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Aïssata Coulibaly

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Université Clermont Auvergne
Ecole Doctorale des Sciences Economiques, Juridiques, Politiques et de Gestion
Centre d'Etudes et de Recherches sur le Développement International

**Essays on Financial Development and Vulnerability in
Employment in Developing Countries**

*Essais sur le développement financier et la vulnérabilité dans l'emploi
dans les pays en développement*

Thèse Nouveau Régime présentée et soutenue publiquement le 27 Février 2017
pour l'obtention du titre de Docteur en Sciences Economiques

Par

Aïssata COULIBALY

Sous la direction de Monsieur Samuel GUERINEAU

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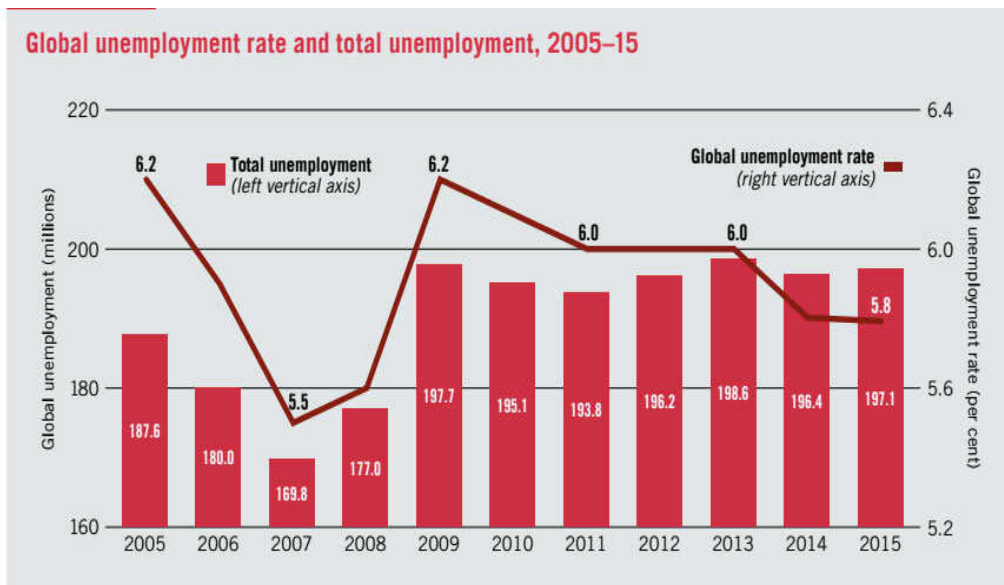
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General Introduction

The 2007-2008 global financial and economic crisis in developed countries severely hit their economy through decreasing growth and employment rates among others. As consequence of the economic growth slowdown in industrialized economies, developing and emerging countries experienced reduction in their exports, and capital inflows decreasing their economic activities. According to the International Labor Organization (2016b), the unemployment rate¹ worldwide raised from 5.5% before the crisis to 5.8 % in 2015 accounting for 197.1 million of unemployed. This represents a gap of 27 million in addition to the pre-crisis level, which is likely to be underestimated given the difficulty to measure unemployment in developing countries (see Figure 1).

Figure 1: Global unemployment trends



Source: ILO calculations based on ILO Research Department's Trends Econometric Models, November 2015.

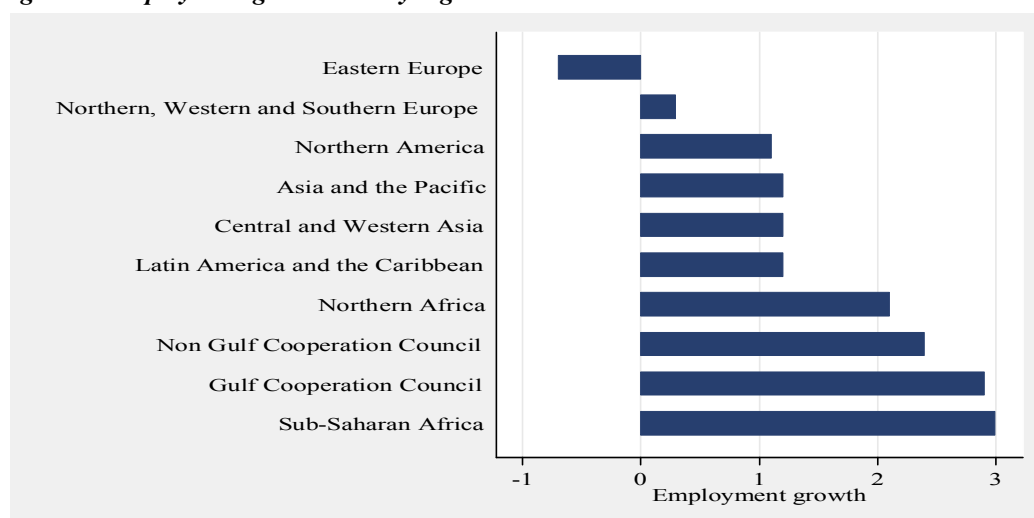
This continuing slowdown is being driven by emerging and developing countries which have been weakened by recession in developed countries as well as recent decline in commodity prices (International Monetary Fund 2016). For instance, with the resulted weakness in global

¹ According to the ILO, the unemployment rate is calculated by expressing the number of unemployed persons as a percentage of the total number of persons in the labour force. The labour force (formerly known as the economically active population) is the sum of the number of persons employed and the number of persons unemployed. The unemployed comprise all persons of working age who were: a) without work during the reference period, i.e. were not in paid employment or self-employment; b) currently available for work, i.e. were available for paid employment or self-employment during the reference period; and c) seeking work, i.e. had taken specific steps in a specified recent period to seek paid employment or self-employment

demand², it is the first time since 15 years that global trade growth is no longer more important than global growth, while it had usually expanded twice as fast as the global economy (World Trade Organization 2016).

In order to handle the employment effect of the crisis, governments have adopted different strategies. Advanced economies rely on contra-cyclical fiscal policy and automatic stabilizers which permit to limit the negative impact on workers' revenue with systematic increase in spending and unemployment benefits. In emerging and developing countries, the crisis has hurt severely workers since they are generally employed in the informal sector, and without access to developed social security systems, they are particularly vulnerable and face increasingly risks (Jütting & Laiglesia 2009). These countries have also implemented programs targeting the most vulnerable with social safety nets like in Philippines and China and increase in public investment as in South Africa and Mexico. All these measures have permitted to reduce the decline in employment³ growth with some disparities among regions as emphasized in Figure 2 below.

Figure 2: Employment growth rate by region⁴ in 2016



Source: Based on compilation and projection from World Employment Social Outlook, (2016b).

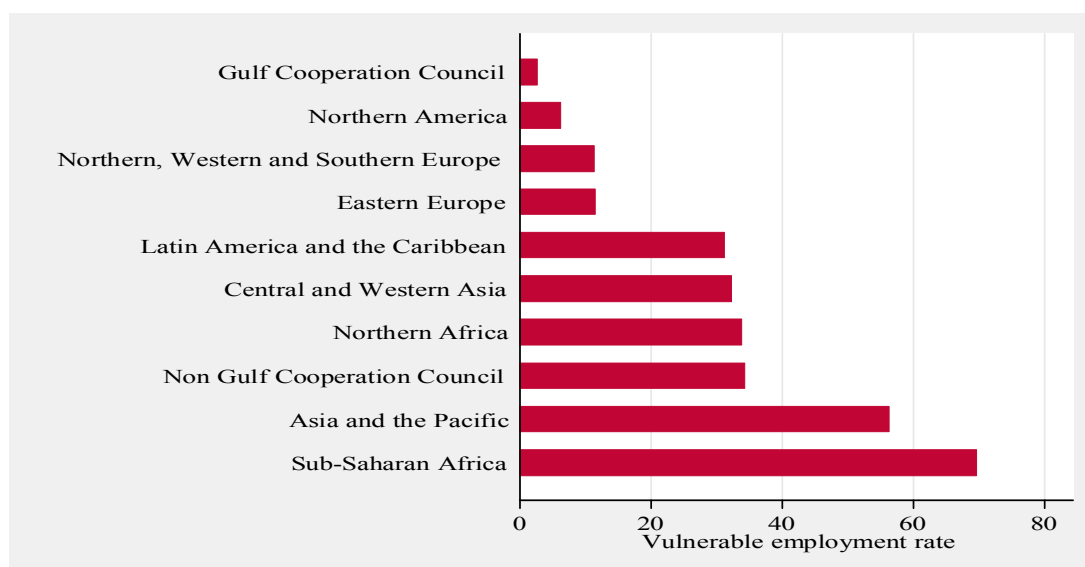
²With the recession, the demand from advanced economies is weak. It is also the case from emerging countries like China which want to be less dependent on international trade and is more and more focused on its domestic market.

³ According to the International Labor Organization, *employment* comprises all persons of working age who during a specified brief period, such as one week or one day, were in the following categories: a) paid employment (whether at work or with a job but not at work); or b) self-employment (whether at work or with an enterprise but not at work). Even if, it varies between countries, the working age population refers to all persons aged 15 and older in order to ensure international comparability.

⁴ Gulf Cooperation Council (GCC) refers to those countries belonging to the Gulf Cooperation Council, namely Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates. Non-GCC refers to the country group comprising Iraq, Jordan, Lebanon, West Bank and Gaza Strip, and Yemen.

Especially, apart from Eastern Europe where we notice a decline of 0.7%, employment growth is positive in all regions with the highest figures for Sub-Saharan Africa where growth is estimated to 3%. However, these improvements in employment trends could hide the fact that workers are more vulnerable in developing countries and they prefer to be in employment despite the decrease in wages due to the weakness of social protection systems. Consequently, according to the ILO, vulnerable employment is a better indicator than unemployment in the context of developing countries. It is defined as the share of own-account and contributing family workers in total employment, those who are subject to high level of precariousness with limited access to social protection schemes. Globally, vulnerable employment represents 46% of total employment accounting for 1.5 billion of people (International Labour Organisation 2016b). Figure 3 below displays vulnerable employment rate by region. In comparison to Figure 2 where employment growth was the most important in Sub-Saharan Africa, this region now exhibits the highest prevalence of vulnerable employment accounting for 70% of total employment followed by Asia and the Pacific region. This indicates that growth has not been enough inclusive to generate more decent jobs which can enable people to earn a fair income and ensure a better quality of life for them and their families.

Figure 3: Vulnerable employment rate by region



Source: Based on compilation and projection from World Employment Social Outlook, (2016b).

1. The financial crisis and employment

Since the crisis has a financial origin, several studies have tried to investigate the consequences of this financial crisis in terms of employment. The impact of the crisis on employment is through a reduction in investment and production due to the increase of uncertainty resulting in higher risk premium (Pindyck & Solimano 1993) and stricter lending standards (Hall 2010). For instance, using survey data on firms from Europe and Asia, Campello et al. (2010) demonstrate that financially constrained firms have reduced their spending and employment and bypass attractive investment opportunities. The crisis can also have structural impacts on unemployment with a hysteresis effect. Especially, if unemployed people lose their skills or become less productive during long periods of unemployment. In addition, the most affected are the most vulnerable like women and young people who generally lack professional experience even if these effects tend to vanish over time. For instance, in the case of Philippines, Castillo (2009) emphasizes that the crisis has jeopardized employment perspectives, particularly for the young people, women, and employers of small and medium enterprises. Han (2009) also demonstrates that the crisis leads to more unemployment which has affected household's financial solvability in United States. These households were no more able to meet their basic needs for housing, food, clothing, and medical care. Moreover, based on a panel of 97 countries from 1980 to 2008, Bernal-Verdugo et al. (2015) show that the financial crisis had increased unemployment in the short term but this effect tends to vanish over time especially for countries with flexible labor market otherwise the negative effect tends to persist even if its intensity is reduced, once again young people are the most affected.

2. Financial development and employment

In this thesis, we argue that beyond the impact of the financial crisis which has largely been investigated, there is a need to focus on the relationship between finance and employment in general. Few studies have investigated empirically this link particularly for developing countries; they generally pay attention to the association between financial development and growth. Despite it is admitted that financial development can lead to more growth especially in developing countries (Akinlo & Egbetunde 2010; Andersen & Tarp 2003; King & Levine 1993; King & Levine 1993; Beck et al. 2000; Levine et al. 2000), it is not sure that growth will generate more employment. A major macroeconomic study in this field is

Pagano and Pica (2012) that used industry level data for a panel of developing and developed countries to assess how financial development can influence employment and reallocation of labor between industries. They find that financial development, measured by the level of industry dependence on the financial sector, tends to generate more employment only in non OECD countries group which is largely composed of developing countries. Moreover, these findings are robust to the use of alternative measures of financial development namely the ratio of credit to the private sector and market capitalization. They are based on the assumption that with access to finance, firms do not favor investment in capital rather than in labor. This study also emphasizes a dark side of financial development resulting in a lower growth of employment during bank crises especially for the industries which are more dependent on external finance and those in financially developed countries.

Other authors focus on specific countries studies. Using data from 1973 to 2007 for Pakistan, Shabbir et al. (2012) find that employment is positively associated with the ratio of credit to the private sector and this relation is bidirectional. These results are similar to that of Tuğcu & Aslan (2012) that used data from Turkey, using as a measure of financial development the ratio of broad money and quasi money to GDP. They emphasize that the relation is unidirectional from financial development to employment, and stable. The proportion of employment explained by financial development tends to increase over time from 0% to 6.65% the following twenty years.

The financial determinants of employment have also been widely investigated in the framework of developed countries (Campello et al. 2010; Nickell & Nicolitsas 1999; Nickell & Wadhvani 1991; Sharpe 1994) as well as the link between labor market regulation and financial development (Gatti et al. 2012; Somers & Weil 2004). They generally underlined that financial imperfections and constraints for firms in terms of high levels of debt and ratio of interest payments to cash flow, low levels of turnover, and limited venture capital⁵ jeopardize employment.

In developing countries, surveys from the Doing Business Initiative also emphasize that financial constraints especially for access to financing are among the first obstacles to firm expansion in terms of investment and employment as underlined in Table 1 below (La Porta & Shleifer 2014).

⁵ As examples of firms which have been financed through venture capital, we can quote Google and Skype.

To sum up, we demonstrate that there is a need to focus researches directly on the relationship between financial development and employment in developing countries. In addition, unemployment rate is not suitable in the context of developing and emerging countries where social security schemes are underdeveloped, thus indicators reflecting vulnerability in employment are more suitable.

Table.1: Obstacles to doing business

	<i>Informal Enterprise Survey</i>	<i>Formal Enterprise Survey</i>			
		<i>Small</i>	<i>Medium</i>	<i>Big</i>	<i>All</i>
Obstacles (% of firms identifying an obstacle as the most important)					
Access to financing	43.8%	20.6%	17.8%	13.6%	18.5%
Political instability	11.4%	9.5%	9.1%	11.7%	9.7%
Access to land	11.2%	5.6%	4.2%	4.1%	5.0%
Corruption	7.4%	7.3%	8.2%	6.0%	7.4%
Electricity	7.3%	10.0%	9.8%	7.4%	9.8%
Business licensing and permits	6.3%	2.3%	2.7%	1.7%	2.4%
Crime	3.4%	5.2%	5.0%	7.2%	5.4%
Legal system	3.3%	0.5%	0.5%	1.9%	0.8%
Customs and trade regulations	2.1%	3.2%	4.4%	5.0%	3.8%
Uneducated workforce	1.8%	4.6%	6.0%	10.4%	6.0%
Labor regulations	1.8%	2.6%	3.1%	4.8%	3.3%
Tax administration	0.1%	4.3%	6.7%	6.4%	5.3%
Practices of competitors in the informal economy	0.1%	14.4%	13.4%	9.9%	12.9%
Tax rates	0.0%	7.7%	6.2%	6.3%	6.8%
Transportation	0.0%	2.2%	2.9%	3.7%	2.8%

Source: (La Porta & Shleifer 2014).

3. Contribution of the thesis

Given that studies on the link between financial development and employment widely focus on developed countries, **we choose to focus on developing and emerging countries which have been neglected in the literature.**

In addition, in these countries without access to social security schemes, during period of crises, households tend to increase their labor supply despite the decrease of wages, raising **their vulnerability and the prevalence of poor workers** (Blundell et al. 2016; Combes et al. 2014). This could also be linked to the fact that with a limited access to financial services (credit, saving and insurance), they used other mechanisms in order to smooth their consumption. Especially, it has been demonstrated that in case of shocks, households rely on **informal**

employment (Jütting & Laiglesia 2009) as well as on **child labor** (Beegle et al. 2006; Dehejia & Gatti 2005; Rose 2001) as buffers. For instance, child labor is still prevalent in developing countries, despite efforts from governments and the international community. At the same time, we notice a raise of the informal sector since the crisis both in developed and developing countries according to the last estimates of Hassan & Schneider (2016).

Moreover, among the poor which are the most vulnerable in developing and emerging countries, unemployment is not a major concern, as they are obliged to work. The main problem is that despite working long hours, they don't earn enough to escape poverty and effectively meet their basic needs in terms of education, health, housing etc. For instance, it is relevant to question the features of jobs which are created. Are they enough productive to ensure a fair income? Do they allow workers to benefit from social security and guarantee safety at work as well as healthy working conditions? Thus, job quality matters if we want to reduce poverty as underlined in the last report of the ILO (2016a) "*World Employment and Social Outlook: Transforming jobs to end Poverty*".

Hence, in this thesis, we concentrate our analysis on the most vulnerable workers and study what are the impacts of financial development respectively on (i) child labor which is still prevalent in developing and emerging countries. (ii) Working poverty, focusing on those workers living below the poverty line with their family. (iii) The informal sector, given that it is the main source of employment in developing countries and participates on a half to three quarters (3/4) of non-agricultural job creation (ILO 2011).

These topics can be grouped under the concept of **decent work** which is at the core of ILO agenda and among the Sustainable Development Goals (SDGs), enacting the new vision of development of the United Nations (UNs)⁶.

Overall, we do not only limit our analysis to the impact of financial development. We also look at how financial products could be designed so as to help the poor manage effectively shocks while preserving discipline for the providers of such products. We refer to them as flexible financial products which help to reduce the vulnerability of the poor and increase their resilience whereas facilitating access to financial services. We focus on microfinance institutions since they used to serve the poor than other financial institutions.

⁶ It is mentioned in the Goal 8 "Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all"

For the rest of this section, we define our key concepts and present for each topic how we contribute to the existing literature.

3.1.Key concepts: some facts and figures

Financial development

By financial development we refer to the capacity of financial institutions (banks, insurances companies and other financial institutions) and markets in “(1) *producing and processing information about possible investments and allocating capital based on these assessments; (2) monitoring individuals and firms and exerting corporate governance after allocating capital; (3) facilitating the trading, diversification, and management of risk; (4) mobilizing and pooling savings; and (5) easing the exchange of goods, services, and financial instruments*” (Čihák et al. 2012).

In this thesis, we focus on financial institutions, since households and firms rely less on financial markets in developing countries. When financial institutions work properly by allocating resource to the most productive projects, they tend to expand opportunities and sustain growth. In contrary, financial development is likely to be detrimental to growth and poverty reduction and to increase inequality if elites prevent the poor from benefiting to financial access through direct control or regulatory capture of the financial system (Rajan & Zingales 2003; Claessens & Perotti 2007).

The traditional measures of financial development have focused on financial depth or size. The recent indicators integrate in addition (i) the degree to which individuals can and do use financial institutions and markets (access), (ii) the efficiency of financial institutions and markets in providing financial services (efficiency), and (ii) the stability of financial institutions and markets (stability).

The most widely used indicator in macroeconomic studies is the ratio of private credit to GDP given its strong correlation with growth and poverty. It refers to domestic private credit to the real sector by financial institutions as percentage of GDP. It excludes credit issued to governments, government agencies, and public enterprises, and from central banks. Compared to other used indicators, like the ratio of money and quasi money to GDP (M2 to GDP), liquid liabilities and the ratio of commercial bank assets to commercial bank plus central bank assets, it has the advantage to capture the degree of bank intermediation. Overall, these measures

including private credit ratio have their limits since they do not control for the quality of credit allocation, the broad access to finance, and the efficiency of providing banking services for example. They continue to be used as they offer longer time series data for a large panel of countries compared to other measures of access, efficiency and stability of the financial system.

The main indicators we used as proxy for financial development include private credit to GDP, M2 to GDP for the depth of the financial sector and the number of bank branches per 100,000 people for access to financial services. This choice is driven by data availability since our objective is to realize empirical macroeconomic studies with cross country panel data.

Child labor

While developed countries have already eradicated child labor, this phenomenon is still prevalent in many developing and emerging countries. The definition of child labor has evolved as a flood of research has permitted to better understand it. The most used definition is proposed by the ILO even if data are gathered through different types of surveys including the UNICEF-supported Multiple Indicator Cluster Surveys (MICS), the ILO-supported Statistical Information and Monitoring Programme on Child Labor (SIMPOC), and the Demographic and Health Surveys (DHS). Since 2010, a joint collaboration between ILO and UNICEF has permitted to make the MICS questionnaire, also used in DHS, more consistent with international standards.

Figure 4: Children in Employment, child labor and worst forms of child labor



Source: (ILO /IPEC 2013), Making progress against child labor: Global estimates and trends 2000-2012

The ILO makes a distinction between children in employment or working children, child labor, and hazardous work by children. More precisely, working children refers to children between the ages of 5 to 17 which have performed a paid work for at least one hour during the reference period, generally a week, in the formal and informal sectors. This includes activities which are compatible with schooling while child labor denotes working activities which may undermines children's physical, mental, social or educational attainment⁷. Child labor is a subcategory of children in employment and hazardous work is also a subset of child labor (see Figure 4 above). Hazardous work is any activity or occupation that leads to adverse effects on the child's safety, health and moral development like night work and long hours of work; exposure to physical, psychological or sexual abuse; work underground, under water, at dangerous heights or in confined spaces; work with dangerous machinery etc. It is generally used as proxy for the worst forms of child labor.

The indicator used in this thesis is close to the definition of working children, it represents the percentage of the population in the 10–14 year-old age bracket that is actively engaged in work. This includes children, who, during the reference period performed “some work” for wage or salary, in cash or in kind at least 1 hour (Ashagrie, 1993). It is widely used in the literature and suitable for cross country panel analysis.

According to the International Labor Organization estimates (ILO /IPEC 2013), about 11% of the world's child population between the ages of 5-17 year olds were concerned by child labor⁸ in 2012, accounting for 168 million of children. The prevalence and the incidence of child labor are higher in Africa with 21.4% of children engaged in work (Figure 5) but Asia and Pacific region still has the highest numbers (almost 78 million). A common perception could be that child labor takes place in an industrial setting but according to Figure 6, the main sector

⁷ According to the ILO Convention states that: children over twelve years of age may, outside the hours fixed for school attendance, could be employed on light work which duration does not exceed 2 hours per day on either school days or holidays, the total number of hours spent at school and on light work in no case to exceed 7 hours per day.

UNICEF's standard indicator for child labour used in MICS includes the following:

- Age 5 to 11 years: At least 1 hour of economic work or 28 hours of unpaid household services per week.
- Age 12 to 14 years: At least 14 hours of economic work or 28 hours of unpaid household services per week.
- Age 15 to 17 years: At least 43 hours of economic or unpaid household services per week.

⁸ According to the ILO, “child labour” is often defined as work that deprives children of their childhood, their potential and their dignity, and that is harmful to physical and mental development. It refers to work that is mentally, physically, socially or morally dangerous and harmful to children; and interferes with their schooling by a) depriving them of the opportunity to attend school; b) obliging them to leave school prematurely; or c) requiring them to attempt to combine school attendance with excessively long and heavy work

employing child laborers is agriculture (59%). In fact, the majority of working children are instead employed by their parents to work on the family farm (ILO /IPEC 2013).

Figure 5 :Percentage of children in child labor, 5-17 years age group, 2012

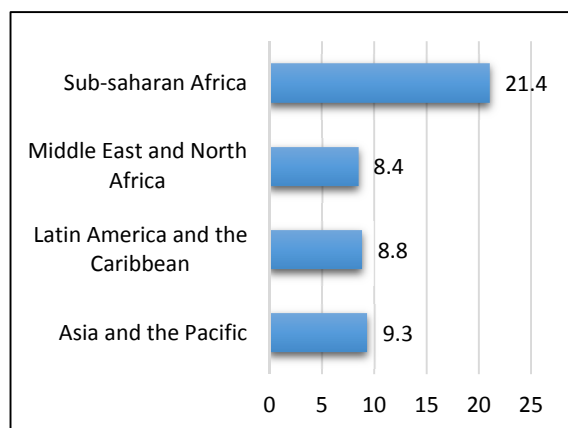
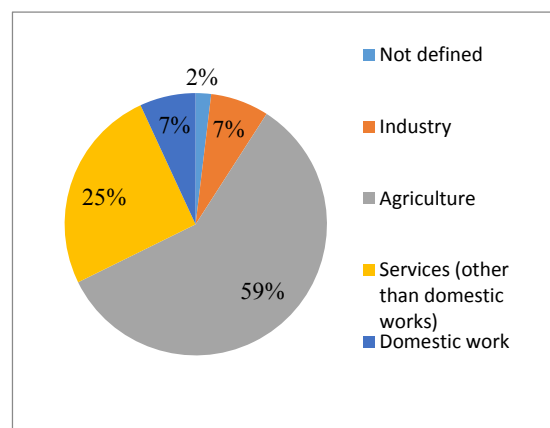


Figure 6 : Distribution of child labor per sector, 5-17 years age group, 2012



Source: ILO /IPEC. (2013). *Marking progress against child labor: global estimates and trends 2000-2012*.

Working poverty

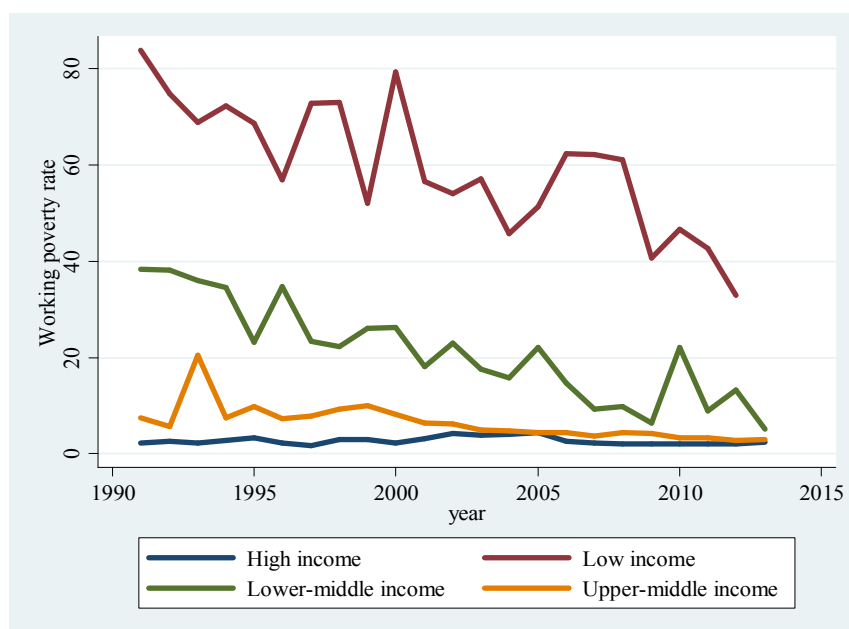
This indicator has been developed by the ILO within the framework of the decent work agenda and also serves to assess the eighth SDG target on inclusive growth and productive employment. It also serves as proxy for vulnerable employment. It represents the proportion of employed persons living in households in which per capita income / expenditure is below the international poverty line in Purchasing Power Parity in order to ensure comparability across countries. The employment status is determined at individual level while poverty status is determined at household level. Precedent macro based estimates of working poverty rates depended on ad hoc assumptions⁹ and lead to biased results. The new estimates rely first on the bottom approach based on direct estimates from national household survey, and follow two principal steps. First, they estimate working poverty rates for countries and years for which no national working poverty estimate is available but for which total poverty rate estimates are available from PovcalNet. Second, they impute working poverty estimates for the remaining

⁹ This definition was based on the assumptions that (i) the poverty rate of working age population is equal to that of the population as a whole. (ii) Labor force participation rate of poor is equal to that of population as a whole. (ii) Unemployment rate of poor is negligible.

countries and years, producing a complete time-series of national working poverty estimates¹⁰ using pool linear regression for all countries with regional interaction variables.

In 2012, poor workers were estimated to 839 million¹¹ in developing countries representing one third of total employment (ILO 2014). Figure 7 below depicts the incidence of working poverty by income level. We can notice that it is declining in all categories of country but as underlined by the ILO (2016a), these gains are fragile because “*a significant proportion of those who moved out of poverty continue to live on just a few dollars per day, often with limited access to essential services and social protection which would allow them to exit precarious living conditions on a more permanent basis*”. Moreover figures remain relatively high in low income countries.

Figure 7: Working poverty incidence by income level



Source: author compilation based on the ILO KILM 9th edition dataset

The informal sector

Defining and measuring the informal sector¹² is a difficult and challenging task since this sector, by its nature, refers to unobserved activities. On the one hand, we have some firms which operate totally in the informal sector; they do not have a bank account, and they do not pay for

¹⁰ The independent variables used are : output per worker, agricultural employment share, prime-age population share, regional dummy variables, country fixed effects

¹¹ The poverty line considered is US\$2.

¹² These expressions are also used: informal, underground, shadow, black or parallel sector or economy.

taxes. On the other hand, we also have registered firms which hide some part of their sales in order to pay less taxes while continuing to hire formal employees and complying with many regulations.

For the purpose of our study, we use the definition of Schneider (2005) where the shadow economy or the informal sector *“includes all market-based legal production of goods and services that are deliberately concealed from public authorities for the following reasons:*

- (1) to avoid payment of income, value added or other taxes,*
- (2) to avoid payment of social security contributions,*
- (3) to avoid having to meet certain legal labor market standards, such as minimum wages, maximum working hours, safety standards, etc.*
- (4) To avoid complying with certain administrative procedures, such as completing statistical questionnaires or other administrative forms.*

This definition does not include all illegal actions related to criminal activities (burglary, robbery, drug dealing), the informal household economy which consists of all household services and production, and tax evasion.”

Economists have attempted to measure informal activities using several tools which can be classified in four groups: the direct and indirect approaches, multiple indicators-multiple causes method (MIMIC), and model-based estimations.

Direct approaches permit to measure the size of the informal sector using surveys, tax audits and other compliance techniques. Their main advantage is to provide a good design of the underground economy activities and the composition of its labor force. Nevertheless, they lead to a lower estimate of the shadow economy and they fail to provide estimations on the growth of the underground economy over time and they don't allow international comparisons. This is because results obtained are sensitive to the mode of implementation of the questionnaire, the design of questionnaires focused on some features of the underground economy, and the predisposition of interviewees to reveals their non-compliance and fraudulent behavior among others (OECD 2002; Restrepo-Echavarria 2015; Schneider 2005; Schneider & Enste 2000).

Indirect approaches use one or more economic indicators (currency demand, electricity consumption, etc.) for the approximation of the size of the informal sector. They are source of many critics. For example, Schneider & Enste (2000) affirm that not all transactions in the

informal sector are done in cash; and informal activities are more intensive in labor than in capital and other sources of energy like gas, oil, coal are also used apart from electricity.

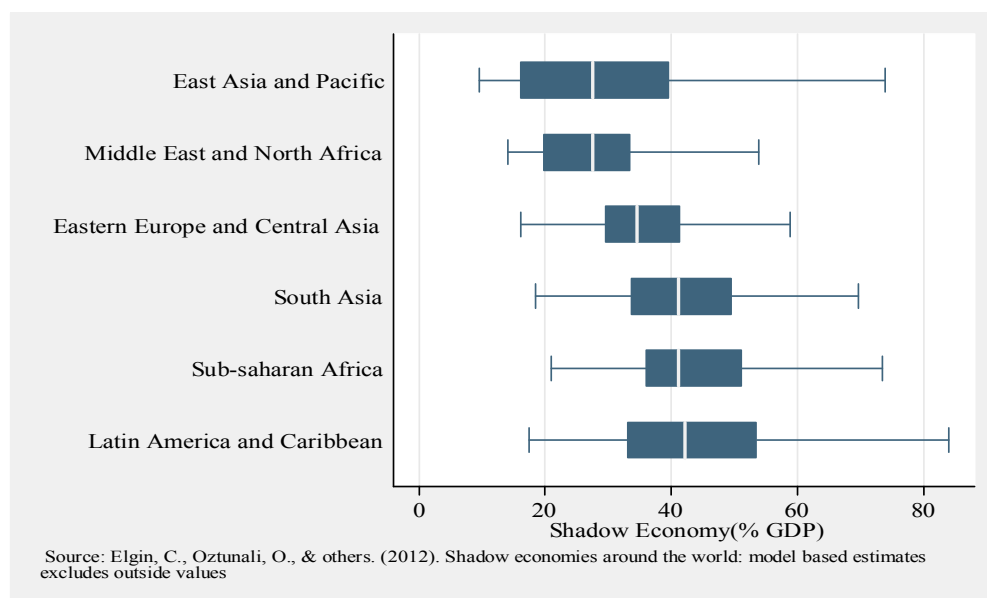
In the MIMIC methodology, the informal sector is considered as an unobserved-latent variable. Its estimation is based on structural and measurement equations. The structural equations model the causal relationship between observable “causes” (e.g. a change in tax rate) and the unobservable. The measurement equations link the unobservable latent variable with other proxies used as indicators (e.g. a nation’s currency demand). From these two sets of relations a reduced form is estimated for identifying the slope coefficients between the size of the shadow economy and its cause variables without directly observing the latent variable. Changes in the cause variables are then used to predict changes in the size of the shadow economy relative to GDP for example. This methodology brings an international overview of the shadow economy and report the dynamics of evolution of the underground economy over time. The widely used estimator developed by Schneider et al. (2010) used this approach.

However, several critics have been made to those methods. OECD (2002) reveals an overestimation of the unrecorded economy; Breusch (2016) and Feige (2016) questioned the lack of transparency in describing the procedures and the fluctuating character of the obtained values according to the variables used as causal or indicators. They also point the use of ad-hoc econometric specifications which lead to measurements errors. In addition, Elgin & Oztunali (2012) and Thomas (1999) blame the lack of microeconomic foundations in the construction of this indicator.

In response to these critics, Elgin and Oztunali (2012) propose a two-sector dynamic general equilibrium (DGE) model to estimate the size of the underground economy relative to GDP for 161 countries since 1950 to 2012. This procedure responds to the weaknesses of the precedent by providing estimations without statistical errors, since it does not use statistical methods. It does not depend on ad-hoc specifications and assumptions and it relies on microeconomic foundations. Likewise, it provides the longest available time series data, allowing us to capture time-series and cross-sectional variation. Their model estimates are also calibrated to the widely employed estimates of Schneider et al. (2010) and therefore the correlation between the two measures of the shadow economy is about 0.99. Consequently, our preferred measure is the indicator developed by Elgin and Oztunali (2012). We don’t use measure of informal employment since international comparability is not ensured.

Figure 8 displays the distribution of the size of the shadow economy across regions. On average, the informal sector size varies between 28% and 42% of GDP and it is more prevalent respectively in Latin America and Caribbean region followed by East Asia and Pacific.

Figure 8: Distribution of the shadow economy by region



Notes: In box plots, the lower and upper hinges of each box show the 25th and 75th percentiles of the samples, the line in the box indicates the respective medians, and the end-points of whiskers mark next adjacent value.

3.2. Contribution to the literature

Child labor and financial development

Financial markets imperfections have been identified in the literature as determinants of child labor with some ambiguous results (Alvi & Dendir 2011; Dehejia & Gatti 2005; Ebeke 2012; Hazarika & Sarangi 2008; Menon 2010; Ranjan 2001; Wydick 1999). Particularly without access to credit, in case of shocks, households tend to rely on child labor as a smoothing mechanism. This is because, they are unable to borrow nor to substitute for the foregone earnings of their children due to the inexistence of a market for loans against future earnings. Major macroeconomic studies find a negative association between child labor proxied by working children and financial development measured by the ratio of private credit to GDP. The main limit of these studies is that they do not take into account time dimension in the data. For instance, the study by Ebeke (2012) focuses only on the year 2000 due to data availability for migration. While, Dehejia and Gatti (2005), in their identification strategy, use as

instruments for financial development, the rate of mortality among colonial settlers and the origin of legal systems which do not vary across time. Furthermore, this negative association is challenged by microeconomic studies that emphasized that access to credit can increase child labor (Wydick 1999; Menon 2010; Hazarika & Sarangi 2008). This is likely to occur if parents invest in productive activities like expanding the family business or farm. This can raise the opportunity cost of education and returns from child labor especially if labor markets are imperfect due to shortages in hiring or to moral hazard. In this case, parents are more confident in the workforce of their own children.

In addition, these studies have neglected the role of inequality despite recent studies emphasize that inequality affect financial development and child labor. Consequently, in this thesis, we revisit the classical relationship between financial development and child labor while controlling for inequality. We contribute to the literature by exploiting time dimension for the data of child labor while proposing instruments that vary across time compared to other macroeconomic studies. We try to conciliate macroeconomic studies that report a positive impact of financial development with those that find a positive effect at the microeconomic level. Our intuition is that the differential impact of financial development on child labor could be linked to the persistence of inequality. We also investigate whether the effect of financial development on child labor is nonlinear by looking at conditional effects linked to the quality of institutions and education services.

Working poverty and financial development

Financial development can have a direct impact on working poverty by facilitating access to financial services (credit, saving and insurance) to the poor who can engage in riskier activities, start microenterprises, smooth their consumption, and cope with shocks. Moreover, information asymmetry is also reduced, for example with more demographic bank branch penetration, resulting in lower capital costs. For instance, Degryse and Ongena (2005) find that loan rate decreases with distance from bank branch while Brevoort and Hannan (2007) show that the likelihood for a local commercial loan to be granted is negatively associated to the distance. In addition, Gobbi and Zizza (2007) also demonstrate that the probability to hold a bank account is positively correlated with bank branches.

Financial development can also have indirect effects on working poverty. First, it can stimulate economic growth, resulting in more jobs creation and higher incomes. This is the trickle down hypothesis which advocates are Dollar and Kraay (2002), and Ravallion and Datt (2002). Second, through better access to financial services for the excluded non-poor entrepreneurs who are able to invest and create more jobs, financial development can also reduce working poverty. Third, the effect could also transit through labor market. In the short run, with access to financial services like credit, the poor workers will no more be obliged to continue to work despite decreasing wages, they will be able to supply labor more elastically (Blundell et al. 2016; Jayachandran 2006). In the medium and long run, as long as access to finance help building human capital (De Gregorio 1996), the economy starts to create relatively high-paid jobs.

It is also important to emphasize the dark side of financial development with financial instability which can hurt the poor and offset these positive effects (Boukhatem 2016; Jeanneney & Kpodar 2011).

The existing literature briefly presented above has focused on poverty in general and don't pay attention to the effect of financial development on the poor's wages as labor is their main asset. They also look at the overall supply of labor, but have disregarded the distinction between the poorest workers and the others. This study aims at filling this gap by investigating the effect of financial access on reducing the prevalence of working poor in developing countries. We use a measure of access to financial services and also investigate how barriers to use financial services affect the prevalence of working poor.

The informal sector and financial development

It has been demonstrated that access to financial services tends to increase the opportunity costs of operating in the informal sector, limiting the spread of the shadow economy (Beck et al. 2014; Berdiev & Saunoris 2016; Bittencourt et al. 2014; Bose et al. 2012; Dabla-Norris et al. 2008). But, there is also concerns about reverse causation since the shadow economy can also influence financial development. Especially, Gobbi & Zizza (2007) demonstrate that a large share of the informal sector harms financial development as it limits the demand for formal financial services, and it leads to higher monitoring costs and interest rates due to tax evasion. But as underlined by Elgin & Uras (2012), increasing the informal sector size also facilitates financial development, particularly if the capacity constraints¹³ on formal financial institutions are binding, the informal sector can compensate for this inadequacy. Thus, it is imperative to take into account this bidirectional relationship in empirical studies. Moreover, with a limited access to credit and capital in many developing countries, people are increasingly dependent from remittances inflows as a source of external finance.

Thus, we contribute to the literature by looking at the joint impact of remittances and financial development on the informal sector. We also investigate if remittances and financial development are complements or substitutes in their effect on the shadow economy. In fact, on the one hand, they can be complementary as remittances can provide insurance to households and increase their willingness to participate in the credit market (Aggarwal et al. 2011; Bettin & Zazzaro 2012; Freund & Spatafora 2008). On the other hand, they can be substitutes since remittances are often used to overcome credit constraints in financially underdeveloped economies, limiting the demand for formal financial services (Brown et al. 2013). We also look at if the volatility of remittances matters since studies emphasize that the impact of remittances is likely to depend on its temporary or permanent nature.

4. Main results

The thesis is divided in four chapters.

¹³ In presence of capacity constraints, the increase in the demand in the formal sector with a lower informal sector can raise marginal costs retarding financial development under the assumption of convex monitoring costs.

In the first chapter, we analyze the relationship between financial development and child labor for a panel of developing countries over the period 1960 to 2004. We find that financial development measured by the ratio of private credit to GDP tends to increase child labor and this result is driven by countries with high level of inequality, above the mean of the Gini coefficient. This could reflect the fact that with access to credit, households tend to invest in their own farm or family business, raising the opportunity cost of schooling and inducing more working children. These findings are robust to the use of different estimation techniques like instrumental variables strategy and generalized method of moments. But, this positive effect is likely to be non nonlinear, especially financial development and education spending are effective in reducing child labor only in countries with better control of corruption. This suggests that better institutions by improving the quality of education and its return tend to alter the positive impact of financial development on child labor.

The second chapter focuses on the effect of access to financial services on the prevalence of working poor. Using a panel of 63 developing countries over the period 2004-2013, we find that improving financial access (as measured by the number of bank branches per 100,000 adults) reduces the prevalence of working poor (workers living with less than US\$ 1.25 a day). This effect is even more relevant in countries affected by strong macroeconomic instability. Our findings are robust to endogeneity bias, the addition of various controls including remittances and mobile phone subscriptions, and to the shifting of the poverty line from US\$ 1.25 to US\$ 1.90. We also show that barriers to use banking services are positively correlated with working poverty. Moreover, our results confirm the validity of some transmissions channels such as growth (trickle-down effect) and the access of the non-poor workers to financial services, suggesting that improving financial access for the excluded non-poor can also have a strong reducing-effect on working poverty.

The third chapter investigates the joint effect of remittances and financial development on the prevalence of the shadow economy¹⁴ for a panel of 63 countries from 1990 to 2009. After factoring for the endogeneity bias of our two variables of interest, we find that financial development and remittances inflows decrease the share of the informal sector in the country of origin. We also test whether remittances and financial development are substitutes or complements. On the one hand, remittances can increase households' willingness to participate in the credit market, enhancing financial development while on the other hand, they are often

¹⁴ We refer alternatively to the informal sector, shadow or underground economy

used to overcome credit constraints in financially underdeveloped economies, limiting the demand for formal financial services. Our findings suggest that they tend to be substitutes in their impact on the informal sector.

Finally in the last chapter, we analyze how financial products could be designed so as to help the poor to manage effectively shocks while preserving discipline for providers of such products. We review both in theory and practice how flexible financial products can be combined to deal with risk as a complement to insurance. We show that both savings and credit must be used sequentially according to the occurrence of income shocks. Incentives to save are necessary to induce behavior consistent with the desired optimum savings plan, and these incentives can be made compatible with the use of savings for shock response. Several microfinance institutions have taken steps toward offering flexible savings-credit-insurance services to respond to risk while preserving borrower and depositor discipline. They however still fall short of a design that would optimize the provision of financial services to deal with risk.

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**Chapter I. Revisiting the Relationship between
Financial Development and Child Labor in
Developing Countries: Do Inequality and
Institutions Matter?**

1. Introduction

Despite many efforts from governments and the international community, child labor is still prevalent in many developing countries. According to the last estimates of the International Labor Organization (ILO /IPEC 2013), about 11% of the world's child population between the ages of 5 and 17 years old were concerned by child labor in 2012, accounting for 168 million of children. Regarding its negative consequences on children human capital development and their prospects for adulthood, this topic is at the core of development studies. So, a wide range of articles have investigated the determinants of child labor both theoretically and empirically and it comes out that poverty is likely the main driving factor. Nevertheless, this finding is challenged by recent micro-studies. For instance landholding, a strong predictor of income level in developing countries, has been found to be associated with more child labor¹⁵ with children working on farms operated by their families as in Ghana and Pakistan (Bhalotra & Heady 2003) or in Burkina-Faso (Dumas 2006). For Dumas (2013), this “wealth paradox” could be explained by labor and credit market imperfections, suggesting the importance of other factors beyond growth and absolute poverty.

This article revisits the link between credit markets imperfections and child labor for a panel of developing countries from 1960 to 2004. Major empirical studies on this topic at macroeconomic level are those of (Dehejia & Gatti 2005; Ebeke 2012). They find that child labor is negatively associated to financial development measured by private credit ratio. In this formulation, access to credit prevent households to use child labor in order to smooth their consumption in case of shocks. The main limit of these studies is that they do not take into account time dimension in the data. For instance, the study by Ebeke (2012) focuses only on the year 2000 due to data availability for migration. While, Dehejia and Gatti (2005), in their identification strategy, use as instruments for financial development, the rate of mortality among colonial settlers and the origin of legal systems which do not vary across time. Moreover their negative finding is questioned by some microeconomic studies (Wydick 1999; Menon 2010; Hazarika & Sarangi 2008). These studies emphasized that a better access to credit can increase child labor, especially if parents invest in

¹⁵ This is the “wealth paradox” meaning that children from rich families are engaged in work in their family business or farm.

productive activities like expanding the family business or farm. This can raise the returns from child labor especially if labor markets are imperfect due to shortages in hiring or to moral hazard. In this case, parents are more confident in the workforce of their own children as the opportunity cost of education has increased.

In addition, a recent literature has highlighted a relationship between financial development and inequality which has been neglected by previous studies looking at the impact of access to financial services on child labor. Indeed, we argue that child labor is more prevalent in presence of inequalities as demonstrated by (Tanaka 2003; D'Alessandro & Fioroni 2016; Ranjan 2001)¹⁶. In this case, financial development which increases (decreases) inequality can also lead to more (less) child labor indirectly.

The literature on the relationship between financial development and inequality could be divided in two strands: linear vs. non-linear approaches. On the one hand, the advocates of the linear hypothesis argue that financial development can increase or reduce inequalities depending on who benefit from better access to financial services. If financial development benefits the rich because they can afford for collateral and are more able to repay a loan, it is the inequality widening hypothesis where the poor continue to be excluded (Rajan & Zingales 2003). On the contrary, it is the inequality narrowing hypothesis with better access to credit or insurance for the poor (Beck, Demirgüç-Kunt, et al. 2007; Mookerjee & Kalipioni 2010). In the other and, some authors highlight a non-linear relationship between inequality and financial development. Greenwood and Jovanovic (1990) refer this as an inverted U relationship between the two variables. This suggests that below a critical point of financial development, the poor are hurt and this exacerbates inequality as demonstrated by Kim and Lin (2011). But, Tan and Law (2012) find an U-shape relationship between inequality and financial development for a panel of 35 developing countries, suggesting that even if at earlier stages of development, poor can benefit from better developed credit markets. Law and al. (2014) also emphasizes that this non-linear relationship is correlated with the level of institutional quality. They find that financial development decreases inequality only beyond a certain level of institutional quality.

¹⁶ More details are given in the section devoted to child labor and inequality.

Consequently, this paper aims to study empirically the impact of financial development on child labor while controlling for the level of inequality. Our contribution is fourfold: (1) we exploit the time dimension of the data for child labor which allow us to have more variability compared to previous macroeconomic studies. (2) We try to conciliate diverging results between studies that find a negative impact of financial development at macroeconomic level to those which find a positive effect at microeconomic level, our intuition is that the different impact of financial development on child labor could be linked to the persistence of inequality. (3) We propose an identification strategy to deal with the endogeneity of financial development. We build upon the existing literature to find an exogenous source of variation. We argue that credit information sharing is expected to have an impact on the development of the financial sector as it allows to have information about borrowers' discipline and limits information asymmetry with the lender. Especially, like Ebeke (2012), we use as instrument for financial development, the existence of public credit bureau and private credit registries. These institutions maintain a database on the standing of borrowers in the financial system and facilitate the exchange of information amongst banks and financial institutions without influencing directly child labor. (4) We also investigate whether the effect of financial development on child labor is nonlinear by looking at conditional effects linked to the level of inequality and the quality of institutions.

We find a positive correlation between financial development, measured by the ratio of private credit to GDP, and child labor especially when inequalities are high, above the mean for our measure of inequality, below the mean we find that financial development tend to reduce child labor. Our results are robust to the use of other estimation techniques like instrumental variables strategy and generalized methods of moments. Many explanations are possible for the positive effect of financial development. Based on our literature review, on the one hand, they can emphasize that credit is used in productive activities which raise the demand for child labor by boosting local economy. On the other hand, it could reflect that households tend to invest in their own farm or business. This raises the opportunity cost of schooling and induce more working children. Especially in sectors that necessitate a great supervision and where risk of moral hazards from hired labor is important, parents would prefer to rely on the workforce of their own children (Menon 2010; Hazarika & Sarangi 2008).

Given this positive effect of financial development, we also test the idea that improving educational quality through better governance could help reduce child labor. Our intuition is that parents in their choice of sending their children to work or not, would confront the high opportunity cost of education to the returns from education. In fact, parents' decision depends on essentially three things: the cost (including the opportunity-cost) of education, the expected return to education, and the extent to which they are able to finance educational investments (Cigno et al. 2002). Especially, households would rationally prefer child labor if the high opportunity cost of education is associated to a lower marginal benefit from schooling. Consequently, we argue that policies which tend to improve the quality of education raising its return can reduce child labor, this could be done through better bureaucracy quality and fewer corruption. To test this hypothesis, we introduce an interaction term between private credit ratio and indicators of the quality of institutions. We also test directly the impact of the provision of education services and their quality by introducing as additional controls; education spending to GDP, and the survival rate from grade five of primary education which measures the share of children enrolled in the first grade of primary school who eventually reach grade five.

Our results suggest that financial development and education spending will be effective in reducing child labor only in countries with better control of corruption which improves the provision of public services and raises its marginal benefit. Moreover, a higher survival rate which is associated to a more efficient education system tends to reduce child labor. This adds more evidence to our intuition that a better quality of education is likely to limit the positive impact of a higher opportunity cost of education on child labor.

The remainder of the paper is organized as follows, after revisiting the last findings on the relationship between financial development, inequality and child labor, we present our analytical framework in section 2. Section 3 is devoted to our empirical strategy while in section 4, we discuss our results with some robustness checks then we conclude in Section 5.

2. Literature review

2.1. Financial development and child labor

According to the theoretical model developed by Ranjan (2001), child labor occurs because of credit constraints and inequality so a policy which limits them through access to financial services or redistribution may reduce it. Many lessons can be drawn from empirical studies aimed at studying the impact of financial development on child labor. First, the negative impact of financial development on child labor is observed generally when credit constrained household rely on child labor to smooth their income in case of shock. This has been verified in microeconomic studies, independently of the nature of the shock whether it is idiosyncratic, specific to the household (Guarcello et al. 2010) or common (Alvi & Dendir 2011) like floods or drought. At macro-level, using data on private credit ratio to GDP; Dehejia and Gatti (2005) or Ebeke (2012) also emphasize that the main transmission channel through which financial development exerts an effect on child labor at cross country level is income volatility.

On the other hand, within the framework of microeconomic studies, some authors have demonstrated that access to credit can increase child labor especially if it is used to invest in productive activities like family farm or non-farm enterprises which increases the opportunity cost of schooling and induce more working children. Especially, Wydick (1999) highlights that parents after investing in their family business or firm can prefer to hire their children, because investment in capital raises the opportunity cost of schooling and increases labor productivity at household level. Moreover, in sectors that necessitate a great supervision and where risk of moral hazards from hired labor is important, parents would prefer to rely on the workforce of their own children, even though credit constraints are no more binding. These findings are similar to those of Menon (2010), and Hazarika and Sarangi (2008). So, the effect of financial development on child labor is not predetermined and at household level, it is driven by different factors linked to the context, the use of credits and household characteristics.

2.2. Inequality and child labor

The relationship between inequality and child labor has been less investigated both theoretically and empirically with a focus on poverty and growth. First, at macroeconomic level, empirical studies suggest that child labor is negatively associated with income growth but these results have been challenged by micro-studies with mixed results. In some cases, income growth may not result in the decrease of child labor, due to the persistence of inequality despite growth (Sarkar & Sarkar 2012). In fact, unequal distribution of income due to gaps in productivity or skills between households have been demonstrated to explain child labor phenomenon (Basu & Van 1998; Basu & Van 1999; Swinnerton & Rogers 1999; Rogers & Swinnerton 2001; Dessy & Vencatachellum 2003). For Emerson and Knabb (2006), we must go beyond income inequality which could be explained by unequal access to opportunities. As opportunity, he refers to school quality, access to higher paid jobs, access to information about the returns to education and actual discrimination, so treating these causes could help reduce child labor.

At theoretical level, Basu and Van (1998) develop a model where child labor depends on whether adult income is below or above some subsistence level. If the economy is sufficiently productive, wages are high enough to ensure that all households are above the subsistence level and send their children to school, then there is no child labor (good equilibrium). Nevertheless; if wages are low, children are sent to work (bad equilibrium). Swinnerton and Rogers (1999) extend this model to introduce the proportion “ α ” of firms’ benefits which are distributed to households. They conclude that if all workers in the economy receive dividends, the “bad equilibrium” where children have to work does not exist. Hence, they propose a policy that redistributes dividends across workers as a way of eliminating the “bad equilibrium”. Basu and Van (1999) reply to this comment by allowing “ α ” to fluctuate between 0 and 1 ($\alpha \in [0, 1]$); $\alpha = 0$ leads to Basu and Van (1998) conclusion with only a bad equilibrium where all children work. If $\alpha = 1$, the model corresponds to Swinnerton and Rogers (1999) with no child labor (good equilibrium). But if α is not equal to zero but inferior to 1, we have an hybrid equilibrium with some children going to school and other working, this is closer to the current situation in developing countries. In order to respond to the precedent-study of Basu and Van (1999), Rogers and Swinnerton (2001) develop a theoretical model to take into account the role productivity plays in determining the effects of a reduction of income inequality on child labor. They find that decreasing inequalities through a redistributive tax can increase child

labor. Especially in poor countries with low productivity, redistribution may not be sufficient to bring the poorest households out of poverty and the tax burden supported by households at the margin of subsistence¹⁷ could be so important that they have to send their children to work. But Ranjan (2001) develops a dynamic theoretical model where he emphasizes that with such a transfer, the increase in the probability of sending the child to work for a rich person is lesser than the decrease in the probability of sending the child to work for the poor, so we can expect a positive association between child labor and inequality. Moreover, he emphasizes that in the precedent studies, inequality is measured by the proportion of households who receive dividends which are equally distributed among them. In his model, inequality refers to the distribution of total parental income and is modelled in the sense of a second order stochastic dominance (Lorenz dominance for distributions with same mean). He finds that for a same level of income, distributions with higher level of inequality would result in more child labor at the equilibrium. In the same vein, Tanaka (2003) develops a theoretical model in which unequal distribution of income could also lead to child labor. He considers that for a given level of income, if the median income is below a certain threshold level, public schooling is no more supported by the majority of households¹⁸ who do not want to support more taxation and / or lose a source of income with their children going to school, reducing both the supply and the demand for education. As implication, redistribution policies that increase the median income above this threshold will result in more school attendance and less child labor.

Likewise, D'Alessandro & Fioroni (2016) develop a theoretical model where they distinguish between unskilled parents who tend to have a high number of children and send them to work and skilled parents who have a low fertility rate with a high investment in education. The fertility differential between high and low skilled increases the proportion of unskilled workers in the labor market which in turns reduces unskilled wages. So, the fact that children can offers only unskilled labor reinforces such process creating a vicious cycle between child labor and inequality.

¹⁷ Households for which an important taxation pushes them below the subsistence level of income so that they are obliged to send their children to work.

¹⁸ He demonstrates that for a given income per capita Y , "if the economy has income distribution with low median income, the economy ends up with an enormous amount of child labor. However, if the income distribution of the economy has high median income, the amount of child labor falls significantly" (Tanaka, 2003 page 97).

The positive link between inequality and child labor is also confirmed by empirical studies. At country level, Nawaz et al. (2011) also demonstrate that for Pakistan, inequality has a positive and significant impact on child labor in the long term while the negative association between school attendance and inequality is confirmed by Checchi (2003) for a panel of 108 countries over the period 1960–1995. Our study is complementary to this paper, because as underlined by Ravallion and Wodon (2000) with data from Bangladesh, schooling and child labor are not necessarily one-for-one substitutes.

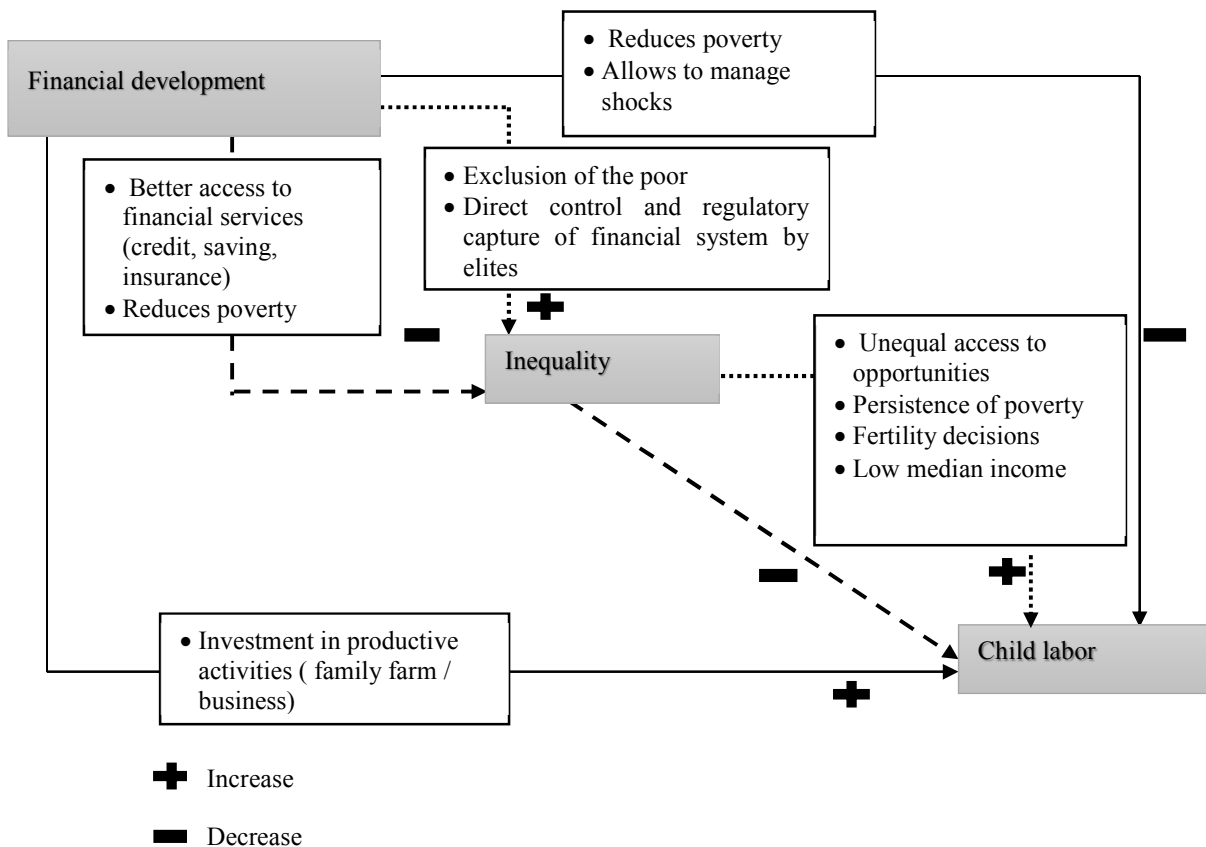
2.3. Financial development and inequality

A recent literature has emphasized the distributional impact of financial development on income. Financial development could reduce poverty and inequality by allowing the poor more than the rich to finance their project or smooth their income (Beck, Demirgüç-Kunt, et al. 2007). But a better access to credit or financial services is not automatically a pro-poor issue. Other studies have demonstrated that the poor can be excluded from the benefits of financial system because they generally lack collateral, credit histories and connection. Thus, this increases inequalities given that the rich are more likely to take advantage from financial development. Greenwood and Jovanovic (1990) highlight that this situation is verified only at early stages of development. For them, the relation is non-linear and take the form of an inverted – U relationship. It is after a certain level of growth that the poor constitute a capital which allow them to participate to the financial system. But, Tan and Law (2012) emphasize the contrary with a U-shape relationship, for them, it is after a certain level of development that financial development increases inequality, below that level, it is reduced, with more profit for the poor.

Furthermore, in developing countries with weak institutional quality, lack of check and balances, income inequality could also be translated on unequal access to finance where elites can prevent the poor from benefiting to financial access through direct control or regulatory capture of the financial system (e.g. Rajan and Zingales (2003); Claessens and Perotti (2007)). It is the case when, for example, connecting firms are favored in access to credit in order to maintain the privileges and the political power of the ruling class. The latter is against diffusion of education which promotes political participation and weakens control structures (Bourguignon & Verdier 2000). These

authors also emphasize that the poor rely more on informal networks for credit, so financial development would only benefit the rich and raise inequality.

Figure I.1: Links between financial development, inequality and child labor



Source: author's compilation

Subsequently, given the relationship between inequality and financial development, it seems relevant to check if differences on the effect of financial development on child labor are not linked with distributional issues. In figure I.1 below, we present an overview of the different relationship between child labor, financial development and inequality based on our literature review, continuous lines are for direct relations and discontinuous lines for indirect connections. First, financial development has a direct negative impact on child labor by allowing poor people to have access to credit and invest in their children education. They are also able to manage shocks and do not use child labor as a smoothing mechanism. But financial development can also increase child labor if credit is used to invest in productive activities like family farm or non-farm enterprises

which increase the opportunity cost of schooling and induce more working children. Moreover, we have an indirect link through inequality, under the assumption that child labor is more prevalent when inequalities are high, financial development could increase child labor if it raises inequality and vice versa.

3. Empirical model

Previous studies looking at the impact of financial development on child labor do not pay attention to its redistributive effects on income which have been emphasized by recent studies. The object of this article is to study how the links between inequality and financial development may explain cross country panel variation of child labor.

Based on the literature on child labor at macroeconomic level (Rajeev H. Dehejia & Gatti 2005; Ebeke 2012; Kis-Katos 2007), we specify the following equations:

$$\text{Model 1: } Cl_{it} = \alpha + \beta X'_{it} + \delta FD_{it} + \mu_i + \nu_t + \varepsilon_{it} \quad (1)$$

$$\text{Model 2: } Cl_{it} = \alpha + \beta X'_{it} + \delta FD_{it} + \gamma I_{it} + \mu_i + \nu_t + \varepsilon_{it} \quad (2)$$

In equation (1), Cl_{it} , FD_{it} , μ_i , ν_t , and ε_{it} represent respectively the prevalence of child labor, private credit ratio, country fixed effects, time effect of period t and the error term in country i at year t . The vector X' contains the traditional determinants of child labor in macroeconomic studies. Thus, we include GDP per capita and its square, percentage of rural population, share of agriculture value added in GDP, trade openness measured by the logarithm of the ratio of exports plus imports to GDP and a variable equal to 1 since a country has adopted the ILO convention 138 establishing minimum working ages. In equation (2), we introduce Inequality (I_{it}), in order to assess the effect of private credit ratio while controlling for inequality.

We expect the coefficients for rural population, share of agriculture in GDP, and inequality to be positive following the results of previous works (Edmonds & Pavcnik 2006; Davies & Voy 2009; Rajeev H. Dehejia & Gatti 2005; Ebeke 2012). We suppose that trade openness may reduce child labor prevalence like Kis-Katos (2007).

We also allow for the log of income per capita to enter the specification nonlinearly because the effects of income on child labor likely differ across poor and rich countries. For each country, the relation will depend on whether it is the income or the substitution effect which tends to dominate. If with growth, the increase of wages raises the opportunity cost to send children to school; this is the substitution effect with more child labor. Income effect tends to decrease child labor because growth raises parents' revenue.

3.1. Identification strategy

We first estimate our model using fixed effects estimator. But given potential sources of biases with endogeneity, we also use an instrumental variables specification. Indeed, three sources of endogeneity are generally pointed out in the literature. Endogeneity may be caused by omitted variables bias. This problem occurs when there is a third variable, which could simultaneously affect child labor, financial development or inequality. Fixed-effects allow us to control for time-invariant unobservable country characteristics. But, there remains time-varying omitted variables. Endogeneity could also be due to measurement errors on our variables of interest which are frequent with data on developing countries.

In order to address endogeneity problem, the strategy adopted in this paper is to build on the existing literature on the determinants of financial development to find an exogenous source of variation in financial access. Following Djankov et al, (2007); Beck et al, (2007), and Ebeke (2012) we use the existence of credit bureaus and public credit registries as source of exogenous variation in financial access in developing countries. A private credit bureau is defined as a private commercial firm or non-profit organization which maintains a database on the standing of borrowers in the financial system and has as primary purpose to facilitate the exchange of information amongst banks and financial institutions (Djankov et al, 2007). The variable takes value one if a credit bureau operates in the country and zero otherwise. Likewise, a public registry is defined as a database owned by public authorities (central bank or banking supervisory authority) that collect information on the standing of borrowers and share it with financial institutions (Djankov et al, 2007). The variable equals one if the public registry operates in a country and zero otherwise. Unlike the above mentioned authors which directly make use of dummy variables, we

use the number of years of operation which seems to be more relevant and relatively exogenous. For example, the establishment of a credit bureau involves dealing with several issues including regulatory framework issues, lack of data or unreliable one, information technology issues, skills and human resources issues (Baer et al. 2009). Therefore, if the establishment of a credit bureau is likely to be predictable, the time when it is set up as well as the number of years of operation are less likely to be predictable. However, to substantiate this reasoning, we test the exogeneity of our instrument while resorting to the Hansen's overidentification test.

There is an extensive literature highlighting the positive correlation between credit information sharing and the access to financial services (Ayyagari et al. 2008; Baer et al. 2009; Beck, Demirgüç-Kunt, et al. 2007). By sharing the information about borrower's behavior, credit bureaus and public registries increase access to bank services, support responsible lending, reduce credit losses and strengthen banking supervision (Baer et al. 2009). Since these positive effects on financial development are strongly correlated with poverty reduction, it appears obvious that the impact of credit bureaus and public registry on child labor operate only through the existence of bank infrastructures. We argue that better information on borrower's behavior drives the establishment of banks and financial institutions near poor households, improving their access to financial services and thereby leading to the reduction of child labor.

Based on the above discussion, the equation (1) is estimated using credit bureau and public registry as instruments for our measure of financial development (Private credit by deposit money banks and other financial institutions to GDP). Because, the 2SLS estimates can be biased if the chosen instruments are weak, we test their strength while resorting to the Kleibergen-Paap F statistic. Moreover, to further ensure that our estimates are not biased, we use the Limited Information Maximum Likelihood (LIML) which is more robust to weak instruments than the simple two stage least square.

Moreover, in our empirical specification, endogeneity may occur due to reverse causality between inequality and child labor. This is because child labor has irreversible consequences on human capital; it can cause poverty which is inherited from one generation to another with current child laborers being children of previous child workers, perpetuating inequalities (D'Alessandro & Fioroni 2016). In Equation (2) in order to deal with remaining endogeneity from inequality, we use the lag of our variable of inequality due to its potential endogeneity because of reverse causality

following (Combes et al. 2014; Aggarwal et al. 2011). This is not the best solution but we adopt this methodology as it is difficult to find pertinent instruments for inequality.

In addition, as robustness check, we also use the generalized method of moments which is more efficient in case of measurement errors, over-identified models, non-spherical error terms, weak instruments and in the presence of highly persistent time series as data on inequality.

3.2. Data description

In order to estimate our model, we construct a panel of developing countries over the period 1960 to 2004 given that comparable data for child labor¹⁹ at country level had been measured during this period and available in world development indicators archives of the World Bank.

Table I.1 : Descriptive Statistics

	Obs	Mean	Std-dev.	Minimum	Maximum
Prevalence of child labor	276	16.07996	15.68164	0	63.11
Private credit ratio (% GDP)	276	23.53386	20.41863	1.139998	122.795
GINI on market income (SWIID)	276	45.88232	8.240429	26.5666	67.70063
GDP per capita (log)	276	10.43908	2.418989	5.510435	16.67552
(GDP per capita (log)) ²	276	114.8135	53.77465	30.36489	278.0731
Rural population	276	56.88974	20.4975	8.675	95.18
Agricultural value added share (% GDP)	276	22.00062	13.90014	1.412958	71.33534
ILO convention 138	276	.3804348	.4863756	0	1
Trade openness	276	4.062433	.5920171	2.258831	5.395478

Child labor is measured by the percentage of the population in the 10–14 years-old age bracket that is actively engaged in work. This includes children, who, during the reference period performed “some work” for wage or salary, in cash or in kind at least 1 hour (Ashagrie 1993). The structure

¹⁹ Caution is required when exploiting the time aspect of the data. As in most countries, and especially in developing economies, economic censuses are rare, the ILO relies heavily on projections (both intra and extrapolations) for its estimates of economic activity rates. Thus, the reductions in child labor force participation rates will appear considerably smoother in the data than in the reality. In the paper, changes in child labor over ten-year periods are used that are relatively less affected by the issue.

of the data does not allow us to infer the intensity of child labor, so we cannot distinguish between light work (which some might argue is beneficial for adolescents) and fulltime labor, which might seriously conflict with human capital accumulation. Moreover, like most official statistics on child labor, these data are likely to suffer from underreporting, because work by children is illegal or restricted by law in most countries, and children often are employed in agriculture or the informal sector. These problems notwithstanding, the ILO data have the advantage of being carefully adjusted on the basis of internationally accepted definitions, thereby allowing cross-country comparisons over time (Ashagrie 1993). To the extent that underreporting is a time-invariant country characteristic or an overall time trend across countries, our fixed-effects estimator will not be subject to this bias. Data have been compiled by the International Labor Organization and are available on the World Development Indicators archives of the World Bank.

Nevertheless, it serves as the best available proxy for the prevalence of child labor in a cross-country panel setting and is widely used in empirical work (Ebeke 2012; Rajeev H. Dehejia & Gatti 2005; Neumayer & de Soysa 2005; Kis-Katos 2007; Cigno et al. 2002).

Our preferred measure for inequality is the Gini coefficient of market income provided by the Standardized World Income Inequality Database created by (Solt 2014). He uses various techniques to estimate the ratios between different types of Gini coefficients relying heavily on information about the ratio for the same country in proximal times to increase the number of comparable observations. He combines data from the United Nations University's World Income Inequality Database, the OECD Income Distribution Database, the Socio-Economic Database for Latin America and the Caribbean generated by CEDLAS and the World Bank, Eurostat, the World Bank's PovcalNet, the UN Economic Commission for Latin America and the Caribbean, the World Top Incomes Database, the University of Texas Inequality Project, national statistical offices around the world, and academic studies. The data collected by the Luxembourg Income Study is employed as the standard.

As a measure for financial development, we use private credit by deposit money banks and other financial institutions to GDP. This indicator is a global measure assessing the size, depth and development of a country's banking sector. It is limited as it does not capture the broad access to bank finance by individuals and firms, the quality and the efficiency of providing banking services. But, it is largely used as an indicator of financial development on macroeconomic studies and

previous works on child labor; moreover, recent data on financial access and the actual usage of banking services are not available before the 2000s. Series are drawn from the Financial Development and Structure Dataset, compiled by Beck, Demirgüç-Kunt and Levine, available on the World Bank website.

Data on child labor, the proportion of rural population, the share of agriculture value added in GDP, GDP per capita and the ratio of exports and imports to GDP are drawn from the World Development Indicators of the World Bank, except for ratification of ILO convention 138²⁰ establishing minimum working ages. The latter variable is a dummy taking the value 1 since a country has ratified the ILO convention and 0 otherwise. Basic summary statistics are presented in table I.1 while partial correlations are available in appendix I-1. In appendix I-2 and I-3, we present respectively by level of development and by region, evolution of child labor, inequality and financial development. Periods corresponds to the different decades between 1960 and 2000. We can notice that in all regions child labor is decreasing and it is the contrary for financial development. Regarding inequality, it is highly persistent in East Asia and Pacific, Latin America and Caribbean and in Middle East and North Africa regions; however, it fluctuates more in South Asia and Sub-Saharan Africa (SSA). The highest figures are for SSA with an increase from 1960 to 1970 and a steadiness after. In South Asia, we can notice a decrease between 1960 and 1980, a rise of inequalities during the 90's afterwards figures become stable.

²⁰ Dates of ratification of the ILO Convention 138 can be found at the following address: http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:11300:0::NO:11300:P11300_INSTRUMENT_ID:312283:NO.

Figure I.2 : Private credit and child labor

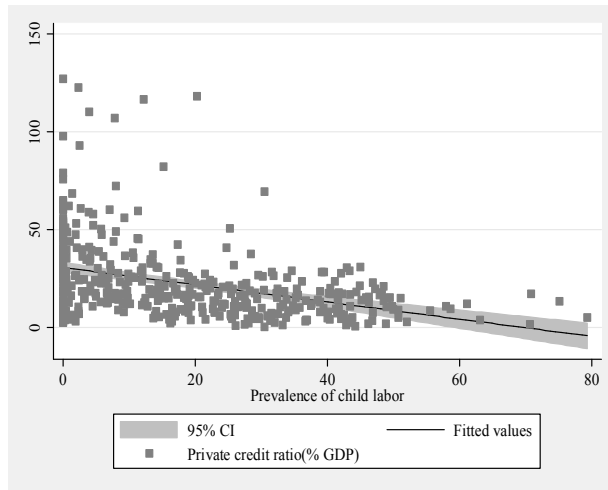
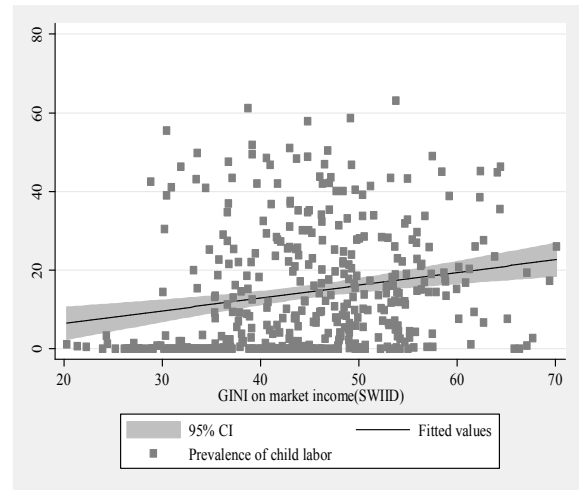


Figure I.3 : Inequality and child labor



Based on figure I.1 and I.2, we can notice that child labor is positively associated to inequality but negatively to financial development measured by private credit ratio to GDP. These graphs are simple correlations, so as to infer for causality, results of our empirical specification are presented in the next section.

4. Results

Table I.2 provides the results of the fixed effect model. Columns (1) and (2) report estimates respectively for model 1 and model 2. In all specifications, child labor is positively associated to financial development. Income level appears to be a great determinant of child labor and we find evidence of a U shape relationship like Acaroglu and Dagdemir (2010).

Table I.2 : Results with fixed-effects

	(1) <i>Model 1</i>	(2) <i>Model 2</i>	(3) <i>High inequality</i>	(4) <i>Low inequality</i>
	Child labor	Child labor	Child labor	Child labor
Private credit ratio(% GDP)	0.031** (0.011)	0.038*** (0.004)	0.015** (0.004)	-0.010 (0.017)
GINI on market income (SWIID)		0.073* (0.031)	0.092 (0.115)	-0.073*** (0.011)
GDP per capita (log)	-12.469*** (2.058)	-17.080*** (1.094)	-7.318* (3.156)	-22.368*** (1.193)
(GDP per capita (log)) ²	0.438*** (0.089)	0.622*** (0.063)	0.406* (0.181)	0.836*** (0.079)
Rural population	0.380*** (0.020)	0.291*** (0.020)	0.278*** (0.018)	0.391*** (0.049)
Agricultural value added share (% GDP)	0.050 (0.028)	0.170*** (0.019)	0.300*** (0.032)	0.149** (0.033)
ILO convention 138	-3.182*** (0.406)	-1.951*** (0.337)	-1.064** (0.316)	-1.670*** (0.199)
Trade openness	-1.339* (0.484)	-1.912** (0.427)	-3.317*** (0.491)	0.563 (0.353)
Constant	81.231*** (8.378)	106.909*** (3.060)	35.086* (12.721)	125.472*** (3.640)
Observations	363	276	158	118
Number of groups	112	99	67	57
R-Squared	0.632	0.698	0.688	0.757

Robust standard errors in brackets where *, **, and *** indicate statistical significance at the 10, 5 and 1 percent levels. In the last two columns, we split our sample according to the mean of the level of inequality measured by the Gini on market income, high inequality refers to countries with level of inequalities above the mean of the Gini index and low inequality for countries with value below the mean.

We investigate whether our result is linked to inequality by splitting the sample according to the mean of the Gini on market income as we do not find evidence of a conditional effect by introducing an interactive term between inequality and private credit²¹. In column (3), we report results for countries with high income inequality (above the mean of our sample) and in column

²¹ This results are note presented here.

(4), for countries with low inequality (below the mean). We find that it is only for high inequality countries that the effect is significant and positive, the coefficient is negative but not significant sign in countries where income inequalities are lower.

Table I.3 : Results with instrumental variables

	(1) Model 1 Child labor	(2) Model 2 Child labor	(3) High inequality Child labor	(4) Low inequality Child labor
Private credit ratio(% GDP)	0.339** (0.075)	0.232* (0.074)	0.268** (0.078)	-0.100** (0.034)
L.GINI on market income(SWIID)		0.096** (0.017)		
(GDP per capita (log)) ²	0.576** (0.139)	0.874*** (0.069)	0.511 (0.277)	0.854*** (0.109)
GDP per capita (log)	-21.240*** (4.183)	-28.868*** (3.431)	-18.205* (7.879)	-21.763*** (1.994)
Rural population	0.143*** (0.016)	0.296*** (0.037)	0.061* (0.025)	0.341*** (0.059)
Agricultural value added share(% GDP)	-0.130** (0.030)	0.004 (0.022)	-0.144** (0.044)	0.026 (0.018)
ILO convention 138	-3.097** (0.809)	-1.949* (0.734)	-2.342** (0.681)	0.808** (0.275)
Trade openness	-3.940** (0.947)	-1.023 (0.611)	-4.327*** (0.933)	1.444*** (0.288)
Observations	358	196	225	100
No of countries	107.000	73.000	66.000	39.000
Hansen p-value	0.204	0.232	0.175	0.475
F-stat for weak ident.	10.236	1025.193	13.576	12.205

Robust standard errors in brackets where *, **, and *** indicate statistical significance at the 10, 5 and 1 percent levels. In the last two columns, we split our sample according to the mean of the level of inequality measured by the Gini on market income, high inequality refers to countries with level of inequalities above the mean of the Gini index and low inequality for countries with value below the mean of 44.

At this stage, due to the plausible endogeneity of financial development and inequality, our coefficients could be biased. So we report in Table I.3, results for the estimations with our instruments using the Limited Information Maximum Likelihood (LIML) estimator.

In order to be able to interpret our tests, we were obliged to partial out some variables like time fixed effects. By the Frisch-Waugh-Lovell (FWL) theorem in LIML, estimation of the coefficients for the remaining regressors are the same as those that would be obtained if the variables were not partialled out (Schaffer 2015). The relevance of the instruments is assessed through the Hansen test

of overidentifying restrictions. Based on the Hansen p-values, we cannot reject the null hypothesis that the instruments are uncorrelated with the errors terms and that the excluded instruments are correctly excluded from the estimated equation. In addition, we report the Wald F statistic based on the Kleibergen-Paap (2006) rk statistic which is superior to the standard Cragg-Donald (1993) statistic in the presence of heteroskedasticity and autocorrelation. The reported statistics are above the Stock and Yogo (2005) critical values and above the value of 10 as suggested by the “rule of thumb” of Staiger and Stock (1997). In order to deal with remaining endogeneity, we use the lag of the Gini coefficient following (Combes et al. 2014; Aggarwal et al. 2011).

We now turn to the discussion of results derived from the estimation factoring for endogeneity. We keep the same order for the columns as in table I.2. Once again, the effect of financial development on child labor is positive. When we split the sample according to the mean of the Gini index like previously, we find that the impact still positive for countries with higher inequalities but for countries with lower levels, the coefficient is now negative and significant. In other words, financial development is efficient in reducing child labor for low level of inequalities otherwise we have the reverse effect with financial deepening leading to more child labor. We also notice that endogeneity tend to underestimate the effects of financial development on child labor given the magnitude of the coefficients comparing table I.2 and table I.3. Based on Table I.3 and column (2), a one standard deviation increase in private credit (21.6) is associated to a 37 %²² increase in child labor relative to the mean of the sample (13.57).

In Table I.4 below, we present the results when we introduce regional dummies and split our sample according to the level of income. In the first four columns, we add interactions between region dummies and the measure of financial development²³. The reasoning is to test for a specific regional effect of private credit. We notice that the marginal effect of being a country of Sub-Saharan Africa and East Asia Pacific is positive which is in line with our previous findings while for Latin America and the Caribbean, it is not significant. In fact, Sub-Saharan Africa and East Asia Pacific are the regions with the highest prevalence of child labor. Surprisingly, the marginal impact of private credit conditional of being a country of Middle East and North Africa is negative. For explanation, we can refer to appendix I-3, it is only in this region that inequality is decreasing during all the

²² The following calculation has been made: $(0.232 * 21.6/13.57) = 0.37$.

²³ Given the presence of fixed effects, we cannot control additively for regional dummies.

period and it also has the fastest growth of its financial system according to our measure of financial development. So in this region, financial development has evolved while inequalities have declined and this could explain the decreasing level of child labor. In other words, the impact of improving financial access for the poor is very effective in Middle East and North Africa compared to the other regions.

Table I.4: Regional and income specificities

	(1)	(2)	(3)	(4)	(5)	(6)
	SSA	LAC	EAP	MENA	Low income	Lower middle income
	Child labor	Child labor	Child labor	Child labor	Child labor	Child labor
Private credit ratio(% GDP)	0.336** (0.098)	0.208** (0.072)	0.055* (0.025)	0.535*** (0.090)	0.391** (0.130)	-0.086* (0.039)
(GDP per capita (log)) ²	0.538** (0.117)	0.457** (0.156)	0.317** (0.112)	0.691* (0.265)	0.463* (0.212)	-0.051 (0.086)
GDP per capita (log)	-21.023*** (3.044)	-15.910** (4.755)	-10.548** (2.842)	-27.396** (6.787)	-21.082*** (3.245)	1.589 (2.742)
Rural population	0.108** (0.025)	0.165*** (0.011)	0.164*** (0.019)	0.140** (0.046)	0.005 (0.028)	0.020 (0.043)
Agricultural value added share(% GDP)	-0.144*** (0.027)	-0.100** (0.034)	-0.073** (0.016)	-0.177** (0.059)	-0.065*** (0.014)	0.003 (0.035)
ILO convention 138	-3.727*** (0.571)	-2.820*** (0.575)	-1.381* (0.528)	-3.866** (0.935)	-3.952*** (0.533)	-0.173 (0.324)
Trade openness	-4.143** (1.411)	-2.927** (0.792)	-2.337** (0.692)	-5.567** (1.565)	-2.856 (1.583)	-2.997** (0.965)
Private credit-ssa	0.323** (0.097)					
Private credit-lac		0.154 (0.121)				
Private credit-eap			0.045* (0.019)			
Private credit-mena				-0.235** (0.077)		
Observations	358	358	358	358	160	127
No of countries	107.000	107.000	107.000	107.000	48.000	38.000
Hansen p-value	0.381	0.303	0.379	0.203	0.168	0.222
F-stat for weak ident.	31.059	32.491	24.117	2.709	33.135	11.028

Robust standard errors in brackets where *, **, and *** indicate statistical significance at the 10, 5 and 1 percent levels. In the last two columns, we split our sample according to the mean of the level of inequality measured by the Gini on market income, high inequality refers to countries with level of inequalities above the mean of the Gini index and low inequality for countries with value below the mean of 44.

ssa, lac, mena and eap refer respectively to Sub-saharan Africa, Latin America and Caribbean and East Asia-Pacific regions.

4.1. Robustness check

Table I.5: GMM estimation and use of another credit variable

	(1)	(2)	(3)	(4)	(5)	(6)
	GMM	GMM	IV	IV	IV	IV
	High inequality	Low inequality	Model 1	Model 2	High inequality	Low inequality
	Child labor	Child labor	Child labor	Child labor	Child labor	Child labor
Private credit ratio(% GDP)	0.0714**	-0.1076*				
	(0.0350)	(0.0633)				
GINI on market income(SWIID)	0.2717**	0.0440				
	(0.1146)	(0.1088)				
Domestic credit(% of GDP)			0.240***	0.163**	0.175***	-0.053**
			(0.027)	(0.047)	(0.027)	(0.019)
L.GINI on market income(SWIID)				0.092*		
				(0.029)		
(GDP per capita (log)) ²			0.313**	0.780***	0.323**	0.606***
			(0.070)	(0.067)	(0.082)	(0.093)
GDP per capita (log)	-14.4014**	-14.4014**	-12.697***	-24.677***	-10.477**	-16.522***
	(6.2914)	(6.2914)	(2.002)	(2.612)	(2.533)	(2.146)
Rural population	0.6020**	0.6020**	0.125***	0.242***	0.055	0.301***
	(0.2748)	(0.2748)	(0.019)	(0.023)	(0.032)	(0.055)
Agricultural value added share(% GDP)	-0.1154	-0.1154	-0.135***	0.012	-0.080**	-0.027
	(0.1310)	(0.1310)	(0.016)	(0.017)	(0.022)	(0.017)
ILO convention 138	0.1427	0.1427	-2.737**	-2.089**	-2.048**	-0.348
	(0.1057)	(0.1057)	(0.642)	(0.635)	(0.592)	(0.185)
Trade openness	-1.2237	-1.2237	-3.022***	-1.553*	-2.508***	0.370
	(1.2969)	(1.2969)	(0.555)	(0.491)	(0.524)	(0.288)
Observations	158	118	442	214	298	116
No of countries	67	57	123.000	78.000	83.000	45.000
Hansen p-value	0.495	0.358	0.202	0.2359	0.4811	0.278
AR2	0.151	0.607				
Number of instruments	38.000	29.000				
F-stat for weak ident.			393.214	493.074	386.702	54.332

Robust standard errors in brackets where *, **, and *** indicate statistical significance at the 10, 5 and 1 percent levels, respectively. Endogenous variables are Private credit ratio and Gini on market income (inequality) for GMM estimation.

In table I.5 above, we test the robustness of our results by using a GMM estimation which is more robust in case of measurement errors, over-identified models, non-spherical error terms and weak instruments. As previously, we split our sample according to the mean of the Gini coefficient. Columns (1) and (2) report results respectively for the countries above and below the mean. Once more, we find that the positive effect of financial development on child labor is driven only by countries with high income inequality. In Countries where the Gini index is below the mean for the sample, the effect is negative and significant. In the last four columns, we use an alternative

measure of financial development namely domestic credit to the private sector which is also a measure of financial deepening. The difference is that this indicator includes credit to public enterprises. Once again, our results are quite similar to those obtained with private credit to GDP.

In order to verify that our results are not sensitive to the use of averages over ten years, we also run our regressions using the averages over five years. Once again our previous results are confirmed, child labor is related positively to financial development and this result is driven by countries with high inequalities (see Appendix I-7 for more details).

4.2. Introducing institutional quality

We also look at if our results are not conditional to institutional quality. Based on our literature review, the positive effect of financial development on child labor could be linked to the high opportunity cost of education. In this line, we want to test the idea that in countries with good institutions and governance, there is a better quality of education reducing the impact of the high opportunity cost of education in parents' choice of child labor (in the case they use credit to invest in family firm or business). In fact, parents' decision whether to send a child to work or/and to school depends essentially on three things: the cost (including the opportunity-cost) of education, the expected return to education, and the extent to which parents are able to finance educational investments (Cigno et al. 2002). Especially, households would rationally prefer child labor if the high opportunity cost of education is associated to a lower marginal benefit from schooling. Consequently, we argue that policies which tend to improve the quality of education raising its return can reduce child labor, this could be done through better bureaucracy quality and fewer corruption for example. In order to test this conditional effect, we introduce an interactive term between private credit ratio and institutional variables taken from International Country Risk Guide (ICRG) which are more pertinent for the provision of public services namely corruption, bureaucracy quality, democratic accountability, and law and order²⁴. For endogenous interactive terms, we multiply the instruments for private credit ratio (existence of public credit registry and private credit bureau) by the exogenous institutions variables (Bun et al. 2014; Wooldridge 2002).

²⁴ Higher values indicate better institutions.

Table I.6 : Controlling for institutional quality

	(1)	(2)	(3)	(4)	(5)	(6)
	Child labor	Child labor	Child labor	Child labor	Child labor	Child labor
Private credit ratio(% GDP)	0.171*** (0.027)	0.176*** (0.034)	0.194** (0.070)	0.454*** (0.141)	0.177*** (0.019)	0.173* (0.090)
L.GINI on market income(SWIID)	0.048*** (0.014)	0.045** (0.019)	0.046** (0.017)	0.045 (0.026)	0.048*** (0.011)	0.014 (0.020)
(GDP per capita (log)) ²	0.589*** (0.080)	0.487*** (0.120)	0.524*** (0.129)	0.570*** (0.144)	0.634*** (0.072)	-0.210* (0.101)
GDP per capita (log)	-16.954*** (2.449)	-15.980*** (3.751)	-16.756*** (4.541)	-22.844*** (6.530)	-17.732*** (2.588)	5.745* (3.055)
Rural population	0.126*** (0.019)	0.168*** (0.022)	0.126*** (0.019)	0.118** (0.046)	0.129*** (0.015)	0.227*** (0.026)
Agricultural value added share(% GDP)	-0.010* (0.005)	-0.032 (0.019)	0.001 (0.012)	-0.022 (0.037)	-0.010 (0.008)	-0.002 (0.003)
ILO convention 138	-0.806*** (0.163)	-1.025*** (0.187)	-1.114*** (0.300)	-1.606** (0.600)	-0.760*** (0.146)	-0.336** (0.134)
Trade openness	-0.534* (0.258)	-0.437 (0.337)	-0.506 (0.408)	-0.939 (0.670)	-0.643*** (0.164)	-0.158 (0.317)
Corruption	0.411 (0.281)				0.686** (0.320)	
Private credit ratio*Corruption	-0.024*** (0.007)				-0.034*** (0.010)	
Law and Order		-0.716** (0.296)				
Private credit ratio*Law and Order		0.005 (0.010)				
Democratic Accountability			0.101 (0.202)			
Private credit ratio*Democratic Accountability			-0.005 (0.006)			
Bureaucracy Quality				0.218 (0.595)	0.156 (0.264)	
Private credit ratio*Bureaucracy Quality				-0.035** (0.013)	-0.000 (0.005)	
Corruption(Heritage)						0.125* (0.058)
Private credit ratio*Corruption(Heritage)						-0.004** (0.002)
Observations	1129	1129	1129	1129	1129	860
No of countries	82.000	82.000	82.000	82.000	82.000	99.000
Hansen p-value	0.446	0.485	0.439	0.474	0.631	0.4123
F-stat for weak ident.	11.265	29.940	11.864	11.817	8.029	8.789

Robust standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Results are presented in Table I.6²⁵, we introduce separately the interactive term with each variable of institutional quality from column (1) to column (4), then in column (5) we introduce simultaneously the interactive terms which were significant separately. We find that private credit ratio is effective in reducing child labor only in countries with better control of corruption and bureaucratic quality. When we introduce jointly the interactive terms for these two measures of institutions, it is only the interaction with corruption which remains significant. This was predictable, given the high correlation between these variables and the fact that corruption affects directly bureaucratic quality. We also use an alternative measure of corruption from the Heritage foundation which has rescaled the Corruption Perception Index (CPI) of Transparency International²⁶. The result presented in column (6) is similar with the negative impact of private credit observed for initial low level of corruption. These findings are rationale as corruption has been demonstrated to have a negative impact on social and political development of countries, undermining the efficiency of public services. We can take for example the seminal case of Kenya, where a Public Expenditure Tracking Survey (PETS) emphasized that in the period 1991-1995, schools received only 13 percent of funds dedicated to cover non-wage expenditures. The bulk of the school grant was captured by local officials (and politicians), within the scope of leakages (Reinikka & Svensson 2004). Moreover, schools in better-off communities managed to receive larger share of funds, enhancing inequalities. In Kenya, it is only 20 percent of schools which received their funds (Glassman et al. 2008). But Since 2003, cash is directly transferred from the central government to the school's bank account, which helps eliminating leakage further underlying the importance of financial development.

In Figure I.4 below, we calculate the net effect of financial development on child labor for different percentile levels from column (5) in Table I.6. We can observe that this effect become negative only after the 75th percentile for corruption which corresponds to the best level of good governance²⁷. We derive that a one standard deviation increase in private credit ratio to GDP (24.12) is associated with a 5%²⁸ decrease in child labor relative to the mean (13.10) for a

²⁵ We do not use five or ten years average as to taken into account all the available data and the variability of institutional quality.

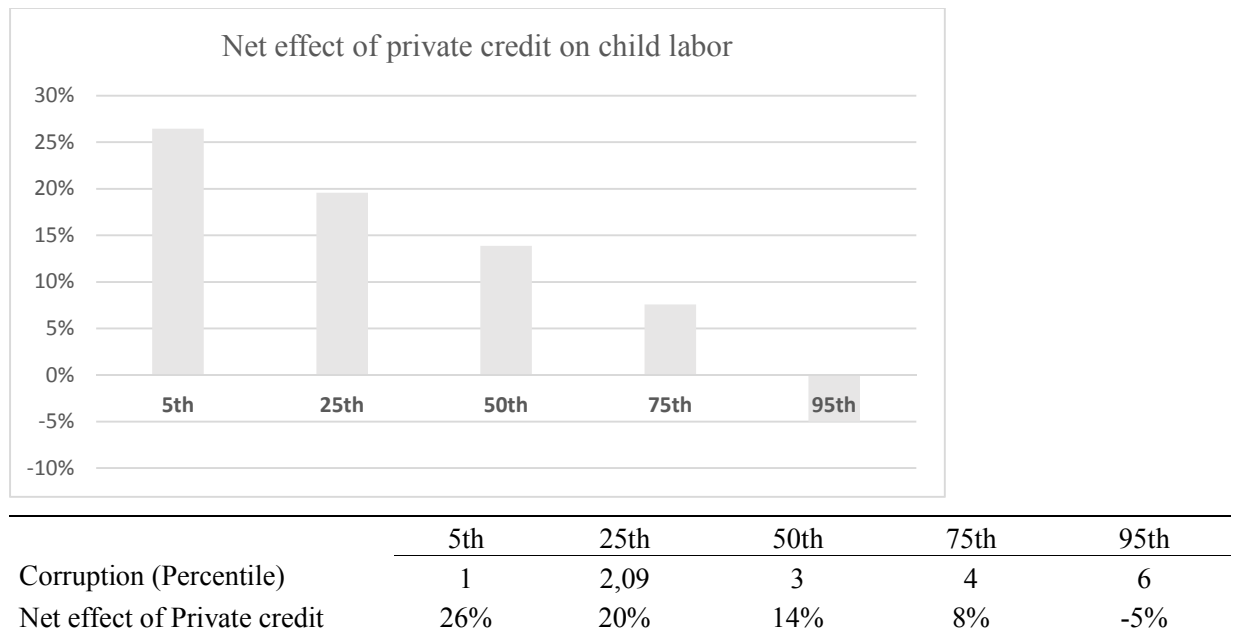
²⁶ The Index converts the raw CPI data to a scale of 0 to 100 by multiplying the CPI score by 10. For example, if a country's raw CPI data score is 5.5, its overall freedom from corruption score is 55.

²⁷ The indicator of corruption varies between 1 (high level of corruption) to 6 (minimum degree of corruption).

²⁸ The following calculation has been made : $((0.177*24.126)+(-0.034*24.126*6))/13.10 = - 0.05$

developing country with a corruption index that corresponds to 95th percentile of the distribution of the variable (6).

Figure I.4: Net effect of private credit on child labor conditional to corruption



4.3. Controlling for the provision and the efficiency of education services

In this section, we want to test directly if the provision of education services and their efficiency could help reduce directly child labor in developing countries. Following (Neumayer & de Soysa 2005); we add as additional controls, the ratio of public expenditures in education to GDP which is more relevant to assess if the provision of education services is a priority for the government. But it doesn't give information about the quality or the efficiency of the education system which can really impact the return from education. So we introduce the survival rate to grade five or the share of primary schools entrants that reach this grade, we choose this indicator as it has more observations than other measures like the pupil to teacher ratio for our period of analysis (1960-2004). All these data are drawn from the World development Indicators of the World Bank. Ideally, we would also like to have indicators which directly measure the marginal benefit from education like the graduate unemployment rate. We do have data on unemployment with secondary or primary education, unfortunately they are not suited for international comparisons as age group, geographic coverage, and collection methods could differ by country or change over time within a

country. Besides these limitations to comparability raised for measuring unemployment, the different ways of classifying the education level may also cause inconsistency across countries. Still, information on educational attainment is the best available indicator of skill levels of the labor force to date (WDI, 2016)²⁹.

Table I.7: Additional controls for education services and efficiency

	(1) Child labor	(2) Child labor	(3) Child labor
Private credit ratio(% GDP)	0.182*** (0.042)	0.178* (0.078)	0.081* (0.034)
L.GINI on market income(SWIID)	0.177*** (0.042)	0.173*** (0.017)	0.205*** (0.014)
(GDP per capita (log)) ²	0.820*** (0.063)	0.746*** (0.193)	0.712*** (0.066)
GDP per capita (log)	-25.704*** (2.842)	-24.262** (6.773)	-18.014*** (1.853)
Rural population	0.239*** (0.034)	0.213** (0.066)	0.170*** (0.025)
Agricultural value added share(% GDP)	-0.006 (0.030)	-0.057* (0.025)	-0.005 (0.021)
ILO convention 138	0.101 (0.277)	0.662** (0.256)	-0.050 (0.129)
Trade openness	-1.937*** (0.439)	-1.955** (0.555)	-2.437*** (0.188)
Education spending to GDP	-0.294*** (0.065)	-0.247* (0.125)	0.629** (0.214)
Survival rate to grade five		-0.068*** (0.017)	-0.021 (0.012)
Education spending*Corruption			-0.197** (0.047)
Corruption			0.623 (0.337)
Private credit ratio*Corruption			-0.020** (0.009)
Observations	245	161	130
No of countries	75.000	53.000	45.000
Hansen p-value	0.232	0.310	0.466
F-stat for weak ident.	23.496	10.082	2.026
Anderson-Rubin F-stat	36.062	66.704	43.705

Robust standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

²⁹ This is based on the suggestions of the World Development Indicators (2016) of the World Bank for the use of unemployment data.

Our results are presented in Table I.7 above. In column (1) and (2) we introduce respectively the level of education spending and the survival rate to grade five in primary education. We observe that the coefficient for public expenditure is negative and significant at 1% level in the first column. As soon as, we introduce the share of primary school entrants that reach grade five, the coefficient of education spending is reduced and less significant (10%), it is now the survival rate which has a negative effect on child labor. This may be due to the fact that the survival rate better captures the provision of education services and acts as a transmission channel for the impact of education expenditures.

In column (3), we test whether public education spending is more effective in reducing child labor in case of a better control of corruption like for the ratio of private credit. For instance, Mauro (1998) highlights that corruption is likely to reduce government spending on education at the expense of other sectors like fuel and energy. This is similar to the findings of Delavallade (2006) for a panel of developing countries. An explanation is that corrupt governments find it easier to collect bribes in these sectors. Moreover, Rajkumar and Swaroop (2008) demonstrate that public spending in education is more effective in increasing education attainment in countries with good governance, in other words, with less corruption. So, we introduce an interactive term between education spending and corruption, we also add an interaction between private credit and corruption in column (3). Once again with all these interactive terms, financial development helps reduce child labor in presence of better control of corruption, this is also the case for education spending. This finding is close to the previous results cited concerning the efficiency of public expenditures, the difference is that rather than focusing on education attainment, our variable of interest is child labor.

5. Conclusion

In this article, we have considered the impact of financial development measured by private credit ratio while controlling for inequality on the prevalence of child labor for a panel of developing countries from 1960 to 2004 due to data availability and comparability. Our main concern was to complete previous studies which lead to mixed results at microeconomic level, and to exploit an updated dataset on financial development and its time dimension at macroeconomic level. We test this by estimating a fixed effect model, then we factor for the endogeneity of private credit, using as instruments existence of public credit registries and private credit bureaus and we then use a GMM estimator which is more relevant in case of weak instrument and measurement errors. We also explore nonlinear effect first by dividing our sample between countries with high inequality (above the mean of the Gini index) and countries with low inequality (below the mean of the Gini index). Second, we look at if the effect of private credit ratio is conditional to institutional quality. This is because the latter has been found to reduce the quality of education services which can alter the returns from education; influencing parents' decisions between child labor and / or schooling. Third, we control for education spending and we look at if its impact is conditional to the effectiveness of institutions.

With an improved dataset on credit in order to ensure consistency over time and incorporate potential data updates and corrections, we find that the results of Dehejia and Gatti (2005) or Ebeke (2012) who find a negative impact on child labor, hold for countries with low level of inequality and better control of corruption. In contrary, financial development tends to increase child labor especially in countries with high level of inequality, above the mean for the Gini index. The fact that financial development increases child labor could have two explanations. On the one hand, it could emphasize that credit is used in productive activities which raise the demand for child labor by boosting local economy. On the other hand, it could reflect that households use their credits to invest in their own farm or non-farm business. This raises the opportunity cost of schooling and induces more working children as demonstrated by previous microeconomic studies. Consequently, even if financial development reduces indirectly child labor through poverty; inequality, and growth, it is not a sufficient condition for eradicating child labor.

Our results also suggest that financial development will be effective in reducing child labor only in countries with better control of corruption which improves the provision of public services. In fact, providing a better quality of education will enhance the returns from schooling and influence the decision of households in the sense of more education than labor. This better control of corruption also conditions the effectiveness of public education spending for reducing child labor.

In terms of policy implications, our paper argues in the sense of paying more attention to the opportunity cost of education and its return. Since governments cannot directly influence this opportunity cost, a greater attention must be paid to actions which add benefits to school attendance. This could be achieved by policies which have been demonstrated to be efficient like improving education quality, struggling against corruption, giving access to information about returns from education, conditional cash transfer program, or abolishing school fees as others. These suggestions are general and they need to be customized locally according to the context in each country, requiring further investigation and perpetual monitoring.

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7. Appendices

Appendix I-1: Partial correlation coefficients

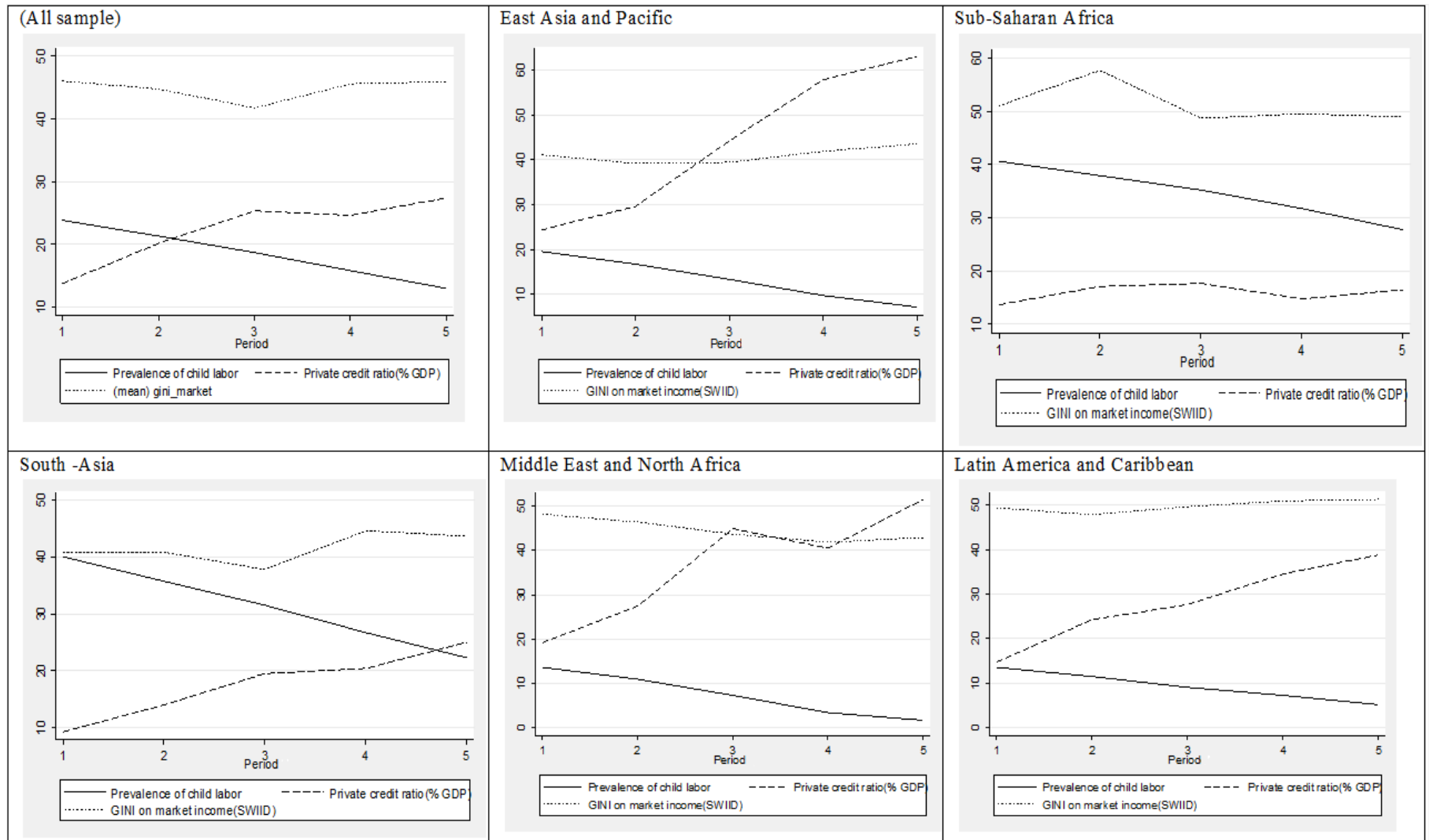
	Prevalence of child labor	Gini on market income	Private credit ratio to GDP	GDP per capita	Rural population	Agriculture	ILO convention 138	Trade openness
Prevalence of child labor	1.0000							
Gini on market income	0.1727*	1.0000						
Private credit ratio to GDP	-0.4401*	-0.0380	1.0000					
GDP per capita	0.0373	0.1156*	0.0637	1.0000				
Rural population	0.7419*	0.0783	-0.4934*	-0.038	1.0000			
Agriculture(%GDP)	0.7626*	-0.0819	-0.5601*	0.0198	0.7739*	1.0000		
ILO convention 138	-0.1644*	-0.0167	0.1676*	-0.040	-0.1519*	-0.1800*	1.0000	
Trade openness	-0.3375*	0.0192	0.1432*	-0.0324	-0.1564*	-0.2873*	0.1929*	1.0000

*Significant correlation at 5% level.

Appendix I-2: Full list of countries

Angola; Albania; Argentina; Armenia; Azerbaijan; Burundi; Burkina Faso; Bangladesh; Bulgaria; Belarus; Belize; Bolivia; Brazil; Barbados; Botswana; Central African Republic; China; Cote d'Ivoire; Cameroon; Colombia; Costa Rica; Czech Republic; Dominican Republic; Algeria; Ecuador; Egypt, Arab Rep.; Estonia; Ethiopia; Fiji; Gabon; Georgia; Ghana; Gambia, The; Guinea-Bissau; Guyana; Honduras; Croatia; Hungary; Indonesia; India; Iran, Islamic Rep.; Jamaica; Jordan; Kazakhstan; Kenya; Kyrgyz Republic; Cambodia; Korea, Rep.; Lao PDR; Sri Lanka; Lesotho; Lithuania; Latvia; Morocco; Moldova; Madagascar; Mexico; Macedonia, FYR; Mali; Mongolia; Mozambique; Mauritania; Mauritius; Malawi; Malaysia; Niger; Nigeria; Nicaragua; Nepal; Pakistan; Panama; Peru; Philippines; Papua New Guinea; Poland; Paraguay; Russian Federation; Rwanda; Sudan; Senegal; El Salvador; Suriname; Slovak Republic; Swaziland; Syrian Arab Republic; Thailand; Trinidad and Tobago; Tunisia; Turkey; Tanzania; Uganda; Ukraine; Uruguay; Vietnam; Yemen, Rep.; South Africa; Zambia; Zimbabwe;

Appendix I-3: Evolution of child labor, inequality and financial development



Appendix I-4: First stage regression for Table I.3

	(1)	(2)	(3)	(4)
	<i>Model 1</i>	<i>Model 2</i>	<i>High inequality</i>	<i>Low inequality</i>
	Private credit ratio(% GDP)	Private credit ratio(% GDP)	Private credit ratio(% GDP)	Private credit ratio(% GDP)
(GDP per capita (log)) ²	-1.097** (0.277)	-1.281* (0.406)	-2.478** (0.540)	0.496 (0.308)
GDP per capita (log)	44.173*** (7.020)	55.687** (10.492)	76.100*** (14.212)	5.954 (5.496)
Rural population	0.050 (0.032)	-0.363* (0.139)	0.093 (0.062)	0.233 (0.264)
Agricultural value added share(% GDP)	0.221*** (0.046)	0.106 (0.053)	0.393*** (0.056)	-0.444*** (0.087)
ILO convention 138	5.398*** (1.127)	7.723*** (1.170)	3.989** (1.059)	11.741*** (0.476)
Trade openness	6.369*** (0.795)	-2.079 (1.770)	8.520*** (1.181)	5.827** (1.963)
Private credit bureau	0.354** (0.101)	0.144** (0.042)	0.537*** (0.116)	0.671*** (0.139)
Public credit registry	0.007 (0.014)	-0.285*** (0.032)	-0.106 (0.064)	0.685** (0.192)
L.GINI on market income(SWIID)		0.058 (0.043)		
Observations	358	196	225	100
No of countries	107.000	73.000	66.000	39.000

Robust standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix I-5: First stage regression for Table I.4

Corresponding column in Table 6	1		2		3		4		5	
	(1) Private credit	(2) Private credit-ssa	(3) Private credit	(4) Private credit-lac	(5) Private credit	(6) Private credit-eap	(7) Private credit	(8) Private credit-mena	(9) Private credit	(10) Private credit
(GDP per capita (log)) ²	-1.048** (0.315)	0.126 (0.089)	-1.010* (0.416)	-0.117** (0.038)	-1.174*** (0.243)	-0.891*** (0.178)	-0.983 (0.647)	-0.002 (0.034)	-0.110 (0.388)	-1.725** (0.463)
GDP per capita (log)	42.194*** (8.098)	-0.833 (2.249)	42.595** (10.920)	2.182 (1.132)	44.244*** (6.307)	32.757*** (4.145)	40.610* (16.641)	0.360 (1.418)	15.448 (8.034)	58.516*** (9.747)
Rural population	0.066 (0.043)	0.104** (0.035)	0.074 (0.043)	-0.053** (0.016)	0.127** (0.038)	-0.012 (0.023)	0.047 (0.079)	0.018 (0.046)	0.301* (0.125)	-0.195 (0.101)
Agricultural value added share(% GDP)	0.202** (0.047)	0.054 (0.036)	0.245** (0.083)	-0.015 (0.013)	0.179** (0.060)	0.125** (0.043)	0.205* (0.086)	-0.020 (0.019)	-0.101** (0.035)	0.463** (0.146)
ILO convention 138	5.398** (1.288)	1.945*** (0.257)	5.265** (1.399)	3.861*** (0.715)	4.607** (1.611)	-2.029** (0.721)	5.175* (2.067)	0.193 (0.878)	3.673** (1.094)	0.631 (2.888)
Trade openness	6.160*** (0.861)	1.104** (0.302)	6.559*** (1.249)	-0.783*** (0.155)	4.262*** (0.487)	4.123*** (0.406)	6.642*** (1.001)	-0.603 (0.296)	2.414** (0.663)	19.133*** (2.042)
Private credit bureau	0.423** (0.098)	-0.048** (0.012)	0.737*** (0.124)	-0.180*** (0.031)	0.163 (0.080)	-0.132*** (0.021)	0.370* (0.138)	0.036 (0.018)	0.664*** (0.085)	0.312*** (0.067)
Public credit registry	0.115 (0.101)	-0.022 (0.010)	-0.039 (0.040)	-0.130*** (0.010)	0.094*** (0.015)	-0.039* (0.015)	-0.090 (0.096)	0.035 (0.018)	-0.094 (0.127)	0.643* (0.238)
Credit bureau-ssa	-0.248** (0.065)	0.501*** (0.093)								
Public registry-ssa	-0.202 (0.200)	-0.041 (0.098)								
Credit bureau-lac			-0.981*** (0.125)	0.189*** (0.039)						
Public registry-lac			1.132*** (0.149)	1.196*** (0.198)						
Credit bureau-eap					3.042*** (0.613)	3.899*** (0.653)				
Public registry-eap					-0.235 (0.656)	0.269 (0.747)				
Public registry-mena							0.387 (0.419)	0.984*** (0.194)		
Observations	358	358	358	358	358	358	358	358	160	127
No of countries	107.000	107.000	107.000	107.000	107.000	107.000	107.000	107.000	48.000	38.000

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix I-6: First stage regression for Table I.5

	(1)	(2)	(3)	(4)
	Model 1	Model 2	High inequality	Low inequality
	Domestic credit(% of GDP)	Domestic credit(% of GDP)	Domestic credit(% of GDP)	Domestic credit(% of GDP)
(GDP per capita (log)) ²	-0.547*** (0.073)	-1.231** (0.253)	-1.673*** (0.233)	0.436 (0.529)
GDP per capita (log)	30.716*** (1.745)	55.375*** (7.550)	53.591*** (6.204)	9.422 (9.930)
Rural population	0.082 (0.048)	-0.193** (0.039)	0.113 (0.059)	0.003 (0.381)
Agricultural value added share (% GDP)	0.361*** (0.029)	0.018 (0.068)	0.384*** (0.015)	-0.021 (0.123)
ILO convention 138	6.757*** (1.071)	11.363** (2.207)	6.162*** (1.211)	14.048*** (1.721)
Trade openness	7.319*** (1.114)	-0.544 (1.547)	7.363*** (1.514)	10.208** (2.349)
Private credit bureau	0.670*** (0.030)	0.462*** (0.061)	0.964*** (0.054)	0.925*** (0.163)
Public credit registry	-0.044 (0.037)	-0.301* (0.110)	-0.212** (0.059)	0.723** (0.241)
L.GINI on market income(SWIID)		0.095 (0.063)		
Observations	442	214	298	116
No of countries	123.000	78.000	83.000	45.000

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix I-7: Results using five years average

A. Fixed effects estimation

	(1)	(2)	(3)	(4)	(5)
				<i>High inequality</i>	<i>Low inequality</i>
	Prevalence of child labor	Prevalence of child labor	Prevalence of child labor	Prevalence of child labor	Prevalence of child labor
Private credit ratio(% GDP)	0.021** (0.008)		0.012 (0.008)	0.016* (0.007)	-0.023* (0.011)
GINI on market income(SWIID)		0.072*** (0.013)	0.056** (0.023)	0.048 (0.077)	-0.080* (0.037)
GDP per capita (log)	-12.139*** (0.548)	-5.685*** (0.994)	-13.500*** (1.173)	-8.456*** (1.710)	-17.922*** (0.842)
(GDP per capita (log)) ²	0.450*** (0.032)	0.236*** (0.047)	0.542*** (0.066)	0.377** (0.115)	0.689*** (0.027)
Rural population	0.397*** (0.007)	0.260*** (0.030)	0.296*** (0.027)	0.310*** (0.018)	0.259*** (0.025)
Agricultural value added share(% GDP)	0.012 (0.013)	0.091*** (0.026)	0.119** (0.039)	0.147** (0.055)	0.140*** (0.024)
ILO convention 138	-2.010*** (0.240)	-1.685*** (0.208)	-1.201*** (0.219)	-1.155*** (0.157)	-0.485** (0.190)
Trade openness	-1.183* (0.626)	-2.798*** (0.504)	-1.720** (0.619)	-2.336*** (0.635)	-0.237 (0.400)
Constant	74.566*** (3.843)	38.293*** (5.440)	78.927*** (5.091)	48.608*** (6.108)	106.582*** (7.003)
Observations	581	494	408	243	165
Number of groups	118	117	106	76	60
R-Squared	0.646	0.690	0.705	0.716	0.728

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

B. Instrumental variables estimates

	(1)	(2)	(3)	(4)
	<i>Model 1</i>	<i>Model 2</i>	<i>High inequality</i>	<i>Low inequality</i>
	Prevalence of child labor	Prevalence of child labor	Prevalence of child labor	Prevalence of child labor
Panel a. IV estimates				
Private credit ratio(% GDP)	0.492** (0.173)	0.243** (0.092)	0.383*** (0.073)	-0.150*** (0.021)
L.GINI on market income(SWIID)		0.072* (0.037)		
(GDP per capita (log)) ²	0.807*** (0.130)	0.822*** (0.122)	0.851*** (0.138)	0.581*** (0.061)
GDP per capita (log)	-28.804*** (6.066)	-26.728*** (5.306)	-28.157*** (4.436)	-12.324*** (0.943)
Rural population	0.187*** (0.020)	0.256*** (0.033)	0.153*** (0.027)	0.184** (0.054)
Agricultural value added share(% GDP)	-0.161** (0.051)	0.069*** (0.019)	-0.221*** (0.044)	0.054 (0.044)
ILO convention 138	-2.499*** (0.705)	-0.990** (0.384)	-1.017** (0.406)	1.042*** (0.185)
Trade openness	-3.700* (1.699)	-0.960 (0.642)	-4.302** (1.450)	0.421* (0.184)
Panel b. First stage results				
Private credit bureau	0.403** (0.126)	0.158** (0.052)	0.616*** (0.146)	0.655*** (0.120)
Public credit registry	0.006 (0.031)	-0.198* (0.084)	-0.121 (0.100)	1.035*** (0.157)
Observations	573	345	397	150
No of countries	110.000	89.000	77.000	44.000
Hansen p-value	0.119		0.186	0.154
F-stat for weak ident.	11.296	21.661	10.452	21.295
Anderson-Rubin F-stat	184.341	195.323	274.712	14.900

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

C. Instrumental variables estimates for regional and income specificities

	(1)	(2)	(3)	(4)	(5)	(6)
	SSA	LAC	EAP	MENA	Low income	Lower middle income
	Prevalence of child labor	Prevalence of child labor	Prevalence of child labor	Prevalence of child labor	Prevalence of child labor	Prevalence of child labor
Private credit ratio(% GDP)	0.368** (0.154)	0.172*** (0.016)	0.022 (0.014)	0.615** (0.203)	0.162** (0.057)	-0.081* (0.040)
(GDP per capita (log)) ²	0.657*** (0.114)	0.442*** (0.026)	0.268*** (0.038)	0.851** (0.269)	-0.055 (0.119)	0.028 (0.126)
GDP per capita (log)	-23.615*** (5.075)	-14.491*** (0.877)	-8.671*** (1.051)	-31.616*** (8.657)	-4.866* (2.171)	-1.939 (3.314)
Rural population	0.144*** (0.017)	0.187*** (0.009)	0.179*** (0.007)	0.201*** (0.051)	0.088*** (0.026)	0.127*** (0.035)
Agricultural value added share(% GDP)	-0.141*** (0.028)	-0.098*** (0.012)	-0.083*** (0.011)	-0.178** (0.064)	-0.095*** (0.016)	-0.081** (0.025)
ILO convention 138	-2.427*** (0.704)	-1.536*** (0.170)	-0.818** (0.253)	-2.655** (1.053)	-1.189** (0.364)	-0.496* (0.260)
Trade openness	-3.371* (1.529)	-2.022*** (0.588)	-1.833** (0.578)	-4.635** (1.649)	-2.176* (1.002)	-2.582*** (0.640)
Private credit-ssa	0.397*** (0.046)					
Private credit-lac		0.177* (0.090)				
Private credit-eap			0.060*** (0.015)			
Private credit-mena				-0.339** (0.108)		
Observations	573	573	573	573	258	200
No of countries	110.000	110.000	110.000	110.000	50.000	39.000
Hansen p-value	0.4031	0.4227	0.4400	0.2707	0.195	0.147
F-stat for weak ident.	10.786	208.250	63.019	25.567	108.569	5.542
Anderson-Rubin F-stat	236.440	59.489	317.685	392.727	125.549	51.124

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

D. First stage results for regional and income specificities

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Private credit ratio(% GDP)	Private credit- ssa	Private credit ratio(% GDP)	Private credit-lac	Private credit ratio(% GDP)	Private credit-eap	Private credit ratio(% GDP)	Private credit-mena	Private credit ratio(% GDP)	Private credit ratio(% GDP)
(GDP per capita (log)) ²	-1.272*** (0.267)	0.001 (0.098)	-1.228** (0.382)	-0.191** (0.059)	-1.404*** (0.212)	-0.855*** (0.175)	-1.180** (0.510)	-0.020 (0.032)	0.414 (0.299)	-1.716** (0.556)
GDP per capita (log)	46.925*** (7.046)	1.486 (2.124)	46.565*** (9.675)	4.524** (1.700)	48.491*** (5.400)	31.410*** (4.518)	44.648*** (13.063)	0.960 (1.116)	3.043 (6.070)	58.650*** (11.358)
Rural population	-0.026 (0.035)	0.092*** (0.023)	-0.022 (0.076)	- (0.015)	0.048 (0.027)	-0.087** (0.031)	-0.033 (0.047)	0.021 (0.039)	0.212** (0.087)	-0.064 (0.130)
Agricultural value added share(% GDP)	0.165*** (0.030)	0.016 (0.023)	0.199** (0.083)	-0.021* (0.010)	0.126*** (0.026)	0.139*** (0.024)	0.157** (0.047)	-0.007 (0.013)	-0.094*** (0.013)	0.541** (0.179)
ILO convention 138	3.388*** (0.530)	0.906* (0.440)	3.074* (1.366)	1.329* (0.634)	2.263*** (0.411)	-0.338 (0.539)	3.536*** (0.819)	0.478 (0.648)	2.368*** (0.228)	3.212 (1.733)
Trade openness	3.827*** (0.786)	0.868*** (0.221)	4.285** (1.585)	-1.171** (0.409)	2.412*** (0.452)	3.130*** (0.286)	4.360*** (1.109)	-0.562 (0.321)	2.699*** (0.343)	13.401*** (3.225)
Private credit bureau	0.473*** (0.088)	-0.010 (0.011)	0.862*** (0.133)	- (0.028)	0.178** (0.074)	-0.138*** (0.022)	0.439** (0.139)	0.039** (0.016)	0.683*** (0.059)	0.293** (0.088)
Public credit registry	0.081 (0.099)	0.006 (0.014)	-0.013 (0.052)	- (0.020)	0.080*** (0.023)	-0.077*** (0.020)	-0.079 (0.084)	0.032* (0.016)	-0.035 (0.106)	0.635** (0.232)
Credit bureau-ssa	-0.271*** (0.035)	0.462*** (0.077)								
Public registry-ssa	-0.136 (0.215)	-0.018 (0.117)								
Private credit-ssa										
Credit bureau-lac			-1.044*** (0.165)	0.132* (0.069)						
Public registry-lac			0.756*** (0.196)	0.862*** (0.167)						
Private credit-lac										
Credit bureau-eap					2.764*** (0.516)	3.409*** (0.545)				
Public registry-eap					0.692	0.923*				

					(0.409)	(0.481)				
Private credit-eap										
Credit bureau-mena							93.522**	72.914***		
							(29.642)	(18.192)		
Public registry-mena							0.485	1.030***		
							(0.304)	(0.133)		
Private credit-mena										
Observations	573	573	573	573	573	573	573	573	258	200
No of countries	110.000	110.000	110.000	110.000	110.000	110.000	110.000	110.000	50.000	39.000
Hansen p-value										

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

E. Instrumental variable estimates for the use of domestic credit

	(1)	(2)	(3)	(4)
	<i>Model 1</i>	<i>Model 2</i>	<i>High inequality</i>	<i>Low inequality</i>
	Prevalence of child labor	Prevalence of child labor	Prevalence of child labor	Prevalence of child labor
Panel a. IV estimates				
Domestic credit(% of GDP)	0.282*** (0.036)	0.172*** (0.038)	0.235*** (0.039)	-0.086** (0.028)
L.GINI on market income(SWIID)		0.076 (0.048)		
(GDP per capita (log)) ²	0.389*** (0.048)	0.545*** (0.077)	0.446*** (0.046)	0.546*** (0.047)
GDP per capita (log)	-15.377*** (0.746)	-18.695*** (1.760)	-14.926*** (1.956)	-12.948*** (0.694)
Rural population	0.145*** (0.013)	0.190*** (0.019)	0.112*** (0.023)	0.177*** (0.023)
Agricultural value added share(% GDP)	-0.144*** (0.019)	0.025 (0.014)	-0.127*** (0.035)	0.094** (0.029)
ILO convention 138	-1.743*** (0.280)	-0.954*** (0.269)	-1.092*** (0.198)	0.061 (0.253)
Trade openness	-3.000*** (0.890)	-1.516** (0.521)	-2.922** (0.964)	-0.095 (0.430)
Panel b. First stage results				
Private credit bureau	0.723*** (0.060)	0.572*** (0.107)	0.936*** (0.074)	1.356*** (0.345)
Public credit registry	-0.075 (0.062)	-0.260* (0.120)	-0.215* (0.101)	1.015*** (0.231)
Observations	720	389	523	171
No of countries	124.000	98.000	90.000	49.000
Hansen p-value	0.125	0.3778	0.255	0.219
F-stat for weak ident.	72.462	20.948	88.406	9.752
Anderson-Rubin F-stat	314.238	74.356	108.589	27.463

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix I-8: First stage regression for Table I.6

Corresponding column in Table I.6	1		2		3		4		5			6	
	(1) Credit ratio(% GDP)	(3) Credit ratio *Corruption	(4) Credit ratio(% GDP)	(6) Credit ratio*Law and Order	(7) Credit ratio(% GDP)	(9) Credit ratio *Democratic Accountability	(10) Credit ratio(% GDP)	(12) Credit ratio *Bureaucracy Quality	(13) Credit ratio(% GDP)	(15) Credit ratio* Corruption	(16) Credit ratio *Bureaucracy Quality	(17) Credit ratio (% GDP)	(19) Credit ratio *Corruption(Heritage)
L.GINI on market income(SWIID)	0.076	0.008	0.056	0.483*	0.040	-0.302	0.061	0.242**	0.077	0.023	0.262***	0.312***	14.451***
(GDP per capita (log)) ²	(0.056) -0.575**	(0.136) 4.078***	(0.067) -	(0.256) -0.545	(0.048) -0.322*	(0.225) 9.635***	(0.063) -0.422**	(0.087) -0.290	(0.064) -0.501**	(0.148) 4.332***	(0.081) -0.382	(0.029) 0.300***	(1.422) -32.575***
GDP per capita (log)	(0.207) 42.462**	(0.394) -	(0.173) 37.328**	(1.275) 142.919**	(0.175) 35.855**	(0.986) -145.591***	(0.158) 36.656**	(0.665) 73.939***	(0.228) 39.277**	(0.412) -	(0.769) 77.305***	(0.081) 23.421**	(8.672) 1691.123***
Rural population	(3.960) -0.148**	(12.015) 0.391	(3.995) -	(37.625) -2.154***	(3.210) -0.084	(15.387) 0.558	(3.218) -0.128*	(14.274) -1.466***	(4.465) -0.146**	(13.465) 0.389	(16.809) -1.493***	(3.739) 0.060	(375.921) 0.355
Agricultural value added share(% GDP)	(0.065) 0.041	(0.318) -0.269	(0.060) 0.132**	(0.350) 1.296***	(0.074) 0.032	(0.514) 0.693**	(0.064) 0.067	(0.266) 0.428*	(0.068) 0.038	(0.325) -0.273	(0.256) 0.388*	(0.038) 0.060	(4.320) 1.222
ILO convention 138	(0.052) 3.250***	(0.180) 8.562***	(0.056) 2.868***	(0.385) 11.726***	(0.054) 3.579***	(0.254) 3.381	(0.081) 3.156***	(0.240) 8.510***	(0.072) 3.003***	(0.187) 7.564***	(0.221) 8.279***	(0.039) 1.156	(2.301) 56.478
Trade openness	(0.710) 1.749	(2.511) -2.531	(0.605) 1.857	(2.302) 2.120	(0.832) 2.253	(2.002) -5.435	(0.547) 1.187	(1.394) -7.870*	(0.469) 1.567	(2.082) -3.431	(1.260) -7.395	(0.878) -1.046	(42.131) -141.323**
Corruption	(2.196) 1.714***	(4.672) 30.707***	(1.580)	(4.824)	(1.659)	(6.046)	(1.621)	(4.211)	(1.698)	(3.946)	(4.370)	(0.826)	(48.358)
Law and Order		(0.394) (1.561)		2.276*** (0.118)		32.369*** (1.931)							
Democratic Accountability						-0.103 30.252***							
Bureaucracy Quality						(0.418) (2.441)			1.358 26.338***		0.748 3.270***		25.582***
Corruption(Heritage)							(0.938) (1.208)		(0.882) (0.956)		(1.068)		0.002 27.889***
Credit bureau	0.663*** (0.132)	0.489 (0.621)	0.552*** (0.109)	0.952** (0.385)	-0.144 (0.246)	-5.171*** (1.247)	0.265 (0.161)	-0.461 (0.429)	0.400* (0.212)	-0.442 (0.791)	-0.268 (0.538)	(0.022) -0.290	(2.321) -19.533
Public credit registry	-0.065 (0.042)	0.829*** (0.145)	-0.118 (0.097)	-2.107*** (0.325)	-0.052 (0.077)	0.585** (0.217)	-0.127** (0.055)	-0.349*** (0.083)	- 0.180***	0.348** (0.057)	-0.419*** (0.159)	0.186*** (0.055)	20.267** (7.622)
Credit bureau*Corruption	-0.007	-0.200**							-0.014	-0.229**	-0.014		

Public credit registry*Corruption	(0.015) -	(0.087) 0.122						(0.017) -	(0.103) 0.014	(0.038) -0.193**			
	0.099***							0.130***					
Credit bureau * Law and Order	(0.030)	(0.126)	0.012	0.420***				(0.024)	(0.105)	(0.085)			
Public credit registry * Law and Order			(0.014) 0.025	(0.042) 0.101*									
Public credit registry * Democratic Accountability			(0.015)	(0.051)	0.011	-0.236***							
Credit bureau * Democratic Accountability					(0.007) 0.105***	(0.029) 1.456***							
Public credit registry * Bureaucracy Quality					(0.034)	(0.191)	0.058**	-0.057	0.072***	0.305***	-0.043		
Credit bureau * Bureaucracy Quality							(0.023) 0.056	(0.034) 0.668***	(0.025) 0.095**	(0.059) 0.327***	(0.036) 0.726***		
Credit bureau * Corruption(Heritage)							(0.041)	(0.101)	(0.039)	(0.081)	(0.091)	- 0.003***	-0.203**
Public credit registry * Corruption(Heritage)												(0.000) 0.001	(0.066) 0.209
												(0.001)	(0.246)
Observations	1129	1129	1129	1129	1129	1129	1129	1129	1129	1129	1129	860	860
No of countries	82.000	82.000	82.000	82.000	82.000	82.000	82.000	82.000	82.000	82.000	82.000	99.000	99.000

Appendix I-9: First stage regression tables for column (7)

	(1)	(2)	(3)	(4)
	Private credit ratio(% GDP)	Private credit ratio(% GDP)	Private credit ratio(% GDP)	Private credit ratio*Corruption
(GDP per capita (log)) ²	-2.774*** (0.597)	-2.528*** (0.435)	-1.767** (0.599)	-1.571 (1.939)
GDP per capita (log)	100.825*** (14.869)	94.094*** (13.841)	63.369** (17.277)	75.312 (51.223)
Rural population	-0.662*** (0.178)	-0.658*** (0.146)	-0.887* (0.354)	-1.873 (1.237)
Agricultural value added share(% GDP)	0.021 (0.152)	0.386*** (0.070)	0.397 (0.250)	1.332 (0.837)
ILO convention 138	1.372** (0.542)	-1.745** (0.672)	-1.689 (2.592)	-13.818 (8.323)
Trade openness	4.428 (2.619)	4.932 (4.474)	-5.105 (5.464)	-12.844 (12.779)
L.GINI on market income(SWIID)	-0.428** (0.128)	-0.321 (0.204)	0.150 (0.075)	1.110* (0.484)
Education spending to GDP	0.727 (0.375)	1.526 (0.790)	4.997* (2.092)	12.907 (7.279)
Private credit bureau	0.318** (0.119)	0.214 (0.163)	0.379 (0.349)	-0.698 (1.020)
Public credit registry	-0.765** (0.262)	-0.556** (0.211)	-0.939* (0.377)	-1.525 (1.245)
Survival rate to grade five		0.059 (0.036)	-0.096 (0.113)	-0.264 (0.320)
Education spending*Corruption			-1.442* (0.591)	-2.112 (2.034)
Corruption			7.248*** (0.940)	44.348*** (7.423)
Private credit bureau*Corruption			0.236** (0.081)	0.456 (0.344)
Public credit registry*Corruption			-0.090 (0.053)	0.065 (0.199)
Observations	245	161	130	130
No of countries	75.000	53.000	45.000	45.000

Chapter II. Access to Financial Services and Working Poverty in Developing Countries

1. Introduction³⁰

A flourishing literature has emphasized a negative relationship between poverty and financial development proxied by some aggregate measures like credit to private sector, usually referred to as “private credit” or bank money deposit to GDP (Beck, Demirgüç-Kunt, et al. 2007; Jalilian & Kirkpatrick 2002; Jeanneney & Kpodar 2011; Odhiambo 2009; Odhiambo 2010). In this study, the emphasis is on demographic branch penetration measured by the number of bank branches per 100,000 people which captures more precisely access to finance. In fact, financial development can directly reduce poverty through providing better access to financial services to the poor. First, with access to banks or formal financial services, transactions are safer, quicker, and cheaper like for payments or the transmission and receipt of remittances. Second, it also enables households and firms with credit and their saving to invest in productive activities such as fertilizer, better seeds, machinery, and other equipment. With saving and insurance, they can also smooth their income and reduce their vulnerability to unfortunate events as economic shocks, drought, disease, or death. The impact could also be indirect through growth³¹ or by providing access to these excluded non-poor micro and small entrepreneurs which can have a strong favourable indirect effect on the poor by increasing their employment opportunities (Beck et al. 2009). However, the current global deficit in quality jobs is likely to threaten several decades of efforts in poverty reduction and clearly put the sustainable development goal of ending poverty by 2030 at risk.

This article examines the poverty-reducing impact of access to finance by focusing on labor market. We argue that because the main asset of the poor is their labor, a better understanding of their working conditions is of great interest. Beyond absolute poverty, and the overall supply of labor force, we focus on the proportion of employed persons in a household whose members are living below the international poverty line in Purchasing Power Parity (PPP), namely the working poor. This indicator has been developed by the International Labor Organization (ILO) for assessing the “decent work” agenda. According to its last estimates, they are 839 million³² of poor workers in developing countries representing one third of total employment (ILO 2014).

³⁰ This chapter has been written with Thierry YOGO, Assistant Professor at the University of Yaoundé (Cameroun).

³¹This is the trickle down hypothesis according to which economic growth will ultimately benefit the poor through more jobs and higher incomes.

³² The poverty line considered is US\$2.

In fact, for the poor, unemployment is not a major concern in developing countries as they already have jobs; the problem is that despite working long hours, they do not earn enough to escape poverty (Fields (2012))³³.

This paper tests the hypothesis that a better access to financial services reduces the share of working poor, those receiving less than US\$ 1.25 per day in the developing world. Access to finance can have an impact on labor both on the demand and the supply side. From the supply side, with better access to financial services, the poor will be able to negotiate better salaries, in other words they will supply labor more elastically. As shown by Blundell et al (2016), poor households respond to income shocks by increasing their labor supply in order to smooth their consumption. This induces a downward pressure on wages. For instance, with data for 257 districts in India, Jayachandran (2006) shows that in case of negative productivity shocks, with no possibility of borrowing or drawing on savings and migrate, the equilibrium wage for poor people is lower because they are constrained to work at lesser rate.

From the demand side, a better access to financial services in developing countries can be beneficial to small enterprises which can invest more and increase their demand for low qualified labor force. This could also be the case for informal businesses which can get out of informality and increase their labor demand. Consequently, the demand for unskilled labor increases as well as wages at the bottom of the distribution. For example, Beck et al (2010) demonstrates that branch deregulation in United States during the 1980s and 1990s reduced income inequality by boosting output and demand for unskilled labor. Thus, the wage and salary earnings of the unskilled and lower paid part of the labor force increased. It follows that the share of poor workers decreases. Similar results have been found for Thailand (Giné & Townsend 2004). Furthermore, Beck et al. (2009) argue that the main impact of financial development on income inequality is through higher wages and the inclusion of a larger share of the population in the formal economy. Overall, increasing access to financial services will reduce working poverty through enhanced business performance, less informal sector and employment vulnerability.

We pay attention to the tail of the distribution of domestic wages, and look at the poorest workers (stuck in poverty traps), who represent a sizeable part of the labor supply in developing countries. Unlike previous studies which use macro focused proxy for financial development

³³ It is estimated that a third of the poor in developing countries have a jobs, but most of them are concentrated in low paid informal activities (World Employment social Outlook, ILO, 2016).

such as private credit, we use an indicator of financial outreach namely the number of bank branches per 100,000 people like (Mookerjee & Kalipioni 2010). It has the advantage of being correlated with aggregates measures as well as micro-indicators of barriers to finance (Beck et al. 2008; Beck, Demirguc-Kunt, et al. 2007) and captures more thinly the real impact of finance through access to ordinary people in a country (Mundaca 2009). In addition to demographic branch penetration, we also look at how barriers to use financial services may have an impact on working poverty. We test this hypothesis by replacing the number of bank branches per 100,000 people by indicators of constraints to use financial services like the amount of collateral required for a loan, the minimum amount to open and to be maintained in saving and checking account as well as the level of annual fees. These variables are more precise for assessing access to financial services, but we don't use them as main variables of interest given the very low number of observations.

We also take advantage of a new dataset on the distribution of wages in developing countries compiled by ILO. It is the Key Indicators of Labor Market (KILM 9th Edition) which gives information on the share of individuals remunerated at less than US\$1.25 per day as a proxy for the prevalence of working poor. Data are available for a large set of countries. The definition of the working poor rate in the dataset is based on (Kapsos & Bourmpoula 2013). The ILO has continuously improved its methodology for the measurement of the working poverty rate across countries. The KILM dataset provides information on the working poverty rates, which are internationally comparable across countries, a critical requirement for the present cross-country study. Another advantage is that the KILM 9th Edition is derived from a micro-based approach to compute the working poverty rates for those countries where direct information from household and labor market surveys is not available. The approach gives robust estimations of the prevalence of working poverty with a minimized prediction error.

Using a sample of 63 developing countries spanning the period 2004 to 2013 and after factoring the endogeneity of financial development, the paper leads to the following results : (1) access to finance measured by the number of bank branches per 100,000 people reduces the share of individuals remunerated at low wages. (2) Working poverty tends to be positively correlated with the indicators of barriers to use banking services. (3) This effect is even more relevant in countries affected by strong macroeconomic instability. Our findings are robust to the shifting of the poverty line from US\$ 1.25 to US\$ 1.90, to the introduction of new control variables namely remittances; mobile phone subscriptions and other measures of financial development such as private credit and bank concentration. Moreover, our results confirm the validity of

some transmissions channels such as growth (trickle down hypothesis) and the access of non-poor workers to financial services.

The rest of this paper is organized as follows: section 2 presents a selective literature review. Section 3 describes the econometric specification and estimation method with some figures and tables on the distribution of access to financial services and working poverty. In Section 4, we discuss our results with some robustness checks, then in section 5, we conclude.

2. Selective literature review

An extensive literature has documented the relationship between financial development and growth, while focusing less on poverty. This is based on the assumption that financial development may trickle down to the poor through its influence on economic growth with more jobs and higher incomes. This theory has been supported by authors like Dollar and Kraay (2002), and Ravallion and Datt (2002).

In addition to this indirect effect, financial development can contribute directly to poverty reduction in many ways (Odhiambo 2009). First, it can improve the opportunities for the poor to access formal finance by addressing the causes of financial market failures such as information asymmetry and the high fixed cost of lending to small borrowers (Jalilian & Kirkpatrick 2005). In particular, demographic branch penetration through more bank branches reduces the distance between lenders and borrowers and improve lending conditions. For instance, Degryse and Ongena (2005) demonstrate that loan rates increase with the distance between the firm and bank branches, this could also be linked to the result of Bofondi and Gobbi (2006) who find that default rates are more than three times higher for firms outside the local market. Moreover, Brevoort and Hannan (2007) show a negative association between distance and the likelihood of a local commercial loan being granted while Gobbi and Zizza (2007) document that it is the probability of a household to hold a bank account which is positively correlated with the number of branches.

Second, with access to financial services such as credit, saving and insurance, the poor can engage in riskier high-yielding activities, start microenterprises, and reduce their vulnerability to shocks (Ellis et al. 2010). In addition, provide wider financial access to the excluded non-

poor entrepreneurs can have a strongly favourable indirect effect on the poor by generating more employment, and higher incomes and thereby reducing poverty (Beck et al. 2009).

Some of the studies which try to investigate empirically the link between financial development and poverty include (Beck, Demirgüç-Kunt, et al. 2007; Boukhatem 2016; Burgess & Pande 2005; Honohan 2008; Inoue & Hamori 2012; Jalilian & Kirkpatrick 2005; Jalilian & Kirkpatrick 2002; Jeanneney & Kpodar 2011; Odhiambo 2010; Odhiambo 2009; Rehman & Shahbaz 2013)³⁴. They generally find that financial development reduces poverty. For instance, Burgess and Pande (2005) find that opening of one bank branch per 100,000 people in a rural unbanked location reduces rural poverty by 4.7 percent in India. But this effect could partly be overshadowed out by macroeconomic and financial instability generated by financial markets expansion as the poor are the most affected (Boukhatem 2016; Jeanneney & Kpodar 2011).

Financial access can also have an impact on poverty through labor market. First, in developing countries, where wages are more volatile and sensitive to growth instability (Agénor et al. 2000; King & Rebelo 1999)³⁵, the poor tend to increase their labor supply in case of shocks, even if wages decrease (Blundell et al. 2016; Jayachandran 2006; Sharif 1991b; Sharif 1991a; Yamada 2008). In other words, the elasticity of labor supply to wage is low. This is because with no possibility of borrowing or drawing on savings, the equilibrium wage for poor people is lower and they are obliged to work at lesser rate. For illustrative purposes, we can consider an economy where people are able to save or borrow. In case of bad shock which reduces the demand for labor, they will supply less labor and instead borrow or draw upon saving to smooth their consumption. But in an economy with limited access to financial services, to deal with shocks, workers will increase their labor supply or reduce it to a lesser extend to meet their consumption need, resulting on a downward pressure on wages. Consequently, access to financial services can enable poor households to supply labor more elastically and manage wage volatility, thus inducing less working poor.

Second, by allowing consumption smoothing, reducing financing constraints and overall disposable income, financial access can affect the composition of the workforce and thus, the equilibrium of the labor market. In the short term, as mentioned earlier, households' labor supply can become more elastic, leading to a lower prevalence of working poor. In the medium

³⁴ An extensive literature review has been compiled by (Uddin et al., 2014).

³⁵ In the five developing countries studied by Agénor, McDermott, and Prasad (2000), the correlation between the quarterly real wage and contemporaneous domestic output ranges from .31 to .68 for 1978-95. The correlation coefficient in the U.S. is about .12 (King and Rebelo 1999).

and long term, as long as access to finance help build human capital (De Gregorio 1996), the economy starts to create relatively high-paid jobs.

The empirical evidence presented above has focused on poverty in general and has not paid attention on how financial development could have an impact on the poor's wages as labor is their main asset. They also look at the overall supply of labor, but have disregarded the distinction between the poorest workers and the others. This study aims at filling this gap by investigating the effect of financial access on reducing the prevalence of working poor in developing countries.

3. Empirical strategy

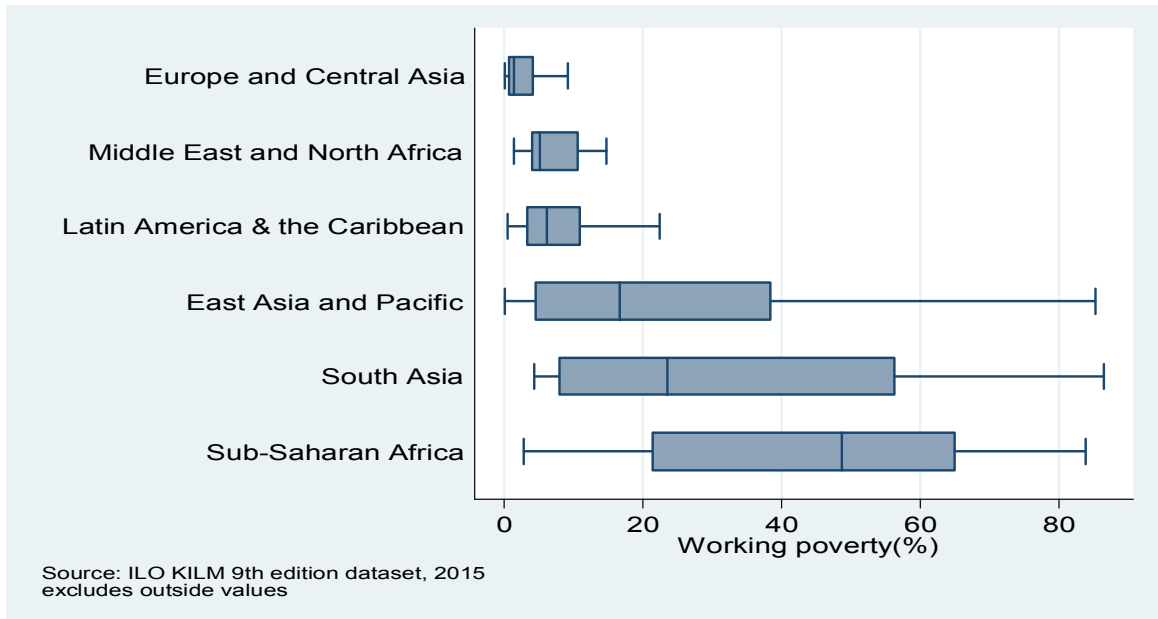
3.1. Econometric model and data

In this section, we explore the link between financial access and working poverty on a sample of 63 developing countries over the period 2004-2013 (See appendix II-1 for the list of countries). Because the estimation of working poverty uses national household surveys which in developing countries are not available on annual basis, the sample used in this study is unbalanced. Likewise, the choice of the sample period is dictated by data availability of the measure of financial access. The baseline econometric model we want to estimate is the following:

$$wp_{i,t} = \beta_1 fin_{i,t} + X'_{i,t} \delta + \alpha_i + \varepsilon_{i,t} \quad (1)$$

Where $wp_{i,t}$ is the share of working poor in the total employment in each country i at year t . Following Kapsos and Bourmpoula (2013), working poverty is defined as the percentage of workers living with less than US\$ 1.25 a day in PPP. The data are drawn from the 9th edition of the Key Indicators of Labor Market (KILM) made available by the International Labor Organization (ILO). Figure II.1 shows the distribution of working poverty across regions. According to this figure, working poverty is more prevalent in South Asia and Sub-Saharan Africa where respectively 27% and 45% of the working force is living with less than US\$ 1.25 per day.

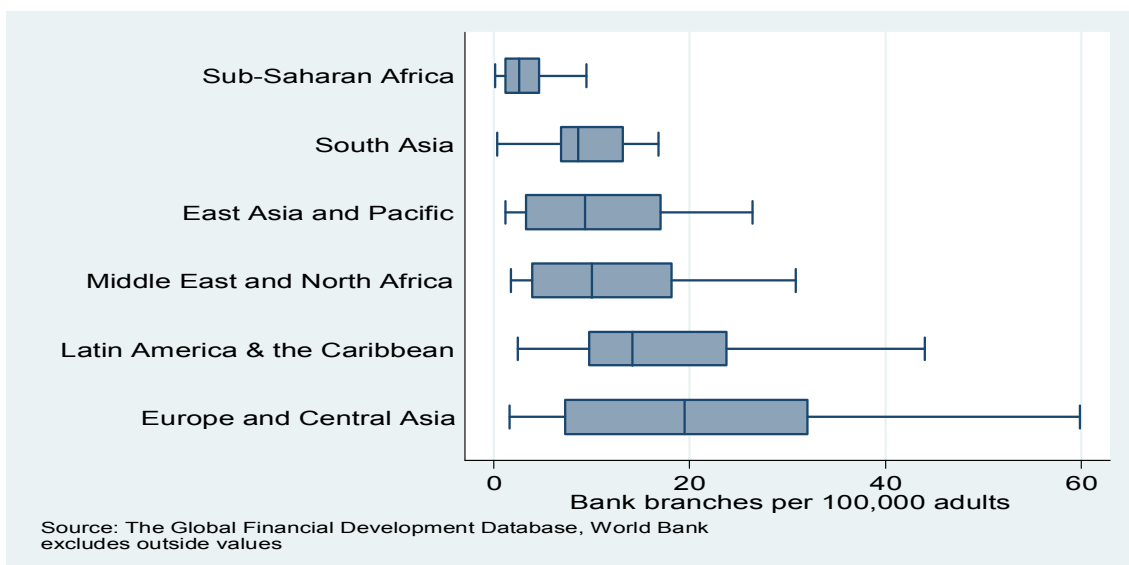
Figure II.1. Distribution of working poverty by region



Notes: In box plots, the lower and upper hinges of each box show the 25th and 75th percentiles of the samples, the line in the box indicates the respective medians, and the end-points of whiskers mark next adjacent value.

The variable $fin_{i,t}$ captures the access to financial services and is measured by the number of bank branches per 100,000 adults. This measure of financial access has been initially computed by Beck et al (2007) and later updated by the World Bank (World Development Indicators, 2014).

Figure II.2. Distribution of bank branches by region



Notes: In box plots, the lower and upper hinges of each box show the 25th and 75th percentiles of the samples, the line in the box indicates the respective medians, and the end-points of whiskers mark next adjacent value.

Figure II.2 displays the distribution of bank branches by regions. As expected, Sub-Saharan Africa is the region which is the less endowed with barely 4 bank branches per 100,000 adults. This region has the lowest degree of financial inclusion and bank branches tend to be concentrated in the biggest cities (Guerineau & Jacolin 2014).

In equation (1), $X'_{i,t}$ is the matrix of control variables including the logarithm of GDP per capita, trade openness, foreign direct investment in percentage of GDP (FDI), growth volatility and income inequality measured by the GINI index. The choice of the control variables is consistent with the literature on poverty and working poverty (see Combes et al, 2014). Country fixed effects are added to the model to control for the unobserved heterogeneity at the country level. Finally, $\varepsilon_{i,t}$ is the idiosyncratic error term which is also likely to capture measurement error on the dependent variable.

The hypothesis tested in this paper is that increased access to financial services in developing countries may reduce the prevalence of working poverty. Specifically, we expect the coefficient β_1 to be negative and significant ($\beta_1 < 0$). In fact, access to financial services helps poor households to smooth their consumption by investing in productive activities which may lift them out of poverty (Beck et al, 2007; Ellis et al, 2010). In the same line, by relaxing financial constraints, better access to financial services enable the poor to raise their reservation wage, leading to the reduction of working poverty. The GDP per capita is included in the model to control for the potential effect of the level of development on working poverty. Due to the fact that the window of opportunities for poor widen with the level of development, we expect a negative effect of GDP per capita on working poverty. The effect of trade openness is ambiguous because trade affects both the demand and the supply side. Furthermore, the effect may depend on how trade affect unskilled and skilled labor. For instance, if trade openness induces an increase in the demand of skilled labor relative to the unskilled one, we may expect a positive effect on working poverty because poor are more likely to offer unskilled labor. The expected effect of FDI is negative because an increase of foreign investment is likely to reduce working poverty through the rise of labor demand. Growth volatility is measured as the rolling standard deviation of GDP growth over ten years and is expected to increase working poverty. As shown by Blundell et al (2016), poor households respond to income shocks by increasing their labor supply in order to smooth their consumption. This induces a downward pressure on wages and increases working poverty (Combes et al, 2014). Data related to GDP per capita, FDI and trade openness are drawn from the World Development Indicators of the World Bank.

Finally, we expect a positive effect of income inequality through the increase of labor supply. The income inequality is measured by the Gini coefficient of market income obtained from the Standardized World Income Inequality Database (SWIID) calculated by Solt (2014). The descriptive statistics related to the control variables are presented in Table II.1.

Table II.1. Descriptive statistics

	Obs.	Mean	Std-Dev	Minimum	Maximum
Working poor(< US\$1.25)	294	10.20818	16.75849	0.1093576	78.18419
Bank branches per 100,000 adults	294	15.26772	13.93865	0.3976429	112.265
GDP volatility	294	3.785184	2.054289	0.3558483	11.92879
Log(GDP per capita)	294	10.85166	2.682094	5.592471	17.02724
Trade openness	294	4.292915	.4491733	3.095848	5.25992
FDI-to-GDP	294	5.140362	5.228183	0.0566923	40.96647
GINI index	294	43.82757	8.16911	17.98894	70.19312
Private credit bureau	294	10.60544	16.16196	0	54
Public credit registry	294	10.80612	14.45765	0	53

3.2. Identification strategy and estimation method

The standard approach to estimate the effect of financial access on working poverty is to use ordinary least square regression. Although this approach gives an idea about the correlation between the two variables, it is difficult to infer a causal effect running from financial access to working poverty. The relationship between financial access and working poverty might be driven by reverse causation. For instance, financial access might be low for poor households. Therefore, the expected negative effect of the former may only indicate this reverse causality. In addition, financial access may be measured with error. In this case, the estimated OLS effect will be attenuated (underestimation/overestimation).

The strategy adopted in this paper is to build on the existing literature on the determinants of financial development to find an exogenous source of variation in financial access. Following Djankov et al, (2007); and Beck et al, (2007), we use the existence of credit bureaus and public credit registries as source of exogenous variation in financial access in developing countries. A private credit bureau is defined as a private commercial firm or non-profit organization which maintains a database on the standing of borrowers in the financial system and has as primary purpose to facilitate the exchange of information amongst banks and financial institutions (Djankov et al, 2007). The variable takes value one if a credit bureau operates in the country and zero otherwise. Likewise, a public registry is defined as a database owned by public authorities (central bank or banking supervisory authority) that collect information on the standing of borrowers and share it with financial institutions (Djankov et al, 2007). The variable equals one if the public registry operates in a country and zero otherwise. Unlike the above mentioned authors who directly make use of dummy variables, we use the number of years of operation which seems to be more relevant and relatively exogenous. For example the establishment of a credit bureau involves dealing with several issues including regulatory framework issues, lack of data or unreliable ones, information technology issues, skills and human resources issues (Baer et al. 2009). Therefore, if the establishment of a credit bureau is likely to be predictable, the time when it is set up as well as the number of years of operation are less likely to be predictable. However, to substantiate this reasoning, we test the exogeneity of our instrument while resorting to the Hansen's overidentification test.

There is an extensive literature highlighting the positive correlation between credit information sharing and the access to financial services (Ayyagari et al. 2008; Baer et al. 2009; Beck, Demirguc-Kunt, et al. 2007). By sharing the information about borrower's behaviour, credit bureaus and public registries increase access to bank services, support responsible lending, reduce credit losses and strengthen banking supervision (Baer et al. 2009). Since these positive effects on financial development and access are strongly correlated with poverty reduction, it appears obvious that the impact of credit bureaus and public registry on working poverty operates only through the existence of bank infrastructures. We argue that better information on borrower's behavior drives the establishment of banks and financial institutions near poor households, improving their access to financial services and thereby leading to the reduction of working poverty.

The World Development Indicators of the World Bank also proposes two measures of credit information sharing, namely private credit bureau coverage and public credit registry coverage. They represent the number of individuals or firms listed as credit bureau or public registry in percentages of the adult population. These data are available since 2004, and their use reduces our sample since with the number of years of existence, we can construct a larger dataset before 2004. So we use these measures as robustness check while our preferred instruments are the number of years of existence of these institutions for our measure of financial access (number of bank branches per 100,000 adults). Because, the 2SLS estimates can be biased if the chosen instruments are weak, we test their strength while resorting to the Kleibergen-Paap F statistic. Moreover, to further ensure that our estimates are not biased, we use the Limited Information Maximum Likelihood (LIML) which is more robust to weak instruments than the simple two stage least square.

4. Empirical findings

As a preliminary step of our investigation, we report in Table II.2 the OLS estimates of the effect of financial access on working poverty.

The first column of the table displays the estimates of the baseline model and shows a negative and significant effect of financial access as measured by the number of bank branches on working poverty. Specifically, an increase of the number of bank branches by a one hundred percent induces a decrease of working poverty by 0.22 percentage point. Similar result is obtained when one controls for the growth volatility. Finally, the third column augments the model with an interaction between the volatility of growth and financial access. The purpose of this inclusion is to test the hypothesis according to which the magnitude of the decreasing effect of financial access is higher in countries that are strongly affected by external shocks. The coefficient of the interaction term is significant and has the expected sign, confirming the hypothesis that access to financial services is even more relevant in countries affected by strong macroeconomic instability.

Table II.2. Fixed effects estimates of the impact of financial access on working poverty

	(1) Working poverty	(2) Working poverty	(3) Working poverty
Log(Bank branches per 100,000 adults)	-0.224***	-0.217***	-0.180***
	(0.012)	(0.009)	(0.020)
GDP volatility		0.028***	0.055***
		(0.004)	(0.008)
Volatility x Bank branches			-0.013**
			(0.006)
Log(GDP per capita)	-0.914***	-0.805***	-0.772***
	(0.035)	(0.022)	(0.023)
Trade openness	0.293***	0.211***	0.210***
	(0.039)	(0.039)	(0.037)
FDI-to-GDP	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)
GINI index	0.032***	0.035***	0.036***
	(0.004)	(0.005)	(0.004)
Constant	9.168***	8.077***	7.599***
	(0.321)	(0.326)	(0.337)
Observations	318	318	318
Number of groups	87	87	87
R-Squared	0.431	0.451	0.453

Note: Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table II.3 reports the instrumental variables estimates which deal with the bias induced by the endogeneity of our interest variable. Two instruments are used to infer a causal effect of

financial access on working poverty, namely the number of years a credit bureau and a public registry have been operating in a country. In order to ensure that the instruments are not weak, we report the first stage regressions which provide an idea about the strength of the correlation with the interest variable (see Panel (b))³⁶. The first stage regressions show that our instruments are not weak as they are strongly correlated with the measure of financial access at the 1% level with the correct positive sign. In addition, we report the Wald F statistic based on the Kleibergen-Paap (2006) rk statistic which is superior to the standard Cragg-Donald (1993) statistic in the presence of heteroskedasticity and autocorrelation. The reported statistics are far above the Stock and Yogo (2005) critical values and above the value of 10 as suggested by the “rule of thumb” of Staiger and Stock (1997). The relevance of the instruments is assessed through the Hansen test of overidentifying restrictions. Based on the Hansen p-values, we cannot reject the null hypothesis that the instruments are uncorrelated with the error term and that the excluded instruments are correctly excluded from the estimated equation.

³⁶ Complete tables are reported in appendix.

Table II.3. Instrumental variable estimates of the effects of financial access on working poverty

	(1)	(2)	(3)	(4)	(5)	(6)
Panel (a) : 2SLS estimates						
Log(Bank branches)	-0.254** (0.109)	-0.352** (0.114)	-0.218** (0.096)	-0.341** (0.120)	-0.550*** (0.171)	-0.269*** (0.074)
GDP volatility		0.027*** (0.003)	0.175** (0.074)	0.027*** (0.003)	0.026*** (0.003)	0.027*** (0.003)
Volatility x Bank branches			-0.069** (0.029)			
Log(GDP per capita)	-0.871*** (0.150)	-0.623*** (0.154)	-0.349** (0.141)	-0.663*** (0.141)	-0.620*** (0.153)	-0.528*** (0.121)
Trade openness	0.305*** (0.060)	0.271*** (0.068)	0.293*** (0.073)	0.259*** (0.067)	0.224*** (0.069)	0.268*** (0.049)
FDI-to-GDP	0.001 (0.002)	0.002 (0.002)	0.003 (0.002)	0.002 (0.002)	0.001 (0.002)	-0.001 (0.002)
GINI index	0.031*** (0.005)	0.032*** (0.005)	0.036*** (0.003)	0.031*** (0.006)	0.044*** (0.005)	0.038*** (0.004)
Bank branches x SSA region				0.098 (0.088)		
Bank branches x LAC region					0.381** (0.127)	
Bank branches x Asia region						-0.440*** (0.104)
Panel (b) First stage results						
Private credit bureau	0.022*** (0.005)	0.024*** (0.006)	0.025*** (0.005)	0.017*** (0.004)	0.018*** (0.006)	0.029*** (0.007)
Public credit registry	0.025*** (0.006)	0.028*** (0.006)	0.028*** (0.005)	0.030*** (0.006)	0.025*** (0.007)	0.025*** (0.007)
Private credit bureau x Volatility			-0.010*** (0.002)			
Public credit registry x Volatility			0.015*** (0.001)			
Private credit bureau x SSA				0.158*** (0.016)		
Private credit bureau x LAC					0.068*** (0.004)	
Private credit bureau x Asia						0.055*** (0.004)
Observations	294	294	294	294	294	294
No of countries	63	63	63	63	63	63
R-squared	0.430	0.429	0.360	0.439	0.426	0.479
Hansen p-value	0.362	0.359	0.620	0.360	0.869	0.361
F-stat for weak ident.	84.638	85.529	75.463	108.131	43.663	61.818
Anderson-Rubin F-stat	2.387	4.062	40.506	14.584	5.586	3.614

Notes: Robust standard errors in parentheses. Country fixed effects are included in all specifications. Other covariates in the first-stage regression are omitted for the presentational convenience, more details are available in Appendix II-2. SSA refers to Sub-Saharan Africa, LAC to Latin America and Caribbean. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The first column of Table II.3 presents the baseline specification and shows a negative and significant effect of financial access on working poverty. The magnitude of the effect is slightly higher than the one obtained with the OLS estimates suggesting that not taking into account the endogeneity may lead to an underestimation of the true impact. Based on these estimates, a one hundred percent increase in financial access (number of bank branches) induces 0.25 percentage point decrease in working poverty. In the second column of the Table II.3, we add the volatility of GDP to the model to control for the effect of uncertainty and macroeconomic instability. The effect of financial access remains statistically significant, but the magnitude increases by about 10 percentage points. This result clearly suggests that improving financial access for the poor is very important especially in a context of macroeconomic uncertainty.

The third column reports the estimates when we control for an interaction between growth volatility and financial access. The expected negative sign is obtained, confirming the fact that the effect of financial access on working poverty is higher for countries facing macroeconomic instability. Another interpretation of this result is that the positive effect of macroeconomic volatility on working poverty is lower when the poor have better access to financial services.

In the last three columns, we add interactions between regional dummies and the measure of financial access³⁷. The reason for that is to test a specific regional effect of financial access. Surprisingly, the marginal effect of financial access conditional of being a country of Sub-Saharan Africa (SSA) is not significant. A potential explanation is the fact that the number of bank branches in Sub-Saharan Africa is almost four times lower than the within sample mean which stands at 15. Therefore, the expected effect cannot be observed because the number of bank branches is very small to reach the poor. In contrast, as expected, the marginal effect of financial access conditional of being an Asian country is negative and significant. In other words, the impact of improving financial access for the poor is very effective in Asia (second region with the highest share of working poor) compared to the other regions.

³⁷ We would have liked to also additively control for regional dummies. Unfortunately it is difficult due to the presence of fixed effect and the multicollinearity related to the presence of the interaction term. Note that the reference group is always the other regions as shown in figure II.1 & II.2.

4.1. Testing for some transmission channels and sensitivity analysis

In this section, we test some economic assumptions based on our literature review and discuss the results of various robustness tests carried out on the baseline model. First, we check the sensitivity of our findings by changing the poverty line from US\$ 1.25 to US\$ 1.90 and include as the dependent variable the share of non-working poor (people living with more than US\$ 13 a day). So in the first four columns of Table II.6, the dependent variable is the proportion of working poor living with less than 1.90\$ while in the last column the share of non-working poor is used as dependent variable. In the first two columns, we replicate the baseline regressions controlling for the interaction between financial access and growth volatility. The results reported in Table 4 shows that the effect of financial access on working poverty remains robust. The number of bank branches per 100,000 people exerts a negative effect on the prevalence of working poor and this effect is reinforced in case of growth volatility. The magnitude of the impact is higher compared to the baseline model suggesting that the effectiveness of financial access in reducing working poverty is higher as one goes away from the poverty trap.

In columns (3), (4) & (5) we test the effectiveness of some transmission channels based on the literature review. First, financial development may have an impact indirectly through growth by improving the level of income of all the population. Secondly, providing a better access of financial services to the excluded non-poor like micro and small entrepreneurs can have a strongly favorable indirect effect on growth and overall reducing the prevalence of working poor (Beck, Demirguc-Kunt, et al. 2007). To test the first hypothesis, we run regressions on the prevalence of working poor (less than US\$ 1.90) without the level of GDP per capita in column (3) and without growth volatility in column 4. For the second hypothesis, we test whether a better access to financial services may increase the share of the non-poor workers, measured by the proportion of workers living with more than 13\$ per day by person based on the category proposed by the ILO dataset following (Kapsos & Bourmpoula 2013).

Our results summarized in Table II.4 show that the amplitude of the coefficients of financial access increases when we drop the level of GDP per capita indicating that it is a potential transmission channel. We also find that financial access increases the proportion of the non-working poor living with more than 13\$ per day. This result brings a strong support to the trickle-down hypothesis

according to which by building a new class of non-poor, improving financial access for all provides more opportunities to poor workers through an increase of labor demand.

Table II.4. Test of transmission channel and robustness check for different poverty line

	(1)	(2)	(3)	(4)	(5)
			w/o GDP per capita	w/o GDP volatility	Model 1
	Working poor(<\$1.90)	Working poor(<\$1.90)	Working poor(<\$1.90)	Working poor(<\$1.90)	Non-working poor (>13\$)
Log(Bank branches)	-5.157***	-5.569***	-11.415***	-3.110***	8.809***
	(1.304)	(1.558)	(0.564)	(0.858)	(1.725)
GDP volatility	0.464***	2.630***	0.483***		0.039
	(0.030)	(0.829)	(0.067)		(0.108)
Volatility x Bank branches		-1.023**			
		(0.340)			
Log(GDP per capita)	-12.747***	-5.465*		-17.539***	21.863***
	(2.499)	(2.872)		(1.510)	(3.393)
Trade openness	1.898***	3.277***	4.580***	2.356**	-3.661
	(0.608)	(0.888)	(0.729)	(0.942)	(2.490)
FDI-to-GDP	0.025	0.046	0.047*	0.011	0.212***
	(0.040)	(0.040)	(0.028)	(0.047)	(0.052)
GINI index	0.075	0.076	-0.007	0.074	-0.172*
	(0.089)	(0.085)	(0.129)	(0.087)	(0.091)
Private credit bureau	0.024***	0.025***	0.038***	0.022***	0.024***
	(0.005)	(0.006)	(0.004)	(0.005)	(0.006)
Public credit registry	0.028***	0.028***	0.045***	0.025***	0.026***
	(0.006)	(0.005)	(0.008)	(0.005)	(0.006)
Private credit bureau x Volatility		-0.010***			
		(0.003)			
Public credit registry x Volatility		0.015***			
		(0.002)			
Observations	294	294	294	294	297
No of countries	63	63	63	63	63
R-squared	0.387	0.247	0.083	0.377	0.168
Hansen p-value	0.217	0.340	0.228	0.217	0.204
F-stat for weak ident.	94.081	37.145	251.646	102.937	86.904
Anderson-Rubin F-stat	107.964	239.012	456.754	78.698	31.604

Notes: Robust standard errors in parentheses. Other covariates in the first-stage regression are omitted for the presentational convenience, more details are available in Appendix. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The second set of robustness tests consist in adding new control variables to our baseline model and see how sensitive the estimates are.

Table II.5. Robustness check, additional control variables

	(1) Working poverty	(2) Working poverty	(3) Working poverty
Panel (a) : 2SLS estimates			
Log(Bank branches)	-0.180** (0.090)	-0.228* (0.119)	-0.179* (0.096)
GDP volatility	0.183*** (0.064)	0.162* (0.087)	0.129 (0.075)
Volatility x Bank branches	-0.074*** (0.025)	-0.063* (0.034)	-0.048 (0.030)
Log(GDP per capita)	-0.372*** (0.101)	-0.229* (0.122)	-0.144 (0.081)
Trade openness	0.281*** (0.074)	0.308*** (0.085)	0.205** (0.089)
FDI-to-GDP	0.003 (0.002)	-0.001 (0.002)	0.002 (0.002)
GINI index	0.036*** (0.003)	0.036*** (0.004)	0.038*** (0.003)
Ilo dummy	-0.096*** (0.028)		
L3.Remittances to GDP		-0.020*** (0.005)	
L.Mobile phone subscription (log)			-0.064** (0.026)
Panel (b) First stage results			
Private credit bureau	0.026*** (0.005)	0.025*** (0.005)	0.019** (0.006)
Public credit registry	0.028*** (0.005)	0.030*** (0.005)	0.018*** (0.005)
Dependent variable : Volatility x Bank branches			
Private credit bureau x Volatility	-0.011*** (0.002)	-0.015*** (0.003)	-0.018*** (0.002)
Public credit registry x Volatility	0.016*** (0.001)	0.015*** (0.001)	0.014*** (0.001)
Observations	294	275	293
No of countries	63	58	63
R-squared	0.375	0.408	0.436
Hansen p-value	0.761	0.651	0.646
F-stat for weak ident.	93.548	94.315	19.905
Anderson-Rubin F-stat	46.086	78.395	74.406

Notes: Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

First, following Combes et al (2014), we include in the model a dummy capturing whether the observations of the working poverty are directly drawn from household surveys or computed by the ILO. Controlling for this dummy helps to rule out any persistent measurement error in the

dependent variable³⁸. Likewise, we control for remittance inflows and mobile phone subscription. Controlling for remittances is consistent with the literature which emphasize its role on poverty reduction and labor supply (Amuedo-Dorantes & Pozo 2012; Combes et al. 2014). In addition, controlling for remittances typically ensure that the effect captured in the model is clearly a financial infrastructure type effect and not a financial flow effect. In the same line, adding mobile phone subscription as a control variable helps taking into account the recent mobile revolution that has stimulated financial access in developing countries through phone-based money transfers (Aker & Mbiti 2010; Asongu 2013). Table II.5 reports the results of these various robustness tests and shows that the effect of financial access on working poverty remains robust irrespective to the control variable added in the model.

In Table II.6 below, for the first two columns, we use alternative measures for our instruments namely the number of private credit bureaus and public credit registries as percentage of the population separately. These indicators are available in the World Development Indicators of the World Bank. Once again, our results remained unchanged with working poverty negatively associated to the number of bank branches while this effect tends to attenuate the impact of growth volatility on the poor workers. In column (3), we introduce two measures of financial development which are private credit ratio to GDP and bank concentration³⁹ in order to ensure that our measure of bank penetration does not capture other dimensions of financial development like (Beck et al. 2014). Given their potential endogeneity, we introduce their lags of two periods. These data are available on the Global Financial Development Database of the World Bank. We find that bank concentration tends to increase working poverty while the ratio of private credit despite its negative sign is not significant.

In Column (4), from the same database, we introduce the value of collateral needed by a formal financial institution for a loan or a line of credit as a percentage of the loan value. This is to control for the barrier to use financial services in addition to their physical access. We find that the value of collateral is positively correlated to working poverty. This is logical as a high level of collateral prevents the poor to benefit from access to financial services. Nonetheless, we only have 42 observations compared to 294 observations when we use demographic branch penetration. This

³⁸ We also perform a parametric test of the presence of attrition bias in the data and the test suggests that there is no attrition bias in the sample.

³⁹ It is measured by the assets of the three largest commercial banks as a share of total commercial banking assets.

emphasizes the scarcity of data on the constraints to use financial services. We also use alternative measures for these barriers⁴⁰ which are the number of locations to open a deposit account, the number of documents needed to open a saving and a deposit account, the minimum amount to open and to be maintained in these accounts as well as , the annual fees associated as percentage of GDP per capita.

Table II.6: Controlling for alternative measures of financial development and barriers to use financial services

	(1)	(2)	(3)	(4)
	Working poverty	Working poverty	Working poverty	Working poverty
Log(Bank branches)	-0.267*** (0.082)	-0.139 (0.098)	-0.520*** (0.120)	-0.432*** (0.055)
GDP volatility	0.020*** (0.006)	0.099** (0.043)	0.216* (0.113)	-0.055** (0.016)
Volatility x Bank branches		-0.035* (0.018)	-0.089* (0.043)	0.023*** (0.004)
Log(GDP per capita)	-0.540*** (0.059)	-0.429*** (0.115)	0.315 (0.193)	-0.555* (0.254)
Trade openness	0.165 (0.094)	0.149* (0.071)	0.465*** (0.131)	0.361** (0.119)
FDI-to-GDP	0.000 (0.001)	0.001 (0.001)	0.001 (0.002)	0.009 (0.011)
GINI index	0.051*** (0.004)	0.058*** (0.006)	0.020*** (0.005)	0.075*** (0.006)
L2.Private credit ratio to GDP(log)			-0.047 (0.033)	
L2.log(Bank concentration)			0.342*** (0.095)	
log (Value of collateral(%loan amount))				0.249*** (0.053)
Observations	253	253	270	42
No of countries	54.000	54.000	54.000	20.000
R-squared	0.452	0.453	0.089	0.537
Hansen p-value	0.404	;0.467	0.6204	0.1981
F-stat for weak ident.	32.917	26.469	66.177	3.985
Anderson-Rubin F-stat	17.124	21.772	49.507	186.308

Notes: Robust standard errors in parentheses. Country fixed effects are included in all specifications. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Instruments for the first two columns are private credit and public registry coverage while in the other column we use the number of years of existence for these two institutions.

⁴⁰ All the amounts used are in percentage of the GDP per capita.

These data are retrieved from (Beck et al. 2008) and are available only for the year 2004-2005 which considerably reduces our sample to 24 observations. So, we are not inferring for causality but for simple correlations. The number of location to open a deposit account is based on the fact that even if there is a wide network of bank offices, they offer different services. This indicator takes a value of 1 to 3 depending on whether an account can be opened at headquarters only (1), at headquarters or a branch (2), or at headquarters, branches, or non-branch offices (3). The number of documents to open an account is an indicator of eligibility based on the fact that besides identification card, banks in some countries can require other documents including wage slips, recommendation letters... The other indicators about the amount needed to open and to be maintained in a saving and a checking account as well as annual fees measure the affordability of these services. More details are given in the article by Beck et al. (2008). The results when we introduce barriers to use banking services are presented in Appendices (II-7) and (II-8) for OLS estimates and in Appendices (II-10) and (II-11) for instrumental variables estimates. We use the same instruments as for bank branches. Our findings confirm the fact that barriers to use banking services are positively correlated to working poverty. Especially for checking account, the number of documents to open an account is significant in all specifications. It is the same case for saving, with in addition, the level of annual fees, and the amount to be maintained in the account which are also significant in the OLS and instrumental variables estimates.

5. Conclusion

According to the proponents of the trickle-down economics a rising tide lifts all boats. In other words, economic growth will ultimately benefit the poor through more jobs and higher incomes. However, despite decades of economic growth in the developing world, in 2013 about 375 million workers lived with less than US\$ 1.25 a day (ILO, 2014). This paper complements the existing literature by investigating the effect of financial access on the prevalence of working poor in developing countries.

Using a sample of 63 developing countries over the period 2004-2013, this paper shows that improving financial access (as measured by the number of bank branches per 100,000 adults) reduces the prevalence of working poor (workers living with less than US\$ 1.25 a day). This effect is robust to endogeneity bias, measurement error in the dependent variable and the addition of various controls including a measure of macroeconomic instability, remittances and mobile phone subscriptions. In addition, the impact of financial access still holds when the poverty line is shifted from US\$ 1.25 to US\$ 1.90. In the same line, the study shows that improving financial access for the excluded non-poor can have a strong reducing-effect on working poverty. We also document that barriers to use banking services can increase working poverty.

Overall, the paper points to an increase of the access to financial services for both the poor and the excluded non-poor to financial services in developing countries. In developing countries, this is a pressing priority, governments as well as financial institutions need to work together by improving banking sector outreach and limiting the barriers to use banking services.

6. References

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7. Appendices

Appendix II-1. List of countries

Albania; Argentina; Armenia; Azerbaijan; Bangladesh; Belarus; Bolivia; Brazil; Bhutan; Central African Republic; Chile; Colombia; Costa Rica; Dominican Republic; Ecuador; Egypt, Arab Rep.; Georgia; Guatemala; Honduras; Indonesia; India; Iran, Islamic Rep.; Jordan; Kazakhstan; Kyrgyz Republic; Cambodia; Sri Lanka; Moldova; Madagascar; Maldives; Mexico; Macedonia, FYR; Mali; Montenegro; Mongolia; Malawi; Malaysia; Namibia; Niger; Nigeria; Nicaragua; Pakistan; Panama; Peru; Philippines; Paraguay; Russian Federation; Rwanda; Senegal; El Salvador; Serbia; Togo; Thailand; Tajikistan; Tunisia; Turkey; Uganda; Ukraine; Uruguay; Venezuela, RB; Vietnam; South Africa; Zambia.

Appendix II-2. First stage regression table results for instrumental variable estimates of the effects of financial access on working poverty

	(1) Log(Bank branches)	(2) Log(Bank branches)	(3) Log(Bank branches)	(4) Volatility x Bank branches	(5) Log(Bank branches)	(6) Bank branches x SSA-region	(7) Log(Bank branches)	(8) Bank branches x LAC-region	(9) Log(Bank branches)	(10) Bank branches x Asia
GDP volatility		-0.020** (0.007)	0.002 (0.008)	2.049*** (0.088)	-0.020** (0.007)	-0.005*** (0.001)	-0.020** (0.007)	-0.008* (0.004)	-0.020** (0.007)	-0.005** (0.002)
Log(GDP per capita)	0.860*** (0.054)	0.720*** (0.068)	0.802*** (0.121)	4.578*** (0.419)	0.717*** (0.082)	-0.039* (0.020)	0.760*** (0.066)	0.523*** (0.077)	0.763*** (0.062)	0.212*** (0.023)
Trade openness	0.488** (0.193)	0.554*** (0.157)	0.532*** (0.146)	1.529** (0.489)	0.498** (0.174)	0.022* (0.011)	0.561*** (0.162)	0.482*** (0.105)	0.558*** (0.162)	0.078** (0.026)
FDI-to-GDP	0.005 (0.003)	0.004* (0.002)	0.003 (0.003)	0.015 (0.013)	0.003 (0.002)	0.002* (0.001)	0.004* (0.002)	0.001 (0.002)	0.004* (0.002)	-0.003** (0.001)
GINI index	-0.015** (0.005)	-0.016*** (0.005)	-0.024*** (0.007)	-0.005 (0.018)	-0.018** (0.006)	0.016*** (0.002)	-0.015*** (0.004)	-0.033*** (0.004)	-0.016*** (0.005)	0.009*** (0.002)
Private credit bureau	0.022*** (0.005)	0.024*** (0.006)	0.025*** (0.005)	0.020 (0.042)	0.017*** (0.004)	-0.003* (0.001)	0.018*** (0.006)	-0.032*** (0.005)	0.029*** (0.008)	-0.010*** (0.001)
Public credit registry	0.025*** (0.006)	0.028*** (0.006)	0.028*** (0.005)	0.081*** (0.022)	0.030*** (0.006)	0.018*** (0.003)	0.025*** (0.007)	0.014* (0.006)	0.025*** (0.007)	0.010*** (0.001)
Private credit bureau x Volatility			-0.004*** (0.001)	-0.010*** (0.002)						
Public credit registry x Volatility			0.001 (0.001)	0.015*** (0.001)						
Private credit bureau x SSA					0.092*** (0.023)	0.158*** (0.016)				
Private credit bureau x LAC							0.012** (0.005)	0.068*** (0.004)		
Private credit bureau x Asia									-0.016** (0.006)	0.055*** (0.004)
Observations	294	294	294	294	294	294	294	294	294	294
No of countries	63.000	63.000	63.000	63.000	63.000	63.000	63.000	63.000	63.000	63.000
R-squared	0.266	0.273	0.290	0.847	0.285	0.409	0.274	0.279	0.274	0.493

Note: Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix II-3. First stage regression table results for robustness check, additional control variables

	(1)	(2)	(3)	(4)	(5)	(6)
	Log(Bank branches)	Volatility x Bank branches	Log(Bank branches)	Volatility x Bank branches	Log(Bank branches)	Volatility x Bank branches
GDP volatility	0.002 (0.008)	2.046*** (0.085)	0.009 (0.012)	2.137*** (0.065)	0.019 (0.013)	2.174*** (0.078)
Log(GDP per capita)	0.793*** (0.109)	4.487*** (0.371)	0.725*** (0.107)	4.067*** (0.529)	0.040 (0.160)	-1.001 (0.609)
Trade openness	0.532*** (0.142)	1.528** (0.491)	0.617*** (0.163)	2.343*** (0.484)	0.594*** (0.139)	1.985*** (0.364)
FDI-to-GDP	0.003 (0.002)	0.016 (0.012)	-0.001 (0.004)	-0.008 (0.010)	0.001 (0.004)	-0.000 (0.020)
GINI index	-0.025*** (0.006)	-0.010 (0.016)	-0.028*** (0.007)	0.017 (0.013)	-0.028*** (0.008)	-0.037* (0.020)
Ilo dummy	-0.038 (0.026)	-0.392*** (0.062)				
L3.Remittances to GDP			0.005* (0.002)	0.050*** (0.010)		
L.Mobile phone subscription (log)					0.158*** (0.015)	1.177*** (0.100)
Private credit bureau	0.026*** (0.005)	0.033 (0.040)	0.025*** (0.005)	0.038 (0.032)	0.019** (0.006)	-0.022 (0.044)
Public credit registry	0.028*** (0.005)	0.078*** (0.020)	0.030*** (0.005)	0.100*** (0.022)	0.018*** (0.005)	-0.001 (0.023)
Private credit bureau x Volatility	-0.004*** (0.001)	-0.011*** (0.002)	-0.005*** (0.001)	-0.015*** (0.003)	-0.005*** (0.001)	-0.018*** (0.002)
Public credit registry x Volatility	0.001 (0.001)	0.016*** (0.001)	0.001 (0.001)	0.015*** (0.001)	0.001 (0.001)	0.014*** (0.001)
Observations	294	294	275	275	293	293
No of countries	63.000	63.000	58.000	58.000	63.000	63.000
R-squared	0.291	0.848	0.296	0.849	0.331	0.874

Note: Robust standard errors in parentheses.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix II-4. First stage regression tables for test of transmission channel and robustness check for different poverty line

	(1)	(2)	(3)	(4)	(5)	(6)
	Log(Bank branches)	Log(Bank branches)	Volatility x Bank branches	Log(Bank branches)	Log(Bank branches)	Log(Bank branches)
GDP volatility	-0.020** (0.007)	0.002 (0.010)	2.049*** (0.100)	-0.033*** (0.004)		-0.020** (0.007)
Log(GDP per capita)	0.720*** (0.065)	0.802*** (0.138)	4.578*** (0.519)		0.860*** (0.048)	0.745*** (0.066)
Trade openness	0.554*** (0.150)	0.532** (0.187)	1.529** (0.653)	0.629*** (0.137)	0.488** (0.174)	0.526*** (0.154)
FDI-to-GDP	0.004* (0.002)	0.003 (0.003)	0.015 (0.018)	0.005*** (0.001)	0.005* (0.002)	0.007*** (0.001)
GINI index	-0.016*** (0.005)	-0.024*** (0.007)	-0.005 (0.023)	-0.017*** (0.005)	-0.015*** (0.004)	-0.016*** (0.005)
Private credit bureau	0.024*** (0.005)	0.025*** (0.006)	0.020 (0.046)	0.038*** (0.004)	0.022*** (0.005)	0.024*** (0.006)
Public credit registry	0.028*** (0.006)	0.028*** (0.005)	0.081** (0.029)	0.045*** (0.008)	0.025*** (0.005)	0.026*** (0.006)
Private credit bureau x Volatility		-0.004*** (0.001)	-0.010*** (0.003)			
Public credit registry x Volatility		0.001 (0.001)	0.015*** (0.002)			
Observations	294	294	294	294	294	297
No of countries	63.000	63.000	63.000	63.000	63.000	63.000
R-squared	0.273	0.290	0.847	0.253	0.266	0.276

Note: Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix II-5. Testing for attrition bias in the sample

	(1)	(2)
Dependent variable : working poverty	OLS-FE	IV-FE
Log(Bank branches)	-0.214*** (0.052)	-0.356* (0.177)
Selection indicator (lagged value)	-0.017 (0.135)	-0.036 (0.025)
Selection indicator (forward value)	-0.074 (0.100)	-0.068 (0.063)
Observations	314	290
Number of groups	87	63
Joint significance test of selection variables, P-value	0.6580	0.1299

Notes: Robust standard errors in parentheses. The models estimated in columns 1 and 2 include the full set of control variables. In column 2, the number of bank branches per 100,000 adults is instrumented by the existence of private credit bureau and / or public credit registry. ***p < 0.01, **p < 0.05, *p < 0.1.

The procedure (Semykina & Wooldridge 2010; Verbeek & Nijman 1992) consists in adding time-varying functions of selection indicators as explanatory variables, and obtaining simple t or joint Wald tests. If we call $S_{i,t}$ the indicator of selection which takes 1 when the dependent variable is observed at each year t and 0 otherwise, we can add $S_{i,t-1}$, and $S_{i,t+1}$ in the model for the working poor and test their joint significance. Under the null hypothesis of no attrition bias, the coefficients of these variables (ρ_1 and ρ_2) should not be statistically different from zero. More formally, the equation to be estimated is:

$$wp_{i,t} = \rho_1 S_{i,t-1} + \rho_2 S_{i,t+1} + \beta_1 fin_{i,t} + X'_{i,t} \delta + \alpha_i + \varepsilon_{i,t}$$

Regardless of the specifications, the coefficients associated with the lagged and forward “selection” dummy variables are not individually and jointly significant.

Appendix II-6. First stage regression results for controlling for alternative measures of financial development and barriers to use financial services

Corresponding column in Table	1	2		3		4		
	(1) Log(Bank branches)	(2) Log(Bank branches)	(3) Volatility x Bank branches	(4) Log(Bank branches)	(5) Volatility x Bank branches	(6) Log(Bank branches)	(7) Volatility x Bank branches	(8) Collateral
GDP volatility	0.001 (0.007)	0.017 (0.010)	1.986*** (0.043)	0.007 (0.016)	2.132*** (0.103)	0.084*** (0.019)	2.526*** (0.059)	0.117*** (0.009)
Log(GDP per capita)	1.472*** (0.175)	1.558*** (0.130)	7.155*** (0.521)	0.855*** (0.201)	3.558*** (0.477)	1.740*** (0.159)	9.441*** (0.474)	0.137 (0.266)
Trade openness	0.477* (0.239)	0.489** (0.203)	1.173 (0.691)	0.558** (0.207)	1.446* (0.779)	1.256*** (0.331)	4.762*** (0.949)	-0.299 (0.214)
FDI-to-GDP	0.007* (0.003)	0.007** (0.003)	0.042*** (0.010)	0.003 (0.002)	0.019 (0.013)	-0.005 (0.011)	-0.041 (0.036)	- (0.005)
GINI index	-0.023*** (0.004)	-0.019*** (0.004)	0.079*** (0.021)	-0.043*** (0.007)	-0.035 (0.020)	-0.006 (0.012)	-0.037 (0.077)	0.055*** (0.013)
Credit bureau coverage	0.005*** (0.001)	0.009*** (0.001)	-0.004 (0.005)					
Credit registry coverage	-0.014** (0.005)	-0.020*** (0.006)	-0.069*** (0.008)					
Credit bureau coverage x Volatility		-0.001*** (0.000)	0.005*** (0.001)					
Credit registry coverage x Volatility		0.002* (0.001)	0.007** (0.003)					
L2.Private credit ratio to GDP(log)				0.040* (0.020)	0.813*** (0.103)			
L2.log (Bank concentration (%))				0.240*** (0.058)	0.162 (0.399)			
Private credit bureau				0.015** (0.006)	-0.013 (0.037)	0.143*** (0.010)	0.170** (0.059)	0.059*** (0.013)
Public credit registry				0.023*** (0.005)	0.055* (0.028)	-0.015 (0.021)	0.278 (0.150)	0.055*** (0.014)
Private credit bureau x Volatility				-0.004** (0.001)	-0.007** (0.002)	0.025*** (0.005)	-0.013 (0.030)	0.003 (0.007)
Public credit registry x Volatility				0.001 (0.001)	0.012*** (0.002)	-0.029*** (0.002)	-0.039** (0.012)	-0.007* (0.004)
Observations	253	253	253	270	270	42	42	42
No of countries	54.000	54.000	54.000	54.000	54.000	20.000	20.000	20.000
R-squared	0.323	0.333	0.848	0.299	0.857	0.683	0.845	0.418

Robust standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix II-7. OLS estimates for the effect of barriers to use checking/deposit account on working poverty

	(1)	(2)	(3)	(4)	(5)
	Working poverty	Working poverty	Working poverty	Working poverty	Working poverty
Log(GDP per capita)	0.008 (0.113)	-0.029 (0.114)	-0.027 (0.100)	-0.029 (0.112)	-0.013 (0.094)
GDP volatility	-0.154 (0.150)	-0.095 (0.140)	-0.114 (0.133)	-0.124 (0.126)	-0.118 (0.124)
Trade openness	0.206 (0.966)	-0.501 (0.872)	-0.304 (0.832)	-0.123 (0.775)	-0.275 (0.721)
FDI-to-GDP	-0.087 (0.112)	-0.095 (0.107)	-0.110 (0.110)	-0.030 (0.117)	-0.105 (0.101)
GINI index	0.064 (0.048)	0.050 (0.053)	0.063 (0.052)	0.040 (0.050)	0.046 (0.043)
Locations for deposit account	-0.988 (0.710)				
Minimum to open checking account		0.009 (0.011)			
Minimum to be in checking account			0.095 (0.079)		
Documents to open checking account				0.556* (0.287)	
Annual fees for checking account					0.112*** (0.037)
Constant	1.340 (5.274)	2.774 (5.844)	1.472 (5.590)	0.104 (5.371)	1.793 (4.883)
Observations	24	24	24	24	24
R-squared	0.251	0.221	0.224	0.286	0.384

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix II-8. OLS estimates for the effect of barriers to use saving account on working poverty

	(1)	(2)	(3)	(4)
	Working poverty	Working poverty	Working poverty	Working poverty
Log(GDP per capita)	-0.021 (0.109)	-0.018 (0.105)	-0.039 (0.108)	0.015 (0.096)
GDP volatility	-0.090 (0.139)	-0.076 (0.131)	-0.119 (0.113)	-0.183 (0.146)
Trade openness	-0.559 (0.846)	-0.530 (0.731)	-0.487 (0.704)	-0.385 (0.708)
FDI-to-GDP	-0.134 (0.108)	-0.152 (0.107)	0.033 (0.121)	-0.095 (0.110)
GINI index	0.051 (0.053)	0.058 (0.054)	0.014 (0.046)	0.022 (0.044)
Minimum to open saving account	0.019 (0.016)			
Minimum to be in saving account		0.076*** (0.024)		
Documents to open saving account			0.683*** (0.229)	
Annual fees for saving account				0.429*** (0.140)
Constant	2.913 (5.732)	2.304 (5.428)	2.541 (4.979)	3.276 (4.585)
Observations	24	24	24	24
R-Squared	0.242	0.355	0.363	0.355

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix II-9. Instrumental variables estimates for the effect of barriers to use checking / deposit account on working poverty

	(1) Working poverty	(2) Working poverty	(3) Working poverty	(4) Working poverty	(5) Working poverty
GDP volatility	-0.344 (0.249)	-0.076 (0.147)	-0.170 (0.141)	-0.189 (0.208)	-0.148 (0.140)
Log(GDP per capita)	0.013 (0.174)	-0.158 (0.165)	-0.172 (0.139)	-0.127 (0.143)	-0.046 (0.087)
Trade openness	2.027 (1.620)	-1.193 (1.087)	-0.292 (0.947)	0.394 (1.191)	-0.219 (0.991)
FDI-to-GDP	-0.023 (0.178)	-0.062 (0.087)	-0.135 (0.197)	0.178 (0.207)	-0.106 (0.139)
GINI index	0.085 (0.057)	0.022 (0.059)	0.081 (0.067)	-0.012 (0.058)	0.026 (0.059)
Private credit bureau					
Public credit registry					
Locations for deposit account	-4.494* (2.140)				
Minimum to open checking account		0.040** (0.015)			
Minimum to be in checking account			0.512* (0.276)		
Documents to open checking account				2.115** (0.782)	
Annual fees for checking account					0.304 (0.185)
Constant	1.062 (6.408)	7.618 (7.536)	1.703 (6.788)	-3.582 (7.826)	2.433 (6.541)
Observations	24	24	24	24	24
F-stat for weak ident.	0.358	0.318	2.815	0.521	0.463
Hansen p-value	0.802	0.636	0.479	0.788	0.476

Appendix II-10. Instrumental variables estimates for the effect of barriers to use saving account on working poverty

	(1) Working poverty	(2) Working poverty	(3) Working poverty	(4) Working poverty
GDP volatility	-0.048 (0.150)	-0.028 (0.152)	-0.141 (0.133)	-0.342 (0.197)
Log(GDP per capita)	-0.127 (0.185)	-0.064 (0.123)	-0.094 (0.126)	0.031 (0.095)
Trade openness	-1.525 (1.197)	-0.958 (1.109)	-0.707 (0.786)	-0.535 (0.989)
FDI-to-GDP	-0.245 (0.182)	-0.243 (0.181)	0.202 (0.157)	-0.075 (0.145)
GINI index	0.024 (0.068)	0.058 (0.072)	-0.040 (0.047)	-0.048 (0.082)
Minimum to open saving account	0.091 (0.058)			
Minimum to be in saving account		0.222* (0.126)		
Documents to open saving account			1.519*** (0.379)	
Annual fees for saving account				1.259* (0.651)
Constant	8.640 (8.179)	3.998 (7.309)	3.916 (5.620)	6.869 (7.311)
Observations	24	24	24	24
F-stat for weak ident.	1.151	0.677	4.085	0.507
Hansen p-value	0.097	0.289	0.763	0.683

Robust standard errors in parentheses, in these specifications, the instruments are the number of years of existence for public credit registry and private credit bureaus.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix II-11. First stage regression tables for the effect of barriers to use checking / deposit account on working poverty

	(1) Locations for deposit account	(2) Minimum to open checking account	(3) Minimum to be in checking account	(4) Documents to open checking account
GDP volatility	-0.064 (0.048)	-0.318 (1.678)	0.236 (0.160)	0.062 (0.098)
Log(GDP per capita)	0.004 (0.032)	3.838 (3.641)	0.254 (0.230)	0.051 (0.051)
Trade openness	0.644** (0.253)	16.699 (24.643)	-1.932 (1.745)	-0.649 (0.652)
FDI-to-GDP	0.014 (0.043)	-0.946 (2.366)	0.084 (0.369)	-0.127 (0.098)
GINI index	0.005 (0.014)	0.874 (1.133)	-0.068 (0.118)	0.032 (0.034)
Private credit bureau	0.006 (0.009)	-0.231 (0.366)	-0.079* (0.039)	-0.014 (0.018)
Public credit registry	0.001 (0.005)	-0.102 (0.277)	-0.046 (0.031)	-0.006 (0.011)
Constant	-0.592 (1.253)	-127.009 (160.052)	9.811 (11.284)	3.917 (3.164)
Observations	24	24	24	24

Robust standard errors in parentheses, in these specifications, the instruments are the number of years of existence for public credit registry and private credit bureaus.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix II-12. First stage regression tables for the effect of barriers to use saving account on working poverty

	(1) Minimum to open saving account	(2) Minimum to be in saving account	(3) Documents to open saving account	(4) Annual fees for saving account
GDP volatility	-0.459 (1.210)	-0.145 (0.791)	0.076 (0.084)	0.234 (0.209)
Log(GDP per capita)	0.895 (1.796)	0.090 (0.514)	0.036 (0.049)	-0.050 (0.089)
Trade openness	6.733 (15.038)	-1.081 (7.542)	-0.524 (0.581)	-0.531 (1.136)
FDI-to-GDP	1.435 (1.677)	0.653 (0.763)	-0.184* (0.087)	-0.010 (0.113)
GINI index	0.135 (0.665)	-0.066 (0.347)	0.062* (0.034)	0.079 (0.081)
Private credit bureau	-0.188 (0.289)	-0.156 (0.167)	-0.036** (0.016)	-0.031 (0.033)
Public credit registry	-0.298 (0.204)	-0.113 (0.151)	-0.014 (0.009)	-0.014 (0.019)
Constant	-30.797 (92.020)	11.701 (45.072)	2.181 (3.077)	-0.709 (7.303)
Observations	24	24	24	24

Robust standard errors in parentheses, in these specifications, the instruments are the number of years of existence for public credit registry and private credit bureaus.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

**Chapter III. Are Financial Development and
Remittances Substitutes or Complements in their
Impact on the Informal Sector?**

1. Introduction⁴¹

In developing and transition economies, the informal sector⁴² represents a large component of the economy accounting for more than 40% of GDP on average in 2013 (Hassan & Schneider 2016). It is also the first source of employment in those countries and participates on a half to three quarters (3/4) of non-agricultural job creation (ILO 2011). Nonetheless, it is considered as a major obstacle for governments by undermining established institutions as well as revenue collection to finance public goods (Berdiev & Saunoris 2016; Schneider & Enste 2000). Consequently, the causes and effects of the shadow economy has been extensively studied in the literature (Beck et al. 2014; Dabla-Norris et al. 2008; Ihrig & Moe 2004; Maloney 2004; Porta & Shleifer 2014; Rauch 1991; Schneider 2005; Schneider & Enste 2000). According to these studies, the main determinants of informality are burdensome regulations and taxes and low institutional quality. Similarly, the fact that financial institutions can influence the spread of the underground economy has been the topic of recent studies (Beck et al. 2014; Berdiev & Saunoris 2016; Blackburn et al. 2012; Straub 2005).

In fact, the development of financial services increases the opportunity cost of informality by allowing firms to benefit from abundant and cheaper capital, as well as lower financial costs since former hidden incomes can be used as collateral. Hence, firms and entrepreneurs face a trade-off between lower capital costs in the formal sector and lower tax obligation and labor costs in the underground sector. In general, empirical studies conclude that financial development limits the spread of the shadow economy (Beck et al. 2014; Berdiev & Saunoris 2016; Bittencourt et al. 2014; Bose et al. 2012; Dabla-Norris et al. 2008).

The prevalence of the shadow economy can also have an impact on financial development. Especially, as demonstrated by Gobbi & Zizza (2007), a large share of the informal sector harms financial development as it limits the demand for formal financial services, and it leads to higher

⁴¹ This chapter has been written with Méline YOFFO during her studies as PhD Student at the University Clermont Auvergne, (CERDI).

⁴² According to Schneider (2005), the shadow economy or the informal sector includes all market-based legal production of goods and services that are deliberately concealed from public authorities for the following reasons: (1) to avoid payment of income, value added or other taxes, (2) to avoid payment of social security contributions, (3) to avoid having to meet certain legal labor market standards, such as minimum wages, maximum working hours, safety standards, etc., and (4) To avoid complying with certain administrative procedures, such as completing statistical questionnaires or other administrative forms.

This definition does not include all illegal actions related to criminal activities (burglary, robbery, drug dealing), the informal household economy which consists of all household services and production, and tax evasion.

monitoring costs and interest rates due to tax evasion. But as underlined by Elgin & Uras (2012), increasing the informal sector size also facilitates financial development through easing the capacity constraint on the financial sector, thereby increasing its efficiency. Thus, it is imperative to take into account this bidirectional relationship in empirical studies.

Moreover, with a limited access to credit and capital in many developing countries, people are increasingly dependent from remittances inflows as a source of external finance. According to the World Bank (2016), remittances are the second largest inflow of capital across the world. They represent about three times the amount of official development aid (ODA) and are higher than foreign direct investment flows, by omitting China. However, little is known about the impact of these inflows on the informal sector as mentioned by Chatterjee & Turnovsky (2016). Studies have generally focused on their impact on the aggregate economy, including growth, inequality and employment (Acosta-González et al. 2014; Giuliano & Ruiz-Arranz 2009). They did not generally distinguish between the formal sector and the informal one.

This paper aims to fill this gap by studying the joint impact of remittances and financial development on the informal sector for a panel of developing countries. From our knowledge, apart from the works of Chatterjee & Turnovsky (2016) and Ivlevs (2016), the literature is very scarce at macroeconomic level. For the former, their results indicate that remittances are likely to reduce the share of the informal sector in GDP if they are temporary, countercyclical and play a role as collateral for debt. In other words, the effect depends on the nature of remittances inflows. More recently, Ivlevs (2016) finds that remittances may contribute to informal employment in migration-sending countries based on a cross country analysis in six transition economies of Eastern Europe and Central Asia.

In addition to analyze this joint effect, we also add to the literature by looking at if remittances and financial development are complements or substitutes in their effect on the shadow economy. In fact, on the one hand, they can be complementary as remittances can provide insurance to households and increase their willingness to participate in the credit market (Aggarwal et al. 2011; Bettin & Zazzaro 2012; Freund & Spatafora 2008). On the other hand, they can be substitutes since remittances are often used to overcome credit constraints in financially underdeveloped economies, limiting the demand for formal financial services (Brown et al. 2013).

Consequently the contribution of this paper is threefold. (i) We provide an empirical evidence on the relationship between financial development, remittances and the shadow economy for a large panel of developing countries. In comparison to the previous studies which are cross country analysis, we factor for heterogeneity across countries and over time. (ii) We rely on an identification strategy to deal with the issue of endogeneity and measurement error in addressing the impact of both remittances and financial development on the shadow economy. For remittances, we use the two instruments proposed by Combes et al. (2014). The first instrument is the log of GDP per capita in migrant destination countries with bilateral migration shares used as weights. The second instrument is the size of oil rents weighted by a bilateral measure of geographical proximity (inverse of bilateral distance) between a remittance receiving country and each country in the world. Concerning financial development indicators, we use their lags of two periods as instruments. More details and justification are discussed below. (iii) We also analyze if remittances unpredictability may influence the spread of the shadow economy given that it can affect consumption and investment decision. In the literature, some authors like Combes & Ebeke (2011) find that remittances increase consumption while for others such as Alcaraz et al. (2012) and Woodruff & Zenteno (2007), they are positively correlated to investment. We argue that these results could be reconciled, given the nature of remittances, if they are predictable or not. In fact, unpredictable remittances are likely to be invested rather than to be consumed based on the permanent income hypothesis. From the demand side, this increase in investment can increase labor demand in the informal sector. From the supply side, households are more likely to increase their labor supply if remittances are unpredictable, raising the informal sector share (see Amuedo-Dorantes & Pozo (2012) for microeconomic evidence, and Combes et al. (2014)) for macroeconomic confirmation of the increase of labor supply related to remittances volatility). These assumptions are based on the fact that the informal sector accounts for more than 50 % of job creation in developing countries. But given the precedent findings of Chatterjee & Turnovsky (2016) who demonstrate that unpredictable or temporary remittances tend to reduce the share of the informal sector by stimulating growth, there are at least two opposing forces in the relationship between the unpredictability of remittances and the prevalence of the informal sector⁴³.

Furthermore, due to the fact that financial development is multidimensional, we follow Elgin & Uras (2013) and Berdiev & Saunoris (2016) and we use three indicators namely money and

⁴³ An increase in investment related to temporary remittances can stimulate growth which has been demonstrated to reduce informality.

quasi money, domestic credit provided by financial corporations to the private sector, and domestic credit from the financial sector including gross credit to various sectors and net credit to the central government. As robustness checks, we employ a principal component analysis and combine the three measures into one indicator. Moreover, the use of a new measure for the shadow economy by Elgin and Oztunali (2012) provides time-series data from 1950 to 2009⁴⁴, which is conducive to studying developmental aspects that unfold over decades. A dynamic approach is better suited as it allows to capture the adjustment of remittances, financial development and the shadow economy transpiring over time.

Using a panel of countries spanning the period 1990 to 2009 and after factoring for the endogeneity of our variables of interest, this article leads to the following results : (i) both remittances inflows and financial development are negatively associated with the informal sector in contrary of remittances unpredictability. (ii) We find evidence of a substitutability between remittances and financial development in their impact on the shadow economy for our sample of developing countries and our results suggest that remittances unpredictability tend to increase the share of the informal sector in the economy.

The structure of the article is as follows: Section 2 presents recent literature review. Section 3 sets out the methodology used to identify the effect of financial development and remittances on the informal sector. Section 4 discusses the results and the sensitivity analysis and we conclude in Section 6.

2. Literature review

2.1. Informality and financial development

The idea that financial institutions influence the choice between operating in the formal sector versus in the informal one has been the topic of recent studies. At theoretical level, notable studies demonstrate that financial development impacts the relative costs and benefits of participating in the informal sector (Straub 2005; Antunes & Cavalcanti 2007; Blackburn et al. 2012). In fact, the development of financial services increases the opportunity cost of informality by allowing firms to benefit from abundant and cheaper capital, as well as lower financial costs since former hidden incomes can be used as collateral. But, this induces that the

⁴⁴ Because of data availability for the financial development and remittances variables, the empirical analysis is based upon panel data over the period 1990–2009.

formal sector exhibits more tax obligation and higher entry costs due to the initial capital which is required. Compared to other specifications, the particularity of the model developed by Blackburn et al (2012) is that they don't focus only on exclusive choice but on how the lack of financial development create incentives to operate underground while continuing to conduct business in the formal sector. Especially, in the case of imperfect credit markets with asymmetric information between borrowers and lenders, enforcement contracts are necessary. Agents looking for a loan have to choose how much of their income to declare by trading off their incentives to offer collateral against their disincentives to comply with tax obligations. The key implication of the analysis is that the marginal net benefit of income disclosure increases with the level of financial development. Based on this assumption, we can derive a negative relationship between financial development and the shadow economy which is confirmed by empirical studies (Dabla-Norris et al. 2008; Bose et al. 2012; Bittencourt et al. 2014; Beck et al. 2014; Berdiev & Saunoris 2016).

The first study by Dabla-Norris et al. (2008) use firm-level survey data to study the impact of financial market development on informality, they find that financial development measured by the ratio of credit to the private sector could be effective in reducing the underground economy in countries with a better rule of law. Moreover, finance constraints tend to induce informality among smaller firms; whereas for larger firms, legal obstacles are more determinant. Beck et al. (2014) also adopt the same approach and demonstrate that firms in countries with better credit information sharing systems and higher branch penetration evade taxes to a lesser degree. This effect is stronger for smaller firms, firms in smaller cities and towns, firms in industries relying more on external financing, and firms in industries and countries with greater growth potential. In other words, financial deepening reduces the prevalence of the shadow economy. Macroeconomic studies which used cross country panel data (Bose et al. 2012; Bittencourt et al. 2014; Berdiev & Saunoris 2016) as well as microeconomic studies like (Capasso & Jappelli 2013) for Italy lead to the same results.

Alternatively, there is also evidence of a reverse causation from the informal sector to financial development (Gobbi & Zizza 2007; Elgin & Uras 2012). For instance, Gobbi & Zizza (2007) demonstrate that the informal sector may affect financial institutions through two channels: (1) from the demand side, being informal can limit the demand for financial services which can influence market structure, (2) from the supply side, a large share of informal sector with more irregular activities has a negative impact on banks by increasing monitoring costs resulting in higher costs and interest rates. Using data from Italy, they find empirical evidence that irregular

employment has a negative impact on bank credit and acts indirectly as a barrier to entry on local financial markets. Thus, this is likely to have negative consequences on the supply of formal banking and financial services.

Elgin & Uras (2012) also develop a theoretical model to study this issue of reverse causality from the underground economy to financial development. The idea is that on the one hand, informal sector harms financial development through increasing financial repression due to tax evasion. On the other hand, increasing the informal sector size also facilitates financial development particularly if the capacity constraints⁴⁵ on the formal financial institutions are binding, the informal sector can compensate for this inadequacy. Hence, the effect of informal sector on financial development will depend on the comparison between gains due to the decline of financial repression and losses due to capacity constraints. The authors find evidence of an inverted-U relationship between financial development and informal sector size. Overall, these studies have made significant contribution in providing evidence of a relationship between the financial sector and the informal economy.

2.2. Informality and remittances

We now turn to the impact of remittances on the informal sector. Studies assessing the link between remittances and informal sector largely carry out two kinds of relationships: the microeconomic impact of remittances and the using of informal channels to remit. Only few of them have inspected the impact of remittances on the size of the informal economy at a macroeconomic level.

Concerning microeconomic studies, academics mostly look at relationships between remittances, business ownership, investment and labor market participation and relate these findings indirectly to the prevalence of the informal sector in the economy. This is based on the assumption that it is the first source of employment in many developing countries and households receiving remittances are likely to invest in this sector, especially in developing countries.

For instance, Amuedo-dorantes & Pozo (2006) find that remittances are positively associated with entrepreneurship and investment using a survey in the Dominican Republic. Woodruff and

⁴⁵ In presence of capacity constraints, the increase in the demand in the formal sector with a lower informal sector can raise marginal costs retarding financial development under the assumption of convex monitoring costs.

Zenteno (2007) examine the effect of capital constraints on investment level of microenterprises of Mexico. They particularly look for this effect in a case of a household receiving remittances inflows. They find that access to remittances can increase the probability of recipient to invest in a small activity and also the level of working capital in an existing firm. Huneycutt (2003) studies the relationship between remittances and microenterprises creation using a large survey data from Salvador. He finds that household receivers of remittances are 42% more likely to create a firm than the others. Those remittances strongly contribute to increase the working capital of enterprises since they benefit from about 190% more capital than other firms. Ivlevs (2016) also explores the effect of receiving remittances on the participation to the labor market. Based on a UNDP/UNICEF survey in six transition countries, he establishes that the likelihood of working informally is higher when an individual is a member of a receiver household compared to a member of a non-migrant household. These findings are similar to those of Posso (2012) who finds that remittances are positively associated with aggregate labor supply. He gives three explanations for these results. First, non-migrating family members increase their labor supply in order to pay for migration related expenses. Second, there is a mimesis effect from neighboring households who increase their labor supply to finance the migration of their family members after being aware of the advantages of remittances. And third, remittances overcome credit constraints resulting in more employment.

At the macroeconomic level, the literature is very scarce. Chatterjee and Turnovsky (2016) asserted that they have been alone to conduct studies in this strands of the literature. In their paper, they develop a theoretical analysis of the effects of remittances on the informal sector over time and across countries. Using a dynamic general equilibrium model with sample averages for 40 developing countries for the period 1999-2007, their results indicate that remittances are likely to reduce the share of the informal sector in GDP if they are temporary, countercyclical and play a role as collateral for debt. In fact, a permanent and exogenous remittance shock leads to the contraction of growth and a reallocation of labor from the formal to the informal sector with the same symptoms of a Dutch disease (real exchange rate appreciation). Especially in the short run, we have growth and consumption expansions which are compensated by the appreciation of the real exchange rate with the increase in the relative price of the informal sector. This leads to the raise of labor demand in this sector with a move of labor from the formal sector, thereby reducing the productivity of private capital in this sector. In transition, the lower overall productivity in the formal sector more than offsets the gains in the informal sector, and GDP contracts. Evidence on this Dutch disease effect of

remittances is widely documented in the literature (Acosta et al. 2009; Amuedo-Dorantes & Pozo 2004; Bourdet & Falck 2006).

This is not the case for temporary and countercyclical remittances which are not associated with the expansion of the informal sector. In fact, in their model, households knowing that the increase in remittances is temporary, use them to reimburse their debt; this raises net savings for the economy, leading to more investment and output expansion. The possibility to use remittances as collateral for debt permits to stimulate general output regardless the nature of remittance shock, so it can be used to limit Dutch disease symptoms of a permanent increase and promote more formalization of activities which is interesting from a policy perspective. This suggests that attention must be paid to the nature of remittances when studying their impact on the informal sector.

In the opposite of the conventional approach which is based on the effect of recorded flows of remittances, Freund and Spatafora (2008) made a difference in their analysis between formal and informal inflows of remittances. They highlighted that most of the remittances inflows are transferred through informal channels, accounting about 35 to 75 % of official flows of remittances in direction to developing countries given the important transaction costs. This situation is more prevalent in receiving regions with underdeveloped financial sector.

These findings with those of Chatterjee and Turnovsky (2016) on the use of remittances as collateral for credit in order to limit the spread of the informal sector, suggest that the effect of remittances is likely to be conditional to the level of financial development in the receiving country. Consequently, in the next section, we analyze whether or not remittances and financial development are substitutes or complements in their effect on the shadow economy.

2.3. Remittances and financial development: Substitutability or complementarity

Many studies have investigated the relationship between financial development and remittances inflows in order to assess if they are complements or substitutes through empirical analysis⁴⁶. The focus has mainly been on the effect of remittances on financial development (Aggarwal et al. 2011; Brown & Carmignani 2015; Brown et al. 2013; Chowdhury 2011; Demirgüç-Kunt et al. 2011; Gupta et al. 2009; Mbaye 2015; Oke et al. 2011) while very few studies investigated

⁴⁶ Our analysis is based on the country of origin for migrants.

the issue of reverse causation indirectly (Freund & Spatafora 2008). One way to study the links between these variables is to look at their joint effect on growth like (Bettin & Zazzaro 2012; Giuliano & Ruiz-Arranz 2009; Nyamongo et al. 2012).

There are several reasons why remittances might complement financial development in receiving countries. First, using data from Mexican municipalities, Demirgüç-Kunt et al. (2011), demonstrate that remittances can result on greater banking breadth (measured by the number of branches and deposit accounts per capita) and depth (measured by the volume of deposits and credit to GDP). They can boost the demand for financial services like savings for households receiving remittances. We can also refer to the “induced financial literacy hypothesis” according to which the receipt of remittances exposes households increasingly to the formal financial sector about which they become better educated, inducing them to make more use of formal bank services for their transfers and other financial transactions (Aggarwal et al. 2011; Gupta et al. 2009). Thus, this will provide information on the income of recipient households and make them more bankable or reliable for receiving a loan for example (Mbaye 2015). Remittances can also increase the volume of resources that banks can potentially mobilize and therefore lend, in addition to remittances costs which are another source of income for banks.

But, as noted by Brown & Carmignani (2015), the relationship between remittances and credit is likely to be nonlinear. They demonstrate that complementarity is verified only at high levels of remittances when individuals who receive remittances might become more financially literate and hence express a stronger demand for banking services and financial intermediation. Inversely at low levels of remittances, we have a substitution effect with individuals not relying on banks to invest or borrow. Moreover, the advocates of the substitutability thesis argue that the impact of remittances on financial development is conditional to the level of development. Especially in financially underdeveloped economies, remittances can permit to overcome credit constraints, limiting the demand for financial services. In the case of Azerbaijan for example, Brown et al. (2013) find a strong negative link between remittances and the probability to open an account which could be due to weak institutional and legal environment or a preference for informal channel. Bettin et al. (2014) who study the effect of financial development and remittances on growth also find that remittances are effective in increasing growth only if banks are efficient. In summary, financial development is more likely to complement remittances when institutions function well otherwise we can have substitutability when they compensate for the lack of good institutions.

In our study, we suppose that this substitutability or complementarity which is observed in the case of growth is likely to be applied to the development of the underground economy.

3. Empirical analysis

3.1. Empirical Model

In this section, we explore the links between the informal sector, remittances and financial development for a panel largely composed of developing countries from 1990 to 2009.⁴⁷ The choice of the sample period is dictated by data availability. Following previous macroeconomic studies on the determinants of the informal sector, the baseline econometric model we want to estimate is:

$$I_{i,t} = \beta_1 R_{i,t} + \beta_2 F_{i,t} + \delta X'_{i,t} + \alpha_i + \gamma_t + \varepsilon_{i,t} \quad (1)$$

where $I_{i,t}$ is the size of the shadow economy in each country i at year t , $R_{i,t}$ remittances inflows and, $F_{i,t}$ the level of financial development. Moreover, $X'_{i,t}$ is the matrix of other control variables, α_i and γ_t , the country and year fixed effects. Finally, $\varepsilon_{i,t}$ denotes the error term.

Following Berdiev & Saunoris (2016), and Basbay et al. (2016), our preferred measure is the share of the informal sector in GDP developed by Elgin and Oztunali (2012). To the best of our knowledge, they provide the longest available time series data, allowing us to capture time-series and cross-sectional variation. The only other alternative is the widely used measure provided by Schneider et al. (2010). They employ the Multiple Indicators Multiple Causes (MIMIC) methodology to predict the size of informality, but the time span is limited to 9 years (from 1999 to 2007)⁴⁸. In a recent paper, these two datasets had been jointly compared by their respective authors and they highlight that their estimates are quite similar. Elgin and Oztunali (2012) introduce a model-based approach to the literature by inferring the size of informality from a two-sector dynamic general equilibrium model. Their model estimates are calibrated to the widely employed estimates in Schneider et al. (2010) and therefore the correlation between the two measures of the shadow economy is about 0.99. In contrary to the earlier literature, they

⁴⁷ For a sample of 62 countries, only 4 countries are in the category of developed countries, we do not introduce a bias and we use all available observations, but as robustness, we also perform estimations using the sample of developing countries only.

⁴⁸ Very recently, Hassan & Schneider (2016) extended this dataset to 2013.

build on microeconomic foundations in their calibration technique, and do not rely on ad-hoc econometric specifications in measuring the size of informality, hence succeed in limiting hazards in measurement error. In our dataset the average size of the shadow economy (% of GDP) is approximately 39%, (see Table III.1 below for descriptive statistics).

In equation (1), $R_{i,t}$ is the remittance variable. In contrary to the other articles cited above which used an aggregate measure including workers' remittances, employee compensation, and migrants' transfer, we only use the category workers' remittances from the IMF's Balances of Payments Statistics (BOPS). This category in the balance of payments comprises current transfers by migrants that are employed residents in their respective host country. Remittances flows therefore refer to regular and unrequited private transfers from residents in one country to another. According to Chami et al. (2008; 2009; 2012)⁴⁹, the inclusion of employee compensation and migrants' transfer lead to misspecification and faulty conclusions in empirical analysis. In fact, these components are not always reported by countries and they include elements which are not conform to the concept of remittances: periodic, unrequited, nonmarket transfers between residents of different countries. So our preferred indicator is workers' remittances relative to GDP.

The variable $F_{i,t}$ captures the level of financial development. Given that it is a multidimensional phenomenon, we used three indicators that are widely used in the literature. These variables are domestic credit provided by financial corporations to the private sector (private credit to GDP), money and quasi money (M2 to GDP), and domestic credit from the financial sector including gross credit to various sectors and net credit to the central government (Domestic credit to GDP). We also used a principal component analysis to derive one indicator of financial development from these three measures.

By $X'_{i,t}$, we refer to the matrix of control variables including the log of GDP per capita, tax revenue to GDP, the percentage of urban population, the share of agriculture value added in GDP, trade openness defined as the log of the sum of exports and imports to GDP (for those variables, see (Bose et al. 2012; D'Hernoncourt & Méon 2012; Elgin 2013)). We also control for corruption ((Dreher & Schneider 2010; Schneider & Enste 2000) and the average of primary and secondary years of education in logarithm as proxy for human capital (Buehn & Farzanegan 2013). We referred to the latter variable as education. All these variables are drawn from the

⁴⁹ More details on the pertinence to use only workers' remittances are given in those articles.

World Development Indicators of the World Bank except for the corruption index which is extracted from International Country Risk Guide (ICRG) provided by the Political Risk Services (PRS), and human capital proxy from the Barro & Lee database.

Apart from GDP per capita, for which we expect a negative effect on the spread of the shadow economy, the inclusion of other control variables leads to ambiguous results in the literature. Especially, a better control of corruption is likely to be positively associated to the informal sector but the results of Dreher & Schneider (2010) suggest that they are complementary in low income countries and substitutable in others. Furthermore, more tax revenue to GDP could highlight a greater tax pressure which can discourage formalization and tax evasion. But, at the same time, higher taxes result in better public goods and services, including a better legal system, which in turn provide an incentive to operate in the formal system. So, the sign of the relationship is therefore undetermined. Concerning human capital, we consider that a better educated person is likely to participate less in the shadow economy only in presence of good institutions (Buehn & Farzanegan 2013). In fact, weak institutions may entail better educated people to use their skills and knowledge in rent-seeking and highly profitable activities of the informal sector. As a consequence, the shadow economy rises despite improvements in education.

In order to assess whether there is a substitution between remittances and financial development in their impact on the informal sector, we run the following regression:

$$I_{i,t} = \beta_1 R_{i,t} + \beta_2 F_{i,t} + \beta_3 R_{i,t} \cdot F_{i,t} + X'_{i,t} \delta + \alpha_i + \gamma_t + \varepsilon_{i,t} \quad (2)$$

We introduce an interactive term between remittances and access to financial services to test if there is a conditional effect. If we consider that β_1 and β_2 have the same sign (negative or positive), we would have a substitutability effect if the interactive term coefficient β_3 has a different sign or a complementarity effect otherwise. Based on our literature review the fact that remittances and financial development are substitutes or complements is an empirical question.

We also pay attention to the nature of remittances by looking at if temporary and volatile remittances have the same impact. To address this issue, we introduce a measure of remittances unpredictability, more details are given in our sensitivity analysis and descriptive statistics are available in Table III.1 below.

Table III.1. Descriptive Statistics

	Obs.	Mean	Std. Dev.	Minimum	Maximum
Informal sector	6307	38.95559	14.68306	9.5841	113.379
Workers remittances to GDP	2842	3.793912	5.675936	.0000347	49.40837
Domestic credit to GDP	6452	43.95051	56.42986	-114.6937	3123.879
M2 to GDP	6279	43.64601	51.52416	1.617155	3049.019
Trade openness (log)	3791	-3.961526	1.535522	-44.19673	-.8645763
Urban population	9878	46.54235	24.68349	2.077	100
Tax revenue to GDP	2392	16.26249	8.666607	.0195571	95.16069
log(GDP per capita)	4133	8.754203	1.178013	5.508054	11.82894
Education	6222	1.390318	.7852824	-3.276386	2.517964
Agriculture, value added (% of GDP)	5683	21.47697	16.38009	0	96.58267
Corruption	3236	2.664104	1.116246	0	6

3.2. Identification strategy and estimation method

We first run our regressions using a standard two way fixed effects estimator. But these results could be biased due to the potential endogeneity from our two variables of interest, so it is difficult to infer for causal effects. First, the relationship between financial development and the informal sector could be driven by reverse causation as we underlined in our literature review (Gobbi & Zizza 2007; Elgin & Uras 2012). For instance, the prevalence of the shadow economy might influence the use of financial services by the population. In particular, as noted by Capasso & Jappelli (2013), an increase in underground activities (e.g. due to an increase in general taxation) reduces the demand for credit, hampering financial market growth. Similarly, low GDP growth might reduce the demand for loans and financial development, while at the same time increasing underground activities. This implies that simply observing that low financial development is associated with a high level of underground activities does not necessarily mean that low financial development actually causes more underground activities.

Concerning remittances, endogeneity could be due to measurement errors as well as reverse causality as only official flows are taken into account in this study, given the difficulty to measure informal inflows. Consequently, a high prevalence of the underground economy could also influence remittances inflows received via formal channel by households.

The strategy adopted in this paper is to build on the existing literature on the determinants of financial development and remittances to find an exogenous source of variation.

Following Combes et al (2014), we use two instruments for remittances : (i) the log of GDP per capita in migrant destination countries with bilateral migration shares used as weights, (ii) the size of oil rents weighted by a bilateral measure of geographical proximity (inverse of bilateral distance) between a remittance receiving country and each country in the world.

Concerning the first instrument, it is now accepted that remittances are positively associated with the economic conditions in the migrant's host countries (Aggarwal et al. 2011; Freund & Spatafora 2008). The instrument (y') is computed as follows:

$$y'_{i,t} = \sum_j y_{j,t} \times w_{i,j,\tau} \quad (3)$$

where $y_{i,t}$ represents the real GDP per capita of the destination country j , and $w_{i,j,\tau}$, the bilateral migration share measured as the number of country's i migrants living in country j divided by the total number of country i migrants living abroad during each decade τ .

The second instrument focuses on the case of remittance flows sent from oil producing countries. The idea behind the instrument is straightforward: country i is more likely to receive large remittance inflows from oil rich countries experiencing a positive oil shock (production or price) if country i and the oil-rich countries are connected through migration linkages. The instrument therefore exploits strong exogenous sources of variation, and fit particularly well remittances sent from oil-rich countries. The second instrument (*Oil*) is constructed as follows:

$$Oil_{i,t} = \sum_j Oil\ rents_{j,t} \times \frac{1}{d_{i,j}} \quad (4)$$

Oil rents measures the US\$ value of oil rents for each country j at year t , and $d_{i,j}$ represents the bilateral distance between countries i and j . Since the bilateral distance is constant over time, within country variations of (*Oil*) are due to changes in the dollar value of oil rents in country j .

For financial development, we use the lags of two periods. This measure is likely to be correlated with future financial development and it is less likely to be influenced by the size of future shadow economies. We recognize that this instrument is at best imperfect and do not

resolve the issue of identification totally, but in absence of a clearly better alternatives, its use has become standard (Bose et al. 2012).

Because, the 2SLS estimates can be biased if the chosen instruments are weak, we test their strength while resorting to the Kleibergen-Paap F statistic. Moreover, to further ensure that our estimates are not biased, we use the Limited Information Maximum Likelihood (LIML) which is more robust to weak instruments than the simple two stage least square. Moreover, in order to capture persistence, potentially mean-reverting dynamics as well as endogeneity, we also use the Generalized Method of Moments (GMM) system estimator for dynamic panel data model. In this case, we introduce among the control variables, the lag of the dependent variable. This estimation technique combines in a system, equations in level and equations in first differences, which allows for the use of lagged differences and lagged levels of the explanatory variables as instruments (Blundell & Bond 1998).

4. Empirical results

As a first step, we report in Table III.2 our results using a two way fixed effects estimator. In the first four columns, we present respectively and separately results from the impact of remittances and our three indicators of financial development (domestic credit to the private sector, domestic credit by financial institutions and M2 to GDP) on the shadow economy. We find that each indicator is negatively and significantly correlated to the prevalence of the shadow economy. In the last three columns, we estimate equation (1) where we introduce financial development and remittances simultaneity and the negative correlations remain quasi unchanged. We notice that the coefficients for remittances increase while those for financial development decrease.

Table III.2: Fixed effects estimates for the impact of remittances and financial development on the shadow economy

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Informal sector	Informal sector	Informal sector	Informal sector	Informal sector	Informal sector	Informal sector
Workers remittances to GDP	-0.094**				-0.120***	-0.099**	-0.098*
	(0.039)				(0.039)	(0.037)	(0.050)
Private credit to GDP		-0.034***			-0.030***		
		(0.009)			(0.006)		
Domestic credit to GDP			-0.016**			-0.008**	
			(0.006)			(0.004)	
M2 to GDP				-0.030***			-0.018**
				(0.010)			(0.008)
Trade openness	0.344***	0.042	0.020	0.112	0.177***	0.251***	0.372***
	(0.012)	(0.064)	(0.062)	(0.084)	(0.050)	(0.030)	(0.062)
Urban population	-0.104***	-0.098***	-0.113***	-0.104***	-0.064	-0.090**	-0.084*
	(0.032)	(0.016)	(0.018)	(0.014)	(0.039)	(0.032)	(0.041)
Tax revenue to GDP	0.023***	0.031***	0.040***	0.040***	0.018**	0.025***	0.023***
	(0.006)	(0.009)	(0.011)	(0.011)	(0.007)	(0.006)	(0.008)
log(GDP per capita)	-5.898***	-5.434***	-6.081***	-5.443***	-5.025***	-5.719***	-5.309***
	(0.705)	(0.994)	(0.840)	(1.025)	(1.095)	(0.720)	(1.090)
Education	-1.422**	-2.030***	-2.391***	-1.632***	-1.789*	-1.607**	-1.300
	(0.592)	(0.369)	(0.332)	(0.342)	(0.871)	(0.682)	(0.889)
Agriculture, value added (% of GDP)	-0.015	-0.041***	-0.033***	-0.033***	-0.018	-0.014	-0.011
	(0.012)	(0.011)	(0.010)	(0.011)	(0.014)	(0.011)	(0.012)
Corruption	-0.030	-0.065**	-0.067**	-0.137***	0.029	-0.004	-0.034
	(0.026)	(0.031)	(0.031)	(0.018)	(0.038)	(0.033)	(0.041)
Constant	98.290***	94.400***	100.986***	94.595***	89.562***	96.232***	92.867***
	(4.224)	(7.907)	(6.651)	(8.057)	(7.487)	(4.414)	(7.210)
Observations	706	1001	992	948	703	703	654
Number of groups	66	79	79	76	66	66	63
R-Squared	0.621	0.589	0.593	0.560	0.650	0.628	0.608

Robust standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Concerning our control variables, apart from trade openness which exhibits a positive correlation, informal sector is negatively associated to the other variables in all regressions and they are sometimes significant.

In Table III.3, we report results of instrumental variables estimates to deal with the endogeneity bias for our two variables of interest. We use as instruments for remittances, the logarithm of the GDP in host country weighted by bilateral migration share, and the logarithm of the size of

oil rents weighted by a bilateral measure of geographical proximity. For financial development, we use the lag of two periods of our indicators. In order to ensure that the instruments are not weak, we report results of the first stage regression to assess the depth of their correlation with the interest variable. The first stage regression tables in Appendix (III-1) indicate that our instruments are not weak as they are strongly correlated with the endogenous variables. In addition, we report the Wald F statistic based on the Kleibergen-Paap (2006) rk statistic which is superior to the standard Cragg-Donald (1993) statistic in the presence of heteroscedasticity and autocorrelation. The reported statistics are far above the Stock and Yogo (2005) critical values and above the value of 10 as suggested by the “rule of thumb” of Staiger and Stock (1997). The relevance of the instruments is assessed through the Hansen test of overidentifying restrictions. Based on the Hansen p-values, we cannot reject the null hypothesis that the instruments are uncorrelated with the errors terms and that the excluded instruments are correctly excluded from the estimated equation.

In the first column of Table III.3, we focus only on the effect of remittances. In the remaining columns, we add respectively private credit ratio, domestic credit by financial institutions and M2 to GDP as in Equation (1). In all the specifications, the share of the shadow economy in GDP is once again negatively associated to remittances and financial development. We also notice that endogeneity tends to underestimate the effects of financial development on the shadow economy given the magnitude of the coefficients comparing Table III.2 and Table III.3. These results for financial development are quietly similar to those of Berdiev and Saunoris (2016) as well as Bose et al. (2012).

Table III.3: Instrumental variables estimates for the effect of remittances and financial development on the shadow economy

	(1)	(2)	(3)	(4)
	Informal sector	Informal sector	Informal sector	Informal sector
Workers remittances to GDP	-0.417** (0.160)	-0.183*** (0.051)	-0.192** (0.090)	-0.264** (0.104)
Private credit to GDP		-0.037*** (0.009)		
Domestic credit to GDP			-0.018*** (0.005)	
M2 to GDP				-0.037*** (0.010)
Trade openness	0.431*** (0.080)	0.102*** (0.025)	0.100* (0.052)	0.284*** (0.068)
Urban population	-0.056* (0.032)	0.001 (0.016)	-0.011 (0.020)	-0.007 (0.024)
Tax revenue to GDP	0.011* (0.005)	0.014*** (0.004)	0.023*** (0.005)	0.021*** (0.005)
log(GDP per capita)	-5.251*** (0.737)	-3.473*** (0.838)	-4.430*** (0.742)	-4.109*** (1.035)
Agriculture, value added (% of GDP)	-0.045 (0.033)	-0.009 (0.018)	0.000 (0.012)	-0.004 (0.012)
Education	-0.648 (0.677)	-0.504 (0.603)	-0.983 (0.657)	-0.247 (0.555)
Corruption	0.033 (0.066)	0.073 (0.062)	0.164*** (0.051)	0.118 (0.082)
Observations	703	696	695	648
No of countries	63.000	63.000	63.000	60.000
Hansen p-value	0.758	0.199	0.316	0.825
F-stat for weak ident.	12.763	12.011	10.147	14.790
Anderson-Rubin F-stat	53.665	91.818	47.801	37.620

Robust standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Moreover, we perform the same regression for equation (1) in Table III.4 using a GMM system estimator where the lag dependent variable is among the regressors. In this dynamic model, it is only in the first column that remittances and financial development proxied by the ratio of credit to the private sector are both significant. Based on column (1) of Table III.4, we can infer that one standard deviation increase in workers' remittances ratio (4.72) is associated to a 1.4%⁵⁰ decrease in the shadow economy relative to the mean of the sample (36.06%). For the ratio of credit to the private sector, a one standard deviation increase (29.7) is associated to the same reduction relative to the sample mean.

⁵⁰ We multiply the coefficient for remittances by the standard deviation of the same variable (4.72) and we divide it by the mean of the informal sector share in the sample (36.06).

Table III.4: GMM estimates for the effect of remittances and financial development on the shadow economy using equation (1)

	(1) Informal sector	(2) Informal sector	(3) Informal sector
L.Informal sector	0.8224*** (0.0453)	0.9763*** (0.0167)	0.9337*** (0.0393)
Workers remittances to GDP	-0.1058** (0.0524)	-0.0522* (0.0278)	-0.0999 (0.0710)
Private credit to GDP	-0.0167** (0.0072)		
Domestic credit to GDP		0.0015 (0.0021)	
M2 to GDP			-0.0279** (0.0129)
Trade openness	0.0224 (0.1133)	0.0774 (0.0979)	-0.0925 (0.1906)
Urban population	-0.0034 (0.0248)	-0.0008 (0.0138)	0.0303* (0.0170)
Tax revenue to GDP	-0.0005 (0.0053)	0.0004 (0.0039)	-0.0005 (0.0043)
log(GDP per capita)	-0.9443* (0.5106)	-0.5201 (0.4404)	-0.5682 (0.5610)
Education	0.4081 (0.4062)	0.0155 (0.3795)	0.1644 (0.4544)
Agriculture, value added (% of GDP)	-0.0004 (0.0186)	-0.0100 (0.0164)	-0.0137 (0.0252)
Corruption	-0.0715 (0.0494)	-0.0223 (0.0749)	0.0079 (0.0593)
Constant	15.2712*** (4.7763)	5.8407 (4.0729)	6.8042 (5.2170)
Observations	703	703	654
Number of groups	66	66	63
Hansen p-value	0.315	0.114	0.388
AR2	0.734	0.806	0.953
Number of instruments	58.000	58.000	53.000

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

4.1. Addressing the issue of substitutability or complementarity between remittances and financial development

In this section, we estimate equation (2) where we introduce an interactive term between financial development and remittances in order to address the issue of complementarity or substitutability between these two variables.

Table III.5: Estimates based on equation (2) with the interactive term

	FE			IV			GMM
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Informal sector	Informal sector	Informal sector	Informal sector	Informal sector	Informal sector	Informal sector
Workers remittances to GDP	-0.194*** (0.024)	-0.259*** (0.049)	-0.386*** (0.051)	-0.747*** (0.110)	0.010 (0.119)	-0.575*** (0.065)	-0.123* (0.065)
Private credit to GDP	-0.034*** (0.007)			-0.063*** (0.010)			-0.011* (0.006)
Private credit*Remittances	0.002** (0.001)			0.011*** (0.004)			0.002* (0.001)
Domestic credit to GDP		-0.010** (0.005)			-0.007 (0.005)		
Domestic credit*Remittances		0.003*** (0.001)			-0.005* (0.003)		
M2 to GDP			-0.034*** (0.008)			-0.050*** (0.013)	
M2 to GDP*Remittances			0.005*** (0.001)			0.004** (0.002)	
Trade openness	0.162*** (0.054)	0.252*** (0.030)	0.401*** (0.080)	0.087 (0.081)	0.211*** (0.042)	0.344*** (0.066)	-0.002 (0.126)
Urban population	-0.067 (0.039)	-0.100*** (0.029)	-0.083** (0.037)	-0.044 (0.028)	-0.006 (0.024)	-0.022 (0.021)	-0.016 (0.016)
Tax revenue to GDP	0.025*** (0.008)	0.028*** (0.007)	0.023*** (0.006)	0.050** (0.020)	0.016*** (0.005)	0.018*** (0.005)	-0.005 (0.008)
log(GDP per capita)	-4.941*** (1.096)	-5.635*** (0.716)	-4.927*** (1.109)	-3.913*** (0.985)	-4.670*** (0.481)	-4.531*** (1.141)	0.081 (0.520)
Agriculture, value added (% of GDP)	-0.022 (0.013)	-0.019* (0.010)	-0.010 (0.011)	-0.047** (0.017)	0.002 (0.015)	-0.019 (0.015)	0.004 (0.016)
Education	-2.100** (0.998)	-2.002** (0.749)	-1.793* (0.907)	-3.356*** (0.966)	0.167 (0.774)	-1.220* (0.613)	-0.095 (0.618)
Corruption	0.012 (0.039)	-0.020 (0.034)	-0.086** (0.039)	0.041 (0.071)	0.147** (0.060)	0.074 (0.082)	-0.059 (0.078)
L.Informal sector							0.993*** (0.013)
Constant	89.626*** (7.298)	96.890*** (4.611)	91.360*** (7.205)				1.042 (3.819)

Chapter III. Are Financial Development and Remittances Substitutes or Complements in their Impact on the Informal Sector?

Observations	703	703	654	696	695	648	703
No of countries	66.000	66.000	63.000	63.000	63.000	60.000	66.000
Hansen p-value				0.457	0.446	0.540	0.380
F-stat for weak ident.				1.303	17.273	8.093	
Anderson-Rubin F-stat				97.422		152.042	
AR2							0.834
Number of instruments							52.000

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In Table III.5 above, we present our results derived from the empirical model presented in equation (2). For each indicator of financial development, we present the results of the regression for the interaction with workers' remittances inflows to GDP. The first three columns are dedicated to fixed effects estimations, the following three columns for instrumental variables (IV) and the last column (7) to the GMM estimator. For the latter estimator, we display results only for the interactive term with private credit ratio, because it is the only indicator which is jointly significant with remittances in Table III.4 using the GMM methodology. As instruments for the interactive term in the IV estimates, we multiply the instruments of remittances by the instrument of financial development.

In all specifications, our findings suggest that remittances and financial development are substitutes in their effect on the shadow economy. Especially, the negative effect of remittances is dampened by financial development. Based on our literature, this is likely to occur in countries with low level of financial institutions when for example remittances are used to compensate for credit constraints. This result is not surprising for our sample which is largely composed of developing countries apart from four countries (Japan, Malta, Slovenia and Portugal)⁵¹. In this case, remittances compensate for the lack of good financial institutions. But this substitution effect is partial given the low amplitude of the coefficient associated with the interactive term. In other words, remittances do not fully compensate for the weakness of financial development.

Moreover, according to Chatterjee & Turnovsky (2016), the negative impact of remittances should be observed if inflows are temporary and could be used as collateral for credit. We are not able to test the last hypotheses within our framework; but as robustness check, we are going to analyze if the temporary or volatile nature of remittances will matter for the shadow economy.

4.2. Sensitivity analysis

First, as robustness check, we construct a new indicator of financial development using a PCA analysis, higher scores indicate high levels of financial development.

⁵¹ We perform our estimations only with the sample of developing countries and we find similar results (see Appendix III-4).

Second, we look at the joint impact of remittances in level and their unpredictability. We assume that unpredictable remittances can influence the prevalence of the shadow economy because of how volatile remittances affect investment and demand decisions. Furthermore, the previous findings of Chatterjee & Turnovsky (2016) who demonstrate that unpredictable or temporary remittances tend to reduce the share of the informal sector by stimulating growth, suggest that the nature of remittances matter. In the literature, some authors like Combes & Ebeke (2011) find that aggregate remittances increase consumption while for others such as Alcaraz et al. (2012), and Woodruff & Zenteno (2007), they are positively correlated to investment. We argue that unpredictable remittances are likely to be invested rather than to be consumed based on the permanent income hypothesis. From the demand side, this increase in investment can increase labor demand in the informal sector. From the supply side, households are more likely to increase their labor supply if remittances are unpredictable, raising the informal sector share ((see Amuedo-Dorantes & Pozo (2012) for microeconomic evidence and Combes et al.(2014) for macroeconomic confirmation for the increase of labor supply related to remittances volatility). For instance, Combes et al. (2014) demonstrate that remittances unpredictability increases the prevalence of poor workers who are engaged essentially in informal activities (Kapsos & Bourmpoula 2013). In addition, this assumption concerning the increase of the shadow economy with unpredictable remittances is based on the fact that the informal sector accounts for more than 50 % of job creation in developing countries. But given the precedent findings of Chatterjee & Turnovsky (2016) who demonstrate that unpredictable or temporary remittances tend to reduce the share of the informal sector by stimulating growth; the impact of remittances volatility is consequently an empirical issue.

Following Combes et al. (2014), we measure remittances unpredictability by the rolling standard deviation (over a three year overlapping window) of the residuals derived from the equation of remittance anticipation, the annual remittance growth rate (Gr) is regressed on the domestic real GDP (Gy) growth rate, and the growth rate of real GDP in the migrants' host countries (Gy'). The equation also controls for a time trend. The following equation is specified:

$$Gr_{i,t} = \alpha_1 Gy_{i,t-1} + \alpha_2 Gy'_{i,t-1} + \alpha_3 t + \varepsilon_{i,t}$$

This definition allows identification of the unpredictability of remittances to the unanticipated component of remittances, once real GDP growth in both remittance receiving and sending countries have been controlled for.

Table III.6: Results for estimations using principal component analysis to measure financial development

	(1)	(2)	(3)	(4)	(5)	(6)
	FE		IV		GMM	
	Informal sector	Informal sector	Informal sector	Informal sector	Informal sector	Informal sector
Workers remittances to GDP	-0.107** (0.047)	-0.169*** (0.040)	-0.084* (0.047)	-0.314** (0.125)	-0.200* (0.114)	-0.094* (0.052)
Financial development	-0.685*** (0.177)	-0.905*** (0.181)	-0.93*** (0.179)	-1.44*** (0.200)	-0.531* (0.293)	-0.305* (0.169)
Financial development*Remittances		0.105*** (0.022)		0.207*** (0.045)		0.076* (0.043)
Trade openness	0.306*** (0.069)	0.303*** (0.079)	0.137*** (0.043)	0.175** (0.063)	0.198 (0.211)	0.268* (0.148)
Urban population	-0.068 (0.040)	-0.077* (0.038)	0.011 (0.012)	-0.028 (0.018)	0.024 (0.026)	0.004 (0.010)
Tax revenue to GDP	0.020** (0.008)	0.028*** (0.007)	0.020*** (0.003)	0.034*** (0.005)	0.006 (0.006)	-0.001 (0.006)
log(GDP per capita)	-4.763*** (1.194)	-4.493*** (1.146)	-2.63*** (0.830)	-2.896** (1.087)	-0.168 (0.771)	-0.053 (0.476)
Agriculture, value added (% of GDP)	-0.011 (0.013)	-0.018 (0.012)	0.012 (0.008)	-0.020 (0.014)	-0.003 (0.031)	-0.008 (0.016)
Education	-1.619* (0.919)	-2.361** (1.031)	0.081 (0.530)	-2.32*** (0.493)	0.287 (0.737)	0.336 (0.472)
Corruption	0.017 (0.046)	-0.025 (0.042)	0.101 (0.062)	0.026 (0.063)	0.032 (0.064)	-0.079 (0.070)
L.Informal sector					0.783*** (0.063)	0.973*** (0.021)
Constant	86.826*** (8.188)	86.410*** (7.541)			8.676 (6.725)	2.083 (3.496)
Observations	652	652	645	645	652	652
No of countries	63.000	63.000	60.000	60.000	63.000	63.000
Hansen p-value			0.291	0.453	0.742	0.436
F-stat for weak ident.			17.685	4.823		
Anderson-Rubin F-stat			176.836	62.982		
AR2					0.660	0.760
Number of instruments			1.116	1.582	48.000	60.000

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table III.6 reports the result using PCA methodology. We find evidence that the shadow economy relative to GDP is negatively associated to financial development and remittances which are substitutes in their impact in all regressions using different estimation techniques (respectively, fixed effects, instrumental variables approach, and GMM system).

Table III.7 shows the estimations comprising remittances unpredictability. The inclusion of this indicator does not affect our previous results. We find that unpredictable inflows tend to increase the informal sector size. This could be due to the fact that they should be invested, increasing the informal sector size through micro entrepreneurship while predictable

remittances are more likely to be used for consumption. Nevertheless, the coefficient for remittances unpredictability is closed to zero, suggesting that even if we control for their unpredictability, remittances inflows tend to reduce the spread of the informal sector.

Table III.7: Estimations controlling for remittances unpredictability

	(1)	(2)	(3)	(4)
	FE		GMM	
	Informal sector	Informal sector	Informal sector	Informal sector
Workers remittances to GDP		-0.109** (0.048)		-0.122** (0.058)
Remittances unpredictability	0.001*** (0.000)	0.001*** (0.000)	0.000* (0.000)	0.001*** (0.000)
Trade openness	0.302*** (0.054)	0.336*** (0.051)	0.179 (0.115)	0.162 (0.118)
Urban population	-0.094** (0.040)	-0.096** (0.041)	0.008 (0.011)	0.007 (0.012)
Tax revenue to GDP	0.024*** (0.006)	0.022*** (0.007)	-0.015 (0.017)	-0.009 (0.013)
log(GDP per capita)	-6.581*** (1.006)	-6.495*** (0.965)	-0.173 (0.346)	-0.247 (0.315)
Agriculture, value added (% of GDP)	-0.007 (0.016)	-0.021 (0.016)	-0.018 (0.017)	-0.026 (0.017)
Education	-0.997 (0.922)	-0.782 (1.024)		
Corruption	0.030 (0.054)	0.005 (0.034)	0.044 (0.067)	-0.079 (0.107)
L.Informal sector			0.997*** (0.024)	0.974*** (0.031)
Constant	102.034*** (6.427)	101.858*** (6.203)	2.034 (3.300)	4.300 (3.019)
Observations	643	640	696	688
No of countries	61.000	61.000	70.000	70.000
Hansen p-value			0.410	0.299
AR1			0.010	0.007
AR2			0.937	0.612
Number of instruments			59.000	59.000

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5. Conclusion

In this paper, we analyze how financial development and remittances inflows interact to explain cross-country panel variations of the shadow economy on a sample largely composed of developing countries from 1990 to 2009. Compared to the existing studies, we are the first from our knowledge to assess the joint impact of remittances and financial development on the informal sector size. Previous studies neglect these relationships despite remittances are among the most important source of external capital flow for developing countries with a significant impact on growth. At the same time, more than 50% of job creation is absorbed by the informal sector. Moreover, it has been proven that remittances are more effective in increasing growth and reducing poverty in presence of good financial institutions. Similarly, it is largely admitted that financial development generates more growth while reducing the spread of the shadow economy which can in turn jeopardize the expansion of financial services. In our empirical model, we consider that remittances measured by workers' remittances and financial development proxied by private credit ratio, domestic credit by financial institutions and money and quasi money to GDP are endogenous, given the inter-connections between these variables.

Using an instrumental variable methodology, we find that the spread of the informal sector is negatively associated to remittances and financial development. Moreover, the latter are partial substitutes⁵² indicating that in countries with an initial low level of financial development, remittances will be more effective in reducing the informal sector size. These results are robust to the use of (i) the GMM system in order to capture persistence, potentially mean-reverting dynamics as well as endogeneity, and (ii) an alternative measure of financial development derived from a principal component analysis even if we restrain our sample to developing countries. In addition, our findings suggest that remittances unpredictability is likely to increase the share of the underground sector in the economy.

In terms of policy implications, our paper is of great interest. We demonstrate that governments can use remittances and financial development as tools to reduce the informal sector size, leading to more revenue in order to finance public investments and stimulate growth. To address this purpose concerning remittances, it is important to increase their productivity, their amount and their predictability. This could be done through policy actions to reduce the cost to remit through better access to financial services, reducing at the same time informal inflows of

⁵² This substitution effect is partial, as remittances do not totally compensate for the weakness of financial institutions, suggesting the need for a suitable financial development policy.

remittances with a better screening for these funds. Moreover, national development strategies must consider the spillover effects associated with remittances and financial development in terms of social development. They jointly reduce the share of the informal sector and they can put the economy in the path of a sustainable growth by facilitating investment and stimulating job creation with lower capital costs and more social protection.

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7. Appendices

Appendix III-1 : First stage regression tables for instrumental variables estimates for equation (1) in Table III.3.

	(1) Workers remittances to GDP	(2) Workers remittances to GDP	(3) Private credit to GDP	(4) Workers remittances to GDP	(5) Domestic credit to GDP	(6) Workers remittances to GDP	(7) M2 to GDP
Trade openness	0.573*** (0.064)	0.403*** (0.079)	-1.457*** (0.473)	0.506*** (0.083)	-7.303*** (1.926)	0.345** (0.151)	-0.659* (0.325)
Urban population	-0.114*** (0.019)	-0.069*** (0.023)	0.288** (0.108)	-0.088*** (0.021)	0.797*** (0.201)	-0.069** (0.029)	0.485*** (0.100)
Tax revenue to GDP	-0.026*** (0.007)	-0.035*** (0.008)	0.030* (0.016)	-0.026*** (0.008)	0.234** (0.097)	-0.025*** (0.007)	0.060*** (0.013)
log(GDP per capita)	-4.509*** (0.321)	-4.867*** (0.234)	14.927*** (4.306)	-5.209*** (0.256)	-8.137 (7.815)	-5.811*** (0.344)	5.425*** (1.496)
Agriculture, value added (% of GDP)	-0.111** (0.040)	-0.119** (0.049)	-0.106** (0.046)	-0.115** (0.053)	0.224 (0.215)	-0.122** (0.054)	0.058 (0.056)
Education	-2.200** (0.987)	-3.296** (1.363)	0.126 (1.847)	-3.519** (1.472)	-23.729*** (5.055)	-3.986*** (0.991)	6.929** (2.555)
Corruption	0.015 (0.180)	0.045 (0.214)	-0.095 (0.149)	0.113 (0.233)	2.903*** (0.801)	0.107 (0.210)	0.942*** (0.328)
log(Oil rents in neighboring countries)	-3.842 (2.322)	-4.027* (2.192)	18.234*** (4.923)	-4.136* (2.167)	-5.257 (27.076)	-4.509* (2.357)	0.780 (13.723)
log(GDP per capita in host countries)	2.501* (1.270)	4.397*** (1.361)	15.581*** (3.390)	3.527** (1.282)	62.700*** (7.972)	3.204** (1.209)	14.897*** (2.611)
L2.Private credit to GDP		-0.044*** (0.008)	0.871*** (0.049)				
L2.Domestic credit to GDP				-0.015*** (0.004)	0.506*** (0.037)		
L2.M2 to GDP						-0.000 (0.009)	0.599*** (0.042)
Observations	703	696	696	695	695	648	648
No of countries	63.000	63.000	63.000	63.000	63.000	60.000	60.000

Robust standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix III-2: First stage regression tables for estimations with the interactive term (Table III.5).

	(1) Workers remittances to GDP	(2) Private credit to GDP	(3) Private credit*Remittances	(4) Workers remittances to GDP	(5) Domestic credit to GDP	(6) Domestic credit*Remittances	(7) Workers remittances to GDP	(8) M2 to GDP	(9) M2 to GDP*Remittances
Trade openness	0.356*** (0.044)	-1.431*** (0.454)	19.101*** (3.244)	0.473*** (0.057)	-6.354*** (1.866)	20.909*** (4.171)	0.302** (0.126)	-0.577** (0.247)	9.136 (13.018)
Urban population	-0.083*** (0.015)	0.331** (0.124)	-0.017 (0.729)	-0.099*** (0.024)	1.167*** (0.237)	-0.232 (1.171)	-0.119*** (0.037)	0.558*** (0.106)	-0.409 (3.332)
Tax revenue to GDP	-0.037*** (0.008)	0.032* (0.016)	-4.771*** (0.675)	-0.023*** (0.008)	0.153* (0.080)	-1.983*** (0.498)	-0.024*** (0.006)	0.055*** (0.011)	-1.262*** (0.406)
log(GDP per capita)	-4.998*** (0.455)	14.739*** (4.209)	-143.543*** (10.319)	-5.386*** (0.294)	-3.651 (5.416)	-315.433*** (21.304)	-5.701*** (0.521)	5.598*** (1.231)	-327.857*** (14.751)
Agriculture, value added (% of GDP)	-0.102* (0.057)	-0.121** (0.043)	-2.795 (2.596)	-0.109** (0.049)	0.015 (0.099)	-4.019 (2.691)	-0.109* (0.052)	0.001 (0.046)	-6.345* (3.439)
Education	-3.234*** (0.993)	-0.136 (1.524)	91.246*** (24.614)	-3.149** (1.458)	-35.113*** (5.872)	4.273 (71.933)	-2.095*** (0.719)	4.735 (3.838)	-33.754 (73.697)
Corruption	0.081 (0.210)	-0.170 (0.146)	6.559 (7.516)	0.092 (0.211)	3.550*** (0.714)	14.976 (11.683)	0.149 (0.209)	1.068** (0.425)	27.354* (15.225)
log(Oil rents in neighboring countries)	-4.200 (2.510)	17.960*** (5.019)	-41.229 (199.711)	-4.187** (1.727)	-4.152 (22.896)	-474.370*** (143.802)	-4.705* (2.612)	4.877 (14.455)	-118.774 (196.158)
log(GDP per capita in host countries)	4.525*** (1.138)	15.801*** (3.234)	80.631* (45.187)	3.605*** (1.101)	60.623*** (7.936)	239.299*** (60.278)	3.297*** (1.036)	14.779*** (2.289)	215.800*** (36.528)
L2.Private credit to GDP	0.318 (0.202)	0.474 (0.402)	-1.012 (12.407)						
GDP host* L2.Private credit	0.006 (0.025)	-0.042 (0.031)	0.733 (0.820)						

Chapter III. Are Financial Development and Remittances Substitutes or Complements in their Impact on the Informal Sector?

Oil rent*	-0.016***	0.032	-0.244						
l2.Private credit	(0.004)	(0.023)	(0.226)						
L2.Domestic credit to GDP				0.115	-3.400***	5.638			
				(0.091)	(0.524)	(4.543)			
Oil rent*				-0.003	0.129***	0.049			
l2.Domestic credit				(0.002)	(0.039)	(0.078)			
GDP host*				-0.005	0.055	-0.703			
l2.Domestic credit				(0.012)	(0.062)	(0.512)			
L2.M2 to GDP							0.495**	-0.682	-6.989
							(0.191)	(0.414)	(18.623)
GDP host*							0.019	0.089	2.209
l2.Broad Money							(0.028)	(0.087)	(1.518)
Oil rent*							-0.027***	0.014	-0.526
l2.Broad Money							(0.006)	(0.040)	(0.321)
Observations	696	696	696	695	695	695	648	648	648
Number of groups	63	63	63	63	63	63	60	60	60
R-Squared	0.198	0.691	0.144	0.165	0.474	0.102	0.169	0.427	0.102

Robust standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix III-3: First stage regression tables for sensitivity analysis using PCA for financial development (Table III.6)

	(1) Workers remittances to GDP	(2) Financial development	(3) Workers remittances to GDP	(4) Financial development	(5) Financial development*Remittances
Trade openness	0.309* (0.154)	-0.056*** (0.011)	0.306** (0.133)	-0.055*** (0.011)	0.099 (0.233)
Urban population	-0.050* (0.028)	0.018*** (0.004)	-0.080** (0.031)	0.022*** (0.004)	0.206*** (0.035)
Tax revenue to GDP	-0.027*** (0.007)	0.002** (0.001)	-0.029*** (0.006)	0.002*** (0.001)	-0.085*** (0.013)
log(GDP per capita)	-5.793*** (0.209)	0.652*** (0.118)	-5.616*** (0.380)	0.629*** (0.096)	-2.795*** (0.555)
Agriculture, value added (% of GDP)	-0.120** (0.048)	0.001 (0.003)	-0.103* (0.055)	-0.002 (0.002)	-0.035 (0.047)
Education	-4.327*** (1.289)	0.247*** (0.077)	-3.294** (1.334)	0.086 (0.157)	4.876*** (1.437)
Corruption	0.162 (0.218)	0.000 (0.007)	0.131 (0.231)	0.005 (0.007)	0.687*** (0.218)
log(Oil rents in neighboring countries)	-4.753** (1.843)	0.333 (0.592)	-5.652** (2.150)	0.477 (0.584)	-0.579 (4.652)
log(GDP per capita in host countries)	4.174*** (1.064)	1.323*** (0.173)	4.269** (1.827)	1.327*** (0.146)	4.086*** (0.625)
L2.Financial development	-0.560*** (0.185)	0.637*** (0.056)	6.976 (4.584)	-0.581 (0.443)	-24.302** (8.778)
Oil rents*Financial development			-0.295*** (0.062)	0.043 (0.033)	0.453* (0.236)
GDP in host country*Financial development			0.000 (0.515)	0.011 (0.048)	1.383*** (0.411)
Observations	645	645	645	645	645
Number of groups	60	60	60	60	60
R-Squared	0.141	0.526	0.157	0.532	0.216

Robust standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix III-4: Estimation with the sample of developing countries using PCA

	(1)	(2)	(3)	(4)	(5)	(6)
	FE		IV		GMM	
	Informal sector	Informal sector	Informal sector	Informal sector	Informal sector	Informal sector
Workers remittances to GDP	-0.107** (0.047)	-0.170*** (0.040)	-0.086* (0.048)	-0.341** (0.136)	-0.196* (0.114)	-0.086* (0.047)
Financial development	-0.688*** (0.177)	-0.911*** (0.180)	- (0.183)	- (0.208)	-0.526* (0.269)	-0.405** (0.183)
Financial development*Remittances		0.106*** (0.022)	0.924*** (0.183)	1.424*** (0.208)		0.081* (0.044)
Trade openness	0.308*** (0.069)	0.306*** (0.078)	0.142*** (0.042)	0.190*** (0.061)	0.200 (0.207)	0.250* (0.147)
Urban population	-0.069 (0.040)	-0.078* (0.038)	0.009 (0.012)	-0.032 (0.019)	0.022 (0.026)	0.004 (0.010)
Tax revenue to GDP	0.020** (0.008)	0.028*** (0.007)	0.020*** (0.003)	0.033*** (0.005)	0.007 (0.006)	-0.003 (0.007)
log(GDP per capita)	-4.748*** (1.193)	-4.469*** (1.138)	- (0.813)	-2.988** (1.138)	-0.138 (0.710)	0.042 (0.465)
Agriculture, value added (% of GDP)	-0.011 (0.013)	-0.018 (0.012)	0.013 (0.008)	-0.023 (0.014)	-0.001 (0.031)	-0.005 (0.016)
Education	-1.615* (0.919)	-2.362** (1.030)	0.089 (0.529)	- (0.508)	0.277 (0.750)	0.170 (0.452)
Corruption	0.014 (0.046)	-0.029 (0.042)	0.095 (0.058)	0.023 (0.063)	0.030 (0.064)	-0.058 (0.065)
L.Informal sector					0.786*** (0.062)	0.971*** (0.023)
Constant	86.836*** (8.190)	86.355*** (7.509)			8.390 (6.403)	1.443 (3.583)
Observations	646	646	639	639	646	646
No of countries	62.000	62.000	59.000	59.000	62.000	62.000
Hansen p-value			0.289	0.455	0.749	0.503
F-stat for weak ident.			17.495	4.977		
Anderson-Rubin F-stat			176.066	57.111		
AR2					0.639	0.726
Number of instruments					48.000	52.000

Robust standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix III-5: List of countries based on the sample using PCA analysis

Albania; Algeria; Armenia; Bangladesh; Bolivia; Botswana; Brazil; Bulgaria; Cameroon; China; Colombia; Congo. Rep.; Costa Rica; Cote d'Ivoire; Croatia; Dominican Republic; Egypt. Arab Rep.; El Salvador; Estonia; Ghana; Guatemala; Honduras; Hungary; India; Indonesia; Jamaica; Japan; Jordan; Kazakhstan; Kenya; Korea. Rep.; Latvia; Lithuania; Mali; Mexico; Mongolia; Morocco; Mozambique; Namibia; Nicaragua; Pakistan; Panama; Papua New Guinea; Paraguay; Peru; Philippines; Poland; Russian Federation; Senegal; Slovak Republic; Sri Lanka; Sudan; Tanzania; Thailand; Togo; Trinidad and Tobago; Tunisia; Turkey; Uganda; Ukraine; Uruguay; Venezuela. RB; Zambia.

Appendix III-6: Principal component analysis

Principal components/correlation

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.56526	2.33223	0.8551	0.8551
Comp2	.233038	.0313383	0.0777	0.9328
Comp3	.201699	.	0.0672	1.0000

Principal components (eigenvectors)

Variable	Comp1	Comp2	Unexplained
M2 to GDP	0.5783	-0.5048	.08285
Private credit to GDP	0.5802	-0.2979	.1159
Domestic credit to GDP	0.5736	0.8102	.002936

Scoring coefficients

Variable	Comp1	Comp2
M2 to GDP	0.5783	-0.5048
Private credit to GDP	0.5802	-0.2979
Domestic credit to GDP	0.5736	0.8102

**Chapter IV. Flexible Financial Products to
Address Risk: a Review and a Proposal**

1. Introduction ⁵³

1.1. Consequences of the permanence of uninsured risk

Microfinance institutions (MFIs) have developed a wide variety of financial products that are adapted to the needs of poor people, but generally not for the purpose of helping them to deal with uninsured risk. In particular, products are rigid and standardized in order to avoid client default (Armendariz & Morduch 2010).

Hence, the permanence of uninsured risks remains a matter of concern, since it restrains investment, income growth, and welfare. It forces households into self-insurance strategies for risk management (ex-ante relative to shocks) and risk coping (ex-post relative to shocks). Ex ante measures include crop diversification, farm fragmentation and share-cropping... Ex post methods include using of informal credit, temporary employment, savings, sell off assets, child labor...

People can also ask their relatives and their network for help in bad years and return the favor in good years. These mechanisms help manage idiosyncratic or independent risk (affecting one person) and some covariate risks with low intensity (affecting everyone at the same period), but they do have limitations. They are ineffective when severe covariate shocks like hurricane, drought and repeated shocks in quick succession occur as serious illness. The most affected in those cases are poor people with low asset and few options to cope with risk. They have to reduce their consumption, take children out of school, use their savings, and engage in risky activities. Consequently, shocks, which are transitory by definition, may affect them permanently (Dercon & Hoddinott 2004); leaving them in a poverty trap (Barnett et al. 2008). Moreover, uninsured risk discourages investment on riskier projects with higher benefits mitigating the increase of welfare and income mainly because of risk aversion. Theoretical evidences suggest that increase in risk reduces the scale of risky crop production (Sandmo 1971; Fafchamps 1992; Kurosaki & Fafchamps 2002). Results from empirical investigations corroborate this predictions, poor households without insurance devote less land to high yielding but volatile rice varieties and castor in India (Morduch 1990), more land to low risk

⁵³ This chapter is based on a collaboration with Elisabeth SADOULET and Alain de JANVRY, Professors at the University of Berkeley (California, USA) and Andrew ABORDONADO when he was a student at this University. It is also associated with a policy brief published by the “Fondation pour les Etudes et Recherches sur le Développement International (FERDI)”: **Progress with flexible microfinance products: a review of evidence and a proposal**, FERDI, Policy brief B83, January 2014.

with small return potatoes in Tanzania (Dercon 1996), and less labor to price volatile coffee in Uganda (Vargas Hill 2009). They are also less likely to take credit or adopt innovations. Dercon & Christiaensen (2011) demonstrated that in Ethiopia, they do not apply for fertilizer available on credit. Some studies estimated that in absence of risk, the average farm income could be 10 to 20 % higher (Gautam et al. 1994; Sakurai & Reardon 1997). Recently, using field experiments in a semi-arid area of India, Vickery et al (2013) show that farmers which have access to rainfall index insurance⁵⁴ are much more inclined to increase investment in higher return and higher risk investments.

Concerning employment, poor farmers used to increase their labor supply in order to manage risk (Rose 2001). This rise could be positive in areas where off farm labor market is important.. As demonstrated by Fink et al (2014); by relaxing credit constraints, access to seasonal agricultural loan decreases off farm labor supply and increases food consumption and local wages of targeted communities in Zambia.

Moreover, wages are more volatile and sensitive to shocks in developing countries⁵⁵. In case of a bad shock coupled with the increase of labor supply, wage diminishes and the poor tend to work even if markets conditions deteriorate partly because of the lack of smoothing mechanism like access to credit or insurance. In Indonesia for instance, labor supply increased despite the collapse of hourly earnings after the crisis in 1998 (Frankenberg et al. 2003). Jayachandran (2006) also shows for 257 districts in India that in case of productivity shocks, with no possibility of borrowing or drawing on savings and migrate, the equilibrium wage for poor farmers is lower because they are obliged to work at lesser rate. In fact, we can distinguish two effect for the labor supply response to wage change. If wage falls in case of bad shocks, people can supply more labor, this is the **income effect**, or shift away from the labor market, and this is **the substitution effect**. In developing countries, it is the income effect which tends to dominate because the elasticity of labor supply to wage is low (Sahn & Alderman 1988)⁵⁶ and sometimes even downward sloping⁵⁷ in the wage (Sharif 1991b) for India; (Sharif 1991a) for Bangladesh or (Yamada 2008) for Peru. For illustrative purposes, we can consider an economy where people are able to save or borrow. In case of bad shock which reduces the demand for

⁵⁴ Index insurance is a contract where payouts are linked to a publicly observable index like rainfall, temperature or a commodity price etc.

⁵⁵ In the five developing countries studied by (Agénor et al. 2000), the correlation between the quarterly real wage and contemporaneous domestic output ranges from .31 to .68 for 1978-95. The correlation coefficient in the U.S. is about .12 (King & Rebelo 1999).

⁵⁶ Low labor elasticity to wages have been demonstrated in diverse economies as in India (Rosenzweig 1984), in Malaysia (Barnum & Squire 1979), and Sierra Leone (Strauss 1982).

⁵⁷ This means that individuals respond to a decrease of wages by an increase in their labor supply.

labor at harvest time as well as agricultural labor productivity, they will supply less labor and instead borrow or draw upon saving to smooth their consumption. But in an economy with limited access to financial services to deal with shocks, workers will reduce their labor supply to a lesser extent or work more in order to meet their consumption need. Consequently, access to financial services to address risk will enable poor households to supply labor more elastically and better manage wage volatility.

The increase in labor supply mentioned above, not only concerns adults, child labor is also used as a risk coping mechanism by poor household in developing countries. Using micro-level data, authors demonstrated that agricultural shocks lead to an increase in child labor, they also showed that this effect could be reduced by access to credit and insurance in Tanzania (Beegle et al. 2006) or in Guatemala (Guarcello et al. 2010). In the same vein, at macro level, Dehejia & Gatti (2005) highlight a negative relationship between financial development measured by access to credit and child labor, the latter is used to limit the effect of income variability. Ebeke (2012) also shows that financial development through access to credit limits child labor particularly in developing countries.

Hence, uninsured risk have an effect on employment especially on working conditions, increasing child labor and labor supply for low level of wages which exacerbate poverty. This suggests that with the right financial instruments to address risk, poor households would be better off. For illustrative purposes, Fink et al (2014) show that access to seasonal agricultural loan increases food consumption and local wages and it decreases off farm labor supply of targeted communities in Zambia.

1.2. The need for flexible financial products to address risk

The permanence of uninsured risks leads to self-insurance strategies and risk coping mechanisms, which are costly and ineffective in cases of severe covariate shocks, or shocks that occur in quick succession. Typically, microfinance credit and savings products have been rigidly defined and managed in order to secure repayment and induce good client performance; preventing their use to confront risk⁵⁸. There have been attempts at reducing risk via insurance with limited success without heavy and continuing subsidies from government, donors and relief agencies. Concerning index-based insurance; the main problem is “basis risk” which refers to the possible huge gap between farmers' income losses and the insurance payouts. Consequently, take up has been low. This requires more flexible financial products (i.e. adapted to clients' conditions like in case of emergencies or shocks) such as flexible savings, open lines of credit, and index-insurance confined to the types of risks that cannot be covered by insurance. These financial products have to be designed and introduced in such a fashion that they both meet clients' demands for risk reduction and secure high discipline and repayment rates for the supplying MFIs. They should include disciplinary and enforcement mechanisms to protect lenders against “moral hazard behaviors,” such as lack of self-control, intra-household disagreement and attention failure. Consequently, the dilemma is to secure discipline as flexibility is increasing. This debate on the right balance between flexibility and discipline goes beyond microfinance, as it emerged in both banking theory and behavioral economics (Laureti 2011).

In the case of credit, greater flexibility would help borrowers use credit to handle less risk management and better cope with risk. This represents a challenge because flexibility also exacerbates the commitment of the client and its discipline problem and MFIs have to reinforce their enforcement strategies. But too much rigidity can lead to credit rationing for example, and thus to the exclusion of the poorer.

Savings are flexible under the simplest passbook account form. The problem is the need to introduce motivational devices that help people acquire the discipline to save as much as they would rationally like to. Introduction of these motivational savings (dedicated savings accounts, fines and constraints on early withdrawal) increases discipline but reduces flexibility, especially

⁵⁸ In general, MFIs use rigid and standardized enforcement mechanisms like joint liability, frequent and regular repayment schedule without grace period, progressive lending, intolerant policy toward default and compulsory savings (Armendariz & Morduch 2010).

to be able to withdraw savings in case of an emergency. So, there is like for credit a tradeoff between flexibility and discipline, but it is reverse. In credit, greater flexibility compromises discipline. In savings, greater discipline compromises flexibility.

Some MFIs have offered such flexible products to their clients. But, few studies have explored the way to make microfinance products more flexible (Sadoulet 2002; Alexander Tedeschi 2006; Ashraf et al. 2006; Laureti & Hamp 2011). The latter presents a literature review of innovative flexible products. But, they do not distinguish between customization and convenience which is to adapt products to clients' needs and flexibility which is to adjust the product to clients' conditions like occurrence of shocks and emergencies. As an example, customization refers to cyclical loans which are adapted to crop cycles, flexibility will be the possibility to have a credit in case of emergencies. Consequently, in our review, we distinguish between convenience and flexibility. We go beyond other studies by reviewing both in theory and practice how microfinance products have been redesigned to offer more flexibility to users so they can be used to reduce and cope with risk. We show that both savings and credit must be used sequentially according to the occurrence of income shocks. Incentives to save are necessary to induce behavior consistent with the desired optimum savings plan, and these incentives can be made compatible with the use of savings for shock response. Several microfinance institutions have taken steps toward offering flexible savings-credit-insurance services to respond to risk while preserving borrower and depositor discipline. They however still fall short of a design that would optimize the provision of financial services to deal with risk.

The remainder of the paper proceeds as follows. Section 2 presents a conceptual framework. In Section 3, we propose a theoretical approach on the use of saving and credit as instruments to deal with risk and its implication for the design of flexible products. Section 4 describes and assesses some flexible products while highlighting their flexibility and discipline features. Finally, in section 5, we conclude by a discussion of achievements and remaining challenges.

2. Conceptual framework: towards flexible financial products in microfinance

2.1. From customization to flexibility

Significant progress has been made in microfinance to give access to financial services to smallholder farmers: transfers, savings, credit, and insurance.

In a **first phase**, rigid microfinance services have been offered to secure repayment and induce good performance of clients in spite of lack of collateral and under the precarious conditions characterizing the livelihoods of the poor. In a **second phase**, increased access to financial products is being sought by customizing products to client needs and capacities. This includes in particular the following types of designs:

- **Transfers:** use of electronic devices have reduced transaction costs.
- **Savings:** secure and convenient savings have been made accessible, but disciplinary devices to help motivate savings such as dedicated purposes, higher interests on time bound deposits, and default options in committing to save create rigidities that reduce using savings to meet emergencies.
- **Credit:** efforts have been made to better customize credit contracts to the needs and capacities of clients. This includes individual as opposed to group loans; less frequent repayments; loans based on past performance and accumulated savings as opposed to collateral; repayment calendars adapted to anticipated cash flows and crop cycles; and interest paid only on outstanding balances. However, the need to insure discipline in repayment has limited offering flexibility in using loans for risk management and coping.

Concerning impact evaluations of customized products, the effect of less frequent instalment on loan repayment seems to be ambiguous (Field et al. 2011; McIntosh 2008) but visits from collectors and SMS reminders seem to increase savings (Karlan & Mullainathan 2009) credit reimbursement (Cadena & Schoar 2011) and decrease borrowing (Ashraf et al. 2005).

While much progress has been made to adapt microfinance services to the needs and capacities of clients, efforts remain to provide financial services that can help them manage and cope with risk, in part substituting for insurance that has met with low uptake.

A **third phase** in microfinance services consists in (1) seeking greater **flexibility** in use so they can serve to manage and cope with risk and (2) seeking to package financial services into **composite financial products** to build on complementarities and allow risk-layering.

2.2. Balancing flexibility and discipline

It is important to conceptualize the meaning underlying flexibility and discipline with respect to financial products. Flexibility in microfinance refers to mechanisms that improve a client's payment ability (Karlan & Mullainathan 2009), improving the clients' ability to cope with risk,

and ability to manage day-to-day monetary costs (Collins et al. 2010). The flexibility of a financial product must be balanced by disciplinary mechanisms. Laureti and Hamp (2011) contend that disciplinary mechanisms are a necessary component of microfinance to protect against two types of moral hazards: 1) in ex-ante moral hazard, borrowers do not put in effort for the success of their business; low effort affects revenues negatively, which could cause them to be insufficient to repay the loan. 2) In ex-post moral hazard, borrowers decide not to pay back a loan even though they have the sufficient budget to do so. Discipline also protects against incentive problems that prevent people from saving, such as lack of self-control and external pressures. But, risks of “too stringent” financial discipline include:

- risk rationing, which happens when clients do not apply for a credit because they consider that the loss in case of default is too high (Boucher & Guirkinger 2007).
- Over-indebtedness and loan delinquency (Chaudhury & Matin 2002; Schicks 2014).

On **the credit side**, payment performance depends on client's willingness and ability to pay (Boucher & Guirkinger 2007). Financial discipline enhances the willingness to pay and can worsen the ability to pay. On the contrary, flexibility by easing money management enhances the ability to pay but it can decrease the willingness to pay. This represents a great challenge as flexibility lowers the commitment of the client and its discipline, mitigating the sustainability of MFIs. Flexibility features include:

- Emergency loans on demand: credit lines, credit cards, good loans, payday loans.
- Contingent loans (flexible duration, borrower chooses when to repay).
- Early repayment options without penalty.

The challenge here is to maintain discipline while allowing greater flexibility. Options that aim to do so include stricter selection, closer monitoring, and heavier sanctions or rewards (Laureti 2011). On the demand side, flexibility might deteriorate the commitment of the client and his discipline. On the supply side, MFIs' operational cost will increase and loan repayment rate decrease.

Concerning **savings**, passbook accounts allow instant unlimited withdrawal. Accounts with no minimum balance allow full withdraw of accumulated savings. Difficulty here is to preserve motivational/commitment devices to help people save while maximizing flexible access for risk response. One option is to link the right to dis-save to the motivation to save. This is the case when saving is for an emergency health expenditure that can be verified by the holder of deposits such as a health expenditure in (Dupas & Robinson 2013). Saving withdrawal can also be indexed on observable triggers similar to index-based insurance. Commitments through

default options can be made fully renegotiable at any time as in the case of CHN experiment (Atkinson et al. 2013). Ashraf et al.(2003) found that the main mechanisms may be divided into:

- Deposit-side mechanisms that help clients make regular deposits.
- Withdrawal-side mechanisms that help clients restrict the use of their funds except for well-planned uses or emergencies.

Introduction of such motivational savings (dedicated savings accounts, fines and constraints on early withdrawal) increases discipline but reduces flexibility, especially to be able to withdraw savings in case of an emergency. Like for credit, there is a tradeoff between flexibility and discipline, but it is reverse.

Electronic transfers such as M-Pesa allow immediate transfers in response to shocks. Transfers can be international (remittances, international solidarity), allowing to mobilize mutual insurance to cope with nationally covariate (Blumenstock et al. 2012).

Index-based schemes help extend insurance to smallholder farmers that could not be covered with assessed loss-based indemnity insurance, but basis risk remains high, insurance premiums are very costly (loading cost), and uninsured background risks remain large. In addition, the poor may be liquidity-constrained in paying premiums, there may be lack of trust in the insurance provider, and poor understanding of how an index-based insurance works. For these reasons, uptake has been low without substantial subsidies.

Composite financial products are also promising in mitigating basis risk, and need more attention; this includes:

- Combining saving and credit, in this case, saving could be used as collateral for credit in case of emergencies for example.
- Combining index insurance with savings: basis risk in index-based weather insurance can be reduced by precautionary savings. Savings can also help protect a farmer from uninsured idiosyncratic risks such as health shocks that cannot be covered by an index-based instrument. In this case, there is complementarity between index insurance and precautionary savings, and they could be jointly offered to farmers (de Nicola et al. 2012).

Livestock is both a productive asset and an instrument for precautionary savings. For households who dis-save to smooth consumption, insurance helps protect assets, acting as a substitute to savings. For households who reduce consumption to smooth asset holding,

insurance helps protect consumption, acting as a complement to savings (Janzen & Carter 2013).

When index insurance is used to insure loans at the bank level, insurance then serves as a complement to credit, inducing farmers to borrow and invest more (Clarke et al. 2012).

In the remainder of this paper, after a theoretical framework on the use of saving and credit as an instrument to deal with risk and its implications, we assess some flexible products.

3. Theory of savings, credit and insurance as instruments to deal with risk

3.1. Basic theory with perfect financial markets

This basic theory of the interplay between saving, risk, and insurance has been developed by Besley (1995) and Deaton (1991). Consider a two-period model, with current wealth y_1 and future stochastic income y_2 . Let $r = 1 + i$ be the return on savings, with i the interest rate. Optimal savings s (borrowing if negative) is obtained from maximization of the utility of consumption $c_1 = y_1 - s$ in period 1 and $c_2 = y_2 + rs$ in period 2 aggregated with a discount factor δ :

$$\max_s (U(y_1 - s)) + \delta EU(y_2 + rs)$$

Optimal savings / borrowing solve $U'_1 = \delta r EU'_2$, where the marginal utility of consumption is U' . Perfect neutralization of risk is achieved if $\delta r = 1$. If $\delta r < 1$, there is savings motivated by income variability/uncertainty.

If the marginal utility of consumption is decreasing in income and convex, there are precautionary savings, i.e., savings increase (borrowing decreases) with the variability of future income. Convexity of marginal utility can be due to preferences ($U''' > 0$) or to the risk of a credit constraint in the future, even with a quadratic utility function.

3.2. Adding a price band in the credit market

Suppose that interest rates on savings (r_s) are low and borrowing rates (r_b) are high, creating a price band $r_s < \frac{1}{\delta} < r_b$. At SafeSave, for example, annual interest rates are 6% on deposit and 36% on loans. The optimal saving (s) and borrowing (b) behavior are solution of:

$$\max_{s,b} (U(y_1 - s + b) + \delta EU(y_2 + r_s s - r_b b))$$

Note that we never observe savings and borrowing in the same time. There is a range of income over which it is optimal to neither save nor borrow.

- $y_1 < y_{min}$ Borrowing b
- $y_{min} < y_1 < y_{max}$ Autarky
- $y_{max} < y_1$ Savings s

The income thresholds $y_{min}(y_{max})$ that triggers borrowing (savings) are decreasing function of $\delta r_b(\delta r_s)$. The optimum saving s increases with the deposit rate r_s . The optimal borrowed amount b decreases with the interest rate r_b .

Hence, the **quality** of the saving and credit instruments for insurance purpose is directly function of the difference $1 - \delta r_s$ and the difference $\delta r_b - 1$.

The **monetary costs** of the savings and credit instruments for insurance purpose are directly function of the $1 - \delta r_s$ difference and the difference $\delta r_b - 1$.

Optimal use of savings and credit, by definition, brings in an increase in utility. But this is potentially at a *monetary cost*, defined as the discounted value of transfer of resources over time. Total consumption C over the two periods is equal to:

$$\begin{aligned} - C &= c_1 + \delta c_2 = y_1 + \delta y_2 - [(1 - \delta r_s)s] \text{ if savings} \\ - C &= c_1 + \delta c_2 = y_1 + \delta y_2 - [(\delta r_b - 1)b] \text{ if borrowing} \end{aligned}$$

with s and b defined as above, i.e., themselves decreasing function of their respective cost.

Hence the expected cost of the savings and credit instruments is a weighted average of the two costs, with the weights proportional to the expected transactions.

In conclusion, without constraint on credit, the savings-credit instrument is triggered by large shocks only (positive or negative), leaving consumption to adjust for smaller shocks. The cost of the instrument is function of the difference between the interest rate and the discount factor. Credit is costly when its interest rate is above the discount factor; savings are costly when their deposit rate is below the discount factor.

3.3. Adding a constraint in borrowing

In contrast to the above results, adding a limit to the amount that can be borrowed makes the savings/credit instrument fail for the worst shocks.

This constraint further affects the borrowing/savings behavior to induce precautionary savings, i.e., a higher level of savings and a lower level of credit when those instruments are used, and (most likely) a shift in the space of autarky towards lower income.

When the transactions cost on the credit market are ignored, this is the result from the basic theory (section 3.1 above).

With a credit constraint, the savings/credit instruments no longer insure the worst negative shocks. The credit constraint also tilts the solution towards more savings and less credit. The credit constraint reduces the utility benefits of the savings/credit instruments. Change in monetary costs comes from increasing the costs associated with savings but decreasing those associated with credit.

3.4. Adding limitations on savings

While constraints on borrowing are imposed by the lender, because of contract enforcement issues, limitations on savings are on the borrower's side. They come from aspects of "behavioral economics": household have difficulty to save because of pressures from others to share or from oneself to consume.

Introducing commitment devices to induce precautionary savings is tricky because these savings are meant to be for discretionary expenditures in periods of negative shocks, and not for a pre-defined planned expense that can be specified in the commitment. Inducements to save must thus come either from motivations unrelated to flexible access to savings (such as reminders, collectors, or lottery tickets), or from commitments that are related to shocks for which savings mobilization will be needed such as health emergencies (Dupas & Robinson 2013).

3.5. Policy implications

With a large span between low deposit and high borrowing interest rates, the savings-credit instrument is expensive and leaves a large range of shocks unprotected. A credit constraint further limits the value of the instrument as it leaves the worse negative shocks unprotected. On the savings side, low interest rate and lack of commitment mechanisms reduce the use of the savings instrument.

Policy implications to make the savings-credit instrument more effective to deal with risk are the following:

- **Savings and credit** are **both** needed to deal with risk, but **sequentially** according to the occurrence of positive and negative shocks relative to expected income. Households should be observed in either state, not both. MFIs must thus offer both flexible savings and flexible credit, with quick transition between the two states.
- Reducing the typically very large **spread** in interest rates between saving and borrowing (30 percentage points at SafeSave) will help reduce the range of uninsured risks, where self-insurance must prevail.
- **Access to loans** to cope with emergencies should be related to **past** precautionary saving behavior, not to the current level of saving, and savings should not be held as collateral on emergency borrowing. A depositor should be allowed to fully withdraw savings before borrowing if needed.

- Helping people help themselves should be applied to incentives to **reconstitute precautionary savings** as a loan is being repaid.

4. Presentation of some flexible financial products to address risk

Some MFIs offer flexible products to their clients. This section provides a description and evaluation of nonexclusive options designed to be microfinance services that are feasible for both borrowers and lenders. Doing so involves offering products that carefully balance flexibility and financial discipline. We can distinguish single products (like those of Bank Rakyat Indonesia (BRI), Financiera Confianza and Banco PROCREDIT), and composite products (the others) which combines elements of savings, credits and / or insurance.

4.1. Bank Rakyat Indonesia's lottery-linked savings account (Simpedes)

BRI is one of the largest bank in Indonesia and propose microfinance products. The saving product called "Simpedes" is innovative as it uses the lottery as a motivation tool that does not affect flexibility for the saver. This high liquidity associated to the lottery is very attractive for the poor. The lottery is organized by small localities where everybody knows each other. Number of tickets depends on the saving balance. BRI saving accounts can be served in all BRI units around the country. Customers of SIMPEDES also receive ATM cards that can be used in other domestic banking networks, supported by 24-hour Internet Banking and mobile banking services.

Table IV.1 : Main features of BRI saving product

Product Description	Flexibility features	Disciplinary features
No fee to open an account. No limitation on withdrawal. Target the middle / lower income (BRI 2010). Average annual rate : 2.41 (BRI 2010)	Minimum balance required. No limitation for withdrawal. No compulsory deposits. No fee for opening an account.	Lottery system organized twice a year encourages savings.

Source: based on BRI website: <http://bri.co.id/articles/18>, accessed January, 04th 2016

Performance and impact

In 2010, Simpedes represented 61 % of the total of savings deposits of BRI. They served as the main source of financing for microloans (*Kupedes*). There is a high demand for this product and from 2006 to 2010; Simpedes grew at an average of 18.76% per year. Up to 2010, the number of Simpedes account holders had reached over 22 million customers (BRI 2010). This demonstrates the large potential for savings among relatively low-income people when they have a safe place to keep their money.

Gertler et al. (2009) used data from the Indonesia Family Life Surveys (IFLS, 1993 and 1997) to test the impact of access to financial services on the ability of Indonesian families to smooth their consumption after declines in adult health, measured by individuals' physical abilities to perform activities of daily living (ADLs).

Their estimates suggested that the average value of BRI savings accounts was large enough to help families insure consumption against major illness for close to half a year, about 5.4 months. And after verifying that localization of credit institutions is not endogenous, they found that for communities which are located next to a BRI branch, health shocks have no effect on consumption. In contrast, the loss of an ADL in areas not served by a BRI branch lowers consumption by 2 to 3 %. These results are interesting as BRI units are associated with increase in savings which allows household to cope with health shocks.

The Bank of Agriculture and Agricultural Cooperatives in Thailand (BAAC) uses the same lottery system to encourage savings.

Recommendations for improvement of design and implementation

Simpedes are very attractive saving accounts for the poor because they are cost free and funds are available at any moment. BRI is continuously extending its network to reach more and more the poor, but it has also been demonstrated that the difficulty to save (Rutherford & Arora 2010) emerges because of external pressure from family and friends (Anderson & Baland 2002), failure to plan and lack of attention (Cadena & Schoar 2011; Karlan & Morduch 2010). BRI can cope with these patterns by introducing motivational devices that help people to save as much as they want through for examples dedicated saving accounts. However, these products would be less flexible and create additional cost for monitoring.

4.2. Seasonal loans: case of Financiera CONFIANZA (Peru) and Banco PROCREDIT (Salvador)

These contracts offered a lot of convenience as they fit closely the income and expenditure flow of farmers with loan installment and loan term adapted to the crop cycle, allowing the household to smooth their consumption. Banco PROCREDIT also has an innovative approach to collateral, because assets are estimated by their subjective or use value for the borrower rather than the recovery or market value for the lender.

Table IV.2 : Main features of seasonal loans

<i>Product description</i>	<i>Flexibility features</i>	<i>Disciplinary features</i>
Seasonal agricultural loans customized to client cash flow. The household is the financial unit. Repayment could be monthly, quarterly, semi-annual, annual or irregular.	Credit line (Confianza), rapid response loan (ProCredit) only for good clients. Discretionary use of funds for emergencies.	Diversified source of income A minimum of 2 ha of land and two years of experience in agriculture production is required by Financiera Confianza against one year for ProCredit. Penalty in case of late for loan repayment. Rigorous loan monitoring with regular visit to check the activity and remember repayment during harvest. Collateral is based on the household income. No tolerance toward default

Source: based on the institutions' websites, accessed January, 04th 2016

Procredit : http://www.bancoprocredit.com.ec/SitePages/Empresas/Financiamiento_Empresarial/Credito_Agropecuario.aspx

Financiera Confianza : <http://www.confianza.pe/productos/activos/inclusion/inclusion-agricola/>

Both Financiera CONFIANZA and Banco PROCREDIT offered emergency credit lines to their clients with good repayment history.

Product delivery⁵⁹

At Banco PROCREDIT, the loan officer organizes meetings with potential client in order to present the product emphasizing that in case of default all agreed penalties will be used including the seizure of collateral. Then, interested clients are interviewed by the loan officer with questions about sources of income for repayment, purpose of the loan, potential sources of collateral, and credit history, two references who are not relatives are also required. The loan officer will visit them and the client's home, place of business, and local community to evaluate the client's work habits, management capacity, character, and history of meeting obligations. With all the information gathered, the cash flow projection is established and the proposed loan is submitted to the credit committee (composed of loan officer, branch credit coordinator and branch manager) which approve, reject or modify the loan contract.

Like Banco PROCREDIT, Financiera CONFIANZA uses cash flow projection. It has developed partnerships with local public and private sector institutions that monitored weather patterns and agricultural commodity prices, in order to better predict repayment rates.

Performance and impact

Table IV.3 : Overview of performance in 2011

			Banco PROCREDIT	Financiera CONFIANZA
Gross Loan Portfolio (USD)			214.7 million	168.0 million
Number of active borrowers			23,503	91,102
Number of Rural borrowers			n.a	11,578
Number of Agricultural loans			1274	n.a
Portfolio at risk > 30 days⁶⁰			14.04 %	4, 87 %

Source: <http://www.mixmarket.org/mfi/PROCREDIT-slv#ixzz2TA5Q8Hdv> / <http://www.mixmarket.org/mfi/financiera-Confianza#ixzz2TA59n8al>, accessed 13 May 2013

Financiera CONFIANZA and Banco PROCREDIT are among the best performing MFIs in Latin America (CGAP-IFAD, 2006) in terms of financial sustainability and outreach. They are

⁵⁹ From (Bucheneau & Meyer 2007).

⁶⁰ Defined as the total value of loans with payments more than 30 days overdue as a percentage of the total portfolio.

both profitable and in March 2013⁶¹, Banco PROCREDIT had 1274 active agricultural loans representing 6.06 per cent of its total portfolio with an amount estimated to US \$ 8,273,246 about 4,33% of the institution's total gross loan portfolio. With 91,102 active clients in 2011, Financiera CONFIANZA has more clients and the proportion of agricultural loans is higher.

Both institutions have a diverse portfolio and limit the proportion of agricultural loans to cope with risks and shocks and ensure their sustainability. But this exclude highly impoverished people conjugated to the income diversification requirement to have access to loan.

Banco PROCREDIT and Financiera CONFIANZA have well managed their seasonal loans to respond to the cyclicity of income and expenses in rural areas. But as underlined by Laureti & Hamp (2011), these short term contracts respond only to seasonal working capital needs, they don't permit to cope with natural disasters and price volatility which are a great concern for farmers, except for good clients who have access to emergencies lines of credit. For Banco ProCredit, about 75 to 90 % of the requests for rapid response loans were approved in 2006 according to Bucheneau and Meyer (2007).

Concerning Banco ProCredit, Gonzalez-Vega et al. (2002) have investigated the dynamics of the rural clients' income situation and corresponding poverty measures from 1997 to 1999. During this study, they interviewed a sample of 241 households that were clients of PROCREDIT in 1999 and compared their characteristics with those obtained in a random sample of rural households. They found that on average, the income of rural clients had relatively decreased but it is less volatile in comparison to rural non-clients. This reduction in income volatility appears to indicate that access to credit has enabled these households to invest in new activities which generate less income on average at the moment but which allow for a reduction in income volatility. Evidence suggested that they redirected their resources to more stable activities, like formal employment.

Concerning clients' satisfaction, in rural areas, they were in general satisfied with the products. Their main criticism was the level of interest rate even if it was not higher compared to the most direct competitors. Secondly, they disliked the size of the instalments, which may point to a shortcoming of the credit technology and its adjustment to the rural income situation. The distance from the branch bank was also criticized.

⁶¹Banco PROCREDIT (2013), "Informe Financiero", EL Salvador
Available at <http://www.bancoprocredit.com.sv/?cat=1016&title=Informes%20Financieros&lang=es>, accessed 14 May 2013

Recommendations for improvement of design and implementation

In order to include more poor people, accent could be placed on asset building with dedicated saving account for example. Dupas & Robinson (2013) demonstrated that allowing the poor to have a safe place where to put their money for a particular purpose could increase savings. Their savings could allow household to diversify their source of income and then to have access to loans.

4.3.SafeSave financial services model

Table IV.4: Main features of SafeSave financial products

	Savings	Credits
Product description	<p>Passbook saving</p> <ul style="list-style-type: none"> - Annual interest rate of 36% above a minimum balance <p>Long term saving (LTS)</p> <ul style="list-style-type: none"> - Interest rate higher than passbook saving - Monthly deposit for a defined term of up to ten years 	<ul style="list-style-type: none"> - Loan linked to passbook saving as collateral (1/3) - For LTS, it is possible to borrow 80% of the account balance.
Flexibility features	<ul style="list-style-type: none"> - Circumvents need for credit history requirement to obtain a loan via the establishment of a savings account - Flexible loan duration - Flexible repayment schedule 	
Disciplinary features	<ul style="list-style-type: none"> - Passbook with limitations on withdrawal (daily maximum - A minimum passbook savings balance equal to 1/3 of a loan balance is required as collateral at all times for borrowers - Monthly interest payment 	

Source: based on Safe Save's website: the <http://www.safesave.org/products>, accessed January, 04th 2016

SafeSave is an organization in Bangladesh, started in 1996 by Stuart Rutherford, which offers three financial services for the poor. Since 2014, it has become a BRAC project, Bangladesh's biggest and best-known NGO. These services include:

- **Passbook Savings:** Clients may deposit as little as one taka (\$0.012) when the collector calls at their house each day. Clients may withdraw up to 500 taka per day (\$6) at their doorstep, or up to 5,000 taka per day (\$60) at the branch office.
- **Long Term Saving (LTS):** In case of early closure or withdrawal, client loses the higher interest rate which becomes equal to the passbook saving account.

- **Loans:** All borrowers start with a credit limit of 5,000 taka (\$60). One loan at a time may be taken per household. Maximum loan interest is 3% per month on the declining balance (36% per year in nominal terms, or about 30% in real (inflation adjusted) terms). For the entry-level loan (of 5,000 taka), and for all loans as soon as their outstanding balance falls to 5,000 taka or below, 2.5% per month is charged (SafeSave 2013).

Product delivery

SafeSave hires field workers to visit their clients door-to-door at their home on a daily basis in order to collect payment on loans. Loans are delivered on an individual basis and there are no community meetings involved. There is no minimum loan size and clients are not required to borrow at all.

Performance and impact

At the end of 2012, SafeSave has nine branches serving 18,700 clients residing in Dhaka. The total dollar amount held in client savings accounts is \$1,057,000 US Dollars. The average individual savings balance is \$57. Approximately 50% of clients hold loans, which are worth a total of \$700,000, with an average per borrower outstanding loan balance of \$72. The loan recovery rate exceeds 97%, suggesting that it is a very safe and feasible model. However, there are aspects of the SafeSave model that could be acting as a barrier to loan uptake. Daily collection visits may place significant pressure on borrowers and act as a disincentive against the uptake of financial services amongst potential borrowers.

The second issue is that, given its collateral requirement for loans, SafeSave is virtually unable to serve the poor who possess little to no collateral. SafeSave attempts to deal with this problem by offering savings accounts for farmers to invest in, in order to reach a certain savings level that can be used as collateral for a future loan. However, given the low savings rates of 6%, this would take considerable time for poor rural farmers to qualify for a decent-sized loan if deposits are small in relation to the cost of required farming inputs. Landless farmers, who may be more short-term oriented, would elect to not pursue SafeSave services.

Recommendations for improvement of design and implementation re SafeSave

This analysis recommends that SafeSave set up savings services with higher savings rates to expedite the time needed to obtain a savings level required to further obtain a substantial loan amount. Moreover, according to our theoretical review, access to loans to cope with emergencies should be related to past precautionary saving behavior, not to the current level of

saving, and savings should not be held as collateral on emergency borrowing. A depositor should be allowed to fully withdraw savings before borrowing if needed.

4.4.Fixed savings plan by Vivekananda Sevakendra-O- Sishu Uddyon (VSSU) in India, West Bengal

Its microfinance offer includes term saving plans with the possibility to take a credit based on saving balance like for SafeSave.

Clients are encouraged to save both with **deposit side mechanisms** that help clients make regular deposits and **withdrawal-side mechanisms** that help clients restrict the use of their funds except for well-planned uses or emergencies (Ashraf et al. 2003).

As **deposit side mechanisms**, Deposits can be daily (DD), weekly (WD) or monthly (RD) or a one-time saving, fixed deposit (FD). Clients have the possibility to take a deposit loan after three months with decreasing interest rate on loan outstanding except for WD, with a 12% flat interest rate per year. For fixed deposits, the maximal loan amount is 80 % of the saving balance. For the other schemes, the loan can exceed the saving amount but the interest rate is higher in this case. Loyal clients with good repayment can get an over deposit loan and repay within 6 months at the reducing balance of 2% per month.

Concerning **withdrawal side mechanisms**, for early withdrawal; no interest is served before 12 months and clients paid fees or lose their interests. Such penalties are higher if they occur early and decrease with term. Assurance death facilities are also available for each saving product if the client makes regular deposit and respects a minimum maturity date.

Table IV.5: Main features of VSSU flexible products

	Savings	Credits
Product description	Saving account (saving up)	- Loan based on saving deposits (saving down) - Customized emergency loans to good clients
Deposit side mechanisms	- Flexible frequency for deposit - Interest rate increases with term if regular deposit - Gifts at the maturity date for clients if they make regular deposit for daily deposit (DD)	
Withdrawal side mechanisms	- Minimum deposit is required - Penalties for premature closing or early withdrawal - Proper interest is paid only if the predetermined contract is respected.	
Flexibility features	- Additional loan deposit available for clients with good repayment history. - Early withdrawal and premature closing are permitted with a cost in case of emergencies	
Disciplinary features	- Door to door fund collectors - Constraints on withdrawal	

Source: based on (Rutherford et al. 2002)

Product delivery

Clients can open a saving account at branch offices or with a collector after filling an opening form and paying Rs. 10 (\$0.16). Funds are collected at client's doorstep by VSSU employees. To get a loan client must go the branch office with a responsible guarantor of his family. Loan is reimbursed at branch or head offices.

Performance and impact

VSSU strategy which is based on helping the clients maximize their potential to save firstly and then transform these savings on helpful lump sums for household expenses, investments or emergencies needs, is the key of its success. This transformation occurs through 1) **saving up** by giving a safe place to savings until they matured into a useful sum and 2) **saving down** through loans by taking an advance against savings (Rutherford and al. 2002). But these incentives to save create rigidity in using saving for emergencies

In 2011/12, the number of active clients was 15,608 from 10,536 in 2006 with a cumulative total of 97,044 members. VSSU has reached 398 villages but the number of branches and staff has decreased since 2009/10. The repayment rate is important; about 96.4% in 2008/09.

In 2002, Rutherford and al.(2002) carried an evaluation of VSSU. They showed that VSSU offered more convenience in practice to its clients with “charges waived, timetables and schedules curtailed or extended”, even if it is not mentioned in the contract. This is because of the special consideration system for each client “bibochena” which is very subjective based on the collector appreciation.

They also found that despite penalties, about 60 % of all savings plans were encashed prior to maturity and the effective interest paid for a term of 24 months was 3%, below the advertised rate of 4%, contributing to the profitability of VSSU.

Concerning client’s perception of VSSU products, they were generally satisfied especially for the daily plan. But we had complaints about the price structure which is complex and not clear for all the clients. As examples, some clients did not understand why withdrawals were not available or were more costly than bargained for. It is important to mention that in 2002, withdrawals were not yet possible for monthly scheme except for premature close with penalties. Among other differences, the minimum deposit for DD has doubled, WD has been introduced and saving maturity has augmented. In 2002, it was possible to have a loan amount which exceeds the saving amount for fixed deposit and it is no more the case.

Recommendations for improvement of design and implementation

The timing which consists in giving access to a safe place for saving and then to give credit is pretty astute and VSSU demonstrates that this strategy is profitable. VSSU has succeeded by combining savings facilities with commitment measures. The institution has already taken into account the recommendations of the assessment of Rutherford and al. (2002) like investment in management system, computerization etc. For the special consideration system for each client

“bibochena” the institution has been encouraged to translate the results of this system into transparent codes of practice.

4.5. Barclays Bank and the Susu Collectors in Ghana

It is about the collaboration between the Barclays Bank, a multinational bank group and the Susu collectors⁶² who are active in informal sector. The idea is that linking formal and informal financial services providers could improve the service offered by combining the strengths of the two types (Pagura & Kirsten 2006). The approach of Barclay's bank to reach poor clients is innovative and complete as it integrates access to financial services through a well-established informal actor. The cooperation allows Susu collectors to give more important amount of credit to their clients with high level of convenience (little bureaucracy, no collateral, low transaction cost). The program includes capacity building on credit, risk and delinquency management in the financial sectors for Susu collectors, and courses on good financial management for their clients.

Table IV.6 : Main features of Barclays Bank and Susu collectors' product

	Saving	credits
Product description	Passbook account	<ul style="list-style-type: none"> - Credit card - Maximum borrowing linked to minimum saving - Interest rate : 2.1%
Flexibility features	<ul style="list-style-type: none"> - Credit limit with flexible use - Flexible repayment within 12 months of drawing 	
Disciplinary features	<ul style="list-style-type: none"> - 3 to 5 year card renewal to Susu collectors from the Bank - Collection of deposit at client's doorstep on daily visit by Susu collectors 	

Source: based on (Laureti & Hamp 2011)

Susu collectors visit each client at their home or workplace to collect a predetermined amount of money on a daily or weekly basis over an agreed period, usually one month. At the end of the period, the accumulated savings are returned to the depositor minus a commission generally equivalent to one day of deposit, corresponding to a monthly interest rate about 3.3%. Since

⁶²"Susu, or daily deposit collection, is a traditional and informal financial institution in West Africa and can be traced back at least three centuries. It is called “ajo” among the Yoruba of Nigeria, “nago” in Ivory Coast, “Yesyes” in Southern Togo and “Susu” in Ghana" (Osei 2008).

2005, Barclay Bank has been providing savings account and investment capital for on lending to Susu collectors in order to facilitate their intermediary action.

Performance and impact

As underlined by Laureti and Hamp (2011), the results of the program were relatively good. From 100 Susu collectors in 2005, their number has attained 500 in 2007. About 70% of them had been trained, and 81% were satisfied about the program. If we considered that a Susu collector has between 200 to 1,500 clients (Osei 2008), the program had indirectly reached about 100,000 to 750,000 persons.

An impact evaluation also showed that 72% of Susu collectors had increased the number of their clients since they joined the program (Laureti & Hamp 2011).

Concerning client satisfaction, 61% said their lives had improved and 93% of those in business recorded an increase in sales and income. Saving and loans proposed by Susu collectors are flexible and could be adjusted to changed circumstances, such as emergencies. Moreover, with capacity building and training, clients who become more comfortable with the financial formal system are encouraged to open an account in a formal institution.

Recommendations for improvement of design and implementation

Susu collectors are well organized in Ghana, they are federated in an association and this has facilitated their participation and their monitoring by the Barclay's bank and its partners. In order to scale up the Ghana program and start microfinance operations in other countries, this strategy could be replicated by looking at the existing financial system and the possible linkages which can be developed to reach poor clients. Concerning outreach, it is limited to Susu collector's clients, it could be interesting to look at other partnership maybe with other MFIs which operate in more remote rural areas.

4.6.M-PESA and M-Shwari in Kenya

M-PESA is a mobile phone-based, person-to-person payment and money transfer system that was developed and implemented in Kenya in 2007 by Safaricom, a Kenyan mobile network operator. M-PESA is not a traditional microfinance product in that it does not provide loans or credit. M-PESA allows users, using their personal mobile phones, to store funds in a digital account. Users are also able to deposit or withdraw funds in the form of hard currency at an M-

PESA agent location. But, access to credit should be obtained from another source as Safaricom has developed partnership with multiple operators (banks, nonprofit organizations, insurance companies, health service providers...).

The collaboration between the Commercial Bank of Africa (CBA) and Safaricom has resulted in the creation of **M- Shwari**. It is a banking account which can be used by M-Pesa users to save and borrow their money while earning interest on money saved only by a click on their phone. Clients can also ask for an emergency loan for a minimum amount of Kshs. 100 (\$1.14) and a maximum of 20,000 (\$227.4) which is obtained after verification of their creditworthiness by a credit scoring system.

Table IV.7: main features of M-pesa / M-shwari products

	Saving	credit
Product description	<ul style="list-style-type: none"> - Savings account accessible through M-Pesa - No fee for withdrawal - No minimum balance 	Emergency credit on demand through M-Pesa
Flexibility features	Serves to qualify for emergency loan	Emergency credit on demand.
Disciplinary features	SMS reminders	Credit scoring

Source: <https://www.safaricom.co.ke/personal/m-pesa>, accessed January, 04th 2016

Performance and impact

These products provide the means for users to save and smooth consumption without having to physically be present at a bank, which reduces transaction costs for both banks and users. But the necessary technological and physical agent infrastructure needs to be accessible to potential users. This requires monetary investment and the initial monetary investment, excluding the provision of mobile phones, amounted to 1.9 million sterling pounds (US\$ 3,063,750) (Karugu & Mwendwa 2008). There are 65,547 M-Pesa agents located throughout urban and medium-to-large market centers in the country. 26,000 M-Pesa agents were added in the last financial year. Kshs 522 billion Kenyan Schillings (\$ 6,181,158,600) was transacted between customers within M-Pesa. Kshs 444 billion Kenyan Schillings (\$ 5,257,537,200) were deposited into M-Pesa via agents. 390 billion Kenyan Schillings were (\$ 4,618,107,000) withdrawn from M-Pesa via agents (Safaricom 2013).

According to Okutoyi (2014), in February, 2014, the number of M-Shwari users amounts to 6 million individuals. Customer savings have reached over Kshs 24 billion (\$273,120,000) over the same period, with Kshs 7.8 billion (\$88,764,000) loaned to users at an average disbursement

rate of 30,000 loans per day. The non-performing loan rate is about 3% for M-Shwari, below the average banking sector non-performing rate of 5%.

Jack and Suri (2014) studied the impact of M-Pesa, Kenya's mobile banking system, on consumption through a randomized control trial. They used an annual balanced panel from 2008 to 2010 controlling for various factors like cell phone ownership, use of bank accounts etc. They find that over a six-month period, while non-users experience a 7 to 10 % reduction in consumption due to negative shock, M-Pesa users are able to smooth shock perfectly and do not experience any significant reduction in consumption. Demombynes & Thegeya (2012) also find that, all else equal, the introduction of M-PESA increased the likelihood to save by 20% and average monthly savings by 12%.

Recommendations for improvement of design and implementation

Given the findings listed above, M-PESA and M-Shwari are proven mechanisms to enhance the responsible economic behaviors of their users, namely increased savings and consumption smoothing. M-PESA mechanism is in high demand amongst those who were previously unbanked and this spurs enormous economic activity. M-PESA and M-Shwari are complementary in providing access to transfer mechanism, loan and saving facilities, whereby borrowers could access their loans digitally. More research on M-PESA reduces moral hazards is needed.

4.7. Self Employed Women's Association (SEWA): flexible products for poor women and their relatives in India

VimoSEWA offer a choice of microinsurance schemes covering life, illness, accidental injuries and property loss with options to also cover husbands and children for a lower incremental fee. Products are available at various prices in order to ensure affordability. The main features are that clients have two ways to pay for coverage 1) via a fixed deposit saving account at SEWA Bank, in this case, premiums are paid with the interest accrued from their savings account or 2) annual payments.

In addition to insurance linked to fixed deposit, SEWA bank also offers credit linked to deposits, for example in case of emergencies and after one year of regular saving, the member can get a loan in lieu of the savings kept with the bank.

Table IV. 8 : Main features of SEWA products

	Saving	Insurance	Credit
Product description	Saving account	Insurance for life , hospitalization, accident, and assets	Loan linked to saving balance, accessible after one year of regular saving.
Flexibility features		Link saving to insurance with assistance to save and pay premium.	Access to overdraft loan in lieu of saving in case of emergencies
Disciplinary features	Payment of premiums from interest of fixed deposit. Door to door premium collection SMS reminders Access to loan based on regular deposit		

Source: <http://www.sewa.org/images/pdf/new/product.pdf>, accessed January, 04th 2016

Product delivery

SEWA insurance is a collaborative effort of SEWA, SEWA Bank and the nationalized insurance companies. Products are marketed and delivered at grass root level through Vimo Saathis, which is a team of women composed of Vimo Aagewans. A Vimo Aagewan is "a community leader trained on the subject matter of insurance, and taught how to sell and service the insurance product" (Garand 2005).

At Sewa Bank level, banksathis are the bank's frontline worker. Supervised by a bank facilitator, banksathis collect savings and assess the creditworthiness of potential borrowers, and they explain them loan process and repayment rules.

Performance and impact

Starting in 1992 with 7,000 members, in January 2013, 119,477 individuals (62060 women, 36258 husbands and 21159 children) are insured under National Insurance VimoSEWA Cooperative Ltd., in both urban and rural areas (VimoSEWA, 2013 website)⁶³. Between 1992 and 2008, 65,953 claimants have received benefits during the crises in their lives with a total payout of Rs 126 million about 2 million USD.

The number of insurers is not stable over years, with increases and decreases as well as the renewal rate which was about 60% in 2010 (Yadav, 2010). Among factors influencing these fluctuations, we have raised in premium or fixed deposit amount. A study by Garand (2005)

⁶³ <http://www.sewainsurance.org/aboutus.aspx>, accessed January, 04th 2016

found that from 2002 to 2005, the low renewal rate was due to annual premium option because the renewal rate for fixed deposit option was around 100%. Asset insurance was the much used product.

The fixed deposit method minimizes VimoSEWA's premium collection costs, creating a semi-permanent user. The disadvantage appears when the FD amount has to increase due to an increase in premium or declining interest rates; members have to be convinced again to contribute.

VimoSEWA has already experienced many covariant shocks with the Gujarat earthquake in 2001 and the communal violence in 2002 which have led to the establishment of a disaster team to better manage earthquake and other crisis (Garand 2005).

Recommendations for improvement of design and implementation

VimoSEWA is centred on insurance products for self employed women in India in order to help them manage risks. But, it has been demonstrated that insurance take up is generally low for poor and illiterate persons who do not understand all the principles, rules and claims process. So, the fixed deposit option is really interesting as it eschews the need for premium collection. Access to flexible loans in case of emergencies after at least one year of regular saving is a good option as loan is based on past precautionary saving behavior, not to the current level of saving.

4.8. Composite financial products studied in Nicola et al. (2012)

This study analyzes the impact of three innovative products, namely weather index insurance, insured credit, and savings account that could improve farmer's ability to cope with agricultural risk. The authors used a dynamic stochastic model applied to the data of an Ethiopian household survey to study the impact of these products on consumption, investment and welfare gains. Its main contribution is to assess the effect on welfare gains of the combinations between the three products.

Product description and flexibility features

Weather index insurance: it permits to manage covariate shocks only. Farmers receive payouts when the local weather station indicates that drought or extreme climatic conditions are going to affect their crops. Take up of such products has been low mainly because of basis risk. This situation is due to the fact that weather index is not based on loss assessment so farmers may experience income reduction which are not indemnified.

Insured agricultural loans: the bank insures its agricultural loan portfolio through an index insurance. Consequently, farmers are allowed to stop their loan repayment when index insurance pays out. In this case, weather index insurance and insured agricultural loan are complementary. But it is not sure that small farmers will have enough money to take at the same time a credit and insure both their lending and their livelihood.

Saving accounts: while weather index insurance is not effective to manage idiosyncratic shock, saving can be used to cope with both covariate and idiosyncratic shocks. When a shock occurs, farmers use saving that they had accumulated during good years. So saving and index based insurance are substitute for covariate shocks. But saving could be insufficient in case of severe shocks or against shocks which occur in quick succession.

Main Results of the Evaluation

The most interesting results concern those of combined products with better welfare gain and more possibility to manage risk. Authors found that:

- Saving products mitigate the welfare loss due to basis risk when they are combined with weather index insurance.
- Offering a combination of weather index insurance, insured credit, and savings leads to higher welfare gains.
- Welfare gains are higher for the poorer farmers who enjoy benefits both from insurance and additional resources to finance agricultural investment and growth faster. So their income become less volatile as they can manage more effectively risk and shocks.

5. Concluding remarks

Flexible financial products for transfers, savings, credit and composite financial products offer promising complements to index-based insurance in risk management and risk coping. Lessons derived from both theory and practice are the following:

- While theory tells us that **savings and credit** must **both** be used to reduce uninsured risks, complemented by index-based insurance as protection for extreme events and for cases where credit constraints apply, there are still few MFIs that offer these products in a flexible and complementary fashion. Innovative partial solutions have been introduced in the case studies reviewed. Exploring the saving-credit-insurance relation

and the design of corresponding composite products is needed to reduce exposure of the poor to uninsured risks. Relying on index insurance alone will not suffice.

- **Incentives to save**, and not to dis-save, can be provided without compromising **flexible access** to savings for risk response. This includes motivational devices such as frequent reminders, visits of deposit collectors, peer pressure, lottery, and pledged savings plans with renegotiable (default) options that do not interfere with flexibility. It also includes dedicated savings accounts related to shocks, and indexation of withdrawals on observable shocks.
- **Flexible loans** can be extended without compromising on repayment **discipline**. This includes credit lines, credit cards, and demand-driven rapid access to emergency loans. Implementation requires introducing disciplinary practices by the providing MFI such as careful selection (collateral, credit scoring from past experience with the MFI or based on credit bureau information servicing MFIs, established reputation), careful monitoring (frequent visits by credit officers), and enhanced sanctions on defaults (fines, ostracization). Difficulty is to design these disciplinary practices in such a fashion that they do not introduce participation constraints that selectively exclude the poor.
- **Composite products** can be constructed to build on complementarities between financial products in handling risk. Most important is a combined saving-credit instrument, with SafeSave the closest approximation to lessons derived from theory. This also includes savings to reduce basis risk in index-based insurance and institutional-level insurance to encourage borrowing.
- **Customization** of micro-finance services can be applied to flexible products. This is all the more important as market failures are idiosyncratic and determine the optimal combination of financial products to deal with risk.

Based on what we have seen in this study derived from theory and practice, the **design** of a financial product to reduce uninsured risks for the poor would have the following features: (1) Motivated flexible savings options are offered for the purpose of coping with shocks. Motivation is orthogonal to or dedicated to risk. Depositors can draw on savings in response to shocks either freely or conditional on verification of the shock in accordance with the dedicated purpose of saving. (2) Flexible credit lines are offered to respond to shocks as precautionary savings are being de-capitalized. Assistance is provided to reconstitute savings with pledged savings plans linked to the repayment of debt. (3) For farmers, index-based insurance is provided at the institutional level to cope with extreme events. This can take the form of social protection as a club good for members of associations or of administrative entities.

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7. Appendices

Appendix IV-1 : Kisan card model, National Bank for Agriculture and Rural Development in India

Table IV.9 : Main features of Kisan card model

Product description	Flexibility features	Disciplinary features
Credit card associated to a passbook.	Maximum borrowing linked to minimum saving and collateral Credit limit with flexible use. Flexible repayment within 12 months of drawing. Borrowers can time loan withdrawal.	Loan amount tied to a minimum savings amount. Card valid for 3 to 5 years subject to annual review.

Source: based on Chanda (2012)

Product delivery

The model targets farmers by providing loans loaded onto a credit card. Farmer borrowers are able to withdraw loan funds from ATMs or use funds at merchants that accept credit cards. The unique feature of the KCC is that borrowers are able to, at their discretion, withdraw loan funds in portions over time.

Performance and impact

Table IV.10 : Merits and Limitations of KCC

Merits	Limitations
Reduction in work load for branch staff by ridding the need for repeat loan appraisal and processing of loan papers under KCC. Minimum paper work and simplification of documentation for withdrawal of funds from the bank.	Financial services not accessible to clients without collateral. No data on loan recovery for Kisan Credit Loans.

Source: based on Chanda (2012)

The most recent data shows that as of 2011, approximately 100,000,000 Kisan Credit Cards have been distributed to farmers in India. Cooperative banks distributed 44.38% of Kisan Cards, commercial banks distributed 41.67%, and regional rural banks in India distributed 13.93%. (Chanda 2012).

The KCC has shown to have an impact on agriculture shares and subsequent economic growth in India. States that have had low initial shares of agriculture and employed the KCC scheme

have done well both in terms of subsequent growth in overall GDP per capita and agricultural productivity (Chanda 2012).

Sajane et al (2011) found that the total cost of credit as percentage of borrowed amount was higher in non-Kisan credit card category (11.06 %), in contrast to the KCC (4.77 %). This reveals that the KCC has the added benefit of dramatic cost reduction for borrowers when compared to other types of lending, including informal lending. Of notable concern regarding the impact of the Kisan Credit Card Scheme is that default and recovery rates are not collected (Chanda 2012).

Jainuddin et al (2013) also assess the impact of KCC Scheme on farmers in Bellary district of Karnataka. They find the holders of KCC invest higher amounts in inputs and have higher returns per rupee spent compared to non-KCC holders.

Recommendations for improvement of design and implementation re Kisan model

The Kisan Credit Card Model adopts many of the same tenets of the SafeSave scheme such as the flexible repayment schedule mechanism. This model, however, eschews daily visits and uses a card renewal scheme as a method of enforcing financial discipline. The Kisan Card Model has been in existence for approximately 14 years and, as mentioned above, demonstrated to lower borrowing costs for both clients and banks.

However, the Kisan Card Model is not without its faults. A significant problem is that there is not any information on its outstanding loan recovery record. Also, this model still renders microfinance inaccessible to farmers without sufficient collateral. The Kisan Credit Card Scheme also proposes the use of savings account system for those with no collateral to begin the building of collateral, so that they may eventually meet the requirements that permit access to the Kisan Credit Scheme.

Appendix IV-2: Flexible health saving products presented in Dupas and Robinson (2013)

Product description

To understand why the poor are limited in their ability to save, authors used a field experiment strategy in Kenya in which they experiment four innovative products with participants of Rotative Saving and Credit Association (ROSCA). These products are:

Safe box: it functions as a simple saving account with soft commitment. Respondents were given a locked box with a padlock and the key was provided. They had to choose a health product that they were saving for and record each deposit.

Lock box: it is the same system like the safe box but the key was kept by the program officer. When they reached their saving goal, respondents called him and they meet at the shop to purchase the health product.

Health pot: ROSCA participants were invited to contribute to a health pot in addition to the regular ROSCA pot. The health pot was earmarked to a specific health product. Respondent were encouraged to choose the same product and to purchase the health product on the behalf of the pot recipient or to accompany him to the shop.

Health saving Account (HSA): this product also took advantage of the ROSCA structure but an agreement among the members is not required. Each participant was encouraged to make regular deposit on an individual saving account earmarked only for health expenditures. The account was managed by the ROSCA treasurer.

The Lock box and the Health pot were designed to mobilize saving for preventive health expenditure and HSA for when health shocks occur. The safe box could be used for both preventive and curative purposes.

The study had evaluated for each product:

Taking up of the savings technologies (adoption).

Investment in preventive health products.

Whether households are able to deal with health emergencies.

Flexibility features

Conditions for withdrawal congruent with risk

Products can be used for preventive health expenditure and health shock.

Financial discipline features

Commitment saving for health purposes

Main Results

Taking up for all four products was high. After 12 months, take up was respectively, 71 % for the safe box, 66% for the lock box, 72% for the health pot and 97 % for the HSA among those sampled for each product. Concerning investment in preventive health products, the *Safe Box* increased investment by about 68% while the *Health Pot* increased investment by about 129%. By contrast, the *HSA* treatment had no effect on investment, which is not surprising in that it was to be used for saving for health emergencies only. This demonstrate that a saving product for a specific purpose encouraged savings. With earmarking, it was easier to avoid unplanned months expenditures. Savings were labeled for a specific purpose and they became not fungible with other sources of income, despite the money is accessible. Labeling here is a form of mental accounting that act as commitment device (Thaler 1990).

The experiment also highlights the fact that informal mechanisms such as ROSCA are insufficient, because giving people only a simple safe box permits to increase savings.

In average, earmarking for preventive health was ineffective for the average individual in contrary of earmarking for health emergencies for which the saving was more liquid.

The impact also vary according to background characteristic:

The only subgroup which continues to pay for preventive health is “the most tax by their social networks” who are always solicited for money by their relatives and receive no assistance in return if needed. These findings are consistent with those of Anderson & Baland (2002), and Jakiela & Ozier (2012) that found respectively for Cameroun and Western Kenya that middle class people or people who are willing to pay prefer to lost money by taking a loan in order to send a signal of their poverty and avoid being asked for money.

Time inconsistency is also an important constraint. For individual with present biased preferences to save more, only the last product permits to increase their saving. So they need products not only with earmarking but also with a strong commitment to make regular loan deposits.

Intra-household heterogeneity in time preferences provokes a misallocation of saving as demonstrated by Schaner (2012) for Kenya.

Appendix IV-3 : Products experimented in Clarke et al (2012)

The authors used an experimental demand elicitation to assess the demand of different kind of insurance and savings accounts by small farmers in rural Bangladesh.

Product description**Insurance**

The authors proposed index based insurance products which covered both covariate shocks like flood, extreme drought and other event which affect yield like pestilence or crop disease which can be idiosyncratic. Respondents have to choose between the basic, medium or high coverage which prices are respectively 600, 1,200 and 1,800 taka, correspondingly to \$8, \$15, and \$23. Life and disability insurance are also proposed in order to cover against idiosyncratic household level shocks like illness.

Savings

Respondents had the possibility to choose the **group saving option or individual saving**. Under the first scheme, each member contributed a same fixed amount and withdrawal are allowed in case of agricultural or non-agricultural emergencies. It is the group which decided, what an emergency is and the maximum of money that could be lend. The individual saving account was fully flexible because we did not have withdrawal restrictions. Interest rate was fixed at 5 % per year for both options.

For some farmers, group saving could be substitute for life and disability insurance products because they are both effective in coping with idiosyncratic shock. Index insurance covers only covariate shocks that are not taken into account by group saving, so these two products are complementary. Individual saving could be a substitute for any kind of insurance because farmers can use it to manage both types of shocks (covariate and idiosyncratic).

Table IV.11 : Flexibility and financial discipline features

<i>Flexibility features</i>	<i>Financial discipline features</i>
<ul style="list-style-type: none"> - Index insurance are effective in case of covariate shocks. - Life and disabilities insurance are useful in case of individual idiosyncratic shocks. - Group saving are designed to manage agricultural and non-agricultural emergencies according to the group definition. - Individual saving with no limitation on withdrawal. 	<ul style="list-style-type: none"> - Payouts for insurance are based on an independently and verifiable index and situation. - Peer monitoring under group saving option.

Product delivery

First the authors used a wide variety of data to determine the kind of risk faced by farmers in rural Bangladesh as well as the risk coping mechanisms generally used in the absence of insurance markets. Then they designed products to offer protection against those risks.

Each participant received 30 stickers corresponding to 600 taka (about US\$ 8). They can allocate the stickers to the types of insurance and levels of coverage they need. If they did not choose an insurance product, they kept their money in their individual saving account with an interest rate of 5% per year. Only the price of area yield insurance was varied across sections.

Main results of the experiment

For insurance

Respondents allocate 90 % of the stickers to insurance products and the remaining mainly on savings. Among insurance products, death and death of spouse were the most popular choice for life and disabilities insurance. For agricultural insurance, insurance for dry days and area yield products were the most commonly selected.

Agricultural demand of each insurance reflects the prevalence of risks, as example in sub districts where pest and disease were prevalent during the last five years, demand for area yield insurance was higher, likewise for drought. For flood insurance, the result was not significant may be because the index had design problems and ineffectively captured flood.

Demand for area yield insurance fell with increasing price.

Male participant tend to choose drought index insurance while women are more interested by life insurance for their spouse. Older farmers prefer area yield insurance.

Risk aversion is not significant in determining the take up of insurance overall may be because it had not been well measured.

For savings

Group saving was preferred by individuals and its demand reached 77% when insurance decisions were made as group. They seemed to be a substitute for life insurance which demand decreased when the first is proposed. This not the case for other insurance products, their demands were not significantly affected. Group decision is influenced by the more educated farmers who were more able to impose their vision. In the case of Bangladesh, the experiment shows that rural farmers are interested in products which cover both covariate and idiosyncratic shocks and how they can be used as substitute (group saving and life insurance) or as complementary (group saving and agriculture insurance). The price was also determinant as an increase in area yield insurance reduced its demand.

General conclusion

1. Main results

This thesis has examined the impact of financial development respectively on child labor, working poverty, and the informal sector in developing and emerging countries. It also explored how financial products could be designed in order to help the poor to handle shocks. Thus, it is divided into four chapters. Chapter one focuses on the joint effect of financial development and inequality on child labor. In contrary to previous macroeconomic studies (Rajeev H. Dehejia & Gatti 2005; Ebeke 2012), we find that child labor is positively associated with financial development, and this effect is mainly driven by countries with high level of inequality, since opposite effect is found for countries with low level of inequality. The positive relationship indicates that with access to credit, households tend to invest in productive activities which increase the opportunity cost of education and the returns from child labor. Given that parents' decision depends essentially on three elements: the cost (including the opportunity-cost) of education, the expected return to education, and the extent to which they are able to finance educational investments; we also analyze if influencing the returns from education through enhancing its quality can help reduce child labor. Hence, we investigate the role of institutions quality in conditioning the effect of financial development and we control for education spending, and the efficiency of education services. We argue that better institutions through a better control of corruption or bureaucracy quality will improve education quality. Our results indicates that financial development will be effective in reducing child labor only in countries with better control of corruption which improves the provision of public services. In fact, providing a better quality of education will enhance the returns from schooling and influence the decision of households in the sense of more education than labor. This better control of corruption also conditions the effectiveness of public education spending for reducing child labor.

The second chapter investigates the effect of demographic bank branch penetration (financial access) on the proportion of workers living with less than US\$ 1.25 a day. We show that access to financial services reduces the prevalence of working poor. Furthermore, this impact is more relevant in countries affected by strong macroeconomic instability, suggesting that the positive effect of shocks on working poverty is lower when the poor have better access to financial services. Given that a better access to financial services does not benefit only to the poor, we

demonstrate that a better access for the excluded non-poor workers can have a strong reducing-effect on working poverty. Given the importance of remittances and the fact that mobile banking is revolutionizing the use of financial services in the developing world, we also control for mobile phone subscriptions and remittances. This does not affect our previous results and we find that they tend to reduce working poverty. Nonetheless, improving banking sector outreach is not sufficient as the poor workers may be confronted to some constraints like a minimum amount to be maintained in bank account. So, we also document that barriers to use financial services are positively correlated to working poverty.

In the third chapter, we explore how financial development and remittances influence the spread of the informal sector. We find that they both reduce informal sector's share in the economy. Moreover, they tend to be partial substitutes, suggesting that with a limited access to financial services, people tend to rely on remittances, in other words, in countries with an initial low level of financial development, remittances will be more effective in reducing the informal sector size. Our results also highlight that remittances volatility tends to increase the informal sector but this effect is small enough not to offset the impact of remittances level.

Finally, the fourth chapter reviews and criticizes innovative flexible financial products which can help the poor people manage shocks more effectively and decrease their vulnerability. In theory, financial services must be used sequentially, particularly, savings and credit must both be used to reduce uninsured risks, supplemented by insurance. Evidences with existing financial products suggest that flexible products can be proposed to the poor without compromising loan repayment and good client performance. But, this kind of products is proposed by few financial institutions and they however still fall short of a design that would optimize the provision of financial services to deal with risk. Our findings suggest that the design of a financial product to reduce uninsured risks for the poor need to have the following features: (1) Motivated flexible savings options are offered for the purpose of coping with shocks. Motivation is orthogonal to or dedicated to risk. Depositors can draw on savings in response to shocks either freely or conditional on verification of the shock in accordance with the dedicated purpose of saving. (2) Flexible credit lines are offered to respond to shocks as precautionary savings are being already used. Assistance is provided to reconstitute savings with pledged savings plans linked to the repayment of debt. (3) Index-based insurance is provided at the institutional level to cope with extreme events.

To sum up, this thesis has shown that financial development will be effective in reducing child labor in countries with low level of inequalities and better control of corruption. Moreover, improving access to financial services and lifting barriers to use them may reduce the prevalence of working poor especially in countries hit by macroeconomic shocks. Financial development is also a means with remittances of increasing productivity by reducing informal sector size.

2. Policy implications

The main challenge for developing and emerging countries in terms of employment is to create jobs which can ensure a decent life and help people escape from poverty. While the financial crisis has increased the prevalence of vulnerable employment and threatens the progress made in reducing child labor, financial development can help to overcome this undesired effects.

First, even if financing constraints may lead to more child labor, a better access to credit is not a panacea. Especially, parents can invest in productive activities which can increase the returns from child labor and the opportunity cost of school attendance. Our results suggest that policies aiming at reducing income inequality and increasing the quality of education services will make financial development more effective in reducing child labor. Particularly, this could be achieved through struggling against corruption so as to limit misappropriation of funds and improve the efficiency of existing funds. In the same line, we also demonstrate that the effectiveness of education expenditures is conditional to a better control of corruption as they are the starting point to build and restore schools, to invest in teacher training thus contributing to better teaching conditions and student achievement. In short, one way to influence parent's decision following a productive investment is to improve education quality.

Moreover, mobilizing more public resources in developing and emerging countries so as to finance public services is jeopardized by a high prevalence of the informal sector. In fact, as demonstrated by La Porta & Shleifer (La Porta & Shleifer 2014), firms tend to remain informal even if the regulatory environment for business is improved because they are not enough productive to support additional costs in the formal sector. We demonstrate that financial development and remittances can be used to make the economy more productive by limiting the spread of the informal sector. This could occur through more productive investment leading to more job creation in the formal sector. We therefore argue in the sense of reducing the cost to remit so as to increase the volume of remittances which can be more effective with a better

level of financial development, limiting also Dutch disease symptoms by channelling funds to more productive investments.

Consequently, by increasing the productivity in the economy, financial development with better access to financial services can help reduce the proportion of poor workers which are active in the informal sector as we demonstrate in this thesis. Furthermore, this effect is more relevant in case of macroeconomic shocks where the poor are the most vulnerable. In practice, governments as well as financial institutions need to work together by improving banking sector outreach and limiting the constraints to use banking services. In developing countries particularly, there is a need to make financial services more affordable for the poor. Especially in case of shocks, where informal mechanisms are very expensive, innovative flexible financial products could be developed. For instance, this should occur by suppressing fees for opening a saving or a checking account so as to make people more comfortable with banking services. Incentives to save can also be used through dedicated accounts to increase the mobilization of saving to finance credits. Then, this saving account can be used as collateral for loan in case of shocks supplemented by insurance services if needed. In summary, flexible financial products should be designed by combining saving, credit and insurance elements while preserving the performance of financial institutions in order to help the most vulnerable manage shocks. Moreover, given the mobile banking revolution, there is a need to reinforce the use of mobile phones as a tool to diffuse flexible financial products in developing countries.

Overall, this thesis emphasizes that financial development can help reduce poverty through its effect on employment. It reduces working poverty and informal employment by promoting the development of productive formal activities and enabling the poor to better cope with shocks. But, an undesired effect is the increase of child labor with access to credit which can be limited by a better quality of education and a decrease of inequalities. Thus, the effectiveness of financial development could be reinforced by enhancing the supply of flexible financial products so as to help vulnerable households to manage shocks without relying on child labor or poorly paid jobs.

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Summary of the thesis

This thesis explored the macroeconomic effects of financial development on the most vulnerable workers in developing and emerging countries. **Chapter one** focuses on child labor. Our results suggest that child labor is positively associated to financial development and inequality particularly in countries with high level of income inequalities and low level of income. In fact, with access to credit, households tend to invest in productive activities which increase the opportunity cost of education and the returns from child labor. Hence, we demonstrate that a better control of corruption makes financial development as well as education spending more effective in reducing child labor by improving education quality. **In the second chapter**, we show that more bank branches and limiting barriers to use financial services reduce the proportion of working poor. This result is more relevant in countries hit by macroeconomic shocks and a better access to financial services also benefits to the excluded non-poor who can in turn invest and reduce poverty. In the **third chapter**, we find that both financial development and remittances tend to reduce the spread of the shadow economy by channelling funds to the more productive activities. Moreover, they tend to be substitutes, indicating that households rely on remittances in countries with low level of financial development. Finally, **chapter four** reviews innovative flexible financial products which can be used to help the more vulnerable to manage shocks. Our results suggest that, first barriers to open saving and checking accounts (like opening fees) need to be suppressed in order to increase the use of these services, generating more information on potential borrowers on the basis of the history and frequency of payments. Then, accumulated savings can be used as collateral for loan supplemented by insurance services. Mobile banking could also serve as support for flexible financial services.

Keywords: Financial development, financial services; child labor, decent work, vulnerability, informal sector shadow economy, underground economy, institutions, inequality, working poverty, developing countries, trickle-down effect, remittances, microfinance, flexibility, discipline, risk, shocks, index-based insurance, combined products.

Résumé de la thèse

Cette thèse s'intéresse aux effets macroéconomiques du développement financier sur la vulnérabilité dans l'emploi dans les pays émergents et en développement. Dans le **premier chapitre**, nous montrons que l'accès au crédit et les inégalités de revenu augmentent le travail des enfants surtout dans les pays à forte inégalité ou à faible revenu. Ce résultat indique que les parents tendent à investir leur crédit dans des projets qui accroissent le coût d'opportunité de l'éducation et le bénéfice attendu du travail des enfants. Ainsi, nous démontrons qu'un meilleur contrôle de la corruption permet d'améliorer l'efficacité du développement financier ainsi que des dépenses d'éducation en vue de réduire le travail des enfants. Cela passe notamment par une amélioration de la qualité de l'éducation. Dans le **second chapitre**, nous démontrons qu'un meilleur accès aux services financiers ainsi qu'une réduction des contraintes en termes d'utilisation de ces produits réduit la proportion de travailleurs pauvres. Cet effet est plus important en cas d'instabilité macroéconomique. De plus, ce meilleur accès bénéficie également aux non pauvres qui étaient précédemment exclus, ces derniers étant plus à même d'investir et de réduire indirectement la proportion de travailleurs pauvres via une croissance plus forte. Les résultats du **troisième chapitre** suggèrent qu'aussi bien le développement financier et les transferts de fonds des migrants peuvent limiter la prolifération du secteur informel. Cependant, ils tendent à être substitués, avec notamment un faible niveau de développement financier initial qui est compensé par l'utilisation des transferts de fonds. Finalement dans le **chapitre 4**, nous passons en revue des produits financiers flexibles et innovants qui pourraient permettre aux plus vulnérables de mieux faire face aux chocs. Nos résultats suggèrent que ces produits doivent être conçus de manière à offrir dans un premier temps des produits d'épargne en supprimant notamment les frais d'ouverture de compte. Leur utilisation devrait permettre de produire de l'information sur les emprunteurs notamment sur la base de l'historique des versements et leur fréquence. Ainsi en cas de choc, l'épargne accumulée peut servir de garantie pour le prêt complété si nécessaire par des produits d'assurance. Le « mobile banking » peut également servir pour la diffusion des produits flexibles et dans une plus large mesure de support pour accroître le niveau de bancarisation, vu le nombre croissant de personnes utilisant le téléphone portable.

Mots clés : Développement financier, services financiers, travail des enfants, travail décent, vulnérabilité, secteur informel, économie parallèle, économie souterraine, institutions, inégalités, travailleurs pauvres, pays en développement, effet de ruissellement, transferts de fonds des migrants, microfinance, flexibilité, discipline, risque, chocs, assurance indiciaire, produits composites.