.89	0.375	-.00841	.022333	15.9018
export*	-.0104512	.03896	-0.27	0.789	-.086816	.065913	.138028

(*) dy/dx is for discrete change of dummy variable from 0 to 1

```
. mfx, predict(outcome(3))

Marginal effects after ologit
      y  = Pr(DP1==3) (predict, outcome(3))
         =  .35240164
```

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
lnage	.003111	.00512	0.61	0.544	-.00693	.013152	2.40834
lnsize	.00716	.00488	1.47	0.142	-.002399	.016719	2.80863
sector*	-.0017211	.00793	-0.22	0.828	-.01726	.013818	.304225
gender*	-.0030793	.01225	-0.25	0.802	-.027093	.020934	.140845
mnger_~u*	-.0045934	.02174	-0.21	0.833	-.047205	.038019	.047887
for_ow~r*	-.0406024	.04436	-0.92	0.360	-.127548	.046344	.061972
lnyear~p	.0018552	.00512	0.36	0.717	-.008179	.01189	2.56113
sole_p~p*	-.0104217	.0079	-1.32	0.187	-.025913	.005069	.580282
lnlabo~d	.001677	.00205	0.82	0.413	-.002338	.005692	15.9018
export*	-.002893	.01226	-0.24	0.813	-.026925	.021139	.138028

(*) dy/dx is for discrete change of dummy variable from 0 to 1

```
. mfx, predict(outcome(4))

Marginal effects after ologit
      y  = Pr(DP1==4) (predict, outcome(4))
         =  .36792103
```

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
lnage	-.0232651	.0365	-0.64	0.524	-.094795	.048264	2.40834
lnsize	-.0535451	.02512	-2.13	0.033	-.102778	-.004312	2.80863
sector*	.0122956	.05396	0.23	0.820	-.09347	.118062	.304225
gender*	.0202132	.07108	0.28	0.776	-.119092	.159518	.140845
mnger_~u*	-.1207479	.08346	-1.45	0.148	-.284321	.042825	.047887
for_ow~r*	-.2081941	.06475	-3.22	0.001	-.335108	-.08128	.061972
lnyear~p	-.0138737	.0377	-0.37	0.713	-.087765	.060018	2.56113
sole_p~p*	.0923526	.05442	1.70	0.090	-.014299	.199004	.580282
lnlabo~d	-.0125409	.01405	-0.89	0.372	-.040083	.015001	15.9018
export*	.0190987	.07223	0.26	0.791	-.122466	.160663	.138028

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Do parental risk preferences influence child labor? Evidence from Burkina Faso

Thesis presented by
Doux BARAKA KUSINZA

Supervisor
Professor Catherine GUIRKINGER (UNamur)

Tutor
Mr. Jérémie GROSS (UNamur)

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ent des Sciences économiques/UNamur • Rempart de la Vierge 8 • 5000 Namur
conomie de Louvain/UCL • Place Montesquieu 3 • 1348 Louvain-la-Neuve

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Abstract

The main objective of this study is to explore the effect of parental risk preferences on child labor in Burkina Faso. The empirical part is based on a cross-sectional survey with national coverage completed in 2014 which includes self-assessed measures of risk attitudes in driving, in finance and in general. The study focuses on individual data of 12,624 children aged between 10 and 16 years old. The findings show that risk-averse parents are less likely to send their children to work and more likely to send them to school. This result is consistent with the old age security model and implies that risk-averse parents consider a long time horizon when taking decisions. They want to smooth their life cycle consumption by giving more weight to children's eduction and less to work, expecting positive transfer from them in adulthood.

Key words: Risk attitude, child labor, child Education, Burkina Faso

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Introduction

Child labor has dominated the debate in development economics for several years. It is considered that it is parents who chiefly decide to put their children on the labor market, reducing their potential future human capital and thereby leading to poverty trap across generations. For that reasons and for many others, the elimination of child labor phenomena has become among the greatest targets of many international and national actors. The achievement of this goal is not as rapid as expected. In fact, according to recent data from the International Labor Organization (ILO, 2017), 152 million children (64 million girls and 88 million boys) are in child labor globally, accounting for almost one in ten of all children worldwide. A total of 71% of children in child labor work in the agricultural sector and 69% perform unpaid work within their own family unit. The situation is more alarming in Africa and Asia where respectively 30% and 11% of children work over 15 hours a week in hidden child labor[1] (Webbink et al, 2012).

However, let us notice that the assessment of child labor prevalence depends on the definition considared. In fact, some definitions include only childen's paid work outside their household, whereas others include unpaid work, family work, and excessive household chores because each form of work may relate to child schooling, health, and well-being (Putnick & Bornstein, 2015) . The ILO's definition includes these dimensions and is widely used. Child labor is *"defined as work that deprives children of their childhood, their potential and their dignity, and that is harmful to physical and mental development"*[2]

Several studies have tried to explain child labor by imperfections of the insurance, labor or credit market. A converging pattern of almost all the case studies across countries is that poor households are more likely to be involved in child labor. The imperfections of markets lead to chronic or transitory poverty and, as a consequence, the household get implicated in child labor. Basu and Van (1998) prove with a theoretical model that the failure of parents' coordination on the labor market causes lower wages and leads households to send their children on labor market for compensation. From this point of view, child labor is seen as

[1] Hidden child labor consider two forms of works: housework and family business work
[2] http://libguides.ilo.org/child-labour-en

an income diversification strategy. The improvement of labor market should decrease child labor. Dumas (2013) nuances this statement by showing with a theoretical model that child labor would increase with market improvement for household with medium-sized plots where adults combine wage and farm work in developing countries. Also, recent studies have shown that the inefficiencies of insurance and credit markets have lead to an increase in child labor in several countries (Alvi and Dendir, 2011; Frolich & Landmann, 2018). Child labor is then seen as a risk management strategy to deal with household's income shocks (Beegle et al, 2006). However, the relationship between child labor and landholding is not straithforward. In fact, while a strange positive relationship between child labor and size of the households' land[3] was found in Pakistan and Ghana by Bhalotra and Heady (2003) ; Basu et al (2010) argue both theoretically and empirically that this relationship follows an invert U-shape in India.

While several authors have mentioned the role that risk and shocks may play in decision to send a child to work, parents' risk attitudes have not been considered per se. In fact, Parents with similar socio-economic characteristics may take different decisions about their children's participation on labour markets when they face income shocks or low wages; and this could be due to difference in risk preferences. In presence of uncertainty about consumption but also future income, the decision of the parents to send their children to work can be explained by how ready they are to take risk.

In addition, parents often face a trade-off between sending children to school or using them either in their own business or in external labor market (Putnick and Bornstein, 2015; Chakrabarty and al, 2011). While there is evidence that a not negligible part of children combine work and education[4] (21% in Burkina Faso in 2014 UNESCO, 2015), it is important to emphasize that each form of child labor reduces significantly the capacity of human capital accumulation (Beegl et al., 2009), and an important proportion of working children are still out of school (50%). As a result, the risk linked to education can have an indirect effect in explaining child labor. Several sources of uncertainty affect the decision to invest in a child's education. First, the could fail to achieve the desired level or could be unemployed after having fulfilled his studies. Another source of uncertainty concerns future earnings of

[3] This phenomena is called wealth paradox

[4] In Sierra Leone for instance, children work in mining to finance they schooling (Maconachie & Hilson, 2016).

the child and whether they will compensate the future value of the investment made by both parents and child. Also, especially in developing countries, there is a risk of early mortality than can affect both schooling and saving decisions (Estevan & Baland, 2007). In contrast, if parents send their children on the labor market, they obtain immediate reward that can be useful for their present consumption. One consequence of such a choice may be the intergenerational transmission of poverty, provided that the child will have low level of human capital and will earn a low wage on the market when he is adult. These uncertain factors which are important in the parents' decision to send their children on labor market are thus linked to their risk aversion.

In this study, I analyze to which extend parents' risk attitude can explain the child labor phenomena in the specific context poor countries. To the best of my knowledge, this study is one of the first which try to explain child labor by taking in account parents' risk aversion. Nevertheless, recent papers have highlighted the effects of parental risk attitude on schooling in the context of both developed (Wölfel and Heineck, 2012, Checchi et al., 2014, Huebener, 2015) and developing countries (Tanaka and Yamano, 2015). The latter study found a strong relationship between the two variables. Risk-averse parents tend to delay school enrollment of their children because they may prefer their young children to contribute to household resources by working. Conversely, considering the old age security model, risk-averse parents may have more incentives to privilege children's human capital accumulation by reducing child labor. The more human capital the child has in the future, the more he will earn and the more he will take care of his parents. Thus, the link between child labor and parental risk attitude is not clear a priori. This study will use empirical evidence from Burkina Faso to investigate the nature of the relationship.

Burkina Faso is one of the poorest countries in the world with nearly 45% of people were living with less than US$1.90 a day in 2014, according to the World Bank Development indicators. The country has a very young population, with around 45% of people being under the age of 15, and the percentage of children in school as well as the literacy rates of adults is amongst the lowest in the world despite significant progress over the recent period. Statistics from UNESCO (2015; ILO,2017) show that 42% of children aged between 5 and 14 years old were on labor market and 21.7% combine work and school in 2014. Finally, many Burkinabe people operate under a high-risk situation (Savadogo et al., 2008). The country is

subject to land degradation, deforestation and desertification, with high rates of food insecurity and under nutrition. At any time, the country may be exposed to climatic shocks like severe drought and flooding, price risks as well as political instability. The risk of unemployment is also high and wages are very low. In such a risky environment, we expect decisions regaring child labor to be strongly related to parental risk attitudes.

Few recent studies have focused on the measurement of risk preferences in developing countries (Yesuf and Bluffstone, 2009, Tanaka and Yamaro, 2015). While information on risk attitudes in those countries have been obtained mainly through lottery experiments, I rely instead on data collected in Burkina Faso in 2014 from a representative sample of 10,411 households. This survey provides unique information on respondents' risk attitudes with a set of questions measuring the willingness of individuals to take risk in three specific domains (circulation, finance and general). Responses to survey risk questions have been proven to be reliable predictors of actual risky behaviors (Dohmen et al., 2011). The survey also contains large information at individual and household level on employment and other characteristics. This study is based on 12,624 individuals data of children aged between 10 and 16 years old.

Results of the analysis indicate that risk averse parents are less likely to send their children to work comparatively to risk neutral and risk loving parents. Risk-averse parents choose to privilege human capital accumulation today may be because they hope that their children will be in better positions to help them in the future. This finding is consistent with old age security model and the fact that risk averse parents in Burkina Faso consider a long time horizon when taking decisions. Given that risk averse parents worry about the future, they expect that better earnings of their children will allow them to smooth their life cycle consumption.

This work is structured in two chapters in addition to the conclusion. The first chapter discusses the review of theoretical and empirical literature around our research question. The second explains the methodology followed for the empirical study, then presents the different statistics and the econometric results.

Chapter 1 Literature review

In this section I explore the existing literature on child labor and discuss how risk attitude may shape this phenomena. Basu and Van (1998) were the first to provide a clear economic analysis of child labor. They were followed by Baland and Robbinson (2000) who developed a theoretical framework on the conditions under which child labor could be inefficient. These two studies have been considered as the key references and several authors have extended these initial models by releasing some of their hypothesis. In the following, I briefly present the theoretical evolution of comprehension of child labor and some empirical evidence.

1.1. Child labor in the theoretical literature

The question mainly examined in the literature is why do parents send their children on the labor market. Several studies link poverty directly to child labor choices while others explain the effect through market imperfections. In the following lines, I first present the relationship between labor and credit markets imperfections, poverty and child labor; second I focus on imperfect credit and insurance markets, risk and child labor.

1.1.1. Labor and credit markets imperfection, poverty and child labor

a. The basic models: Basu and Van (1998), Baland and Robinnson (2000)

In their economic analysis, Basu and Van's (1998) assume that child and adult labor are substitute and parents will decide not to send their children to the labor market if adult wages are high. In their framework, two possible equilibriums can be found in the economy: a bad equilibrium with child labor and low wages or a good one with only adult labor with high wages. With the coordination failure, all parents will send their children to the labor market and the economy will be stuck in the bad equilibrium. The situation can be improved through the accumulation of capital that will increase productivity of labor and move the economy to the good equilibrium with high wages and no child labor. An early anti-child labor policy may reduce the welfare of all economic agents. However, the wage labor elasticity assumption of this model may be questionable. Indeed, the model assumes that when wages are high, parents automatically remove their children from the labor market[5].

[5] It is even possible to imagine that an increase in wages could give more incentives to parents to involve their children in labor

From this limitation, Baland and Robbinson (2000) focused their research on the conditions under which child labor could be the optimal decision of parents, even when wages are high. In a world with no negative bequest and no borrowing, where parents are altruistic[6] and face a tradeoff between children's education and labor, child labor is efficient if and only if marginal return to education equals to its opportunity cost. According to the model, child labor is inefficient if it is used as a substitute for negative savings or bequest. This occurs when parents are poor, cannot borrow when they need or are not altruistic enough. In this case, a child labor ban policy can lead to Pareto improvement.

b. Landholding and child labor: the U-inverted relationship

These two studies highlight the positive role of poverty in explaining child labor. This statement was questioned later on by Bhalotra and Heady (2003). Given that the majority of working children are found in agriculture dominated by family labor with the land as the main factor of production, the relationship between child labor and land ownership is not obvious. In fact, owning a large land may create two divergent effects. On one hand, it creates high household income and thereby child labor aleviation (wealth effect à la Basu and Van). On the other hand, in presence of imperfect labor and land market, large land owners who are unable to hire labor on their farm will be more likely to employ their own children since the marginal product of child labor is increasing with land size (incentive effect). Imperfections on the labor market in agriculture originate from moral hazard problems with hired labor and the uncertainty of productivity[7] due to weather conditions. When the incentive effect dominates the wealth effect, child labor will be increasing with the land size. This phenomena is called "wealth paradox". Neverthless, according to Basu et al (2010), if the household's land-ownership continues to rise, there will be a turning point where the wealth effect will dominate the incentive effect as a consequence of the luxury axiom[8]. As a result, there will be a decline in child labor such that the relation with land-ownership follows an inverted U-shape.

c. Will child labor be reduced with labor market improvement?

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[6] Their utility depends on their intertemporal consumption and the utility of the children

[7] In fact, agricultural productivity is observed only after the harvesting period while labor force is hired and paid at each cultural step and the production depends largely on agricultural technics, soil fertility and weather conditions.

[8] Basu and Van (1998) define the luxury axiom as "a family will send the children to the labor market only if the family's income from non-child labor sources drops very low

The recent economic literature has shown that improvements on the labor market will not necessarily translate into reduction of child labor. In a theoretical analysis, Dumas (2013) shows that households with medium-sized plots may use more child labor when they face lower market imperfections if adults are combining wage and farm works. Indeed, adults may transfer some farm labor to their children farm work and take advantage of lower transactions in wage. In the same way, Chaudhuri (2011) also explains that one of the features of the labor market improvement is the reduction of the general level of wage. As a result, children and adult working in the agricultural sector are worse off and that would increase child labor in order to smooth the household's consumption.

1.1.2. Risk, insurance market imperfection and child labor

In his paper, Pouliot (2006) introduced uncertainty in Baland and Robinson's child labor model. The main contribution is the fact that child labor can be inefficiently high in periode 1 even if households are not credit constrained and bequests are interior solutions when there is high uncertainty on return to education in period 2 and insurance markets are not complete. Indeed, the fact that the nature of this uncertainty can no longer be offset through reallocation of savings across periods or by altering the amount of bequests as in the basic model explains the prediction of the model. One source of uncertainty in the return to child human capital is the mortality risk especially in developing countries where life expectancies are still low. In this perspective, Estevan & Baland (2007) shed some light on the fact that a higher risk of young mortality will increase child labor when parents are not too altruistic and expect positive transfers from their children in the future as in the old age security model. Netherless, they also claim that, if parents expect to make some positive transfers to their children in the future, the risk of young mortality may lead them to invest more in their education (and then to reduce savings) when they are still alive. The mortality risk hereby affects saving decisions and lead to an ambiguous change in child labor. However, as child labor is mainly observed in poor households, the old age security model is more likely to be at play and, the number of working children will increase with mortality risk. Access to insurance will reduce the risk and subsenquantly the child labor as predicted by Frolich & Landmann (2018).

1.2. What do we know about child labour on the field?

Over the past two decades, there have been a lot of empirical studies that attempted to test and/or to quantify the predictions of the child labor models presented the previous section.

As in the theoretical literature, some empirical papers focus on the direct link between child labor and poverty while others investigate the indirect effect through markets imperfections. In this part, I sequentially and separately review these studies.

1.2.1. Child labor and poverty

A huge number of studies have established a positive influence of households' poverty on the likelihood that children participate to the labor market (Amin and al, 2003; Ersado, 2005; Beegle and al, 2006; Bandara and al, 2014; Basu and al, 2010). Using a logistic model on data from Bangladesh, Amin and al (2005) show that working children are more likely to be present in households from the lower quintile revenue. This result is confirmed in rural areas of Nepal, Peru and Zimbabwe by Ersado (2005) who relies on a multinomial logistic model. Nonetheless, the poverty hypothesis is not confirmed for the urban areas.

Beegle et al (2006) and Bandara et al (2014) relied on households' panel data from Tanzania to analyze the effect of various shocks on child labor. Their converging results prove that income shocks increase child labor and the effect of agricultural shock is much higher on boys than girls. Access to bank accounts has a buffering effect on the impact of shock on child hunger and reduces child labor.

The relationship between landholding and child labor has been explored in the empirical literature (Bhalotra & Heady, 2003; Basu et al, 2010). Bhalorta and Heady (2003) conducted a research that aimed to verify the wealth paradox in rural Ghana and Pakistan using the parsimonious model. Their findings are consistent with the predictions of the theoretical model. The daughers of land-rich households exhibit a higher probability to work and not to attend school comparatively to their peers from land-poor families. This result tends to nuance the pure poverty hypothesis. However, using data from the Himachal Pradesh and Uttaranchal states of India and the Gaussian Kernel regression (non parametric), Basu et al (2010) find that landholding and child labor follows an inverted-U relationship. The turning point after which the size of land reduces child labor is set on 4 acres land per household.

1.2.2. Child labor and markets' imperfection

Several studies have empirically analysed the effects of labor, insurance, land and credit markets imperfections on child labor (Dumas, 2013; Frolich and Landmann, 2018). In Madagascar, Dumas (2013) estimates a maximum likelihood (tobit) model and shows that on

average labor market imperfections[9] increase child labor in rural households but effects are heteregeneous on land-ownership. The prediction of the theoretical model claiming that households with medium size plot will increase child labor with improvement of markets is not confirmed by the data. In their contribution, Frolich and Landmann (2018) prove that the extension of health insurance in urban Pakistan has substentially decreased the proportion of working children. The reduction of child labor is a result of the ex-ante feeling of protection as opposed to the ex-post shock mitigation effect. In fact, this finding confirms the prediction of their theoretical model.

1.2.3. Child labor and public policies

In this part, I review the effects of conditional cash transfer on child labor and the effectiveness of an anti child labor policy in India. In their paper, Galiani & McEwan (2013) analyze the effects of a randomly assigned conditional cash transfers to 40 of 70 poor municipalities in Honduran. In the two poorest strata of the population the reduction of child labor, thanks to the conditional cash transfer program, is much higher while on average the probability of being enrolled in school rise by 8% and the likelihood to work decrease by 3% for the eligible children.

In India, Bharadwaj and Lakdawala (2013) examine the consequences of the Indian child labor prohibition act of 1986. They use employment data of cohorts concerned by the ban. These data were collected in surveys conducted before and after the act. Their findings are consistent with Basu and Van (1998) predictions. In fact, in the presence of ban, the children's wages decreased and child labor increased especially in the informal sector. Within a family the application of the prohibition act to one child increased the labor supply of the other children in order to keep the consumption level. At the end of the day, the policy produced the reverse effect.

1.3. What are the links between parental risk attitude and child labor?

None of these previous studies have taken into account the parental risk attitude per se to explain child labor. Nevertheless, as shown before, several studies conclude that risk on future household's income, on child mortality and on return on human capital investment increase child labor (Pouliot 2006; Estevan & Baland, 2007). Also, households increase the number of working children when they feel not protected against risk when they do not

[9] Labor market imperfection is measured by information asymmetries and lack of enforcement issues.

have access to credit or insurance markets that act as buffer stock for household's consumption (Baland and Robinson, 2000; Frolich and Landmann, 2018).

The decision of the parents to increase the supply of child labor does not depend directly on whether there is uncertainty or not. What matters more, is how ready they are to play in a risky or uncertain environment. Two households similar characteristics may be facing the same risk in the future but will take different decisions regarding child labor. What really makes the difference is their risk aversion. Parents who love risk would have more incentives to invest in risky assets than will risk averse ones. An other possible scenario if we consider the old age security model is for parents to anticipate that the poverty risk is higher when they get older and could no longer work. They can ensure themselves by investing more in their children's human capital and reducing child labor today. They may consider that despite the risks on return to education, the human capital will increase productivity and that will lead to higher wages of the children in the future. This would help the parents to smooth their life cycle consumption. In this way, it is not really about atruism, but it is about developing mechanism in order to be protected against risk. In this perspective, the more risk averse are the parents, the less they will send their children on the labor market and the more they will invest in their education. To the best of my knowledge, no previous study has directly linked parents' risk preference to child labor. However, some theoretical and empirical research have been conducted on the links between parents' risk aversion and their children's education.

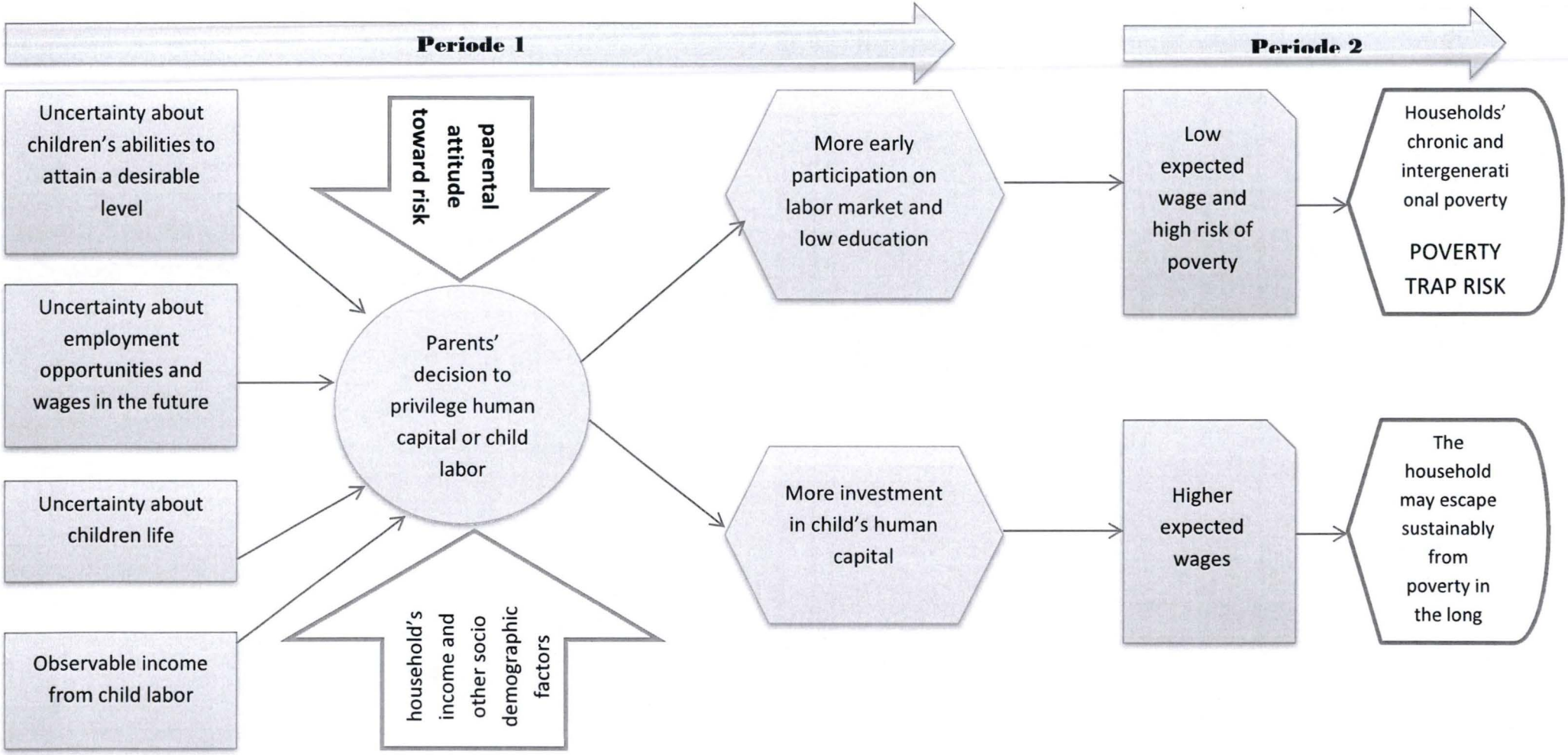
In a recent contribution, Checchi et al. (2014) proposed a simple two-period model of parental investment in children's education. Parents observe imperfectly children's ability, so they rely on the expected valued of future earnings when deciding to finance their children's education. In such setting, parents will invest more resources in children's human capital when they have low risk aversion as education is a risky investment. In the context of developing countries, the issue of risk associated to education decisions is exacerbated due to both a poor schooling environment and insecure household resources (Glewwe and Kremer, 2006). Tanaka and Yamano (2015) are the only authors so far who have empirically investigated the relationship between parental risk attitudes and children's school performance in the context of a poor country. They show that parental risk aversion appears to be positively correlated with delayed enrollment of children (especially for boys) and

patient parents tend to spend more on education in Uganda. Furthermore, a study conducted in rural Burkina Faso shows that income uncertainty reduces several educational outcomes including enrollment, education expenditure and years of education completed (Kazianga, 2012).

This study considers the question in a different way by questioning how parents' risk preferences influence child labor choices in a context of low school attainment and frequent income shocks. Briefly, the channel through which the effect may be observed can be summarized in the following scheme (see figure 1).

The figure 1 describes a world in which in period 1, parents face a large number of uncertainties (children's ability to attain a desirable level of education, employment opportunities in the future and children mortality risk). In the meantime, they observe perfectly the current wage on child labor market. They have to take a decision regarding working time of their children and time and resources to be devoted to human capital accumulation. Their choice will depend on household's socio economic characteristics and their risk preferences. If the human capital is more privileged, the household expect higher children's earning in the period 2, and the household may sustainably escape poverty in the long run. In contrast, if the children are sent early on the labor market, there is a high risk of being less productive in the period 2 or working in a less productive sector such that they will earns lower wages and therefore would be chronically poor with a high risk of intergenerational transmission of poverty as their children are more likely to behave in the same way.

Figure 1: Conceptual framework



Chapter 2 Application to Burkina Faso

This chapter investigates the effects of parental risk preferences on child labor choices in an empirical perspective using data from the 2014 Multi-sectoral Continuous Survey conducted in Burkina Faso. The chapter is structured in the following way. In the first part, I present the context and the data while the second is devoted to the econometric analysis.

2.1. Context and Data

In this part I briefly describe the socio economic context of Burkina Faso in the first time, while in the second I introduce the dataset used in this study. After, the choice and measure of variables are presented in the third sub section while descriptive statistics are the subject of the fourth.

2.1.1. Context[10]

Burkina Faso is a landlocked francophone country in West Africa. It is in the category of low human development countries according to the Human Development Index, ranking 183rd out of 188 countries in 2014. The gross national income per capita, expressed in constant 2010 US dollars, increased from USD 575 in 2010 to USD 638 in 2014. However, the proportion of individuals living below the national poverty line is still very high, albeit decreasing over time, from 51.1% in 2003 to 40.1% in 2014. The majority of people live in rural areas (71% in 2014). The economy depends mainly on agricultural activities. The labor participation rate was estimated at 85% in 2014, with around 80% of the active population employed in the agricultural sector.

In 2014, the population of Burkina Faso was estimated at 17.6 million. It has been growing at an annual average rate of between 2.8% and 3.1% since 1998. It is characterized by a very young age structure. The share of children aged from 0 to 14 in the total population was nearly 48% in 2014 and less than 3% of people were older than 65. Child labor is a widespread phenomenon in Burkina Faso. Children are currently working in cotton harvesting and artisanal gold mining. 42.1% of children aged between 5-14 years old were

[10] See http://data.worldbank.org/country/burkina-faso

working in 2014 whereas school attendance was 41.9%. 21.7% of children between 7 and 14 were combining both work and schooling (UNESCO, 2015).

The government of Burkina Faso has established some legislative frameworks against child labor. This includes the mining code that prohibits child labor in artisanal gold mining and quarries, the implementation of 45 Committees for Vigilance and Surveillance to ensure that children are not used in mining and cotton harvesting and other national plans (Burkina Faso, 2015). These anti child labor policies did not address directly the deep causes of child labor and this may explain their ineffectiveness, as mentioned I India (Bharadwaj and Lakdawala, 2014)

2.1.2. The survey

Due to its economic situation and population structure, Burkina Faso offers a unique setting to study the influential role of parental risk attitude. For that purpose, I conduct an empirical analysis using a household survey with national coverage completed in 2014 by the National Institute of Statistics and Demography (*Institut National de la Statistique et de la Démographie*, INSD) with the assistance of the World Bank. This survey was conducted as part of the Living Standards Measurement Study – Integrated Surveys on Agriculture (LSMS-ISA) program of the World Bank, whose aim is to produce high-quality data and to analyze these household data for public policy-making[11].

In Burkina Faso, the INSD completed the so-called Continuous Multisectoral survey (Enquête Multisectorielle Continue, EMCBF) from January 2014 to December 2014. Its main purpose was to provide relevant and permanent indicators related to the Millennium Development Goals (EMCBF Report, 2015). The survey was organized in four successive rounds: a first interview from January to March, a second interview from April to June, a third interview from July to September, and a fourth interview from October to December. In addition, a specific interview on agriculture was conducted. The overall sampling design was a two-stage stratified cluster design. In a first stage, around 900 primary units (zones de dénombrement) were randomly selected with a probability proportional to local population size. In a second stage, exactly 12 households were randomly selected within each primary unit. Overall, the EMCBF survey covered 10,411 households distributed throughout the national territory, with around 60% in rural areas.

[11] The selected countries are Burkina Faso, Ethiopia, Malawi, Mali, Niger, Nigeria, Tanzania and Uganda. The LSMS-ISA program is described online at http://go.worldbank.org/BCLXW38HY0.

Specific questionnaires were designed for each interview. Information about each household member activities was recorded at each quarter. In the first and the second interview, the eligible interviewee for work activities should be at least 15 years old. In the third and fourth interviews, child labor was considered by extending to 10 years old[12]. Given that in the third phase children are in vacation and there is no tradeoff with schooling decision, I mainly focus on the fourth interview that took place when children were supposed to be at school. A unique feature of the EMCBF survey is the presence of questions measuring risk attitudes in the third and fourth interviews.

Considering the purpose of this study, I chose to focus on working children aged between 10 to 16 years old in reference to the standard definition of child labor set by the International Labor Organization (ILO). Then, these observations are matched with characteristics of household heads for whom information on risk attitudes for both third and fourth rounds available. After, the information about households' wealth and land are matched with the head-child data. In the process, observations with missing values regarding child labor or parental risk attitude were deleted. Also, the non-matched observations were deleted in order to have an analyzable and clean data set. Finally, I end up with a sample of matched head-child pairs comprising 12,624 children with 6,001 children in the 10-12 years group (47.5%) and 6,623 in the 13-16 years group (52.5%). I also constructed a second sample with information on head, spouse and children to study the specific influence of fathers and mothers[13]. It includes 6,224 children, with 2,811 in the 6-12 years group (45.1%) and 3,413 in the 13-16 years group (54.84 %).

2.1.3. Variables

The choice of variables used in this work is done with respect to the relevance and the availability in the data base. Sequentially, I highlight how dependent and independent variables were selected and measured and the potential effect on child labor

a. Dependent variable: child labor

In accordance with the ILO definition of child labor and the eligibility criteria in the EMCBF survey, I consider the existence of child labor if the working individual is below 16 years old. The sample thus consists of children between 10 and 16 years old given the survey's

[12] Questions were designed to capture labor supply of all the member of the household above 10 years old

[13] As polygamy is frequently observed in Burkina Faso, I selected the wife with the identification number just after that of the household head in the household roster. When there are multiple wives in the household, it is not possible to match precisely each child to his/her mother.

eligibility condition. Specifically, the child is considered as involved in labor if in the last seven days before the survey he has been working with or without remuneration outside the household or inside the household in agriculture, breeding, industry, services or commercial activities. The variable is dichotomous and equal to 1 if the child has been working and 0 if not. Alternatively, I also use a specific variable that measures the number of hours worked per week. Due to a lot of missing values, I rely mainly on the dichotomous variable.

b. Independent variables

- **The parental risk preferences**: in the economic literature, three broad methods are used to measure risk attitude: the lottery method, the subjective measure of risk and the global score method (Ferrer-i-Carbonell and Ramos 2010; Dohmen et al., 2012). In this study, I use the subjective measure as it has been proved to be a reliable predictor of actual risk behaviors (Dohmen et al., 2012). This choice is also motivated by the fact that it is the only one that has been used in the survey in question. The main question of interest is formulated as follows "to what extent are you willing to take risks ?", respondents have to report a score for three different life domains: i) "on the road (driving a car, a motorcycle, a bike, ...)", "in relation to financial matters", "in general". For each domain, the score can range between 1 and 10 with 1 being a situation where the respondent is not at all willing to take risk and 10 a situation where the respondent is very willing to take risk. As the risk-taking module is asked both in the third and fourth rounds, I have six distinct risk scores for each respondent. I consider the two rounds because there may be some change in risk attitude related to the political crisis in Burkina Faso. In October 2014, people took to the streets to protest against their president. This could lead very risk-loving people to temper their own attitude.

  To create a single composite risk attitude index from the six scores, I proceed in the following way. While a first solution would have been the average of the risk scores, I choose instead to rely on a principal component analysis adjusted to ordered indicators. In a standard principal component analysis, the correlation matrix is calculated using Pearson correlations which assume that all variables are normally distributed. I relax this assumption by considering polychoric correlations which are appropriate when the outcomes are ordered measurements of continuous latent variables. The polychoric correlation matrix is then used as input for the principal component analysis and I obtain a composite risk indicator by considering the first principal component. Unsurprisingly,

the risk indicators is very close to some simple average over the two periods, with a coefficient of correlation higher than 0.99.

Next, I classify risk attitudes of the parents in three categories. Let X be the risk composite score calculated for each individual. Denoting by μ the mean and σ the standard deviation of the sample, I proceed as in Wölfel and Heineck (2012) and consider a distance of plus-minus one standard deviation around the mean. The parent is classified as risk-neutral when $\mu - \sigma \leq X \leq \mu - \sigma$, risk-averse when $X < \mu - \sigma$ and risk-loving when $X > \mu - \sigma$.

Moreover, the parental risk attitude may be correlated with other characteristics and this may lead to bias coefficients since these factor are also linked to child labor. To overcome this endogeneity risk, I incorporate in the model controls like education, wealth, land size and so one in order to estimate the effect that could be attributed to risk preferences.

- **The parents' level of education**: in light of several studies, there is a strong correlation between parents' level of education and investment in human capital of their children. Parents with a high level of education will have more incentive to invest in their children's education and consequently reduce their working time. Also, the more educated people tend to be risk lovers (Yesuf & Bluffstone, 2009). The education level was initially coded on a seven-grade scale from the level of no education to the level of university studies. Given the low frequencies at the high levels of education, the variable has been recoded to four levels: no education (1), primary (2), lower secondary (2) and upper secondary and above (3)
- **The wealth index**: the economic literature shows that poverty is among the main causes of child labor. To approximate the households' standard of living, I use the assets owned by the household. During their first interview, respondents had to fill in a list of durable goods for domestic use only. Using information on the 26 different items, I construct a household wealth index using a principal component analysis (Filmer and Pritchett, 2001). For better analysis, I group this variable into four quintiles. In reference to the existing literature, I expect working children to be more present in the household in the first quintile.
- **Total size of household's land:** Land size has been proved to be an important variable in explaining child labor particularly in agricultural economies like Burkina Faso. The

economic debate is whether land size increases child labor (Bhalotra and Heady, 2003) or at a certain point through the wealth effect, it leads to a reduction of child labor (Basu et al, 2010). This variable was extracted from the interview that was especially devoted to agriculture. Data on different lands owned by the household were expressed in hectares and I construct the variable by summing up all the land that belongs to the household. Given the heterogeneity of land distribution, the variable is then grouped in 3 quintiles. To verify the existence of an inverted U-shape, I use the square of the variable.

- **Other controls:** access to bank account, age and gender of the household head and child, the household size, residence, region, number of siblings, marital status of the head, And employment status of the head. All these variables are expected to have an effect of child labor. The information about wages of household members is not well recorded but obviously it would be an important predictor of child labor choices.

2.1.4. Descriptive statistics

In this part, different characteristics of the household are presented with respect to the risk attitude of the head and after, I highlight the features of the households involved in child labor. Furthermore, graphic representation illustrates some cross variable analysis in relation with child labor.

a. Characteristics of the parents

a1. Parents' education and risk preferences

It follows from table 1 that more than 85% of household heads and their spouses in Burkina Faso have no education. In addition, there seem to be a relationship between the level of education and the attitude towards risk. In fact, the proportion of heads and spouses with a high education level is higher in the category risk lovers. Also, the proportion of parents whose level of education exceeds lower secondary school remains very low in this country and on average heads are more educated than spouses. Most parents were born in periods when the education system was not widespread enough in Burkina Faso and education was not conceived as necessary for human development. This fact could explain their situation.

a2. Household head's socio-demographic characteristics and risk preferences

In addition, 91.4% of household heads surveyed are men. As in most African countries, men remain the main contributors to household income. The proportion of female heads of households is also relatively high in households where the head has high risk aversion

(12.6%). Regarding the age of household heads, they are in majority (32%) in the range of 40 to 50 years old and therefore in the active period normally. This trend is valid regardless the head's risk attitude. There is also some dependence between age of the household head and risk attitude. Heads aged between 30 and 50 are more likely to take risk (60% risk lovers) than other age groups.

In addition, the table shows a large proportion of polygamous household heads, 48% versus 45% monogamous. The share increases from risk-averse heads to risk neutral. This fact may find its explanation in the Muslim religion practiced by a large part of the population (63%). Polygamy can lead high dependent family sizes and therefore low income availabilities per individual and that can lead to high child labor prevalence. It can also

A look at the professional activities of the heads of households concerned by the study highlights the fact that 88% work in their own small business activities. The proportion of household heads working for themselves increases as the risk preference increases. Thus, even if a great part of the activities are informal, the investment is always linked to the attitude towards risk.

a3. Household's characteristics and risk preferences

By looking at the location, globally more than 74% of households live in rural areas. The majority (82.4%) of households do not have access to banking services nor microfinance. This means that they can neither borrow nor save when they need and this could result in an increase of child labor when they face some income shock. Let us notice nevertheless that there might be some informal arrangement at the household or village level but they are proved to be limited. The proportion of households who have access to financial services is higher in the risk-lovers group comparatively the risk averse ones.

Regarding the household's wealth index, a higher proportion of households are in the first quintile (29.3%). Also, we observe that the richer household are generally the one whose heads are risk lovers. This fact is shown by the higher proportion of the household in the third and fourth quintile in the higher head's willingness to take risk households. The data also show that the average size of land is 4 hectares with large dispersion (std dev. 5) suggesting inequality in land distribution. We do not observe huge variability of the average land per household with respect to the parental risk preferences but dispersion is much higher for risk neutral heads.

The selected households have an average household size of 10 people. The household size tends to increase with the willingness to take risk. Since the proportion of polygamous household heads is the highest among risk-lovers, they may be more likely to have many children.

Table 1: Characteristics of the sample with respect to head's risk attitude

Variable	Modality	Head's risk preference			Overall
		Risk-averse	Neutral	Risk-lover	
Head's education	No education	87.9%	86.5%	78.5%	85.2%
	Primary school	7.6%	9.8%	15.5%	10.3%
	Lower secondary	4.2%	3.3%	5.2%	3.9%
	Upper secondary and above	0.4%	0.4%	0.8%	0.5%
Spouse's education	No education	89.2%	88.1%	83.0%	87.3%
	Primary school	7.2%	7.3%	10.5%	7.7%
	Lower secondary	3.4%	4.3%	6.2%	4.6%
	Upper secondary and above	0.2%	0.3%	0.3%	0.4%
Head's gender	Female	12.6%	8.6%	1.8%	8.6%
	Male	87.4%	91.4%	98.2%	91.4%
Head's age	20-30	1.3%	2.0%	2.5%	2.0%
	31-40	11.8%	18.8%	29.5%	19.0%
	41-50	25.9%	32.2%	39.6%	32.0%
	51-60	27.2%	26.5%	23.5%	26.1%
	60 and above	33.9%	20.4%	4.8%	20.9%
Residence	Rural	69.0%	76.9%	75.5%	74.6%
	Urban	31.0%	23.1%	24.5%	25.4%
Marital status (head)	Monogamous	43.1%	44.9%	50.0%	45.2%
	Polygamous	43.9%	49.6%	46.9%	48.1%
	Other	13.0%	5.5%	3.1%	6.7%
Access to financial or MF	Yes	12.2%	16.3%	29.4%	17.6%
	No	87.8%	83.7%	70.6%	82.4%
Work status	Wage work	17.0%	9.4%	11.0%	12.3%
	Self-employment	83.0%	90.6%	89.0%	87.7%
Retirement pension	Non beneficiaries	97.7%	97.9%	96.1%	97.4%
	Beneficiaries	2.3%	2.1%	3.9%	2.6%
Wealth index	Quantile 1	34.1%	30.3%	17.2%	29.3%
	Quantile 2	18.6%	20.8%	20.9%	20.3%
	Quantile 3	28.5%	27.1%	29.6%	27.7%
	Quantile 4	18.8%	21.7%	32.3%	22.7%
Land size quantile	Quantile 1	29.8%	30.8%	29.9%	30.9%
	Quantile 2	32.9%	33.4%	31.9%	32.9%
	Quantile 3	37.3%	35.8%	38.1%	36.1%
Land size	Land size in ha (std dev)	3.8 (4.2)	4,1 (5.3)	4(4.4)	4(5)
Hh size	Number of hh members (std dev)	9.4 (4)	10 (5)	10.2 (4.5)	9.9 (4.5)

Source: author's own calculation based on EMCBF (2014)

b. Child labor in Burkina Faso: main features

b.1. General characteristics of working children

Overall, 7,778 children surveyed are currently involved in child labor that corresponds to 61.05% of the total. 88 % of working children are mainly in seasonal activities whereas 9% are in permanent works and 2% in fixed-term work. Also, 94.2% of children are working in family unpaid activities while 5.8% work either for themselves (3%) or for other people (2.8%).

b.2. Distribution of child labor across gender and age

The proportion of working children in the group of secondary (13-16) age children is slightly higher (64.9%) comparatively to their pair aged between 10 and 12 years old (56.9%). Also, the distribution of child labor by gender shows that at all ages, there are on average more working boys than girls. The gap between girls and boys is much higher at lower ages (10 and 11) and later on from age 16. The distribution of working boys and girls is equal at age 13 that correspond to the starting secondary school age. It should be noticed that the proportion of working girls and boys is increasing with age. From this first view on data, child labor in the context of Burkina Faso affects all children regardless of their age or gender. In ages more close to majority, parents are more incentivized to send their children to work. Also, girls are relatively favored as compared to boys. In fact, child labor in the context of Burkina Faso can be seen as a way of giving to the child skills especially in agriculture largely dominated by cotton. As the boy is expected to play an important role in the family later, the parents will train him more as the girls will go to her in-law family once adult. This statement does not imply that child labor is beneficial for boys per se. In fact, while the boy would be equipped in traditional agricultural technics with low productivity, he will be missing the opportunity to accumulate skills that would help him to be more productive in modern agricultural sectors or non-agricultural activities.

Figure 2: child labor across gender and age

Source: author's own calculation based on EMCBF (2014)

b.3. Parental risk preferences and child labor

Figure 3 illustrates the relationship between child labor and parents' risk attitude in urban and in rural areas. The first observation is the inequality in distribution of child labor with respect to the location. Indeed, households living in rural areas are more involved in child labor comparatively to those living in cities. The possible explanation of this fact is the predominance of agriculture in rural areas which is proved to use more child labor.

Also, we observe that for both household heads and spouses, the proportion of working children in town is lower when parents are willing to take risk than when parents are risk averse. However, in rural areas, the relationship is less clear. To verify whether the link between parental risk attitude and child labor is strong we run a chi-square test and it follows that the relationship is statistically significant (13.28***).

Figure 3: parental risk attitude and child labor

Source: author's own calculation based on EMCBF (2014)

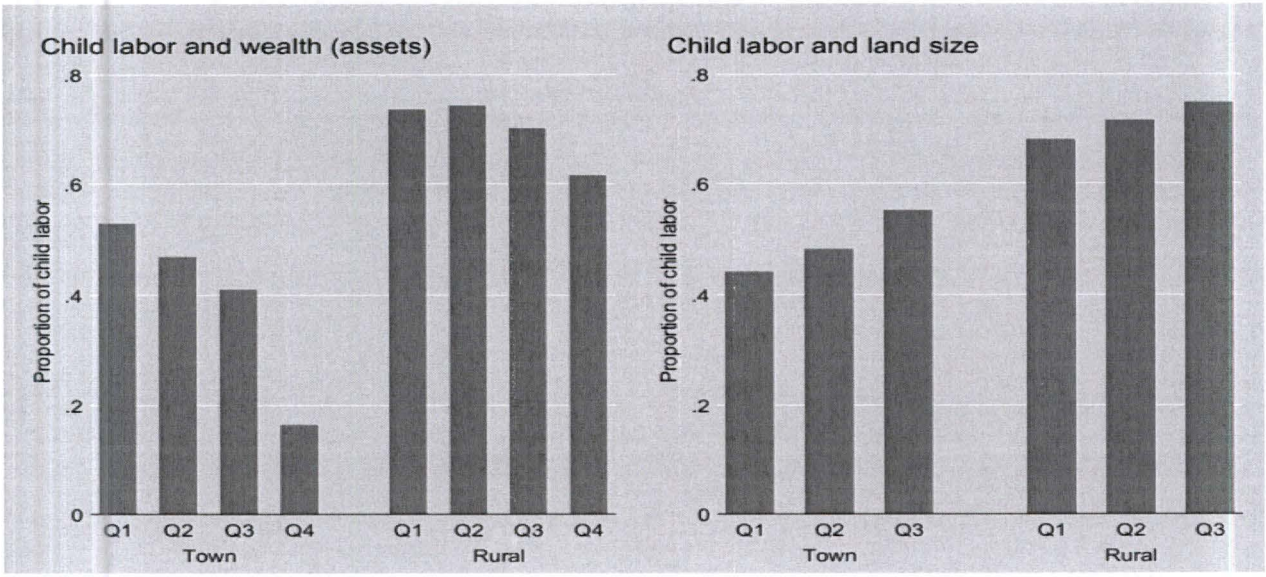
b.3. Child labor and standard of living

Figure 3 and Table 2 below show how the prevalence of child labor is distributed accross total household's land size and wealth index. Regarding assets, in urban as well as in rural areas, the proportion of working children decreases with household's wealth. The gap between rich family and poor family is more pronounced in urban comparatively to rural areas. This may be explained by the type of assets owned by the household. In fact, households in rural areas are more likely to own agricultural assets (but land) and this can even have a low or nil effect on child labor whereas in town owning assets is a sign of being wealthier. Also, the inequality in standard of living may be higher in urban areas such that to survive poor household must necessarily send their children to work. It is also observed that the share of working children among the richest of households in the village stay higher than the share of working children among the poorest households in town.

Paradoxically, the relationship between child labor and land size seems be positive both in town and in rural areas. The considered land is the one used in agriculture. Households with higher land size are more involved in child labor both in urban and in rural areas. As the majority of children work in their families, the more land the households has, the more labor force it will require. The average size of land that belongs to households involved in child labor is slightly higher (4.1) and less dispersed (4.5) comparatively to those with no working

kids (3.8, sd 5.9) as indicated in table 2. This type of wealth paradox is typical to agricultural economy.

Figure 4: Child labor and wealth (assets); child labor and family's land size



c. Family and personal characteristics of the children

c1. Child's characteristics and child labor

The table 2 presents the general characteristics of working and not working children in the fourth quarter 2014 in Burkina Faso. It appears that a large proportion of children selected in the sample are male. In the whole sample, only 46.4% of the children concerned are girls. These results also support those from previous graphs on child labor by gender. 56% of working children are male whereas 44% are girls. Therefore, efforts to alleviate child labor should focus on all children regardless gender. It is also observed that the majority of working children are those whose age is between 13 and 16 years old (54.9%).

c2. Parents characteristics and child labor

Regarding the risk preferences of the parents, while a great share of parents are risk neutral, the proportion of heads and spouse risk averse (21% and 18% respectively) is higher than risk lovers (14.5 and 15.7). In relative terms, there are not many differences between working children in the group of risk-averse and risk-lovers parents a priori. However, as explained graphically there may be differences considering rural/urban localization and other unobservable factors.

With respect to the education of household heads and spouses, 92% and 94% of working children come from households whose head and spouse respectively have no education compared to 75.5% and 79% of children not working. In addition, heads and spouses with upper secondary education level do not use labor force of their children. According to these first statistics, the difference in parents' education level can explain differences in child labor rates. However, a good proportion of parents with no education level are able to keep their children out of work that can destroy their ability to accumulate human capital.

In addition, there are some differences in the prevalence of child labor considering the gender of the household head. They are mainly explained by the composition effect of the sample, which is widely made up of male headed household (91.4%). To verify this effect, the Chi-square test leads to the conclusion that there is no dependency between child labor and the gender of the household head. The sample is largely composed of heads of households whose age is between 40-50 years. This tendency is true for working and non-working children groups. According to chi-square statistics, there is some dependency between age of the household's head and child labor.

Table 2: family and personal characteristic of children

Variable	Modality	Child labor		Overall
		No	Yes	
child's gender	Girls	49.9%	44.0%	46.4%
	Boys	50.1%	56.0%	53.6%
Child's Age	below 12 (primary)	51.1%	45.1%	47.5%
	12-16 (lower secondary)	48.9%	54.9%	52.5%
Siblings		4.7(3.0)	5.3 (3.4)	5.0 (3.3)
Household size		9.4 (4.5)	10.1 (4.4)	9.9 (4.5)
head's risk attitude	Risk-averse	21.8%	20.4%	21.0%
	Risk-neutral	62.6%	65.9%	64.6%
	Risk-lover	15.5%	13.7%	14.5%
Spouse's risk attitude	Risk-averse	20.4%	16.1%	18.0%
	Risk-neutral	63.0%	69.0%	66.3%
	Risk-lover	16.7%	14.9%	15.7%
Head's education	No education	75.5%	92.0%	85.2%
	Primary school	15.4%	6.8%	10.3%
	Lower secondary	7.8%	1.2%	3.9%
	Upper secondary and above	1.2%	0.0%	0.5%
Spouse's education	No education	79.2%	94.0%	87.3%
	Primary school	10.8%	5.1%	7.7%
	Lower secondary	9.1%	0.9%	4.6%
	Upper secondary and above	0.8%		0.4%
Head's gender	Female	9.8%	7.8%	8.6%
	Male	90.2%	92.2%	91.4%
Head's age	20-30	1.9%	2.0%	2.0%

	31-40	21.0%	17.5%	19.0%
	41-50	34.6%	30.2%	32.0%
	51-60	25.6%	26.4%	26.1%
	60 and above	16.8%	23.8%	20.9%
Location	Rural	55.5%	87.7%	74.6%
	Urban	44.5%	12.3%	25.4%
Marital Status (head)	Monogamous	51.1%	41.1%	45.2%
	Polygamous	40.2%	53.6%	48.1%
	Other	8.7%	5.3%	6.7%
Access to financial or MF	Yes	28.7%	9.8%	17.6%
	No	71.3%	90.2%	82.4%
Wealth index	Quantile 1	22.2%	34.1%	29.3%
	Quantile 2	15.7%	23.5%	20.3%
	Quantile 3	26.2%	28.8%	27.7%
	Quantile 4	35.9%	13.6%	22.7%
Work Status	Wage work	18.5%	8.0%	12.3%
	Self employment	81.5%	92.0%	87.7%
Retirement	Non beneficiaries	94.1%	99.7%	97.4%
	Beneficiaries	5.9%	0.3%	2.6%
Land size	Landsize in ha (std dev)	3.8 (5.9)	4.1 (4.5)	4(5)
Land size quantile	Quantile 1	36.7%	28.1%	30.9%
	Quantile 2	33.2%	32.9%	32.9%
	Quantile 3	30.1%	39.1%	36.1%

Source: author's own calculations based on EMCBF (2014)

c3. Household's characteristics and child labor

With 74.6% of children living in rural areas, 88% of those working come from villages; 12% from urban areas. Being in child labor therefore depends on the child's background that is most often related to the socio-economic situation. As rural areas are economically disadvantaged, they also face problems of child labor due either to poverty or to cultural considerations.

Considering the marital status, it is observed that the majority of working children come from households whose chief is polygamous (53.6%). Also, working children are found in households with an average size (10.1) higher than not working (9.4). In addition, on average working children have many siblings (5.3) compared to not working children (4.7). In large families, the consumption per member may be low such that to survive, the household would be obliged to be involved in child labor. Polygamous household are more likely to have higher size. The Chi-square test concludes that there is a dependency between marital status and child labor.

By focusing on the relationship between access to financial services and child labor, the statistics show that in absolute (90.2) as in relative terms (89.75%), child labor is more prevalent in households with no access to banking or microfinance services. Also, 92% of working children come from self-employed heads' households. Child labor could be used in these frames as a way to avoid the costs of paid workers.

2.2. Econometric analysis

This part completes the descriptive statistics in order to establish the direction of the relationship between parental risk preferences and child labor. I specify firstly the econometric model and in the second time I present and discuss the result of estimations.

2.2.1. Specification of the empirical model

In order to explain the probability of being involved in child labor, I run a binary probit model in which the dependent variable is explained by the parental risk attitude and a long list of explanatory variables. Formally, I estimate the following equation

$$P(Y = 1|X) = f(\beta X)$$

Where Y is the dependent variable equal to 1 if the child has been working and 0 if not; X a vector of explanatory variables including parental characteristic (such as risk preferences, education), household factors and the child's characteristics. The estimation of the parameters β is done using the maximization algorithms of a log likelihood function assuming that errors are normally distributed (Bourbonnais, 2009).

Different variants of the models are considered. While in the first step I run some regressions for the entire sample, in the second time I split the sample across age and location. Finally, I incorporate the spouse's characteristics. Given that child labor is observed at individual level when the parental and households' characteristic are captured at the household level, I use cluster robust standard error estimation at the household level.

2.2.2. Regression results

a. Determinants of child labor

The econometric results are presented sequentially in the table below. In the table 3, I first estimate the relationship between child labor and parental risk attitude without controls. I sequentially incorporate several variables to isolate the effect of household head's risk

preferences. It should be noticed that, while at the beginning the coefficients of risk attitude variables were not significant, as variables are being incorporated, they become significant claiming that some controls especially land size and region were correlated with risk attitude. To be more precise, in the seventh estimation, I use the composite score of risk attitude of the household head to explain the probability that the child works. The signs of coefficients in sixth and seventh models are the same. All the models are globally significant implying that the chosen variables significantly explain the probability of the children of Burkina Faso to be involved in child labor.

a.1. Household head's risk attitude and child labor

From these first estimations, it is observed that there is a significant relationship between household head's risk attitude and the probability that his child is working in Burkina Faso. Indeed, the more risk-averse heads are less likely to implicate their children in child labor comparatively to other categories (risk neutral and risk loving heads). The negative coefficient of risk-averse heads in the estimations 6 as well as well the positive coefficient of the composite risk preference score in the seventh model provides some ground for this statement. The more the heads are ready to take risk, the higher is the probability that his children work. Also, it is shown that child last year's school enrollment (used as a proxy for current schooling status) decreases the probability of working. This implies some substitutability between child labor and schooling. From this result, I deduct that the more risk parents prefer to keep their children out of child labor phenomena and eventually encourage them to go to school (See Table 3b: determinants of child schooling). The possible explanation is the following. Given the absence of social security in the context of Burkina Faso, the risk-averse parents have more incentives in children's human capital accumulation that will put them in better positions on the labor markets when they are adults and so that they can better take care of their parents.

I try to verify the issue of substitutability between child schooling and child labor by estimating the determinants of child enrollments as reported in Table 3b. It is proved here that risk-averse household heads are more likely to enroll their children to school. Also, the signs of the majority of determinants of child schooling are the opposite of those in the model of child labor. From this result, the fact that risk-averse parents care about their long term welfare incentivize them to choose to invest more in children education and keep them

out of work in order to be protected against poverty risk. Children's education is thereby seen as a mechanism to smooth life cycle consumption.

α.2. Child's characteristics and child labor

Regarding characteristics of the children, the probability of working increases with child's age and when he is a boy. When the child is growing up, he develops the physical strength that can be useful for the family heavy tasks. Regarding gender, the type of task taken into consideration may influence my findings. Indeed, girls are more involved in household chores such as cooking, child care, and drawing water that are not considered as child labor.

α2. Role of standards of living

Regarding the relationship between standard of living and child labor, the analysis indicates that wealthier households are less involved in child labor comparatively to poor ones. Nevertheless, there are not significant differences between the intermediate quintiles and the poorest regarding the probability of being in child labor. This highlights the fact that the households who are not involved in child labor in Burkina Faso are the ones who have accumulated so many assets and have secured their income so that even if negative shocks occur, they can get through thanks to their assets.

α3. Land size and child labor

The findings also highlight the role of land size in explaining child labor in Burkina Faso, whose economy is largely dominated by agriculture that is proved to have a great share of working children. As in the wealth paradox theory, the increase in household's land size is accompanied by an increase in child labor prevalence. The positive coefficient of the variables in the models illustrates this phenomenon. As we are in the context of high climatic risk country associated with high uncertainty on agricultural production, parents prefer to use their children on their land instead of hiring external paid workers. Children working on their land help by this way their households to avoid paid labor which expected to be expensive when it is needed as agricultural activities are seasonal. This incentive effect is however limited to a certain threshold. In fact, after a given point the households with extremely large lands are no longer involved in child labor. As they can benefit from higher production on larger land, they will use external paid workers instead of their own children. For these particular households, the wealth effect would dominate the incentive effect so that the relationship between land size and the probability that the child works follow an

inverted U-shape in the context of Burkina Faso. The negative coefficient of the squared land size translates this claiming.

Table 3a: determinant of child labor

Variable	Modality	Model1	Model2	Model3	Model4	Model5	Model6	Model7[14]
Head 's risk attitude	Risk-averse	-0.06	-0.09*	-0.07	-0.14**	-0.24***	-0.29***	
	Risk-neutral							
	Risk-lover	-0.11*	0.00	0.02	0.06	0.14	0.14	
	Aggregate risk score							0.09***
Head's education	No education							
	Primary school		-0.41***	-0.37***	-0.36***	-0.17*	-0.09	-0.09
	Lower secondary		-0.70***	-0.52***	-0.58***	-0.17	-0.04	-0.09
	Upper secondary		-1.73***	-1.24**	-1.26**	-0.7	-0.57	-0.54
Household' s wealth index	Quantile 1							
	Quantile 2		-0.01	-0.02	-0.04	-0.06	0.00	-0.02
	Quantile 3		-0.18***	-0.15***	-0.13**	-0.09	0.01	-0.04
	Quantile 4		-0.69***	-0.43***	-0.44***	-0.40***	-0.23**	-0.27***
Land size in ha				0.06***	0.06***	0.06***	0.05***	0.04***
Land size in ha square				-0.00***	-0.00***	-0.00***	-0.00***	-0.00***
Region					Yes	Yes	Yes	Yes
Child enrolled previous year						-1.36***	-1.34***	-1.31***
Child's age						0.02	0.02*	0.03*
Child is a boy						0.13***	0.12**	0.11**
Head is male						0.08	0.09	0.07
Number of siblings						-0.01	-0.01	-0.01
Household size						0.00	0.00	0.00
Access to finance							-0.13	-0.13
Head's age							Yes (-)	Yes (-)
Head's Marital Status							No	No
Head's work sector							No	No
Beneficiary of retirement							-0.18	-0.25
Religion (ref: muslim)							Yes (+)	Yes (+)
Living in town							-0.45***	-0.48***
Cons		0.31***	0.59***	0.46***	0.23**	0.33	0.94**	0.86*
N		12740	12740	11224	11212	7103	7101	7101

Source: author's calculations, EMCBF survey 2014, Burkina Faso.
Note: significance levels are 1% (***), 5% (**) and 10% (*)

a4. Other controls

In addition, on average, the household head's age reduces the probability that his child goes early on the labor market. The older parents would have more experiences in their work and

[14] In this estimation, I consider the score reported by the head of the household after polychroric PCA

enough income such that they can cover households' expenses and be less incentivized to engage their children in child labor. There are also differences in child labor prevalence with respect to household head's religion. In fact, being catholic increases the probability that the child work comparatively to being a Muslim. The possible explanation can be based on difference on values of education and work attached to each religion.

We also observe rural areas' households are more involved in child labor comparatively to towns. Agriculture is more prevalent in rural areas and it is proved to be the most child labor intensive sector. Also, being trained early in agricultural technics is considered as a value especially in rural areas. We also observe big differences in child labor depending on the region. This regional fix effects capture difference in culture and believes in the importance or inconveniences of children being early in heavy work.

Table 3b: determinant of child labor

Variable	Modality	Prob child works	Prob enrollment
Child enrolled previous year		-1.32***	
Child's age		0.02*	-0.18***
Child is a boy		0.12**	-0.22***
Head is male		0.11	-0.18
Number of siblings		-0.01	0.00
Household size		0.00	0.01
Head's risk attitude	Risk –averse	-0.29***	0.28***
	Risk –neutral		
	Risk loving	0.14	0.00
Head's education	No education		
	Primary school	-0.09	0.05
	Lower secondary	-0.04	0.64***
	Upper secondary and above	-0.56	(omitted)
Household wealth index	Quantile 1		
	Quantile 2	-0.01	0.06
	Quantile 3	0.00	0.25***
	Quantile 4	-0.24**	0.30***
Land size		0.05***	-0.01
Land size in ha squared		-0.00***	0.00
Household is urban area		-0.45***	0.45***
Head's age		Yes (-)	Yes (+)
Region		Yes	Yes
other controls		Yes	Yes
_cons		0.63	2.68***
N		7101	7078

Source: author's calculations, EMCBF survey 2014, Burkina Faso.
Note: significance levels are 1% (***), 5% (**) and 10% (*)

The estimations in Table 3a have shed some light on differences of child labor prevalence with respect to the child's age and the residence of the household. In the following estimations, I focus on this fact by splitting our sample by residence and child's age. According to the current education system prevailing in Burkina Faso, children normally start primary school at age 6. The lower secondary school begins from 13 to 16 years old. Relying on this feature, we distinguish between working children of primary school age and lower secondary school age.

b. Specific age and location determinants of child labor

It follows from Table 4 that primary age children whose household heads are risk averse are less likely to work in urban as well as in rural areas. This affirmation holds also for children aged between 13-16 years old in urban areas but not in rural areas. These negative coefficients reinforce my previous findings based on the whole sample. The old security age assumption regarding choice of the risk-averse household heads is thus verified in the context of Burkina Faso. For the primary age group, risk loving parents are even more ready to implicate their children in child labor comparatively to risk neutral ones. This fact is even more dangerous for the future development of the child because primary schooling is crucial for future human capital development. As working at the primary age level diminishes the capacity of the child to accumulate adequate human capital, the cost will be high for the child, his family and the society. As more risk loving parents are not frightened about the uncertainty in the future, they prefer to take advantage of the free labor from their children to increase the current household income. It remains true that it remains true that being in schooling the previous year diminish substantially the probability that the child is currently working. This fact is verified everywhere at all age.

Regarding child's characteristics, the results prove that gender differences in child labor holds only for primary age children, precisely in rural areas. Also, while having many siblings does not matter in explaining child labor, in urban areas, household size is an important factor that increases the probability of early supplying of labor force of primary age children.

Table 4: determinant of child labor by location and age (Probit)

Variable	Modality	Rural areas		Urban		Overall	
		10-12	13-16	10-12	13-16	10-12	13-16
Child enrolled previous year		-1.21***	-1.49***	-1.77***	-1.43***	-1.27***	-1.43***
Child is a boy		0.16**	0.11	0.17	-0.07	0.17**	0.07
Number of siblings		-0.01	0.00	-0.02	0.02	-0.01	0
Household size		-0.02	-0.01	0.08***	0.01	0.00	-0.01
Head's risk attitude	Risk-averse	-0.34***	-0.16	-0.79***	-0.56***	-0.43***	-0.26**
	Risk-neutral						
	Risk-lovers	0.17	0.12	0.11	0.06	0.21*	0.12
Household wealth index	Quantile 1						
	Quantile 2	-0.03	0.08	-0.18	0.04	-0.05	0.01
	Quantile 3	0.07	0.02	-0.27	-0.1	-0.01	-0.06
	Quantile 4	-0.25*	-0.13	-0.66***	-0.29	-0.38***	-0.30**
Land size in ha		0.04*	0.05***	0.09*	0.16**	0.05***	0.06***
Land size in ha square		-0.00**	-0.00**	0.00	-0.01**	-0.00**	-0.00***
Having a bank account		-0.33**	0.08	-0.31	-0.35*	-0.36***	-0.09
Self employment		No	Yes	Yes	No	No	No
Head's education		No	No	No	No	No	No
Head's age		Yes	No	No	No	Yes	No
Religion		Yes	No	Yes	Yes	Yes	Yes
Region		Yes	Yes	Yes	Yes	Yes	Yes
Other controls		No	No	No	No	No	No
N		2676	2768	777	832	3459	3635

Source: author's calculations, EMCBF survey 2014, Burkina Faso.
Note: significance levels are 1% (***), 5% (**) and 10% (*)

It is also observed that household's wealth is still important in explaining of child labor. Wealthier households are less likely to involve their kids in heavy working comparatively to poor households in rural as well as in urban areas. Also, the inverted U-shape relationship between land size and probability of child labor is verified in all the considered subdivision of the sample except in the primary school age group in the urban area where the relation positive. Households using bank or microfinance services are less involved in child labor in Burkina Faso specifically in the primary age group in rural areas and in secondary age group in the urban areas. This implies that having the possibility to save or to borrow when there is a need changes completely the household behavior related to child labor decisions. This finding highlights the importance of developing financial or micro financial markets in fighting child labor in Burkina Faso.

c. Taking into account spouse's characteristics

The risk preferences of the household head and his spouse may be correlated and the coefficient of the heads in the previous model may be capturing both the effect of head's and spouse risk aversion. I verify the importance of each parents' risk aversion by controlling for spouse's characteristics in a restricted sample (due to missing observation on spouse's characteristics).

Table 5: determinant of child labor with spouse's risk preferences

Variable	Modality	Rural areas		Urban		Overall	
		10-12	13-16	10-12	13-16	10-12	13-16
Child enrolled previous year		-1.24***	-1.25***	-2.90***	-1.67***	-1.37***	-1.28***
Child is a boy		0.27**	0.14	0.26	-0.18	0.28***	0.09
Head is male		1.21**	0.34			1.09**	0.35
Number of siblings		-0.01	0.01	0.00	0.08	0.00	-0.02
Household size		0.01	0.03	0.17***	0.07	0.03	0.04*
Head's risk attitude	Risk-averse	-0.46**	-0.13	-0.32	-0.48	-0.38**	-0.30*
	Risk-neutral						
	Risk-lover	0.21	0.36*	0.1	0.03	0.23	0.22
Spouse's risk attitude	Risk-averse	0.1	-0.19	-0.21	0.1	-0.01	-0.02
	Risk-neutral						
	Risk-lover	0.1	-0.27	0.51*	0.3	0.19	-0.16
Spouse's education	No education						
	Primary school	-0.1	0.43	-0.58*	-0.4	-0.2	0.03
	Lower secondary	-1.35***	-0.27	-0.49	-0.54	-1.02***	-0.41
household wealth index	Quantile 1						
	Quantile 2	-0.09	0.09	-0.18	0.12	-0.1	0.04
	Quantile 3	-0.06	-0.14	-0.11	-0.2	-0.09	-0.15
	Quantile 4	-0.26	-0.34	-0.42	-0.23	-0.35**	-0.47***
land size in ha		0.03	0.06*	0.00	0.06	0.03	0.05*
land size in ha square		0.00	-0.00**	0.00	-0.01	0.00	-0.00**
Have a bank account		-0.47**	0.07	-0.51*	-0.91***	-0.48***	-0.18
Head's Education		No	No	No	No	No	No
Religion		No	Yes	Yes	No	Yes	Yes
Region		Yes	Yes	Yes	Yes	Yes	Yes
Other controls		No	No	No	No	No	No
N		1285	1332	414	475	1714	1860

Source: author's calculations, EMCBF survey 2014, Burkina Faso.
Note: significance levels are 1% (***), 5% (**) and 10% (*)

The estimations in Table 5 show that head's risk preferences still matter in explaining child labor particularly in rural areas for the youngest workers. Also, when combining rural and urban areas, it is clear that in both primary age children and secondary age ones, the most

risk-averse parents are less likely to involve their children in child labor. Risk loving parents heads present a high probability of being involved in child labor especially in rural areas. Furthermore, when looking at spouse's risk preferences, a weak relationship is found except among the youngest children in urban areas where risk loving spouses present a higher probability that her children work. This finding could be mainly explained by the higher bargaining power of the heads in decision taking in the households in African countries and specifically in Muslim-dominated countries like Burkina Faso. Alternatively, this may also be explain by the fact that the head is the one who generally take decision about children's education while the spouse is specialized in other aspects of household's life.

Nevertheless, spouse's education level plays an important role in fighting child labor for primary age group while education level of the head does not seem to matter at all. Highly educated spouse presents a lower probability of involving their children in child labor. As mothers spend more time with their children, the relatively more educated will care much about her children's education and will not be motivated to involve them in heavy work that can be harmful for their human capital development. Also, in this framework, the fact that the household head is a man increases the probability that the child work in rural areas and for the 10-12 years old group. In addition, in the same group, boys are more likely to work than girls. This gender bias can be a result of several campaigns conducted by national and international actors in favor of young girls schooling in African countries. This is illustrated by the negative relationship between child schooling and working probability in the Table 3a. In general, households' characteristics affect child labor in the same direction as in previous estimations: inverted U-relationship with land, negative effect of wealth level and access to finance services.

2.2.3. Robustness checks

In order to verify the robustness of the analysis with respect to the risk attitude measure, I run separately Table 6 regressions using alternative measures that are the reported scores of risk in each domain. The results conclude that the higher willingness to take risk in two domains out of three is associated with higher probability of child labor. When taking into account the simple mean of all the reported scores, the value and the significance of the

coefficients remain almost the same as in regressions with aggregate indicator derived from polychroric principal component analysis.

Table 6: Robustness check

Risk measure	Score coefficients	Risk-Averse	Risk Neutral	Risk loving	Controls
(1) Aggregate indicator PPCA	0.09***				Yes
(2) General average	0.10***				Yes
(3) Mean[15] Risk in finance	0.09***				Yes
(4) Mean Risk in roads	0.01				Yes
(5) Mean Risk in general	0.11***				Yes
(6) Risk in finance		-0.22***	Reference	0.18**	Yes
(7) Risk in roads		-0.15	Reference	-0.13	Yes
(8) Risk in general		-0.30***	Reference	0.31***	Yes

Source: author's calculations, EMCBF survey 2014, Burkina Faso.
Note: significance levels are 1% (***), 5% (**) and 10% (*)

Also, there is no difference when considering the risk in finance while it is observed that the risk taking in road does not matter at all in explaining child labor. In the regressions 6 to 8, I classify household heads' risk behavior with respect to each domain. Considering risk neutrals as the reference group, the results confirm the previous ones and prove the validity of the composite measure. These results highlight the fact that financial and general risks are the most important in child labor decision while risk in roads plays a negligible role. Indeed, tradeoffs that are made in child labor decision concern especially financial matters.

2.2.4. Discussion

The econometric findings shed light on the fact that risk-averse parents are less likely to involve their children in heavy works. This study as well as previous ones (Kazianga and Makamu, 2016) shows the negative relationship between child labor and child schooling in the context of Burkina Faso. Also, consequently, factors that increase child labor play an opposite role in child schooling. The risk-averse parents are more likely to privilege child education comparatively to child labor. As they care much about their future welfare when they are economically inactive, they prefer not to involve their children in child labor and therefore encourage them to accumulate more human capital. The children will be more productive on the labor market in their adulthood and will be taking care of their parents. The parental choice is then seen as an ex-ante risk management strategy that will guarantee the future welfare. This reasoning stems from the old age security model. Risk-averse

[15] All the means are cross the two rounds

parents in Burkina Faso consider a long time horizon when taking decision regarding the benefits they could have from their children. As they know that when they are old, they will lose an important share of their revenue, especially in the context of a country without social security, they consider children's education as a mean to smooth their life cycle consumption. Children are considered in this way, as a life cycle insurance mechanism. Notwithstanding the existence of high uncertainty related to human capital investment, the risk-averse parents consider that on average future earnings of skilled children will be sufficiently high to compensate the opportunity cost of studying, instead of working. However, a nuance to this statement should be considered given that the substitution between child labor and education is not perfect. Nonetheless, I rely on the fact that child labor diminishes significantly the human capital accumulation both in term of education as well as health. Another possible way to check the validity of this assumption would be to analyze the effects of social security on the behavior of risk-averse parents.

As already mentioned, several researches have been focusing on the effects of parental risk preference on children's education. The conclusions of this study differ from those highlighted by Tanaka & Yamano (2015), Huebener (2015), Checchi et al (2014), and Wölfel and Heineck (2012). These studies concluded that the relationship between parental risk aversion and investment in their children's education was negative. Nonetheless, André (2009) had already noted the fact that obtaining a higher level of education may represent a form of insurance, and thus imply a reduction in the level of ex-ante risk. The findings of this study are closed to André's in suggesting that parents protect themselves by privileging more children's education than work.

However, the analyses that were carried out in this study are not sufficient to establish a strong and convincing causal relationship between risk preferences and child labor. In fact, while these latters remain important, there are still some confounding factors that were not controlled like time preferences. This information was missing in our data base and could affect both child labor and risk preference (Tanaka & Yamano, 2015). This endogeneity risk is a main limit of this study.

The effect of the child's characteristic on the probability of being economically active found in this study is consistent with the existing literature in Burkina Faso. Indeed, Kazianga and

Makamu (2016) concludes that boys are more likely to be active in the cotton farming and an increase in cotton revenue reduce girl's child labor and increase their school attendance while there is no effects on boys, the income effect being wiped out by the subsitution effect. However, this result should be taken with reserve. In fact, some household chores on which girls spend a lot of time[16] were not taken into consideration.

Moreover, the poverty hypothesis in explaining child labor is also verified by this study as in the previous (Amin and al, 2003; Ersado, 2005; Beegle and al, 2006; Bandara and al, 2014; Basu and al, 2010). In fact, the wealthier households present a lower prevalence of child labor comparatively to the poor ones. Poverty alleviation should lead in principle to the reduction of child labor to some extends. Also, as predicted by Baland and Robinson access to credit market should reduce the probability of child labor. This study claims that the simple fact of having the possibility to save will change household behavior. In this perspective, the extension of microfinance institutions in rural areas is a good strategy to reduce child labor.

These findings are also consistent with the wealth paradox theory as well as the inverted U-shape relationship between child labor and landholdings (Bhalotra & Heady, 2003; Basu et al, 2010). As the Burkinabe's economy is mainly dominated by agriculture and especially cotton farming, the first effect of the increase in household's land size is the increase in the probability that children work on their land. This first step translates inti the dominance of the incentive effect on the wealth effect. Later on, with extremely higher land size, households are obliged to use external labor force and reduce the internal labor force especially for children. The most wealthier families consider in this view that child labor is a very inferior good.

[16] This is called hidden child labor (Webbink et al, 2012)

Conclusion

The objective of this research was to analyze the link between child labor and parental risk attitude. To reach this goal, the study relies on data from the Multisectoral Continuous Survey that covered nearly 10411 households. I used individual data of 12,624 children with 6,001 in the 10-12 years group (47.5%) and 6,623 in the 13-16 years group (52.5%). To measure parental risk attitude, subjective measures were used in which parents are asked to express their willingness to take risk in circulation, in finance and in general.

The estimation results show the existence of a significant link between the probability of Burkinabe children to be in heavy works and the parents' attitude toward risk. Households with risk-averse parents are in general less likely to send their children to work comparatively to risk neutral or risk loving parents. Also, households with a risk-averse head are more likely to enroll their children at school than those whose heads prefer to take risk. This finding reflects a consideration that investment in child education in Burkina Faso is perceived as an ex-ante risk management strategy. The risk-averse parents protect themselves in keeping their children out of labor market and privileging more human capital formation. This is consistent with old age security model. Also, this result reflects the fact that risk-averse parents have a time horizon that is relatively long and want to smooth their life cycle consumption. Other variables also have a significant effect on child labor. The wealthier households are less involved in child labor whereas household's land size increases child labor. Above some threshold, land size has a negative effect on child labor. Spouse's education reduces the probability that children are involved in heavy works. Child labor is more prevalent for boys and for households living in rural areas. Finally, there exist differences between different of Burkina Faso in terms of child labor prevalence.

The originality of this work is to have explored an issue rarely raised in literature in developing countries. Indeed, most empirical studies explain child labor by imperfections of insurance, labor or credit markets that can affect the households' decision to send their children early on labor market. This study has the merit of having been among the first to put into the debate the relationship between parents' risk attitude and their behavior regarding child labor. This research, however, suffers from some limitations particularly the existence of non-controlled confounding factors like time preference that cannot allow attributing fully the effect found to risk preferences.

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