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THESIS

ESSAYS ON FINANCIAL INCLUSION AND FIRM PERFORMANCE: EVIDENCE FROM DEVELOPING AFRICA AND ASIA

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Contents

List of Figures

List of Tables

Chapter 1

Abstract

This thesis consists of three chapters about two different topics: financial inclusion in developing Africa and Asia; and firm growth in Vietnam.

The first chapter examines the association between financial inclusion services provided (bank account, mobile money, or both) and the characteristics of their users in eight developing countries in Africa and Asia. We employ multiple correspondence analysis (MCA) to find that poverty, education, age, gender, and location are the main determinants of financial service usage in these countries. Moreover, we provide a typology of each financial inclusion service users in both regions, as well as its dynamic over time. We find that financial inclusion has been relatively a success in Asia, but is yet to materialized in Africa.

The second chapter studies the impact of financial inclusion to reduce poverty at individual level for 8 developing countries in Africa and Asia. In particular, it investigates how individuals overcome poverty by using Bank (*BK*), Mobile money (*MM*) or both Bank and Mobile money (*BM*). The results show that financial inclusion reduces the probability of individuals being poor. However, MM and BM are more efficient than BK as their impacts are greater in magnitude and they target poorer users.

The third chapter investigates impact of firm size on firm growth for Vietnamese firms by checking against Gibrat's law. It finds that before the financial crisis, small firms grow faster than larger ones regardless of their initial size. After the crisis, the results is not much different when using number of employees as a firm size measure. However, when firm size is measured in assets and turnover, after the crisis large firms grow faster than smaller ones, except for 25% of the smallest firms in the first quantile. The results show the relationship between firm size and firm growth vary across different types of firm ownership that confirms the impact of types of firm ownership besides industry.

Chapter 2

Introduction

The world Bank defines the extreme poor as those living on less than $1.90 a day. According to this organization, in 1990, 36% of world population or 1.9 billion people are extreme poor. Based on the most recent estimates, this number in 2015 is 10% of world's population or 734 million people. World Bank aims to reduce extreme poverty in the world to less than 3% by 2030. However, due to the COVID-19 crisis as well as the oil price drop, it is very difficult for the World Bank to achieve its goals. World Bank estimates that 40 million to 60 million people will fall into extreme poverty in 2020, compared to 2019, as a result of COVID-19. The global extreme poverty rate could rise by 0.3 to 0.7%, to around 9% in 2020.

Financial inclusion (FI) is defined as individuals and businesses having access to useful and affordable financial products and services that meet their needs (i.e., transactions, payments, savings, credit and insurance) delivered in a responsible and sustainable way. FI has emerged as a building block for both poverty reduction and opportunities for economic growth, as it offers incremental and complementary solutions to tackle poverty, promote inclusive development, and address the millennium development goals.

In 2015, World Bank Group developed a framework with the goal to enabling 1 billion people around the world gain access to a transaction account through targeted interventions by 2020. This was referred to as "*Universal Financial Access 2020*"(UFA2020). To date, over thirty partners, including the United Nations, have pledged commitments toward achieving the UFA2020's goals, and the benefit of FI is increasing undeniable. However, the fact that 1.7 billion adults around the world remain unbanked raises many questions for researchers and policy makers and financial inclusion remain an important topic especially in developing countries.

The first two chapters of this thesis discuss about financial inclusion. In the first chapter, we employ multiple correspondence analysis (MCA) to establish the association over time

between users' characteristics and the FI services provided (banking (BK), mobile money (MM), and both (BM)) for 8 developing countries in Africa and Asia . Although major regional differences in FI services usage exist between Africa and Asia, MCA results clearly outlined that gender, poverty, education, age, and location are key determinants of FI access in both regions. While the dynamic of financial services usage in the African sample seems to shift from banking service (BK) toward mobile money (MM), the Asian countries have seen a steady increase in all financial services usage since 2013. Interestingly, our results also show that the overall share of financially excluded individuals, as well that of most subgroups in the sample (classified by age, gender, poverty, location, education), has decreased significantly over time for Asia. More importantly, many disadvantaged groups (e.g. poor, females, and rural Asians) have seen a drop in their shares of financially excluded individuals, while their use of financial services has steadily increased since 2013. This also suggests that financial inclusion has empowered the poorest in Asia. By contrast, the Africa countries in the sample show mix results. With the exception of poor individuals, the proportion of financially excluded individuals in most of the other subgroups has not changed much during the period. These results suggest that financial inclusion is yet to be effective in Africa compared with Asia. But the fact that the share of financially excluded poor individuals has been dropping since 2016 indicates that Africa is moving toward financial inclusion. Moreover, we provide a typology of each financial inclusion service users in both regions, as well as its dynamic over time by employing clustering. While young, rural and females financial service users in Africa seem to move toward mobile money service (MM), the same groups prefer either banking service (BK) or mobile money service (MM) in the Asian sample. In both regions, financial service users who are not poor, live in urban area, and have basic education combine both banking service and mobile money service (BM). Poor males and young females under 45 years old who live mostly in rural area prefer BK service, while the same groups tend toward MM service usage in the African sample.

The second chapter examines whether individuals can reduce the probability of being poor by being financial included. Using quantile regression, it finds that using bank (BK), Mobile money (MM) or both Bank and Mobile money (BM) does reduce individuals' chances to be poor and the impact of all three services are in a U- shape. In fact, MM and BM are more efficient than BK as their impacts are greater in magnitude and they target poorer users.

However, the impacts of all three financial services for people at the bottom of poverty distribution (i.e., the poorest individuals) are small. This implies that those services are not efficient to poorest individuals. Looking at the impacts for different segments of the population based on age, gender, education, living location, occupation and income levels, the paper finds that the impact of BK are different from MM and BM. Regardless of wealth status, BK benefits young educated males who live in urban areas doing non-manual work with medium income more. In contrast, MM and BM impacts are greater for older uneducated low- income females in rural areas, except for those at the bottom of poverty distribution. The paper suggests that governments should encourage individuals using BK or/and Mobile money together with improving individuals' education and income to reduce poverty more efficiently.

Firm size is one determinant factor of firm performance and shows the profitability of business. With economics of scale, enterprises can produce more efficiently, reduce costs, easy to apply technology to production, to negotiate with suppliers and access capital hence increase its competitiveness. According to 2019 Global Competitiveness Report, Vietnam competitiveness ranked 67 out of 141 countries and territories, up to ten places (77) from 2018 (Schwab, 2019). Although there has been an improvement in competitive ranking, Vietnam's position is still low compared to many countries. One reason why Vietnamese firms can not compete on the global market is because 95% are in small and medium sizes with most of them are super small and developed from household business. The third chapter of this thesis investigates the relationship between size and growth for Vietnamese firms by checking against Gibrat's law. From that, it examines the development of Vietnamese firms over time and identifies factors preventing Vietnamese firm from growing. The chapter employs non-linear regression to find that before the financial crisis, small firms grow faster than larger ones. This is true for most of Vietnamese firms regardless of their initial size, industries and types of ownership, except for largest State and Joint Stock companies. The results after the crisis do not change much when using number of employees as a firm size measure. However, when using assets and turnover as a size measure, we find that after the crisis large firms grow faster than smaller ones . Only 25% of the smallest firms remain reluctant to grow as being small gives them higher growth rates. All three measures of firm size show that small private and collective firms grow faster than larger ones regardless of their initial size and industries.

Chapter 3

Empowering the powerless: Financial inclusion in developing Africa and Asia

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Certification:	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.
Signature	Date: 23/09/2021

Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:

i. the candidate's stated contribution to the publication is accurate (as detailed above);
ii. permission is granted for the candidate in include the publication in the thesis; and
iii. the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Name of Co-Author	Firmin Doko Tchatoka
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Abstract

Financial inclusion has emerged as a building block for poverty reduction and opportunities for economic growth in developing countries. In the last decade, there has been an increasing mobilization in developing nations to lift people out of poverty through financial inclusion. For example, the World Bank Group fixed a goal to enabling one billion people around the world gain access to a transaction account through targeted interventions by 2020. Despite this undeniable effort, about 1.7 billion adults remain unbanked around the globe (Demirguc-Kunt et al., 2015), and more than half are women from the poorest 40 percent of households within their country (Demirguc-Kunt et al., 2018). This study uses survey data from Financial Inclusion Insights (FII) and employs multiple correspondence analysis (MCA), along with clustering technique, to show financial inclusion has been relatively a success in Asia, but is yet to materialized in Africa. However, the proportion of financially excluded poor individuals in the African sample has been dropping slightly since 2016, suggesting that the countries in the African sample are moving slowly toward financial exclusion.

3.1 Introduction

Financial inclusion (FI) is usually defined as individuals and businesses having access to useful and affordable financial products and services that meet their needs (i.e., transactions, payments, savings, credit and insurance) delivered in a responsible and sustainable way. FI has emerged as a building block for both poverty reduction and opportunities for economic growth, as it offers incremental and complementary solutions to tackle poverty, promote inclusive development, and address the millennium development goals.

Since 2011, the World Bank Group (WBG) has launched *Global Findex*, a database which tracks financial inclusion efforts around the world. Many media outlets and organizations have written about or used the database, including Bloomberg, CNN, The Financial Times, Forbes, The New York Times, The Wall Street Journal, and the World Economic Forum. In 2015, WBG developed a framework with the goal to enabling 1 billion people around the World gain access to a transaction account through targeted interventions by 2020. This was referred to as "*Universal Financial Access 2020*"(UFA2020). To date, over thirty partners, including the United Nations, have pledged commitments toward achieving the UFA2020's goals,[1] and the benefit of FI is increasing undeniable. The Gallup's most recent survey in 2017 shows that 1.2 billion adults worldwide have opened a bank account since 2011, including 515 million in the preceding three years. Globally, 69% of adults– 3.8 billion people– now have an account at a bank or with a mobile money provider. Bank accounts offer people a pathway out of poverty by helping individuals invest in education and business opportunities, as well as manage unexpected expenses (like a hospital bill or the loss of a breadwinner) that can push families into hardship.

Despite this progress, 1.7 billion adults remain unbanked (Demirguc-Kunt et al., 2015) around the world. This raises several questions. First, which are the financially excluded people around the world, and why are they still financially excluded? Second, is there any substantial progress toward UFA2020's goals? Third, Are there regional differences in financial services access and usage around the world, e.g., Africa versus developing Asia? The answers to these questions are paramount, not only to evaluate the FI progress, but also to design policies that will boost access to financial services for targeted vulnerable groups.

[1] The UFA2020 initiative focuses on 25 priority countries representing almost 70% of all financially excluded in the world. The goals are to provide advances financial access and inclusion, create a regulatory environment to enable access to transaction accounts, expand access points and improve financial capability, drive high volume government programs into those transaction accounts, and reach disadvantaged populations– women and rural producers.

Several studies that examine the reasons so many people around the world are still financially excluded have often looked at the demand side, with the aim to explain what prevent those individuals from using financial services; see e.g. Allen et al., 2012, Fungáčová and Weill, 2015 and Demirgüç-Kunt and Klapper, 2012. This narrow focus is usually justified by the unavailability of data from the supply side. This study is one of the first to exploit a rich dataset from the supply side; the survey data from *Financial Inclusion Insights*– a program of *InterMedia* funded by Bill & Melinda Gates Foundation– across eight countries in Africa (Keynia, Nageria, Uganda, Tanzania) and Asia (India, Indonesia, Bangladesh, Pakistan). The literature on FI globally falls into three main categories.

The first look at the benefit of financial inclusion, with most studies examining the impact of FI on either poverty and inequality[2] or economic growth and unemployment.[3] Specifically, FI facilitates education of children and reduce child labour through easy access to credit that enables households smooth consumption expenditure overtime (Becker, 1964). Moreover, a greater access to credit services can promote self employment, thus reducing unemployment (Menon and Meulen Rodgers, 2011). FI can also impact macroeconomic policies. For example, Mbutor and Uba, 2013 find an inverse relationship between the inflation rate and the size of commercial banks' loans and advances, meaning that FI is likely to improve the effectiveness of monetary policy. The second category explores the factors that explain FI access. While some of these studies were conducted at the individual country level (see e.g. Fungáčová and Weill, 2015; Efobi, Beecroft, and Osabuohien, 2014, for China and Nigeria respectively), other mainly focused on groups of Africa countries (see e.g. Allen et al., 2012; Demirgüç-Kunt and Klapper, 2012). In general, the main conclusion of these studies is that education, income, and age are key determinants of Financial services access (Allen et al., 2012; Fungáčová and Weill, 2015), but gender and religion also matter (Demirgüç-Kunt and Klapper, 2012). The third category focuses on building an index to measure the degree of financial inclusion or the performance of financial systems; see e.g. Sharma (2008), Gupte, Venkataramani, and Gupta (2012), and Cámara and Tuesta (2014).

Despite this widespread literature, whether financial inclusion has empower the poorest around the globe is still unclear. Equally important is that none of these studies have established a typology of FI services users over time. As mentioned before, providing such

[2] See e.g. Jeanneney and Kpodar (2011), Sarma and Pais (2011), Beck, Demirguc-Kunt, and Martinez Peria (2005), Beck, Demirgüç-Kunt, and Levine (2007), Clarke, Xu, and Zou (2006), Burgess and Pande (2005), Honohan (2004), and Galor and Zeira (1993).

[3] See e.g. (Abu-Bader and Abu-Qarn, 2008; Menon and Meulen Rodgers, 2011; Bittencourt, 2012; Pal, 2011; Yang and Yi, 2008).

a typology is paramount, not only to measure the progress of financial services access, but also to design policies that boost financial access for vulnerable groups (e.g. women and rural producers). Taking advantage of the rich *Financial Inclusion Insights* survey data, our study contributes to the financial inclusion literature in two main ways.

First, by employing multiple correspondence analysis (MCA)– a data analysis technique for nominal categorical data, used to detect and represent underlying structures in a data set, we establish the association over time between users' characteristics and the FI services provided (banking (BK), mobile money (MM), and both (BM)). Although major regional differences in FI services usage exists between Africa and Asia, MCA results clearly outlined that gender, poverty, education, age, and location are key determinants of FI access in both regions. While the dynamic of financial services usage in the African sample seems to shift from banking service (BK) toward mobile money (MM), the Asian countries has seen a steady increase in all financial services usage since 2013. The shift from banking service to mobile money service in Africa could be explained by the increasing mobilization to lift people out of poverty, especially women and rural producers, through financial inclusion; see e.g. Atkinson and Messy (2013) and Triki and Faye (2013). Since BK service is rarely available to rural and female Africans, the expansion of mobile phones and access to internet in rural areas has paved a way to MM service as the only viable alternative solution to financial inclusion (see e.g. the M-PESA in Kenya; Van Hove and Dubus, 2019, Kenya and Uganda; Johnson and Nino-Zarazua, 2011).

Interestingly, our results also show that the overall share of financially excluded individuals, as well that of most subgroups in the sample (classified by age, gender, poverty, location, education), has decreased significantly over time for Asia. In this region for example, the overall share of financially excluded individuals has dropped drastically from about 60% in 2013 to about 34% in 2017. Similarly, the share of financially excluded poor (respectively female) has substantially decreased from around 50% (respectively 38%) in 2013 to roughly 21% (respectively 20%) in 2017. Only the proportions of financially excluded non-poor individuals, individuals living in urban areas, and those with tertiary education have remained steadily constant in the Asian sample. As such, financial exclusion has been relatively a success in the Asian countries studied. More importantly, many disadvantaged groups (e.g. poor, females, and rural Asians) have seen a drop in their shares of financially excluded individuals, while their use of financial services has steadily increased since 2013. This also suggests that financial inclusion has empowered the poorest in Asia. By contrast,

the Africa countries in the sample show mix results. With the exception of poor individuals, the proportion of financially excluded individuals in most of the other subgroups has not changed much during the period. The share of financially excluded poor individuals, however, has dropped slightly from around 45% in 2013 to about 38% in 2017. These results suggest that financial inclusion is yet to be effective in Africa compared with Asia. But the fact that the share of financially excluded poor individuals has been dropping since 2016 indicates that Africa is moving toward financial inclusion.

Second, we provide a typology of each financial inclusion service users in both regions, as well as its dynamic over time by employing clustering– the task of grouping a set of objects in such a way that objects in the same group are more similar to each other than to those in other groups. We found that while young, rural and female financial inclusion services users in Africa seem to shift toward mobile money service (MM), the same group in Asia prefer either the banking (BK) or mobile money (MM) service. In both regions (Africa and Asia), financial inclusion services users in urban areas who are not poor, and have basic education combine both banking service and mobile money service (BM). Poor males and young females under 45 years old who live mostly in rural areas prefer banking services (BK) in Asia, while the same group tend toward mobile money (MM) service usage in Africa.

The remaining of the paper is organized as follows. Section 3.2 studies the determinants of FI access. Section 3.3 establishes the typology of financial inclusion services users over time. Conclusions are drawn in Section 3.4.

3.2 Determinants of financial inclusion services usage

In this study, we use MCA to provide an exhaustive description of the associate between individuals' socio-economic characteristics and the financial inclusion services offered (BK, MM, and BM). MCA is a data analysis technique for nominal categorical data, used to detect and represent underlying structures in a data set. From the geometric point view, MCA represents data as points in a low-dimensional Euclidean space. With the exception of Dungey, Tchatoka, and Yanotti (2018), MCA technique is not well known in the financial literature, so we shall introduce the method briefly in Section 3.2.1. Section 3.2.2 presents the data used for the analysis, and Section 3.2.3 contains the main results.

3.2.1 MCA method

MCA is performed by applying the correspondence analysis algorithm to either an indicator matrix[4] known as *a Burt table* (see e.g. Greenacre, 2017). Analyzing the indicator matrix allows the direct representation of individuals as points in geometric space. The Burt table is the symmetric matrix of all two-way cross-tabulations between the categorical variables, and has an analogy to the covariance matrix of continuous variables. Analyzing the Burt table is a more natural generalization of simple correspondence analysis, and individuals or the means of groups of individuals can be added as supplementary points to the graphical display.

Specifically, let $\mathcal{I}$ be a set of n individuals with p characteristics $X = [X_1, \ldots, X_p]$. Each characteristics $X_j, j = 1, \ldots, p$, has k_j categories. The total number of categories is $k = \sum_{j=1}^{q} k_j$. Define x_{i,k_j} such that

$$x_{i,k_j} = \begin{cases} 1 & \text{if } i \in \mathcal{I} \text{ is in category } k_j, \\ 0 & \text{otherwise;} \end{cases} \tag{3.2.1}$$

and let $X_k = [X_{k_1}, \ldots, X_{k_p}] \in \mathbb{R}^{n \times k}$. MCA analyses the data matrix X_k consisting of entries 1 or 0 depending on whether individual $i \in \mathcal{I}$ chooses category k_j or not. Let $\phi_{k_j} = (\phi_{jl})_{l=1,\ldots,k_j}$ denote the scale value vector of category $l = 1, \ldots, k_j$ and $\tilde{X}_k = \sum_{j=1}^{p} X_{k_j} \phi_{k_j}$ be the scaled variable induced by scaling X_k. Let $\phi_k = (\phi'_{k_1}, \ldots, \phi'_{k_p})'$ be the k dimension vector of scale values and $\tilde{X} = [\tilde{X}_1, \ldots, \tilde{X}_p]$ the matrix of scaled variables.

The MCA principle solves:

$$\max_{\phi_k} Var\left[\frac{1}{p}\sum_{j=1}^{p}\sum_{l=1}^{k}\phi_{jl}x_{jl}\right] \quad s.t. \quad e_k' D \phi_k = 0,\ \phi_k' D \phi_k = np \tag{3.2.2}$$

$$\iff \max_{a_{jl}} Var\left[\frac{1}{p}\sum_{j=1}^{p}\sum_{l=1}^{k}\sqrt{\frac{a_{jl}^2 n}{p n_{jl}}} y_{jl}\right] \quad s.t. \ \sum_{j=1}^{p}\sum_{l=1}^{k} n_{jl}^{\frac{1}{2}} a_{jl} = 0,\ \sum_{j=1}^{p}\sum_{l=1}^{k} a_{jl}^{\frac{1}{2}} = 1, \tag{3.2.3}$$

where D is a k-dimensional diagonal matrix constructed with non-null frequencies n_{jl}, e_k a k-dimensional vector of ones, and $a_k = \sqrt{\frac{n_{jl}}{np}}\,\phi_{jl}$. The solution ϕ^* in (3.2.2) and a^* in (3.2.3)

[4] An indicator matrix is an individuals-by-variables matrix, where the rows represent individuals and the columns are dummy variables representing categories of the variables.

are related as

$$\phi^* = (np)^{\frac{1}{2}} D^{\frac{-1}{2}} a^*. \tag{3.2.4}$$

Equation (3.2.4) shows that the optimal scaling parameters ϕ^* and a^* depend on the number of characteristics p, the number of individuals n and the frequency of occurrence D.

The k components of ϕ^* are the category factors, $\hat{\psi}^* = (\frac{1}{Q})X\phi^*$, and the subject factors (normalised variables) are $\psi^* = \frac{\hat{\psi}^*}{(\lambda_h)^{\frac{1}{2}}}$, where λ_h is the hth eigenvalue of the *Burt* matrix and it represents the variance explained by the hth principal component. As such, $p\lambda_h/(k-p)$ is the proportion of the variance explained by the hth component. The contribution of category l, $l = 1, \ldots, k$, to the hth principal component, c_l^h, and the correlation between $\tilde{X}_j^h$ and ψ^*, are then given by

$$c_{jl}^h = \frac{n_{jl}(\phi_{jl}^*)^2}{np}, \quad corr(\tilde{X}_j^h, \psi^*) = \left(\lambda_h p \sum_{l=1}^{k} c_{jl}^h\right)^2. \tag{3.2.5}$$

Contributions c_{jl}^h help locate the observations or variables important for a given factor, while correlations $corr(\tilde{X}_j^h, \psi^*)$ help locate the factors important for a given observation or variable. It is important to note that MCA codes data by creating several binary columns for each variable with the constraint that only one of the columns takes the value 1. This creates artificial additional dimensions because one categorical variable is coded with several columns. As such, the inertia (i.e. variance) of the solution space is artificially inflated, leading to the percentage of inertia explained by the first dimension being severely underestimated. This problem can be alleviated by using, for example, the correction of the data matrix eigenvalues in Greenacre (1993).

3.2.2 Data description

We use survey data from Financial Inclusion Insights (FII). The surveys started in 2013 in partnership with the *Bill and Melinda Gates Foundation*, with the goal to build a meaningful knowledge about the financial landscape in eight countries across Africa (Kenya, Nigeria, Tanzania and Uganda) and Asia (Bangladesh, India, Indonesia, and Pakistan). These eight countries have a combined population of over 2 billion. The survey is conducted each year with the updates in the questionnaire and tabulated data, but the number of respondents in each country are kept fixed over time and depends on the country population size. Table 3.1

shows the sample size for each country, with India representing over 7 times the sample of Bangladesh, Indonesia, Nigeria and Pakistan, and over 14 times that of Kenya, Tanzania and Uganda.

TABLE 3.1: Survey samples per country

Country	Sample
Bangladesh	6,000
India	45,000
Indonesia	6,000
Kenya	3,000
Nigeria	6,000
Pakistan	6,000
Uganda	3,000
Tanzania	3,000

Source: Financial Inclusion Insights (FII).

FII describes the financial inclusion process as a customer journey in which customers moves from being financially excluded to financially included. Figure 3.1 below depicts this journey. At each level of the process, customers are further classified into different types based on their engagement into various range of financial services. To enable this classification, the survey is designed in a way that an extended level of information is provided by the respondents. First, data on socio-economic characteristics of respondents are collected (this includes age, gender, family status, education and wealth status). Second, the survey also asks questions about preconditions to access to financial services. Examples of such questions are whether respondents own a mobile phone, national ID, a SIM card, the distance from respondents' location to the nearest financial service, the availability of local network. Third, respondents are asked about how they use the financial services, including if they own a financial account under their own name, how often they use a financial services, the type of services they use and whether they encounter difficulties in using the financial services provided to them.

FII considers a respondent to be *financially included* if he has an account under his own name at a financial institution. As such, individuals owning *mobile money accounts* under their name are classified as financially included.

The data used were obtained from the FII surveys and cover five years (2013 to 2017). The pooled sample of all eight countries has size over 381,542 observations. While this is a pooled sample, the presence of country and continent identifiers allows to identify the

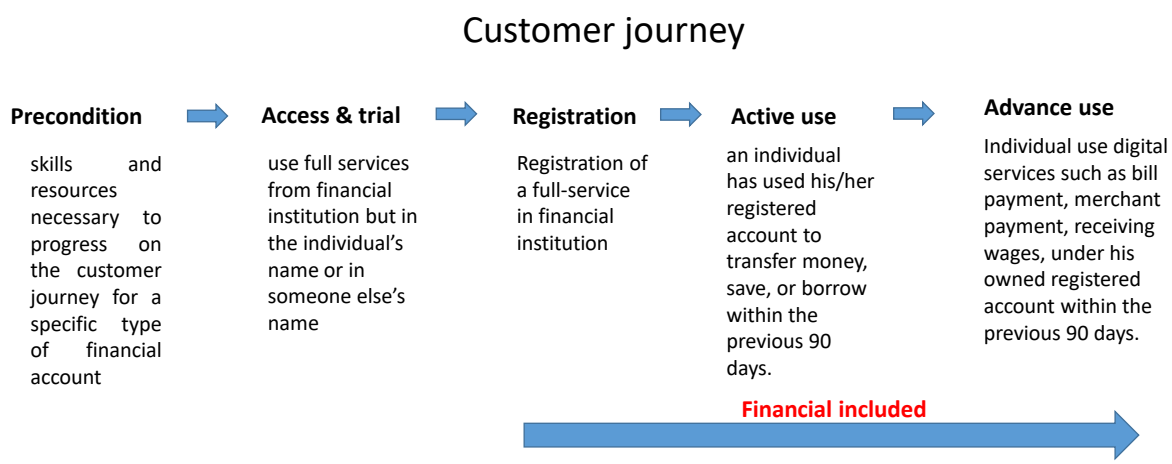

FIGURE 3.1: Financial inclusion process

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country and continent of the respondents. Table 3.2 reports the variables (characteristics) for which data on the respondents are collected, along with the type of financial services provided. Note that the continuous variables, such as respondent age, are categorised as they are given in range.

Table 3.3 presents summary statistics of the respondents characteristics as well as their use of the financial services provided. The first part of the table contains the results of the pooled four African countries, while the second part reports that of the pooled four Asian countries. In each region (Africa or Asia), respondents are classified into 4 distinct groups based on their financial inclusion status, i.e., their level of access of the financial services provided. The first group is comprised of respondents who do not use any service provided, this group represents *financially excluded* individuals. The second group represents individuals who only have registered bank account under their own name, so this group is labelled as *bank* (BK) users. The third group is comprised of respondents who have registered mobile money account under their own name with a provider, thus are labelled as *mobile money* (MM) users. Finally, the fourth group represents individuals with both registered bank and mobile money accounts under their name, thus are labelled *bank and mobile money* (BM) users.

TABLE 3.2: Individual characteristics and financial services provided

Variables	**Description**
Age	Age from 15 to 24 years $(15-24)$; age from 25 to 34 years $(25-34)$; age from 25 to 34 years $(25-34)$; age from 45 to 54 years $(45-54)$; age above 55 years (≥ 55)
Poverty	Poor (P); not poor (NP).
Gender	Male (M); female (F).
Location	Urban (UR); rural (RU).
Specialty	Female living in rural (RuF) area; female living in urban (NRuF) area; poor living in rural (RP) area; living in urban area and not poor (NRP).
Literacy skill	Respondents have basic literacy skill (L1); respondents without basic literacy skill (L0).
Numeration skill	Respondents with basic financial numeration skill (N1); respondents without basic numeration skill (N0).
Financial services	Respondents do not use any services (*financially excluded*); respondents only use bank services (BK); respondents only use Mobile money service (MM); respondents use both bank and Mobile money services (BM).

As seen from the table, the average individual in the Africa region is about 34 years old while that of the Asian region is nearly 38 years old. The three groups of financial service users (BK, MM, and BM) in Africa are not much different in age, with the average BK user being the youngest (about 34 years old) while the average BM user is the oldest (about 37 years old). With respect to financial services users, the average financially excluded individual is relatively young in the Africa region (slightly below 33 years old). In the Asia region, the average MM user is the youngest (about 30 years old), follows by BM (about 33 years old) and BK (slightly below 40 years old). The average financially excluded individual in Asian countries is old (36 years old) compared with the African countries (slightly below 34 years old). The percentage of people living in rural area is quite similar in both regions (65.71% in Africa compared with 67.13% in Asia). However, there appears to be a substantial

difference between the two regions regarding financial services usage. First, most financially excluded people in the African countries studies live in rural area (75.39%), while this proportion is 69.12% for the Asian countries. Second, 48.72% of BK users, 62.23% of MM users and 47.42% of BM users live in rural Africa, while these shares stand at 65.77%, 61.49%, and 39.57% respectively in Asia. As such, in the African countries surveyed, an individual living in urban area is more likely to use BK (51.28%) or both BM (52.58%), while an individual who lives in urban area is more likely to use BM (60.43%) in Asia.

Males appear different from females in their choices of financial services. While MM service seems to be preferred by females in Africa (58.74%), BK is predominant for females (51.16%) in Asia. The share of male BK and BM users is very high in Africa, while that of male MM and BM users is the highest in Asia. There is clearly a more noticeable gender gap in Asia in terms of financial service usage compared with Africa. For example, 74.41% of males use BM (against 25.59% of females) in the Asian countries surveyed, while this share 46.81% of males (versus 53.19% of females) in the African countries. For the African countries in the sample, with the exception of BM users, users of the other financial services and the financially excluded individuals are mostly poor. This contrasts slightly with the Asian countries where poverty distribution is quite uniform across all financial services users and the financially excluded individuals– all are mostly poor. Note that in both regions, the financially excluded individuals are the most poorest.

The overall share of individuals with basic literacy and numeracy skills are high in both regions (71.85% and 91.39% respectively in Africa, versus 66.40% and 85.83% respectively in Asia). However, the sample of each region still contains non negligible shares of people with no basic literacy and numeracy skills (28.15% and 8.61% respectively in Africa, versus 33.60% and 14.17% respectively in Asia). Due to the high shares of individual with basic literacy and numeracy skills, sizable shares of financial services users (BK, MM, and BM) also have basic literacy and numeracy skills in both regions. Interestingly, even the majority of financially excluded people in both regions have basic literacy and numeracy skills. Despite this similarity, there appear to be a slight difference between the two regions. Indeed, while the lowest share of basic literacy and numeracy skills is materialised in the MM users' group for Africa, it is the BK users' group that has the lowest share of basic literacy and numeracy skill in the Asian sample.

TABLE 3.3: Characteristics of financial services users

AFRICA

Characteristics↓ Services →	**Financially Excluded**	**BK**	**MM**	**BM**	**All**
Age	33.705	34.28	35.142	37.407	34.459
Urban	24.61%	51.28%	37.77%	52.58%	34.29%
Rural	75.39%	48.72%	62.23%	47.42%	65.71%
Male	42.40%	63.86%	41.26%	56.22%	46.81%
Female	57.60%	36.14%	58.74%	43.78%	53.19%
Poor	79.90%	65.13%	57.06%	29.08%	67.80%
Not poor	20.10%	34.87%	42.94%	70.92%	32.20%
Literacy	58.58%	92.30%	81.00%	91.22%	71.85%
Numeracy	88.18%	95.32%	94.17%	96.20%	91.39%
Total Obs.	39,299	11,977	16,874	6,853	75,003

ASIA

Characteristics↓ Services →	**Financially Excluded**	**BK**	**MM**	**BM**	**All**
Age	36.421	39.595	30.383	33.366	37.9
Urban	30.88%	34.23%	38.51%	60.43%	32.87%
Rural	69.12%	65.77%	61.49%	39.57%	67.13%
Male	39.93%	48.84%	68.89%	74.41%	44.75%
Female	60.07%	51.16%	31.11%	25.59%	55.25%
Poor	73.42%	66.95%	63.51%	51.93%	70.01%
Not poor	26.58%	33.05%	36.49%	48.07%	29.99%
Literacy	61.55%	70.68%	80.82%	90.20%	66.40%
Numeracy	82.54%	88.80%	98.65%	98.70%	85.83%
Total Obs.	152,506	148,753	1,857	2,775	305,891

3.2.3 MCA results

The section has two main goals. First, it aims to establish the association between the type of financial services provided and the characteristics of their users. One advantage of knowing this association is that it can help map users to the financial services provided, thus enabling policy-makers and stakeholder to design targeted policies toward, for example, achieving the UFA2020 goals. Second, the section aims to evaluate the progress of financial inclusion in Africa and Asia toward the UFA2020 goals. Of particular interest is to understand how FI has evolved since 2013, and whether the inclusion process has empowered those in need (e.g., rural producers, poor, women, etc.).

To achieve these goals, we employ the MCA technique described in Section 3.2.1. To enable regional comparison of the FI process between Africa and Asia, we run the MCA separately for each region. As the data cover five years (2013 to 2017), we only show the graphical representations of the MCA results for 2013 (start period) and 2017 (end period

2017) to ease readability. Presenting the results in details for all years and both countries will lengthen the study without adding any qualitative value. Nevertheless, we will analyze the dynamic over time of the FI process in both continent. In particular, we will show how FI has evolved between 2013 and 2017, and which segment of the population has benefited from the inclusion process.

3.2.3.1 Accessibility to financial services

An important question we would like to answer first in relation to financial inclusion is 'What financial inclusion services are offered to users, and who use them?' The first part of the question is straightforward, as we have discussed in the Section 3.2.2 the financial services offered in both Africa and Asia, i.e. bank accounts (BK), mobile money (MM), and the combination both bank accounts and mobile money (BM). To answer the second part of the question, we run MCA to find the association between each financial service and its users' characteristics. As such, MCA is an interesting tool to exhaustive describe the characteristics of each financial service users. As discussed above, we shall focus mainly on the 2013 and 2017 samples in the detailed description of the MCA results.

3.2.3.1.1 Financial inclusion in 2013 Figures 3.2&3.3 present the MCA results for both the African and Asian samples in the variable space (user characteristics). In both regions, the first three principal dimensions summarize most of the data variability. More specifically, their contribution to the total data inertia is 68.3% for Africa and 80.1% for Asia. Each of the remaining dimensions contributes less than 2% to the total variability in the data, thus are left out, as is often the case in most MCA applications. The results for dimensions 1&2 are presented in Figure 3.2, while that of dimensions 1&3 are shown in Figure 3.3. Showing the figures side-by-side makes it easier to see the differences between both regions. In these figures, the variables that are significant (thus can be interpreted) are located farther away from the origin, and categories (or variables) that are highly associated are located close to each other and they usually contribute to the same dimensions. Each dimension is a principal factor formed by a linear combination of the variables, and the contribution of each variable to this dimension can be quantified. For both regions, we see that *Dimension 1* contrasts financial services users that are poor, over 35 years old, have low education (thus no basic literacy and numeration skills) on the right to younger users (less than 35 years old), not poor, highly educated (thus have basic literacy and numeration skills) on the left.

While *education* contributes mostly to *Dimension 1* in Africa, *poverty* and *location* are also important determinants of this dimension for Asia. As such, *Dimension 1* is labelled '*Education*' for Africa, and '*Education, poverty, location*' for Asia. This is the first difference between the two regions. *Dimension 2* (i.e., the vertical axes in Figure 3.2) fundamentally differ between the two regions. For the African sample, it is mainly described by *gender* and *poverty*, while for the Asian sample, *age* and *location* mostly form the dimension. Looking at *Dimension 3*, both regions also differ slightly in the sense that *gender* mostly contributes to it in the Asian sample, while in addition to *gender*, *age* also plays an important role in the African sample. Table 3.4 below details the description of the three dimensions for each region in 2013.

TABLE 3.4: MCA main dimensions in 2013

	Africa	**Asia**
Dimensions	Description	Description
1	Education	Education, Poverty, Location
2	Gender, Poverty	Age, Location
3	Age, Gender	Gender

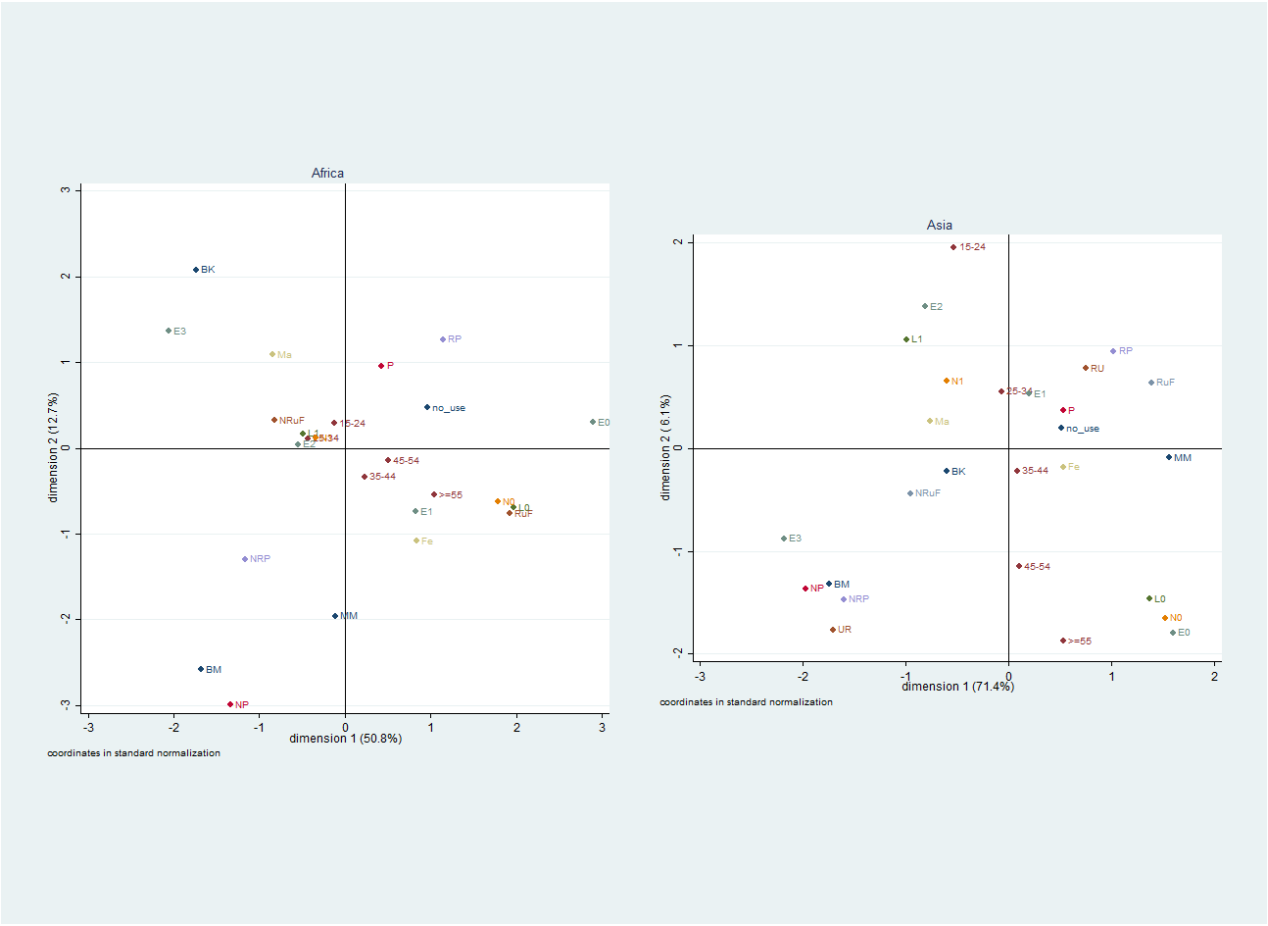


FIGURE 3.2: 2013 MCA results in dimensions 1&2– Africa vs. Asia.

Four main types of financial users are: excluded people (no-use); bank users (BK) , Mobile money users (MM); bank and mobile money users (BM). Other characteristics of financial users are: Age categories: $(15-24)$, $(25-34)$, $(35-44)$, $(45-54)$, ≥ 55. Poverty status: poor (P), not poor (NP). Literacy ability: basic (L1) , not basic (L0) . Numeration ability: basic (N1) , not basic (N0) . Location: rural (RU), urban (UR). Gender: Male (Ma), female (Fe). Education status: no-formal education (E0), primary education (E1) , secondary education (E2) , higher education (E3) . Special status: female in rural area (RuF), female in urban area (NRuF), poor in rural area (RP), not poor (NP).

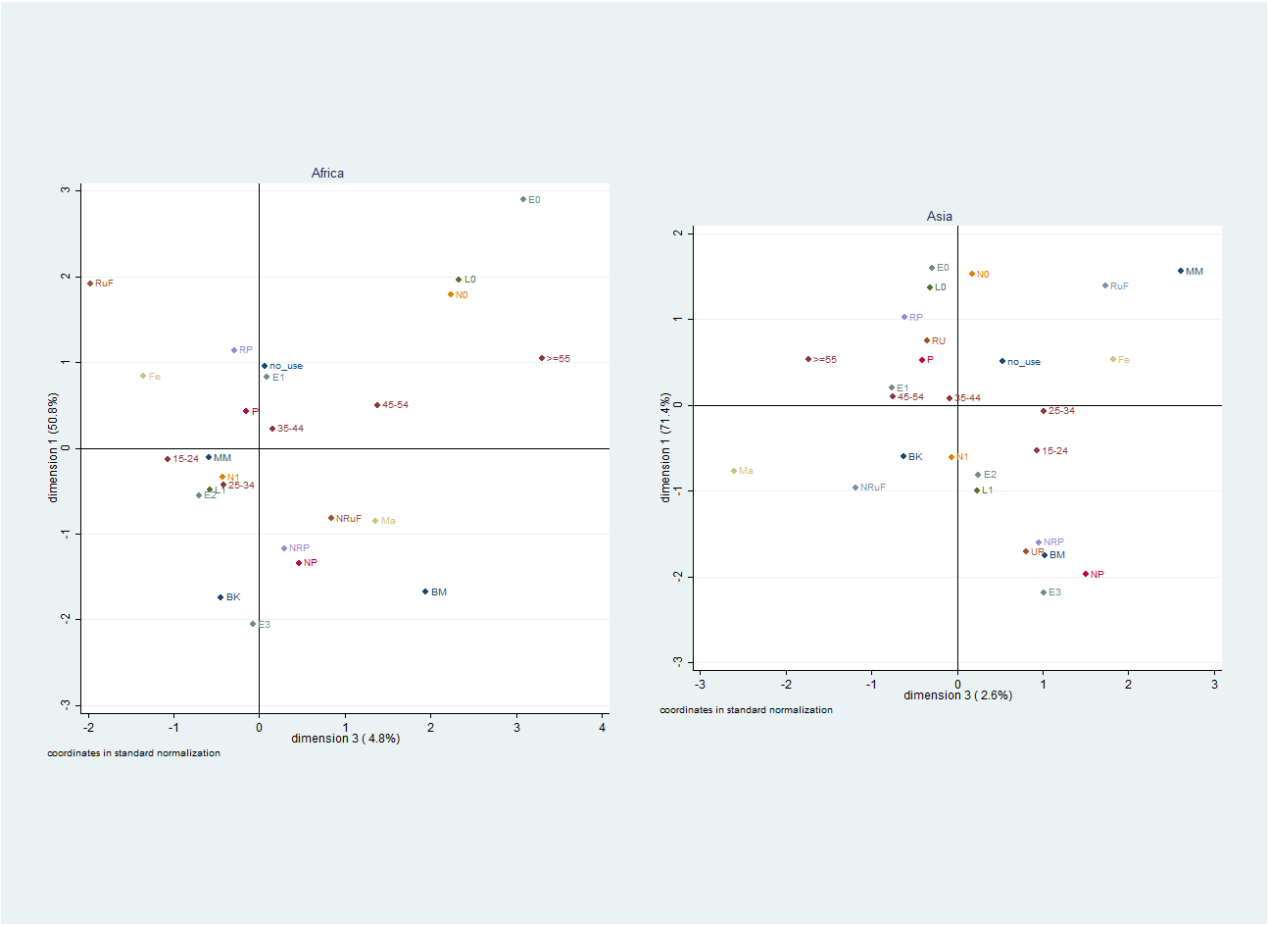


FIGURE 3.3: 2013 MCA results in dimensions 1&3– Africa vs. Asia.

Four main types of financial users are: excluded people (no-use); bank users (BK) , Mobile money users (MM); bank and mobile money users (BM). Other characteristics of financial users are: Age categories: $(15-24)$, $(25-34)$, $(35-44)$, $(45-54)$, ≥ 55. Poverty status: poor (P), not poor (NP). Literacy ability: basic (L1) , not basic (L0) . Numeration ability: basic (N1) , not basic (N0) . Location: rural (RU), urban (UR). Gender: Male (Ma), female (Fe). Education status: no-formal education (E0), primary education (E1) , secondary education (E2) , higher education (E3) . Special status: female in rural area (RuF), female in urban area (NRuF), poor in rural area (RP), not poor (NP).

MCA allows to plot the financial inclusion indicators in the variable space to find out their association with user characteristics. Hence, each financial service is mainly associated with the characteristics of a group of its users (those users can be exhaustively described through their characteristics). As such, Figure 3.2 shows bank users (BK) at the top upper left corner close to highly educated male individuals in the African sample. At the bottom left corner of this figure are mobile money (MM) and both bank and mobile money (BM) users. This group of individuals are not poor and live in urban areas. On the right hand-side of the figure are individuals who are not associated with any of the financial services provided, thus are *financially excluded*. This group is comprised of females over 35 years old, less educated (no formal education or have only a primary education), poor and living in rural area. For the Asian sample (Figure 3.2), bank and mobile money (BM) users are located at the bottom left corner of the figure. The group is comprised of highly educated individuals, not poor and living in urban area. Bank users (BK) are males with secondary education and basic skills in literacy and numeration (see the top left corner of Figure 3.2 for Asia). On the top right-hand side of the figure is *financial excluded* individuals and mobile money (MM) users. MM users for Asia are young living mostly in rural area, or poor females with a primary education. At the bottom right corner (Figure 3.2 for Asia) is the group of old individuals (over 55 years old) with no formal education, and lack literacy and numeration skills. This group of individuals are close to MM or no-financial service, thus those among them who use financial services mostly choose MM. The space of dimension 1&3 (Figure 3.3) can be described in the same, thereby complementing our analysis above analysis.

Figures 3.4&3.5 highlights formally dimensions 1-3 and suggests 3 to 4 possible groupings of individuals as per their usage and non-usage of financial services provided, and also locates the available financial services in the space. For example, in Figure 3.4, the group at the top left corner for the African sample captures highly educated male individuals who are mostly bank users (BK). The group in the right-hand side (Figure 3.4 for Africa) captures females over 35 years old, less educated (no formal education or have only a primary education), poor and living in rural area. It is also apparent in the African sample that in these two dimensions, there is no financial service that is contained in the grouping of these individuals (i.e., they were financially excluded in 2013). In contrast, the bottom left grouping in the African sample are individuals who are not poor and live in urban area. MM and BM services are located in this dimension space.

Table 3.5 provides the description of each group, with the two region side-by-side to

enable easy comparison. As seen, both regions share some similarities in terms of their financial services usage, but also some dissimilarities. Firstly, BK users in both regions are educated males, but the African BK users are more educated, as they own tertiary education compared with the Asian BK users who only have secondary education. Secondly, MM users are young (under 35 years old) and not poor with a secondary education in the African sample, while in Asia, MM users are either rural females under 54 years old with primary education, or old people (more than 55 years old) with no formal education, no basic literacy and numeration skills. Thirdly, BM users in African are young (under 35 years old), not poor, and have secondary education, whereas in Asia, BM users are highly educated, live in urban area, and are not poor. Finally, financially excluded people in the African sample are poor, old and less educated rural females, while in the Asian sample, those are either poor rural females under 54 years old with primary education; or old individuals (over 55 years old) with no formal education (thus no basic literacy and numeracy skills).

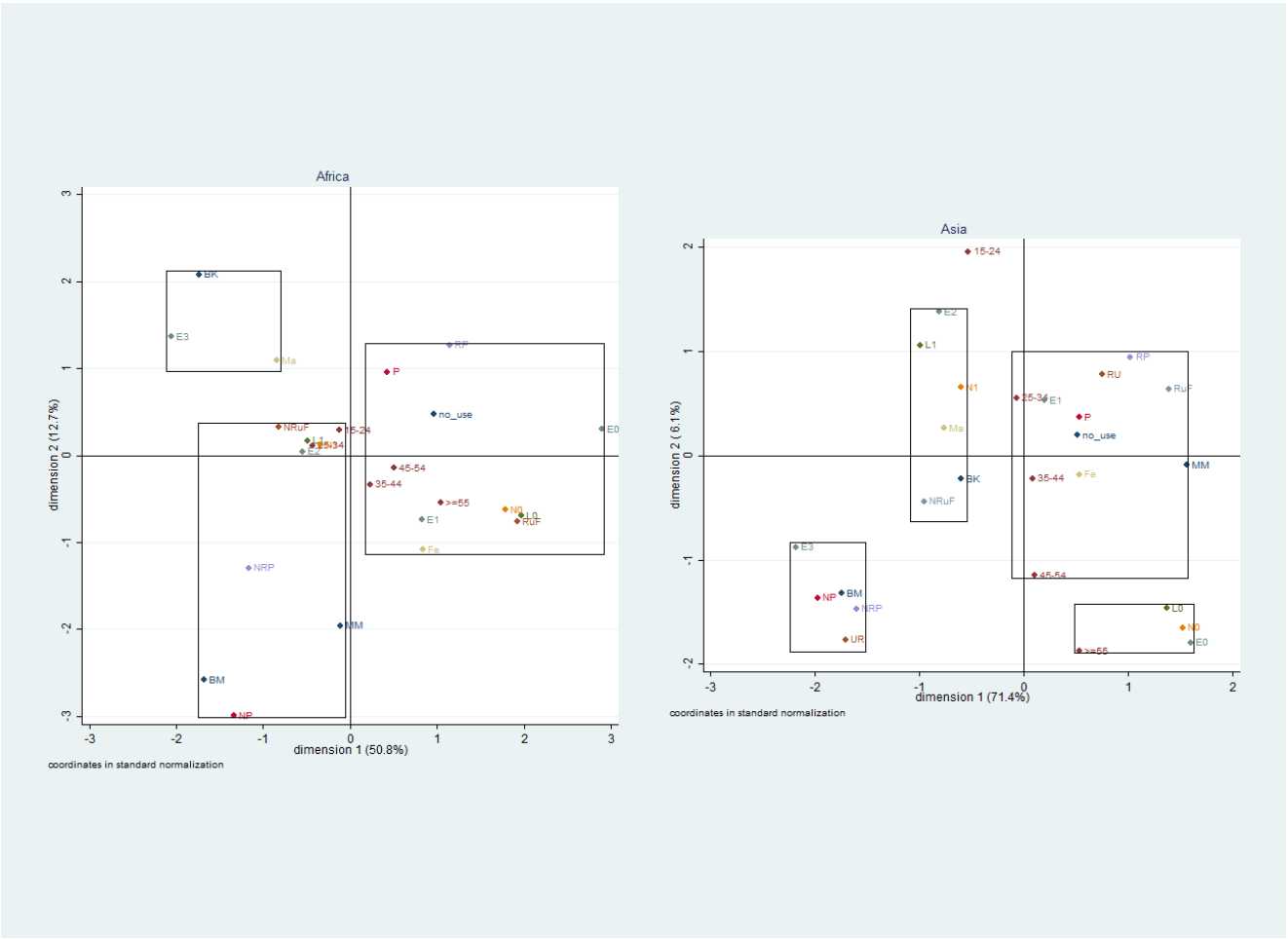


FIGURE 3.4: Use of financial services in 2013: Dimensions 1&2– Africa vs. Asia.

Four main types of financial users are: excluded people (no-use); bank users (BK) , Mobile money users (MM); bank and mobile money users (BM). Other characteristics of financial users are: Age categories: $(15-24)$, $(25-34)$, $(35-44)$, $(45-54)$, ≥ 55. Poverty status: poor (P), not poor (NP). Literacy ability: basic (L1) , not basic (L0) . Numeration ability: basic (N1) , not basic (N0) . Location: rural (RU), urban (UR). Gender: Male (Ma), female (Fe). Education status: no-formal education (E0), primary education (E1) , secondary education (E2) , higher education (E3) . Special status: female in rural area (RuF), female in urban area (NRuF), poor in rural area (RP), not poor (NP).

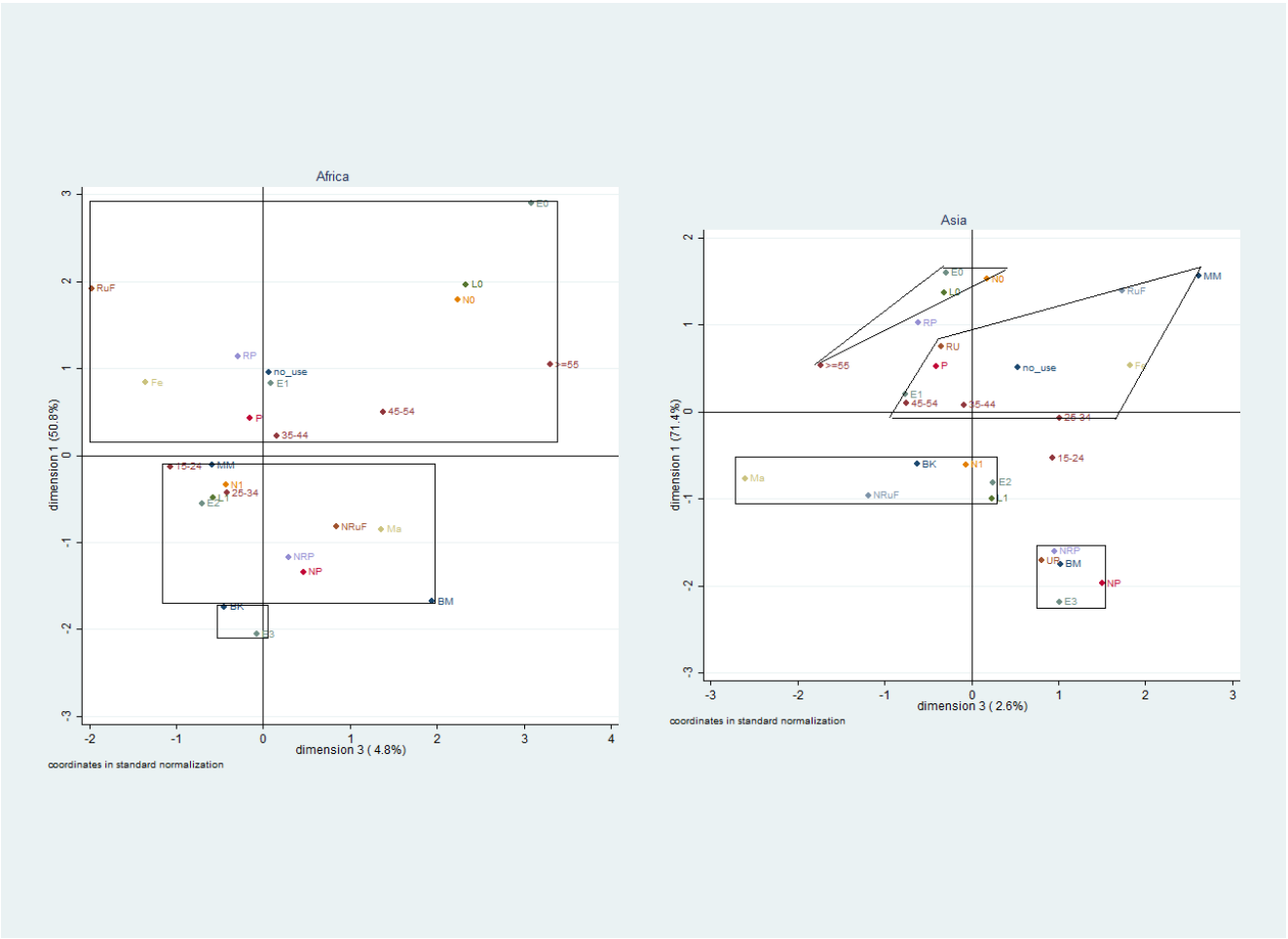


FIGURE 3.5: Use of financial services in 2013: Dimensions 1&3– Africa vs. Asia.

Four main types of financial users are: excluded people (no-use); bank users (BK) , Mobile money users (MM); bank and mobile money users (BM). Other characteristics of financial users are: Age categories: $(15-24)$, $(25-34)$, $(35-44)$, $(45-54)$, ≥ 55. Poverty status: poor (P), not poor (NP). Literacy ability: basic (L1) , not basic (L0) . Numeration ability: basic (N1) , not basic (N0) . Location: rural (RU), urban (UR). Gender: Male (Ma), female (Fe). Education status: no-formal education (E0), primary education (E1) , secondary education (E2) , higher education (E3) . Special status: female in rural area (RuF), female in urban area (NRuF), poor in rural area (RP), not poor (NP).

TABLE 3.5: Characteristics of financial users in 2013: Africa vs. Asia

	Africa	**Asian**
BK	Tertiary education, males	Males, Secondary education (have basic literacy & numeration skills)
MM	Not poor, under 35 years old, secondary education	Females, rural, poor, under 54 years old, primary education; or Older than 55 years old, no formal education (thus have no literacy & numeration skills)
BM	Not poor, under 35 years old, secondary education	Not poor, urban, high education
Financially excluded	Females, poor, rural, over 35 years old, low education	Females, rural, poor, under 54 years old, primary education; or Older than 55 years old, no formal education (thus have no literacy & numeration skills)

3.2.3.1.2 State of financial inclusion in 2017 We now focus on the financial inclusion process in 2017. As in Section 3.2.3.1.1, three principal dimensions explained most of the data variability (80.1% for the African sample and 68.2% for the Asian sample). Note that these numbers have flipped compared with the ones in Section 3.2.3.1.1, with the African sample now capturing more variability in the data than the Asian sample. Figures 3.6&3.7 illustrate how financial services user characteristics are located in the spaces of these three dimensions. It important to note that the factors that form these three main dimensions have changed in many instances compared with the 2013 results. While education remains a key factor in Dimension 1 in both regions (similar to 2013), poverty now is no longer a significant determinant of Dimension 1 in the Asian sample, rather plays an important role in the African data. This suggests that the inclusion process may have evolved in both regions. Also, education appears important in Dimension 2 for Africa whereas poverty is key factor of that dimension in the Asian data. Age, that was not an important determinant of Dimension 2 in 2013 in the Africa sample, is now contributing to it in 2017, while the contribution of poverty and location has flipped the sides compared with 2013. Similarly, Dimension 3 in 2017 is the flip of that of 2013, with now only gender mostly explaining it in

the Africa data, whereby age and gender are its key determinants in the Asian data. Table 3.6 below summarizes these dimensions.

TABLE 3.6: MCA main dimensions in 2017

	Africa	**Asia**
Dimensions	Description	Description
1	Education, Poverty, Location	Education, Location
2	Age, Education	Age, Poverty
3	Gender	Age, Gender

As before, we can plot the financial inclusion service indicators in the variable spaces to find out their association with user characteristics. Considering first the sample of African countries, we see from Figure 3.6 that bank users (BK) and those who combine both bank and mobile money (BM) are located at the left-hand side of the figure. Those individuals are highly educated, not poor, and live in urban area. MM users are located at the bottom of Figure 3.6 (see subfigure *Africa*) and are young females with secondary education living mostly in rural area. This represents a substantiated change compared with 2013 where the age group 15-24 years old was not significant (close to the origin). Financially excluded individuals are poor who live in rural area, have at most primary education. Those individuals are located on the right-hand side of Figure 3.6 (see subfigure *Africa*), and they also appear at the top right-hand side of Figure 3.7 (see subfigure *Africa*). This group of individuals formally lack basic literacy and numeration skills, and are over 55 years old. Looking at the sample of Asian countries (Figures 3.6&3.7, subfigure *Asia*), we see that BM and MM users are located on the top left part of Figure 3.6 (*Asia*) and bottom left part of Figure 3.7 (*Asia*). They highly educated males, not poor and living in urban area. As the banking service variable (BK) and no financial service usage one (no_users) are close to the origin in both the Dimensions (1,2) & (1,3) spaces, they are difficulty to interpreted. However, it is likely that they are together with individuals between 25-44 years old with primary education, poor and living in rural area. Individuals without formal education and basic numeration & literacy skills are located at the bottom right part of Figure 3.7 (*Asia*) and the first upper two quadrants of Figure 3.7 (*Asia*). As in 2013, this group of individuals are mostly old people.

Table 3.7 contains a summary of each financial service user characteristics. The table

enables both regional (Africa vs. Asia) and dynamic (2013 vs. 2017) comparisons. Considering regional differences first, with the exception of *financially excluded* individuals (i.e., no_users), users of the financial services provided differ between Africa and Asia. While BK users in the African sample are not poor, highly educated and live in urban area, the Asia countries' BK users are poor with primary education, who live in rural area and are under 45 years old. MM users in the African sample are young females (under 35 years old) with secondary education, whereby in the Asian sample, MM users are young highly educated males (under 25 years old), not poor and live in urban area. The combination of bank and mobile money users (BM) in Africa are highly educated individuals living in urban area and not poor, while in the Asian sample, although highly educated, not poor, and live in urban area, BM users are mostly young males (under 25 years old). Now, looking at temporal differences, it is apparent that financial service usage has evolved over time. Indeed, comparing the description of each financial service users in 2013 with that in 2017 (Table 3.5 vs. Table 3.7), noticeable differences appear in both regions. For example in 2017, BK users are no longer associated with gender in both regions (so the service is now available to females), and less educated individuals have access to bank accounts in Asia. Similarly, MM users are now associated with gender, where educated young females dominate the market in Africa, while educated young males who are not poor and live in urban area prevail in Asia. These results substantially contrast with the ones found in 2013.

TABLE 3.7: Characteristics of financial services users in 2017

	Africa	**Asia**
BK	Not poor, urban, high education	Rural, poor, under 45 years old, primary education
MM	Females, under 35 years old, secondary education	High education, males, under 25 years old, not poor, urban
BM	Not poor, urban, high education	High education, urban, males, under 25 years old, not poor
Financially excluded	Males, 35-55 years old, primary education; or	Rural, poor, under 45 years old, primary education; or
	Rural poor females, over 55 years old with no formal education (thus lack basic literacy & numeracy skills)	Rural poor females, over 55 years old with no formal education (thus lack basic literacy & numeracy skills)

Clearly, these results show that financial inclusion has evolved between 2013 and 2017. However, whether the inclusion process has empowered the poorest (e.g., rural producers, poor, women, etc.) is still unclear. Since each financial services is associated with specific users, and the fact that the decomposition of the survey sample has remained the same over time, we can trace out how the share of the main sub-population groups of financial services users has changed over time. This analysis allows, for example, to track the switch of individuals from a service to another. To enable this, we must run MCA not only for 2013 and 2017, but also the other survey years (2014, 2015, and 2016). Since the survey sampling was drawn independently each year, we believe that running separate MCA will capture the dynamic of the FI process over time. Section 3.2.3.2 presents the details.

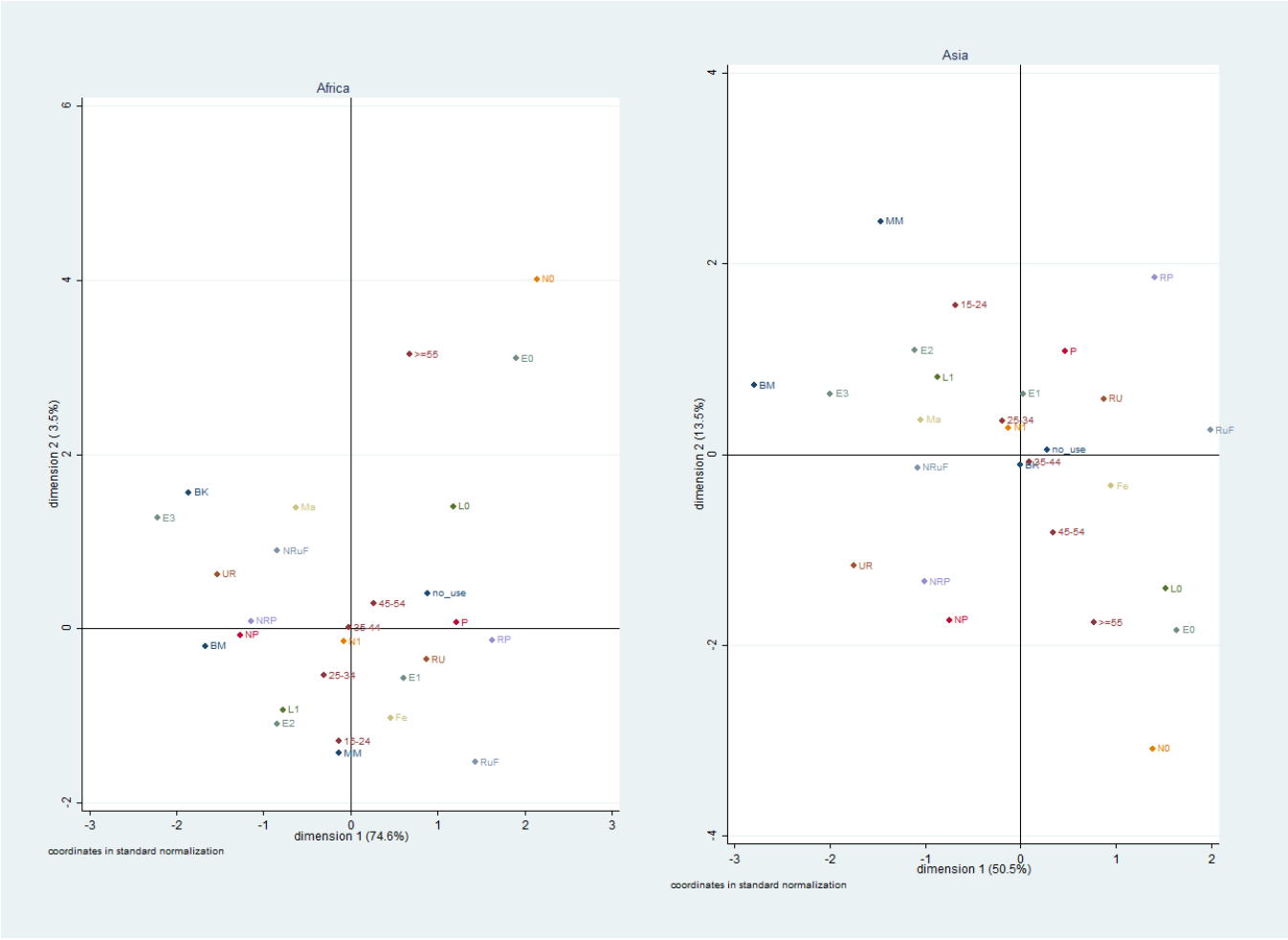


FIGURE 3.6: 2017 MCA results in dimensions 1&2– Africa vs. Asia.

Four main types of financial users are: excluded people (no-use); bank users (BK) , Mobile money users (MM); bank and mobile money users (BM). Other characteristics of financial users are: Age categories: $(15-24)$, $(25-34)$, $(35-44)$, $(45-54)$, ≥ 55. Poverty status: poor (P), not poor (NP). Literacy ability: basic (L1) , not basic (L0) . Numeration ability: basic (N1) , not basic (N0) . Location: rural (RU), urban (UR). Gender: Male (Ma), female (Fe). Education status: no-formal education (E0), primary education (E1) , secondary education (E2) , higher education (E3) . Special status: female in rural area (RuF), female in urban area (NRuF), poor in rural area (RP), not poor (NP).

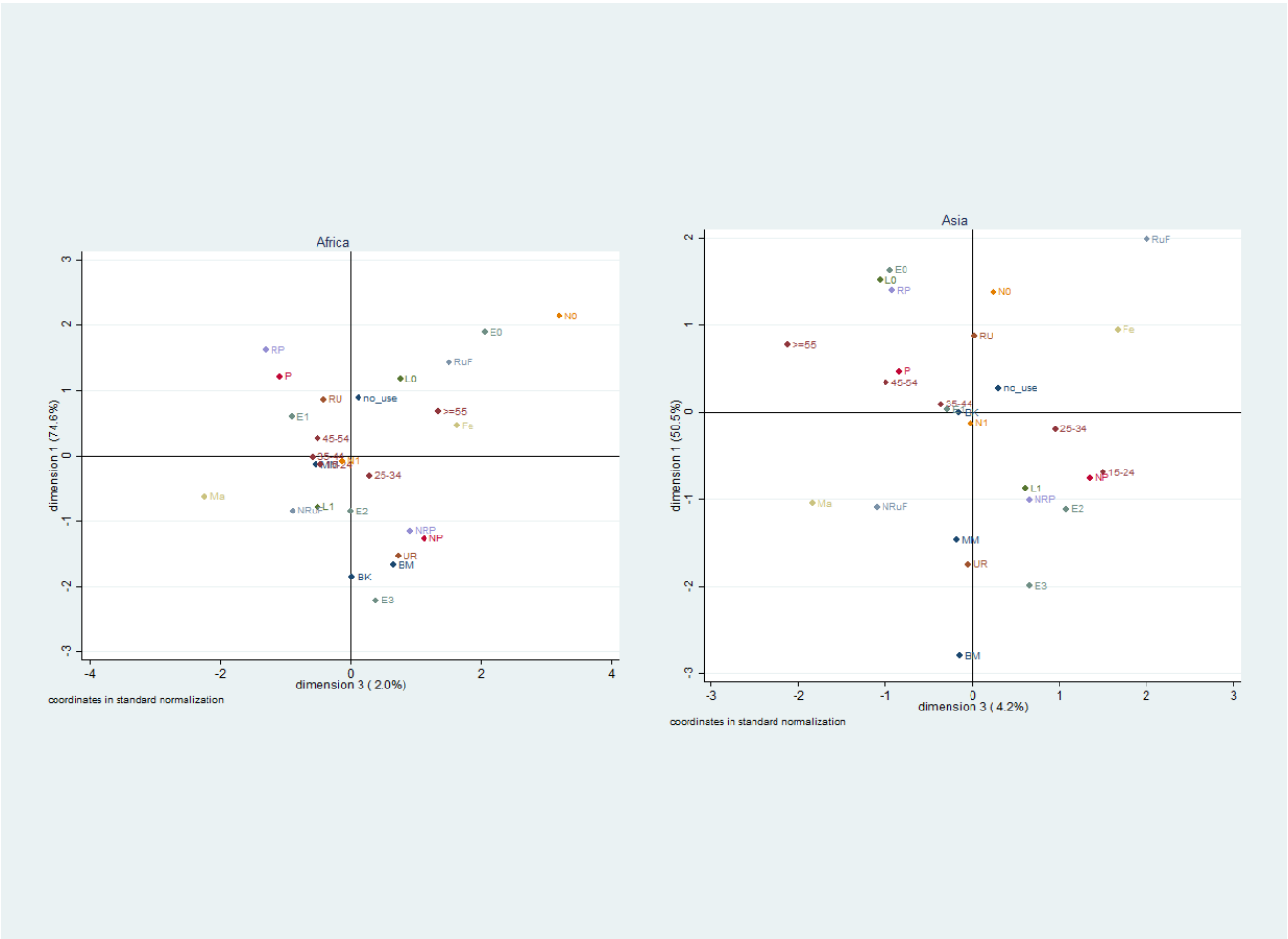


FIGURE 3.7: 2017 MCA results in dimensions 1&3– Africa vs. Asia.

Four main types of financial users are: excluded people (no-use); bank users (BK) , Mobile money users (MM); bank and mobile money users (BM). Other characteristics of financial users are: Age categories: $(15-24)$, $(25-34)$, $(35-44)$, $(45-54)$, ≥ 55. Poverty status: poor (P), not poor (NP). Literacy ability: basic (L1) , not basic (L0) . Numeration ability: basic (N1) , not basic (N0) . Location: rural (RU), urban (UR). Gender: Male (Ma), female (Fe). Education status: no-formal education (E0), primary education (E1) , secondary education (E2) , higher education (E3) . Special status: female in rural area (RuF), female in urban area (NRuF), poor in rural area (RP), not poor (NP).

3.2.3.2 Dynamic of financial inclusion between 2013 and 2017

Our previous analysis in Tables 3.5&3.7 show that poverty, location, education, age and gender explain most of the differences in the choice of the financial services provided in both continent. Each of these variables separate financial service users and non-users into a number of distinct subgroups. For example, *age* separates all BK, MM, BM users, as well as financially excluded individuals into five groups (15–24; 25–34; 35–44; 45–54, and $\geq$ 55). Similarly, *poverty* separates them into two groups (poor (P) and not poor (NP)), and so is *gender* (females and males). As such, the dynamic of financial inclusion can be assessed by examining, for example, how the share of each service (BK, MM, BM) users and non-users in each subgroup has changed over time. For clarity, we separate financial services users and non-users in this analysis. Section 3.2.3.2.1 deals with the dynamic of users, while Section 3.2.3.2.2 is concerned with that of non-users.

3.2.3.2.1 Financial inclusion services usage over time Considering first the usage of BK services, Figure 3.8 shows the plots over time of the share the overall BK users, as well as that of the main subgroups using this service (age, education, gender, location, and poverty). As MCA section, the plots are shown both regions side-by-side (Africa in the first row and Asia in the second) to enable regional comparison. For a given year, the share of each subgroup are computed as the number of BK users in that group divided by the total number of observations in the sample (i.e., the entire surveyed population that year). As the question related to location was not included in the survey questionnaire of the African countries in 2013, the plots related to the subgroups resulting from this variable start from 2014 (see the bottom left subfigure in Figure 3.8). Looking first at the sample of African countries (first row), with the exception of the groups of individuals with no-formal education and individuals over 55 years old that remained steadily constant over time (top left subfigure), and the group of individuals who are *not poor* (bottom left subfigure) which trended upward, there is a downward trend in BK service usage for the other subgroups (including the overall BK usage). For example, the overall BK usage has fallen from roughly 18% in 2013 to around 12% in 2017. Similarly, the share of young BK users (under 24 years old) has decreased from around 14% in 2013 to about 7.5% in 2017 (top left subfigure). Remarkably, the share of BK users who were *poor* has decreased drastically, from slightly over 15% in 2013 to around 2.5% in 2017 (bottom left subfigure). Meanwhile, all subgroups of BK users in the Asian sample, including poor BK users, have steadily increased over the period (top right and bottom right

subfigures). As such, most BK users in the African sample seem to have shifted from banking services to alternate financial inclusion services. In the Asian sample, however, the size of most subgroups of BK users has steadily increased over time. Nevertheless, some similarities between the two regions exist. In particular, the share of individuals over 55 years old has remained steadily constant over the period in both regions, while that of individuals who are not poor has trended upward.

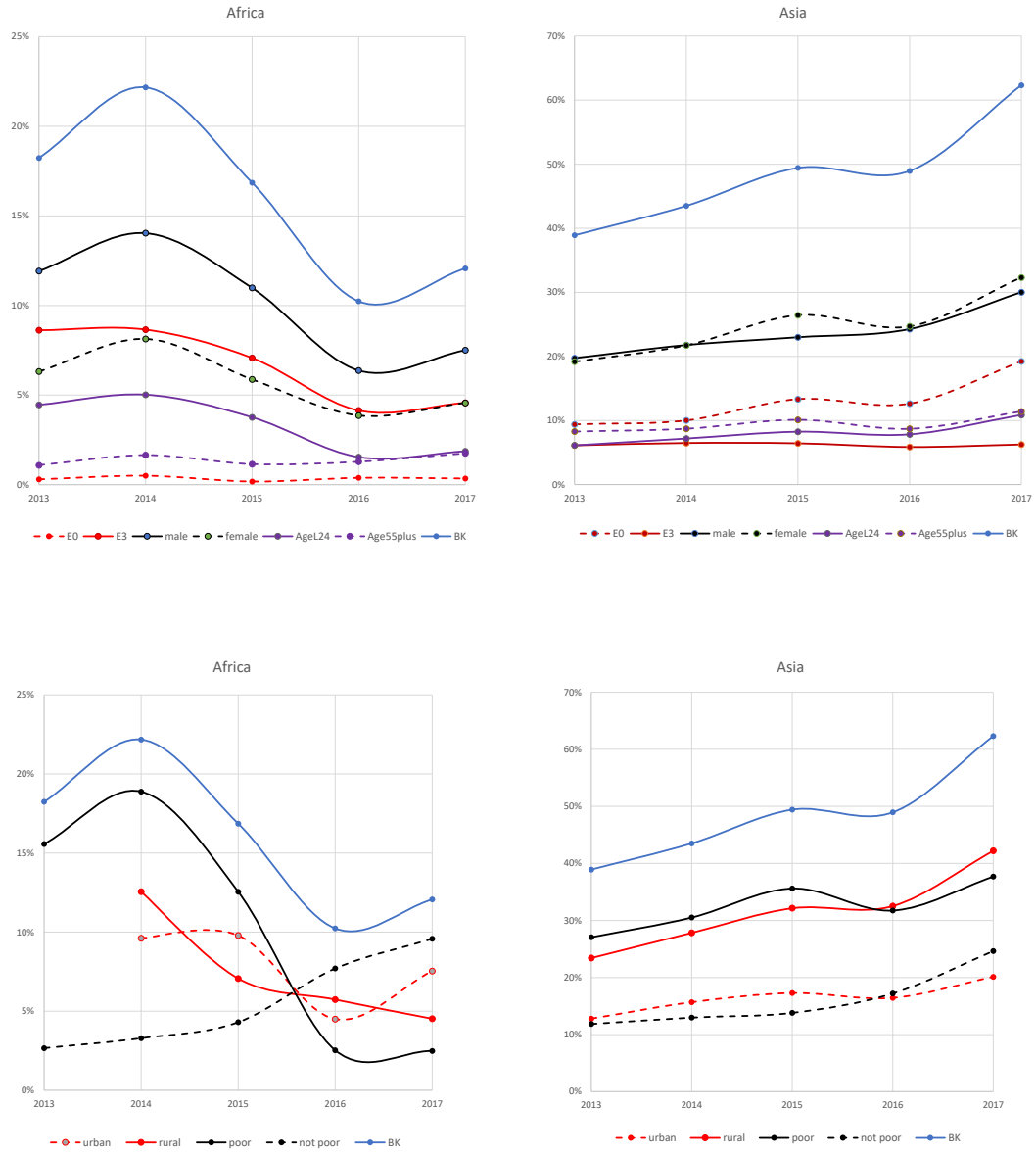


FIGURE 3.8: BK usage over time– Africa vs. Asia.
Bank account (BK) financial service. The main characteristics of this service users from the MCA results are: Age categories: $(15-24)$, $(25-34)$, $(35-44)$, $(45-54)$, ≥ 55. Poverty: poor (P), not poor (NP). Location: rural (RU), urban (UR). Gender: Male (Ma), female (Fe). Education: no-formal education (E0), primary education (E1) , secondary education (E2) , higher education (E3).

Now, looking at MM usage (Figure 3.9), we see that in the African sample, the proportion of users in most subgroups has either slightly increased, or remained steadily constant over time, with the overall MM usage seeing a bounce from 20% in 2013 to roughly 25% in 2017. In particular, the proportion of female MM users has increased steadily from around 12.5% in 2013 to slightly above 15% in 2017. Similarly, the proportions of MM users who are not poor and those living in rural area have also increased steadily over the period. This suggests that the drop of BK usages observed in these subgroups may have benefited to MM usage, i.e., there may have been a shift from BK to MM among these subgroups. Another explanation could be that the increasing effort in the Africa region to lift people out of poverty through financial inclusion has seen strong mobilization in educating females and rural Africans to use these services (see e.g. Atkinson and Messy, 2013; Triki and Faye, 2013). Since BK service is rarely available to rural and female Africans, the expansion of mobile phones and internet even in rural areas has made MM service the only viable solution (see e.g. the M-PESA in Kenya; Van Hove and Dubus, 2019, Kenya and Uganda; Johnson and Nino-Zarazua, 2011). This could explain the steady increase in females and rural MM usage for the African region. Similarly to BK service, the share of MM users in most subgroups has increased in the Asian sample (top and bottom right subfigures of Figure 3.9). Note that the numbers shown in the vertical axis in these subfigures are small compared with the African sample due to the large sample size in this region, with Indian alone tripling all individuals survey in the Africa region. Unlike the African sample, males dominate females in MM usage in the Asian sample, while the shares of poor and rural Asians are quite identical after 2014. The latter pattern is also observed between the non-poor and rural Asian MM users.

Figure 3.10 presents the change in BM usage within each subgroups. Considering the African sample (top and bottom left subfigures), with the exception of the share of poor individuals, all other subgroups have seen either an increase trend or a steady constant evolution in their shares over time. The drop in BM usage within the poorest Asians may be associated with that of the BK usage in the same group. Meanwhile, the proportion of non-poor BM users has bounced from around 5.7% in 2013 to about 8.2% in 2017. Clearly, males dominate females in BM usage, while urban Asians use this service more often than rural Asians. This is no surprise seeing the discrepancy in BK usage between males and females on one hand, and urban and rural on the other hand (Figure 3.8). Again, the proportion of BM usage has steadily increased in most subgroups, including the poor, in the Asian sample (top and bottom right subfigures). While males BM users dominates female (similar

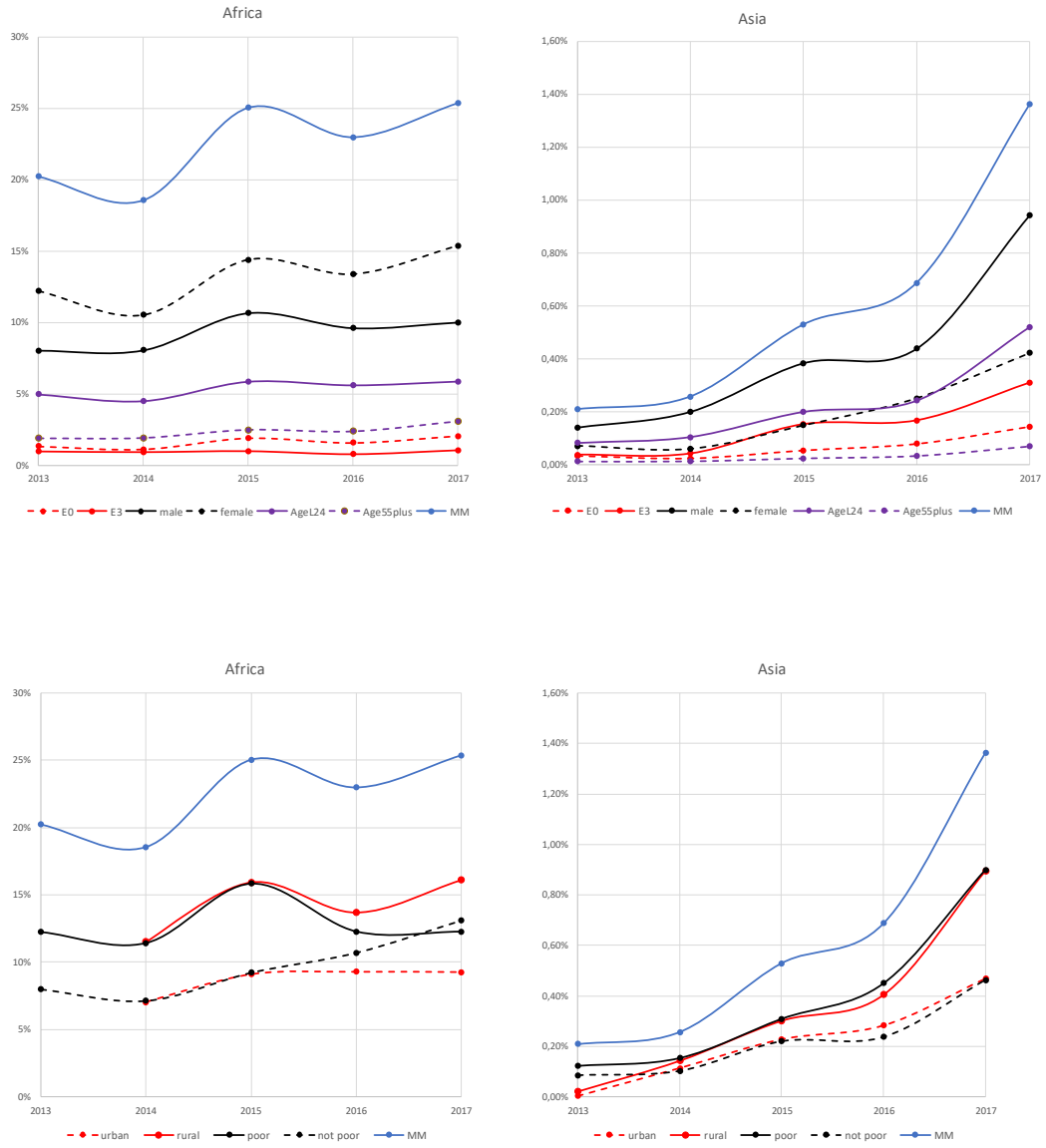


FIGURE 3.9: MM usage over time– Africa vs. Asia.
Mobile Money (MM) financial service. The main characteristics of this service users from the MCA results are: Age categories: $(15-24)$, $(25-34)$, $(35-44)$, $(45-54)$, ≥ 55. Poverty: poor (P), not poor (NP). Location: rural (RU), urban (UR). Gender: Male (Ma), female (Fe). Education: no-formal education (E0), primary education (E1) , secondary education (E2) , higher education (E3).

to Africa), the increase in the fraction of poor BM users is more pronounced than that of non-poor users in Asia. Poor BM users dominate non-poor users at the end of the period, which is contrary to the African case.

3.2.3.2.2 Financially excluded individuals over time Figure 3.11 is the plots of the proportion of financially excluded over times in the African sample (top and bottom left subfigures) and the Asian sample (top and bottom right subfigures). Looking first at the Asian

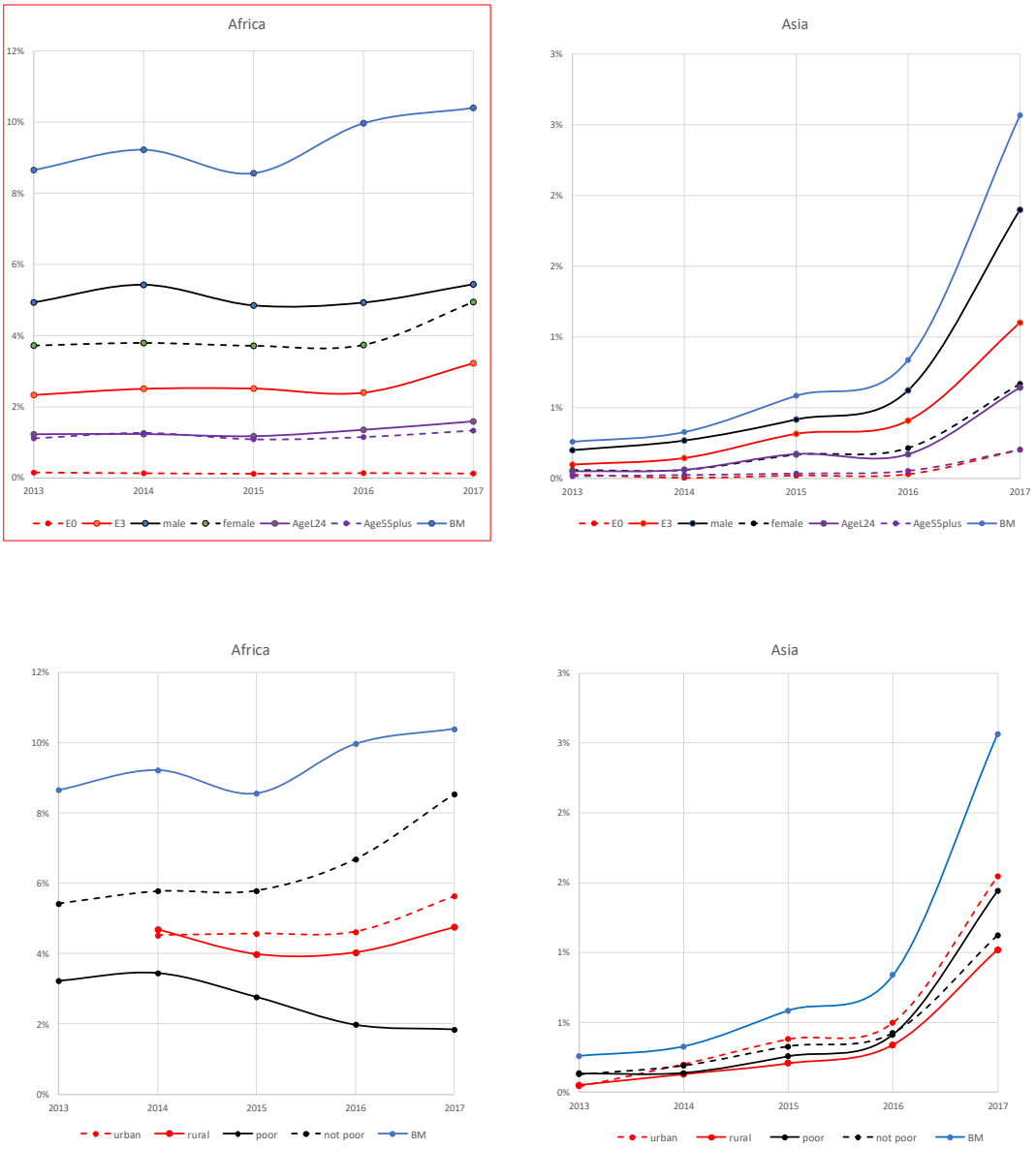


FIGURE 3.10: BM usage over time– Africa vs. Asia
Bank and Mobile money (BM) financial service. The main characteristics of this service users from the MCA results are: Age categories: $(15-24)$, $(25-34)$, $(35-44)$, $(45-54)$, ≥ 55. Poverty: poor (P), not poor (NP). Location: rural (RU), urban (UR). Gender: Male (Ma), female (Fe). Education: no-formal education (E0), primary education (E1) , secondary education (E2) , higher education (E3).

sample (top and bottom right subfigures), we see that the overall proportion of financially excluded individuals, as well that of most subgroups, has decreased significantly over. For example, this fraction has dropped drastically from slightly above 60% in 2013 to about 34% in 2017. Similarly, the fraction of financially excluded poor (respectively females) has substantially decreased from around 50% (respectively 38%) in 2013 to roughly 21% (respectively 20%) in 2017. Only the proportions of financially excluded non-poor, urban, and

higher educated individuals, have remained steadily constant in the Asian sample during the period. Coupling these with the significant increase in financial services usage (BK, MM, and BM) evidenced in Section 3.2.3.2.1, it is apparent that financial inclusion has been relatively a success in the Asian countries studied. More importantly, many disadvantaged groups (e.g. poor, women, and rural Asians) have seen a drop in their fraction of financially excluded individuals, while their usage of financial services has increased steadily since 2013. As such, financial inclusion also seems to have empowered the poorest in the Asian countries studied. Regarding the results of the Africa sample (top and bottom left subfigures), there is a slight difference compared with Asia. With the exception of financially excluded poor individuals, the proportion of financially excluded individuals in most of the other subgroups has not changed much during the period. The proportion of financially excluded poor individuals, however, has dropped slightly from around 45% in 2013 to about 38% in 2017. Therefore, financial inclusion is yet to materialise in the African countries compared with Asia. However, the fact that the proportion of financially excluded poor individuals has dropped since 2016 indicates that these African countries are moving toward financial inclusion.

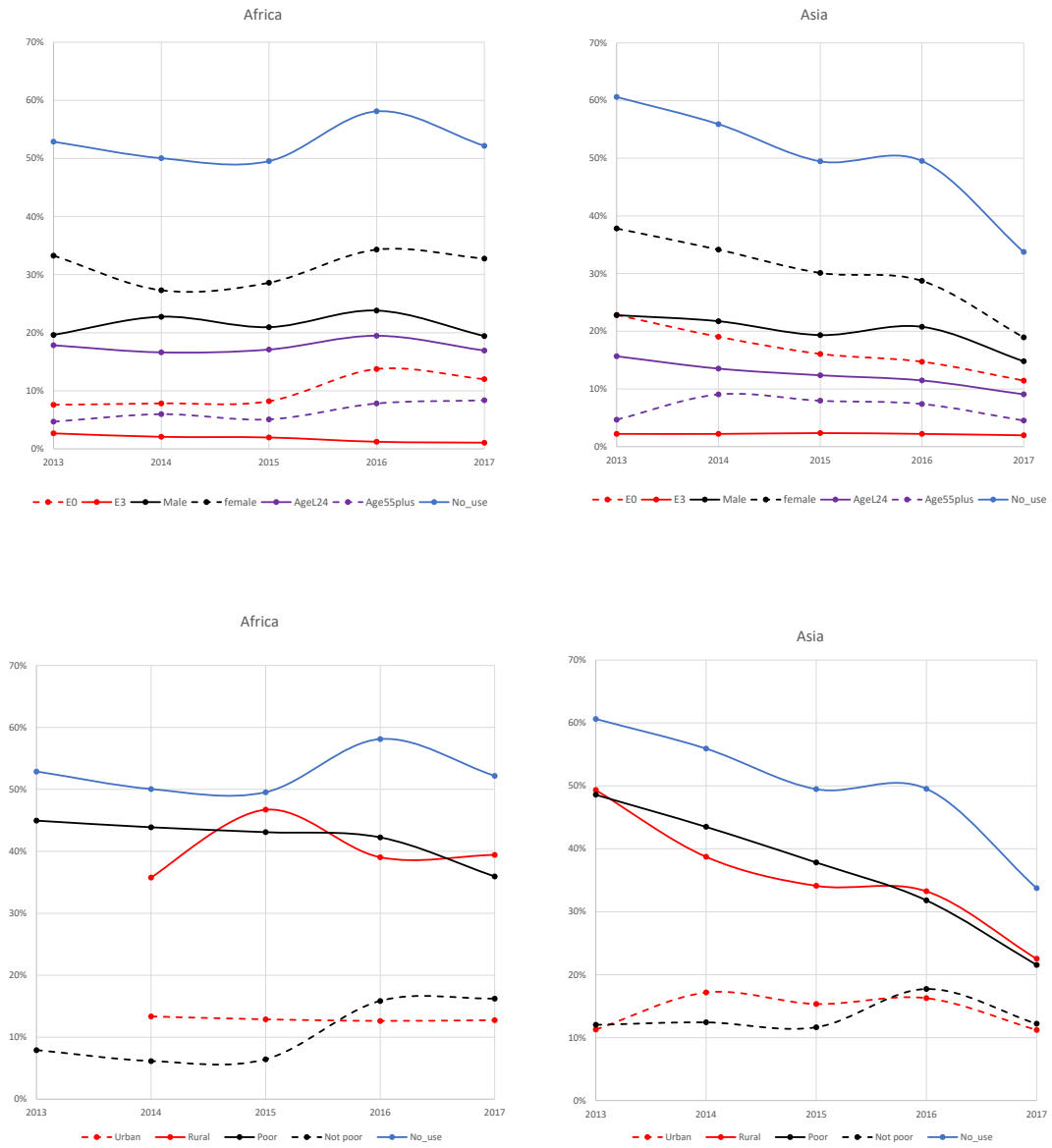


FIGURE 3.11: Financially excluded individuals over time– Africa vs. Asia.
No-users (no_use), Age categories: $(15-24)$, $(25-34)$, $(35-44)$, $(45-54)$, ≥ 55. Poverty: poor (P), not poor (NP). Location: rural (RU), urban (UR). Gender: Male (Ma), female (Fe). Education: no-formal education (E0), primary education (E1) , secondary education (E2) , higher education (E3).

Although Section 3.2.1 provides an extensive characterization of each financial inclusion service users (see e.g. Tables 3.5&3.7), there is evidence of clusters among users based on their characteristics. This makes it difficult at this stage of the analysis to know exactly the profile of each service users or that of the financially excluded individuals. In the next section, we use cluster analysis to build the typology (i.e. distinct subgroups) of financial services users.

3.3 Typology of financial inclusion service users

The MCA results describe the association between the financial services provided and characteristics of their users. As such, it is possible to build a typology of financial services users based on these characteristics. To do it, we use cluster analysis to map the financial services users to the services provided (i.e., BK, MM, and BM). As cluster analysis is not well known in the finance literature, we first describe the technique briefly in Section 3.3.1.

3.3.1 Cluster analysis

A cluster is usually defined as a group of similar objects or people positioned or occurring closely together. As such, cluster objects are similar to one another within the same cluster and dissimilar to the objects in other clusters. Cluster analysis (or clustering) is a technique of grouping a set of data objects into clusters. It can for example help policy-makers or stakeholders discover distinct groups among financial services users, and then use this knowledge to develop targeted policy programs to increase accessibility to financial services. The clustering methodology in this study builds on the factors (dimensions) obtained from the MCA. The results of the MCA suggest that three main (principal) dimensions summarise most of the data variability in both the African and Asian samples. As the need to know both the number of factors which span the data and the initial number of clusters to be formed is paramount to any cluster analysis success, especially when working with large datasets, conducting the MCA analysis as the first step was crucial.

We perform k-means clustering due to the size of the dataset. This method maximizes the between-cluster variance and minimizes the within-cluster variance relative to the mean of the cluster. The within-cluster variation forms homogeneous clusters. The algorithm initially assigns objects to a pre-assigned number of clusters, and these observations are successively reassigned between clusters by minimizing the within-cluster variation. Observations are reassigned to new clusters only when the within-cluster variation is reduced by that reallocation. In our application the initial distribution of observations into the clusters is random, although robustness tests to alternative initial conditions (first observation, last observation and observation by predefined category) yielded qualitatively the same results.

Specifically, let $\mathbb{F} = (\mathbf{F}_1, \mathbf{F}_2, \mathbf{F}_3)$ be the space spanned by the 3 factors obtained from MCA. Each individual i ($i = 1, \ldots, n$) in the sample is associated with its coordinate $f_i =$

$(f_{ji})_{1\leq j\leq 3}$. Let $\mathbb{S} = \{S_k;\ k = 1,\ \ldots,\ 4\}$ be a partition of the n individuals into four sub-groups, $n_k = |S_k|$, and $\mu_k = (\bar{f}_{jk})_{1\leq j\leq 3}$, $\bar{f}_{jk} = \frac{1}{n_k}\sum_{i\in S_k} f_{jk}^i$. The algorithm for each individual i, solves:

$$min_{S_k\in\mathbb{S}}\|f_i - \mu_k\|^2, \tag{3.3.1}$$

where $\|\cdot\|$ is the Euclidean norm. The algorithm has three steps:

1. Specify the initial clusters, $\mathbb{S}^0 = \{S_k^0;\ k = 1,\ \ldots,\ K\}$, and define the centroids $\mu_k^0 = (\bar{f}_{jk}^0)_{1\leq j\leq 3}$;
2. For each observation i, compute $\|f_i - \mu_k\|^2$ and set $i \in S_{\bar{k}}^{(t)}$ if $\|f_i - \mu_{\bar{k}}\|^2 \leq \|f_i - \mu_k\|^2$ for all $k \neq \bar{k}$. Recalculate the centroids $\mu_k^{(t)} = (\bar{f}_{jk}^{(t)})_{1\leq j\leq 3}$;
3. Iterate step 2 until $\|f_i - \mu_{\bar{k}}\|^2 < \epsilon$, for some $\epsilon > 0$.

The number of clusters to be pre-assigned in step 1, as well as the initial distribution of observations into these clusters are obtained from the MCA, which again underscores the importance of conducting MCA first.

3.3.2 Classification of financial services users

We apply the above algorithm to our samples (Africa and Asia). As the goal is to describe whether individuals cluster based on their financial service usage, we only consider the users of the three financial services available (i.e., BK, MM, and BM). From the previous sections, we know that our data span a five-year interval, so we conduct a year-by-by cluster analysis in each region. This allows us to study the dynamic of the clusters formed over time, as well as regional differences.

Considering the African sample of financial services users, the MCA results suggest 2 clusters for the first three years (2013 to 2015) and 3 clusters the last two years (2016 and 2017). Meanwhile, these numbers has reversed in the Asian sample, with 3 clusters the first three years (2013 to 2015) and 2 clusters the last two years (2016 and 2017). This the first discrepancy between both regions.

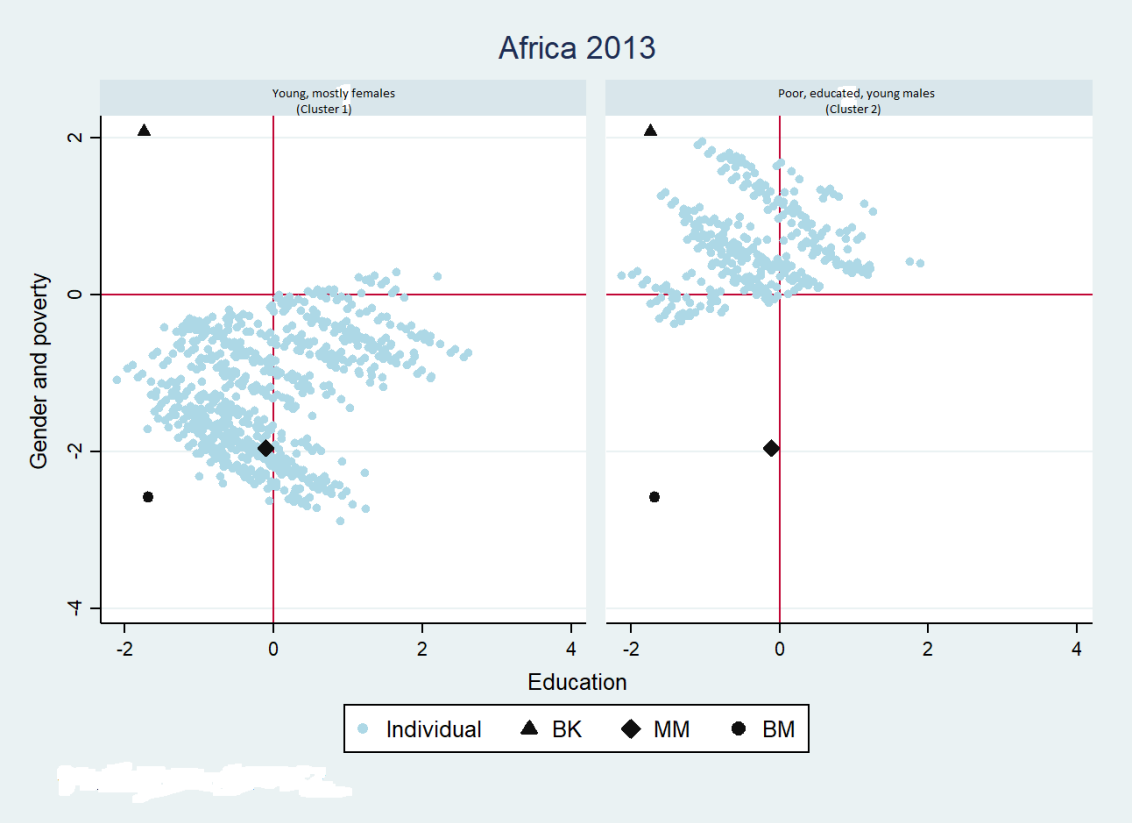
Tables 3.8 &3.9 presents the description of the clusters over time in the African and Asian sample respectively. As an illustration of how these tables were built, Figures 3.12-3.13 show the plots of the clusters in each region in 2013 (Figure 3.12) and 2017 (Figure 3.13), as well as the financial services available to each group (cluster). We only present these two year in order to for briefly. Similar graphs for the other years are available under request.

Focusing first on 2013 (Figure 3.12), we see from Figure 3.12a (African sample) that Cluster 1 is comprised of young users (under 36 years old) who are mostly females with at least a primary education. This group usually uses MM service. Cluster 2 is formed by poor educated young who are mostly males. This group likely uses BK service. Clearly, most financial services users in the African countries in the sample where mostly young in 2013 and predominantly use either BK or MM. We know from the MCA results that in 2013, BM service were associated with individuals with secondary education, under 35 years old, and not poor. This group does not appear in 2013 as a cluster probably because its size is small. Also, we see that individuals over 35 years (poor or low educated) were financially excluded in 2013 in the African sample. The clustering results confirms this results. Regarding the Asian sample, the description of the 2013 3 clusters, as well as their financial service usage differ slightly from that observed in the African sample. Specifically, Cluster 1 is mostly comprised of urban educated users who are not poor. This group mostly chooses either the BK service or both bank and mobile money services (BM). Cluster 2 is formed by poor males living mostly in rural area. This group mostly chooses BK service. Finally, Cluster 3 is comprised of rural female users who are on average in their late thirties and mostly poor. This group mainly choose either BK or mobile money (MM) services. The main similarity between the two regions is that financial excluded individuals are old with no formal education.

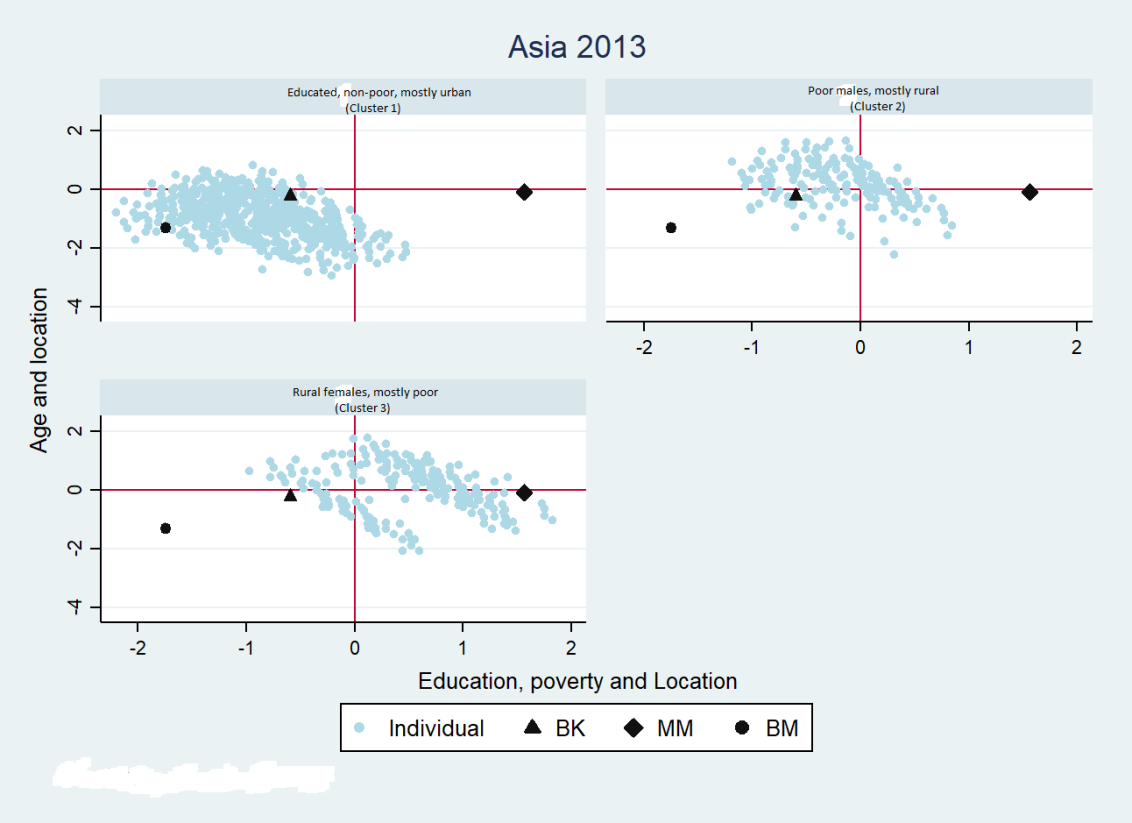
Consider now the 2017 results (Figure 3.13), we now three clusters in the African sample, while the Asian sample contains two clusters, thus reversing the 2013 cluster numbers between the two regions. In the African sample, individuals in Cluster 1 are still mostly MM service users. They are still young (on average in their late thirties) but all males (a contrast with 2013), mostly poor with basic education (primary and secondary), and mostly live in rural area. Cluster 2 is comprised of young females with primary or secondary education living mostly in rural area too. They are also mostly MM service users, and their characteristics are much closer to that of the 2013 Cluster 1. Cluster 3 is formed by educated non-poor individuals. This group is mostly comprised of either BK or BM service users. Looking at the Asian sample, there are now two clusters. Cluster 1 is formed by rural poor individuals with mostly no tertiary education. They mainly use the BK service, but sometimes the MM service. Cluster 2 is comprised of non-poor rural individuals or educated individuals mostly over 25 years old. This group likely prefers either the Bk or BM service.

Detailed descriptive statistics of each clusters in 2013 and 2017 are included in Tables A.1&A.4 in the Appendix. More importantly, a complete characterization of each cluster

for all years (2013 to 2017) is provided in Tables 3.8&3.9. This represents the typology of financial services users, as well as its dynamic in rica (Table 3.8) and Asian (Table 3.9).



(A) Financial services users in Africa: 2013



(B) Financial services users in Asia: 2013

FIGURE 3.12: Clusters of financial services users in Africa and Asia: 2013

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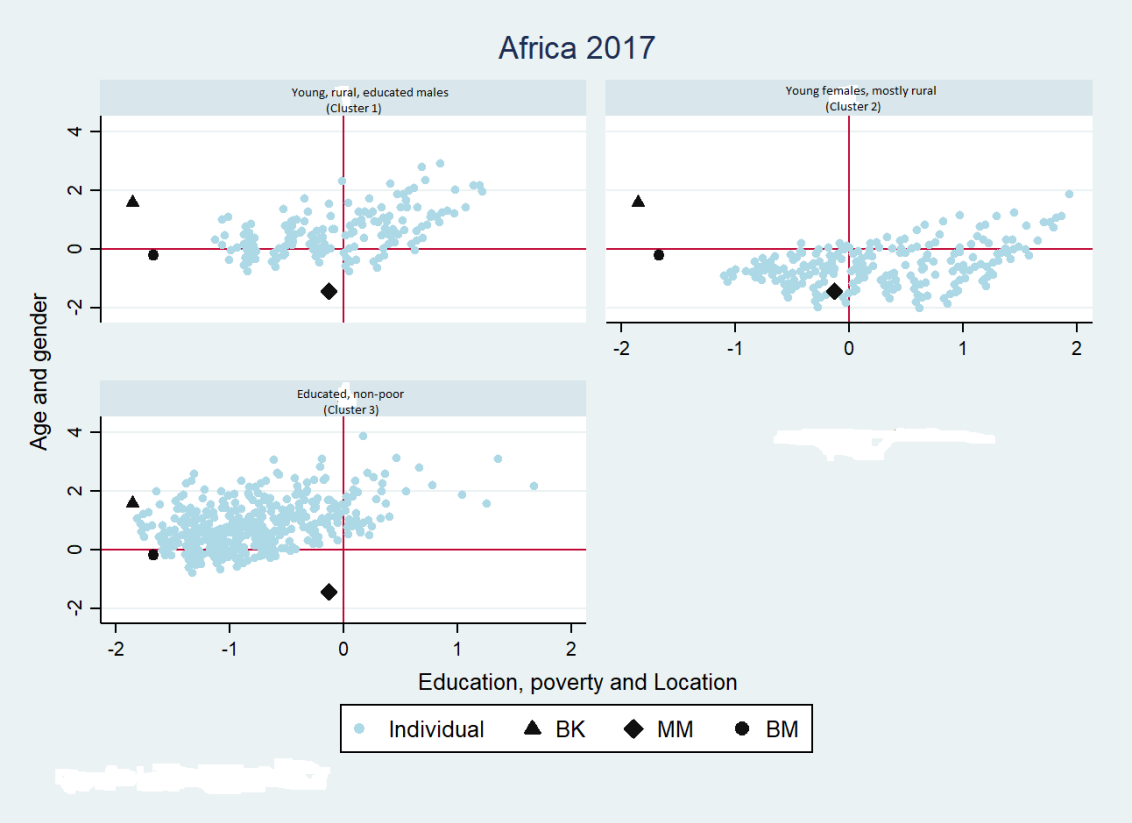
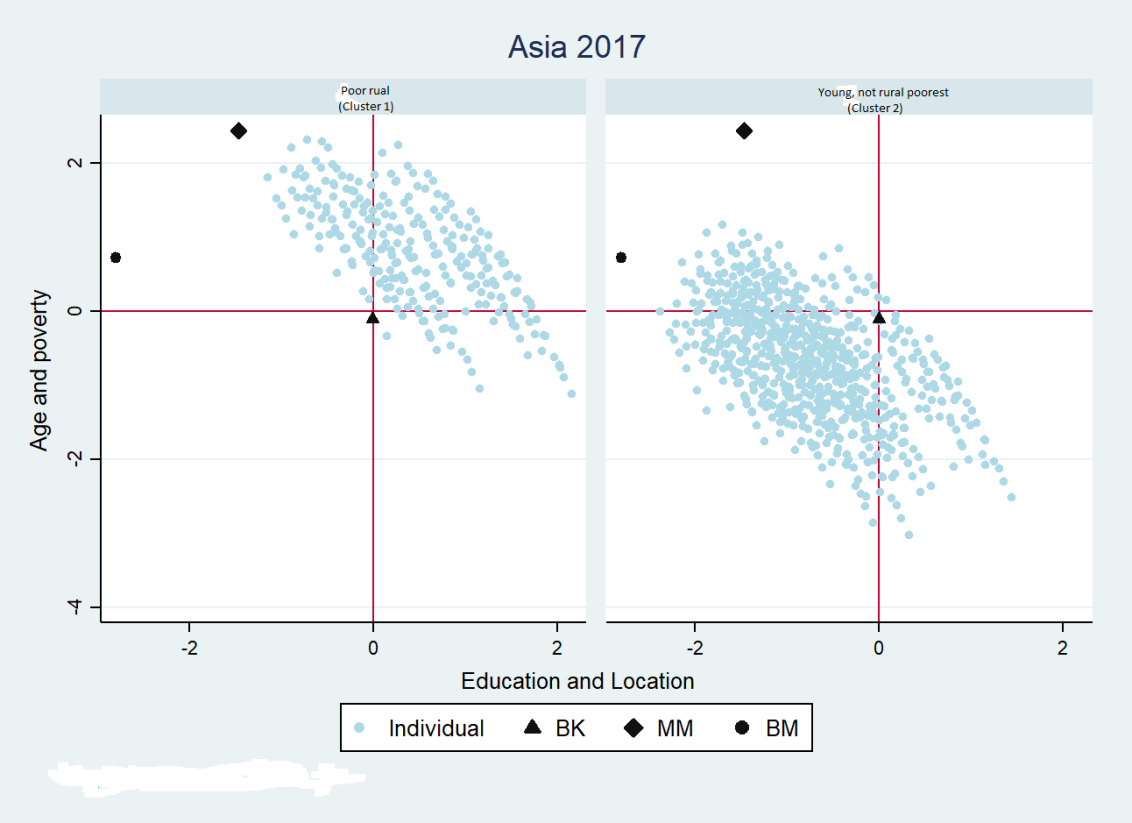


(A) Financial services users in Africa: 2017



(B) Financial services users in Asia: 2017

FIGURE 3.13: Clusters of financial services users in Africa and Asia: 2017

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TABLE 3.8: Typology of financial users overtime- Africa

2013				2014			
Cluster	**Profile**	**User characteristics**	**Product**	**Cluster**	**Profile**	**User characteristics**	**Product**
1	Young, mostly females	Mostly females, under 45 years old, primary or secondary education	MM	1	Poor, educated, young, mostly males	Mostly males, under 35 years old, mostly in the rural, poor, high education (secondary or higher level)	BK
2	Poor, educated, young males	Males, under 35 years old, poor, high educated (secondary or higher level)	BK	2	Young, mostly not poor females	Mostly females, under 35 years old, mostly not poor and in the urban, primary or secondary	MM
2015				**2016**			
Cluster	**Profile**	**User characteristics**	**Product**	**Cluster**	**Profile**	**User characteristics**	**Product**
1	Young, not poor, mostly females	Mostly females, under 35 years old, mostly not poor, mixed between rural and urban, primary and secondary	MM	1	Young, not poor, educated males	Males, from 25 to 44 years old, not poor, mixed between rural and urban, high educated (secondary or higher level)	BK, BM
2	Young, poor, educated mostly males	Mostly males, under 45 years old, poor, mixed between rural and urban, high educated (secondary or higher level)	BK	2	Young, not poor, educated females	Females, under 35 years old, not poor, mixed between rural and urban, primary and secondary education	MM
				3	Rural, mostly poor	Under 45 years old, mostly poor and in the rural, primary education level	MM
2017							
Cluster	**Profile**	**User characteristics**	**Product**				
1	Young, rural, educated males	Males, under 45 years old, mostly poor, in the rural, primary or secondary education	MM				
2	Young females, mostly in rural	Females, under 45 years old, mostly in the rural, primary or secondary education	MM				
3	Educated, non-poor	Under 45 years old, mostly in the urban, not poor, high education level (secondary or higher)	BK, BM				

TABLE 3.9: Typology of financial users overtime- Asia

2013				2014			
Cluster	**Profile**	**User characteristics**	**Product**	**Cluster**	**Profile**	**User characteristics**	**Product**
1	Educated, none-poor, mostly urban	From 25 to 44 years old, mostly from urban and not poor, high educated (secondary or higher level)	BK, BM	1	Poor males, mostly rural	Males, older than 44 years old, poor, mostly in the rural, secondary education	BK
2	Poor males, mostly rural	Males, over 35 years old, poor, in the rural, secondary education	BK	2	Rural, poor females	Females, from 25 to 44 years old, poor, in the rural, low education and numeration skill	BK
3	Rural females, mostly poor	Females, from 25 to 44 years old, poor, in the rural, low education and literacy skill	BK, MM	3	Educated, mostly urban non-poor	Mostly not poor and in the urban, high education (secondary or higher level)	BK, MM
2015				**2016**			
Cluster	**Profile**	**User characteristics**	**Product**	**Cluster**	**Profile**	**User characteristics**	**Product**
1	Rural, poor females	Females, under 45 years old, poor, in the rural, low education and literacy skill	BK	1	Rural poor	Under 45 years old, poor, in the rural, secondary or no education	BK, MM
2	Educated, mostly urban non-poor	Mostly not poor and in the urban, high education (secondary and higher level)	BK,MM	2	Educated, mostly non-poor	From 25 to 44 years old, mostly not poor, mixed between rural and urban, secondary education	BK
3	Poor males, mostly rural	Males, poor, mostly in the rural, secondary education	BK				
2017							
Cluster	**Profile**	**User characteristics**	**Product**				
1	Rural poor	Under 45 years old, poor, in the rural, low education (no education or primary education)	BK				
2	Educated, not rural poorest	From 25 to 44 years old, mostly not poor, mostly educated	BK				

3.4 Conclusion

Financial inclusion has become one of the powerful tools for poverty reduction and opportunities for economic growth in developing nations. In this study, we examined the association between financial inclusion services provided (bank account, mobile money, or both) and the characteristics of their users in eight developing countries in Africa and Asia. The countries considered are Keynia, Nageria, Uganda, Tanzania in Africa; and Bangladesh, India, Indonesia, Pakistan in Asia. Using survey data from Financial Inclusion Insights (FII) over five years (2013-2017), we employ multiple correspondence analysis (MCA) to find that poverty, education, age, gender, and location are the main determinants of financial service usage in these countries. While the dynamic of financial service usage in the African countries seems to be shifted from banking service (BK) toward mobile money (MM), the Asian countries has seen a steady increase in all financial services usage (BK, MM, or both– BM) since 2013. The shift from banking service to mobile money service in Africa could be explained by the increasing mobilization to lift people out of poverty, especially women and rural Africans, through financial inclusion; see e.g. Atkinson and Messy (2013) and Triki and Faye (2013). Since BK services are rarely available to rural and female Africans, the expansion of mobile phones and access to internet in rural areas has made MM service usage a viable path to financial inclusion (see e.g. the M-PESA in Kenya; Van Hove and Dubus, 2019, Kenya and Uganda; Johnson and Nino-Zarazua, 2011).

Interestingly, our results show that the overall proportion of financially excluded individuals, as well that of most subgroups of the population (classified by age, gender, poverty, location, education), has decreased significantly over time in the Asian sample. For example, the overall fraction of financially excluded individuals in this region has dropped drastically from about 60% in 2013 to about 34% in 2017. Similarly, the proportion of financially excluded poor (respectively females) has substantially decreased from around 50% (respectively 38%) in 2013 to roughly 21% (respectively 20%) in 2017. Only the proportions of financially excluded non-poor individuals, individuals living in urban area, and those with tertiary education have remained steadily constant in the Asian sample. These groups are likely not engage in any financial activity. These results, along with the significant increase in all financial service usage in the Asian sample, suggest that financial exclusion has been relatively a success in Asia. More importantly, many disadvantaged groups (e.g. poor, women, and rural Asians) have seen a drop in their proportion of financially excluded individuals,

while their use of financial services has steadily increased since 2013. Therefore, financial inclusion also seems to have empowered the poorest in Asia. By contrast, the Africa countries have seen mix results. With the exception of poor individuals, the proportion of financially excluded individuals in most of the other subgroups has not changed much during the period. The proportion of financially excluded poor individuals, however, has dropped slightly from around 45% in 2013 to about 38% in 2017, thus suggesting that financial inclusion is yet to be effective in Africa compared with Asia. Nevertheless, the fact that the proportion of financially excluded poor individuals has dropped since 2016 indicates that the African countries are moving toward financial inclusion.

Moreover, we provide a typology of each financial inclusion service users in both regions, as well as its dynamic over time. While young, rural and females financial service users in Africa seem to move toward mobile money service (MM), the same groups prefer either banking service (BK) or mobile money service (MM) in the Asian sample. In both regions, financial service users who are not poor, live in urban area, and have basic education combine both banking service and mobile money service (BM). Poor males and young females under 45 years old who live mostly in rural area prefer BK service, while the same groups tend toward MM service usage in the African sample.

Chapter 4

Financial Inclusion as a route out of poverty in developing Africa and Asia

Statement of Authorship

Title of Paper	Financial inclusion as a Route Out of Poverty in developing Africa and Asia
Publication Status	☐ Published ☐ Accepted for Publication ☐ Submitted for Publication ☑ Unpublished and Unsubmitted w ork w ritten in manuscript style
Publication Details	

Principal Author

Name of Principal Author (Candidate)	Ha Trang Vo
Contribution to the Paper	Contributed to initiate research idea, planning the paper, analyse the data, interpreted the results and wrote parts of the manuscripts.
Overall percentage (%)	70 %
Certification:	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.
Signature	Date: 23/09/2021

Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:

i. the candidate's stated contribution to the publication is accurate (as detailed above);
ii. permission is granted for the candidate in include the publication in the thesis; and
iii. the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Name of Co-Author	Firmin Doko Tchatoka
Contribution to the Paper	Contributed planning the paper and the methodology, supervised the development of the work, helped to interpret the data and wrote parts of the manuscripts.
Signature	Date: 23/09/2021

Name of Co-Author	
Contribution to the Paper	
Signature	Date

Please cut and paste additional co-author panels here as required.

Abstract

The World Bank (WB) defines the extreme poverty as individuals living on less than $1.90 a day. According to the WB, 36% of the world's population or 1.9 billion people were classified extremely poor in 1990. Based on the most recent estimates, this number in 2015 was 10% of the world's population or 734 million people. The World Bank fixed the goal to reduce extreme poverty in the world to less than 3% by 2030, and to foster income growth of the bottom 40% of the population in each country. However, with the current COVID-19 crisis, the WB estimated that about 40 million to 60 million people fall into extreme poverty (under $1.90/day) in 2020, compared to 2019. The WB considers financial inclusion as a key enabler to reducing poverty and boosting prosperity. This chapter examines the impact of financial inclusion on poverty reduction at the micro-level. In particular, it investigates how financial inclusion products– Banks (BK), Mobile money (MM) or both (BM)– help individuals overcome poverty in developing Africa and Asia. Using survey data of 8 developing countries (India, Indonesia, Pakistan, Tanzania, Nigeria, Bangladesh, Uganda and Kenya) from 2014 to 2017, we find that financial inclusion was successful in reducing the likelihood of individuals' being poor in these countries. However, we find that Mobile money (MM) and a combination of both Banks and Mobile money (BM) services are more efficient in getting people out of poverty than Bank services. Furthermore, heterogeneous effects are observed across financial inclusion products and different segments of the population in term of poverty reduction. In particular, BK services are more effective for young educated males who live in urban areas, while MM and BM services have a greater impact on old uneducated low-income females in rural areas.

4.1 Introduction

The World Bank estimated that 36% of the world's population or 1.9 billion people were classified extremely poor in 1990. This number in 2015 was 10% of the world's population or 734 million people. Among them, half live in five countries: India, Nigeria, Democratic Republic of Congo, Ethiopia, and Bangladesh. The majority of the global poor live in rural areas and are poorly educated, employed in the agricultural sector, and under 18 years of age. The 43 countries in the world with the highest poverty rates are fragile, in conflict-affected situations (mostly in Sub-Saharan Africa). The World Bank fixed the goal to reduce extreme poverty in the world to less than 3% by 2030, and to foster income growth of the bottom 40% of the population in each country. However, the COVID-19 crisis as well as oil price drop have made it difficult to achieve these goals. The COVID-19 crisis has a disproportionate impact on the poor, through job loss, loss of remittances, rising prices, and disruptions in services such as education and health care. For the first time since 1998, poverty rates is estimated to rise as the global economy falls into recession and there is a sharp drop in GDP per capita in all countries. The World Bank estimated that about 40 million to 60 million people fell into the extreme poverty category in 2020, compared to 2019. The World Bank also estimates that by 2030 up to two-thirds of the global extreme poor may be living in fragile and conflict-affected economies, making it evident that without intensified action, the global poverty goals may never be met.

Financial inclusion is considered as a key enabler to reducing poverty and boosting prosperity. Financial inclusion means that individuals and businesses have access to useful and affordable financial products and services that meet their needs – transactions, payments, savings, credit and insurance – delivered in a responsible and sustainable way. The impact of financial inclusion on poverty reduction has been examined enormously in the literature. Park and Mercado (2015) examine the impact of financial inclusion on poverty and income inequality. By proposing a financial inclusion indicator for 37 selected developing Asian economies for this purpose, they find that financial inclusion significantly lowers poverty and income inequality for all countries. Burgess and Pande (2005) measure financial inclusion based on the expansion of bank branches in rural India. They find that banks expansion into unbanked locations in India significantly reduces rural poverty while urban poverty outcome is unaffected. This effect is mediated through increased deposit mobilization and credit disbursement by banks in rural areas. Jeanneney and Kpodar (2011) investigate how

financial development reduces poverty directly through a distributional effect, beyond its indirect effect through economic growth. Using data from a sample of developing countries from 1966 through 2000, they show that poor individuals benefit from the ability of the banking system to facilitate transactions and provide savings opportunities. Similarly, Beck, Demirgüç-Kunt, and Levine (2007) show that financial development is associated with a drop in the fraction of the population living in poverty.

Although a number of studies find financial inclusion to be a key driver of getting people out of poverty, some studies such as Manji (2010) argue that it is difficult to reconcile the promotion of financial inclusion with the aim of international development to end poverty. While the final target is to help individuals and households get out of poverty, most of the literature on this topic often focus on the impact at country or state level using aggregate data. This raises the question what the actual and direct impact of financial inclusion is on individuals and households. Moreover, despite a number of thematic put forward so far to define financial inclusion, the concept is still ambiguous in many aspects, and this has often led to many researchers using different measures to capture financial inclusion (from number of bank branches to proportion of population using banks, as well as financial inclusion indexes). At the individual level, the concept is even more vague, making it sometimes impossible to differentiate the types of financial inclusion services users. In fact individuals engage differently in financial services from the sophistication of the services they use to how often they use those services, and which financial providers they select. As a result, the economic impacts of financial inclusion for different users vary but this heterogeneity is not generally addressed by the existing literature.

This chapter examines the impact of financial inclusion in reducing poverty at the micro-level. In particular, it investigates how financial inclusion services– Banks (*BK*), Mobile money (*MM*) or both (*BM*)– serve as a route out of of poverty for individuals and households. Using quantile regression techniques and survey data in 8 developing countries (India, Indonesia, Pakistan, Tanzania, Nigeria, Bangladesh, Uganda and Kenya) for the period 2014-2017, we find that financial inclusion significantly reduces the likelihood of individuals being poor, but the impact is smaller at the bottom of the poverty distribution (i.e., the poorest individuals/households). Moreover, Mobile money and the combination of Banks and Mobile money services exert a greater impact on poverty reduction than Banking services alone. In addition, heterogeneous impacts are evidenced in terms of poverty reduction across financial inclusion services provided as well as different segments of the populations.

In particular, Banking services have a greater impact on young educated males who live in urban areas with medium income, while Mobile money and the combination of Banks and Mobile money services are more effective for older uneducated low-income females in rural areas.

The remainder of the chapter is organised as follows. Section 5.4 summarizes data, Section 4.3 presents the empirical framework, Section 4.4 discusses the results, and finally Section 4.5 concludes.

4.2 Data summary

We use survey data from the Financial Inclusion Insights (FII) program. This program was conceived in 2013 in partnership with the Bill and Melinda Gates Foundation to build meaningful knowledge about the financial landscape in eight countries across Africa and Asia (India, Indonesia, Pakistan, Bangladesh in Asia an Uganda, Nigeria, Kenya and Tanzania in Africa). The survey is conducted annually since 2013. In the survey, respondents are asked about their social characteristics such as age, marital status, education level, number of children, etc. To gather data about respondent's economic conditions, the surveys ask questions about their living conditions such as the construction material of the house, the number of rooms in the house, the main source of drinking water, etc. Those questions are adjusted every year and are different in each country. A Poverty Propensity Index (PPI) is built based on the answers to ten questions considering their frequency across several different geographic sub-samples. This ensures accurate PPI when it is applied in specific sub-national areas of a country. Weights is estimated to each response associated with ten questions. These weights are then normalized so that the total score is between 0 and 100. The adjust weights form the basis for the scorecards and each score associated with a poverty probability (that serves as our dependent variable, Pov). The surveys also ask questions about how respondents engage with financial services such as if they have an account at financial services providers, what services they use, how often they use them and if they have any difficulties while using those services.

While Banks (BK) are traditional official financial supplier, telecommunication companies also provide financial transactions through mobile phones which is Mobile Money (MM). Actually, MM has become more and more popular with 271 mobile money services in 93 countries and 411 million registered mobile money accounts across the world in 2015. In

this chapter, respondents are considered to be financially included if they have financial accounts under their own name at an official financial institution (BK or MM account or both) and have used financial services in the last 90 days. In contrast, financial excluded users are respondents who do not have an account at official financial institution (BK or MM) or have BK or MM accounts but have not used them in the last 90 days.

The chapter uses data from 2014 to 2017 which covers in total 309,520 respondents. Table B.1 in the appendix presents the description of the variables, and Table 4.1 describes the characteristics of financial services users. Financial services users are divided into 4 groups based on financial services providers. The first group is Banks (BK) users, the second is Mobile Money (MM) users, users of both Banks and Mobile Money (thus BM users) form the third group. Finally, the fourth group includes individuals who do not use either bank or Mobile money at all. This latter group represents the *financially excluded* individuals in our sample.

The first part of Table 4.1 shows the characteristics of BK users. On average, a BK user is a 39 year- old male, living in rural areas with secondary education who earns medium to high income as a labourer. The likelihood of being poor for an average BK user is 62.1%. However BK users' characteristics vary significantly between different quantiles. BK users have approximately the same age (39 years old) in the first three quantiles and a bit younger (about 38 years old) in the fourth quantile. The percentages of male BK users in all quantiles are not much different from the average (55%). Education of BK users in the first quantile is the highest, next are those in the second quantile and third quantile while BK users in the fourth quantile have the lowest education level. In detail, the numbers of BK users with no formal education and have completed primary in the first quantile are the lowest and less than the average (13% have no education and 15% complete primary). In this quantile, the percentage of BK users who have finished secondary education is similar to the average (43%) and the number of individuals having a diploma is the highest and over the average (27% vs 19%)). Education levels of BK users in the second quantile is not much different from the average. Compared with the average, the number of BK users in third quantile with no formal education is higher (24% vs 19%) and the number of users with a diploma is lower (9% vs 19%) while the ratio of BK users who have finished primary and secondary school are similar. In the fourth quantile, 30% of BK users have no formal education and 21% have finished primary education- both much higher than the average. In contrast, the number of BK users who have completed secondary school and have a diploma is much

lower than the average (37% and 11% respectively). Regarding the location, 51% of BK users in the first quantile live in urban areas, which is higher than the average (41%). The number of BK users in the second quantile who live in urban areas is similar to the average (about 40%). The third and fourth quantiles have fewest BK users living in urban areas (30%). In terms of income distribution and occupation, only 33% of BK users in the first quantile do manual work, which is much lower than the average (87%) and is the lowest among the four quantile groups. That explains why BK users in the first quantile have the highest income (40% are high income earners, 37% are medium income earners and only 21% are low income earners). 88% of BK users in the second quantile are labourers which is similar to the average. In fact, the percentages of BK users with low, medium and high income in this quantile are 23%, 45% and 31% respectively. In the third and fourth quantiles, more than 90% of BK users do manual work which is higher than the average. As a result, in these two quantiles, the number of low income BK users is higher than the average while that of high income users is lower than the average. The likelihood of being poor for a BK users in the first quantile is 26%, which is much lower than the average (62%). This number in the second quantile (63%) is similar to the average, and is much higher than the average in the third and fourth quantiles at 86% and 96% respectively.

The second part of Table 4.1 contains the characteristics of MM users. On average, MM user is a 35 year- old male with primary education, living in the rural areas with low to medium income, and does a manual work. The likelihood of being poor for an average MM users is 50.7%. MM users in the first quantile have the lowest likelihood of being poor (19% compared to 50.7% on average), while those in the second quantile have a higher likelihood of being poor (60%) compared to the average (50.7%). This likelihood for MM users in the third and fourth quantiles are highest (82% and 96%). Regarding age, MM users in the first and second quantiles are slightly younger (about 34 years old) than the average while users in the third and fourth quantile are slightly older (36 years old). In terms of education, MM users in the first quantile are more educated than those in the other quantiles. In fact, the percentage of MM users who have no education or have primary school education are lower than the average (2% and 28% respectively compared to 5% and 40% on average) while the number of users who finish secondary school and diploma level (44% and 24%) are higher than the average (38% and 17%). MM users in the second quantile have similar education compared to the average, while those in the third and fourth quantiles have lower education than the average. These quantiles have higher numbers of low educated individuals and

lower numbers of high educated ones. In fact, only 31% and 20% of MM users in the third and fourth quantiles respectively have a secondary education, compared to 48% in the first quantile and 44% in the second quantile. Also, 56% of MM users in the first quantile live in urban areas (which is more than the average) while this number is 45% in the second quantile and it is equal to the average (45%). Meanwhile, most MM users in the third and fourth quantiles live in rural areas as only 33% in the third quantile and 26% in the fourth quantile live in urban areas. Looking at income distribution, we see that the fraction of high income MM users is the highest in the first quantile (larger than the average). The income distribution of MM users in the second quantile is not much different from the average, with 36% being low income earners, 43% being medium income earners and 29% being high income earners. The ratios of low income MM users are 52% and 62% in the third and fourth quantiles respectively, which are much higher than the average. However, the number of high income MM users are lower than the average at 8% and 7% respectively. In all quantiles, the numbers of MM users who do manual work (labourers) are not much different from the average, ranking from 74% in the first quantile to 88% in the fourth quantile. Clearly, over 74% of MM users are labourers, which matches closely the stylized fact of the MM users.

The characteristics of BM users are presented in part three of Table 4.1. On average, BM user is a 35- year- old male, living in urban areas with a secondary or high education. Despite the status of this average BM users as a manual worker, his income is higher than the median income and he has a low likelihood of being poor (38%). Only BM users in the first quantile have a lower likelihood of being poor than the average (16% compared to 38%). Users in the other three quantiles have much higher chances of being poor than the average (60% for users in the second quantile, 83% for users in the third quantile and 96% for users in the fourth quantile). The percentages of male BM users in all four quantiles are not much different from the average and are around 65%. BM users in the first, second and fourth quantiles are as young as the average age (35 years) while BM users in the third quantile are slightly older (37 years). In the first quantile, only 1% of BM users are uneducated and 14% have finished primary school which are lower than the averages. The numbers of BM users with a secondary education and a diploma are similar to the average (40% and 43% respectively). In the second quantile, the numbers of users at different education levels are similar to the averages. In contrast, 32% of BM users in the third quantile have finished primary school (higher than the average, 18%) and fewer users (20%) have a diploma compare to the average (39%), while the ratios of users with no education or finishing secondary

school are the same as the average. Users in the fourth quantile have lowest education. In fact, compared to the average, more users are uneducated (5%) and have finished primary school (29%) and fewer users have finished secondary school or have a diploma (33% and 32% respectively). In the first, second and fourth quantile, the ratios of users living in urban areas are not much different from the average ranking from 50% to 60%. However, this number in the third quantile is much lower at 39% which suggests that more BM users in the third quantile live in rural areas. BM users in the first and second quantiles have similar income to the average. In the third quantile, compared to the average, more BM users have low income (37%) and fewer users have high income (17%) while the number of users having median income is not much different. The ratios of BM users in the fourth quantile are spread quite equally among the three income levels (about 32% of BM users in each level). Clearly, more BM users have low income. In all quantiles, BM users do manual work and this number in the fourth quantile is significantly higher (81%) than the average and that of the other quantiles.

The fourth part of Table 4.1 summarises the characteristics of financially excluded (i.e., those who do not use any of the financial inclusion products offered). As seen, the average financially excluded individual is a 36- year- old female who lives in a rural area with a low to median income, and works as a labourer. Of course, the likelihood of being poor for a financially excluded individual is high (70%). However, financially excluded individuals in the first quantile have relatively a low chance of being poor (27%). As expected, this ratio increases to 62% in the second quantile, 85% in the third quantile and 97% in the fourth quantile. Financially excluded individuals in the first three quantiles are 1 year older than the average (37 years) while those in the fourth quantile are 1 year younger than the average (35 years). The ratios of financially excluded males in all four quantiles are around 40%. In the first and second quantiles, the number of financially excluded without education is equal to number of those who have finished primary school, and it is lower than the average (23% in the first quantile and 25% in the second quantile). The numbers of financially excluded with a secondary education with a diploma are higher than the average (over 40% have finished secondary school and about 10% have a diploma). 42% of financially excluded individuals in the first quantile live in urban areas which is highest in four quantiles (higher than the average, 29%). This number in the second quantile is 34% (slightly higher than the average). In contrast, most financially excluded persons in the third and fourth quantiles live

in rural areas. Regarding income distribution, the numbers of financially excluded individuals in the first quantile spread equally among the three income levels (from 30% to 36%). The number of low income earners is lower than the average (32% compared to 42%), while the number of high income earners is higher than the average (30% compared to 18%). Moving to the second quantile, the number of low income earners are 32% (lower than the average). The fraction of median and high income earners are 43% and 22% respectively (higher than the average). The number of financially excluded people in the third quantile in each income levels are not much different from the average. In the fourth quantile, more financially excluded people have low income compared to the average (56%) while fewer have high income (8%). Those with median income make up 35% of all financially excluded individuals in the sample, which is similar to the average. In all four quantiles, most financially excluded individuals do manual work, ranking from 93% to 97% (similar to the average).

Part five of Table 4.1 presents the characteristics of respondents in the whole sample. The average respondent is a 37- year- old female who lives in a rural area with low to medium income, and she does manual work. The likelihood of being poor for the average respondent is 67%. The chances of living in poverty increase from 26% in the first quantile to 63% in the second quantile, 85% in the third quantile and 97% in the fourth quantile. Regarding age, respondents in the first and second quantile have the same age as the average person (37 years). Respondents in the third quantile are slightly older (38 years) and respondents in the fourth quantile are slightly younger (36 years). The percentage of male in all four quantiles are not much different from the average (around 45%). In the first quantile, 17% of respondents are uneducated and 21% of whom finished primary school (lower than the average, 24%). The ratios of respondents with secondary education and a diploma are 43% and 17% respectively (higher than the average). The percentages of respondents at different education levels in the second quantile are similar to the average with 22% having no education, 24% completing primary school, 43% finishing secondary level and 10% having diploma. In the third quantile, the number of respondents without formal education (29%) is a little higher than the average (26%) and the number of respondents completing primary and secondary school are not much different from the average (26% and 38%). However, only 5% of respondents completed s diploma, which is lower than the average (10%). In the fourth quantile, 37% of respondents have no education, 10% higher than the average. The number of respondents finishing primary school is not much different from the average (27%) while the ratios of respondents finishing secondary and having a diploma (29% and

5% respectively) are lower than the average. 46% of respondents in the first quantile live in urban areas, much higher than the average. This number in the second quantile is 36% which is similar to the average. 26% of respondents in the third quantile and 21% of respondents in the fourth quantile live in urban areas which are much lower than the average. Most of respondents in the first quantile have medium to high in come (70%). Only 28% have low income which is 10% lower than the average. 30% of respondents in the second quantile earn low income which is lower than the average while number of respondents earning medium and high income are 44% and 24% which are a little higher than the average. In the third and fourth quantiles, the numbers of low income earners (41% in the third quantile and 51% in the fourth quantile) are higher than average. The ratios of medium income earners (43% in third quantile and 36% in fourth quantile) are not much different from the average. The number of high income respondents are 14% in the third quantile and 11% in the fourth quantile which are much lower than the average. In all four quantiles, most of respondents do manual work and the ratios increase from the first quantile (87%) to the fourth quantile (95%). In short, in all groups of financial users (BK, MM, BM and financial excluded users), users in the first quantile have lowest likelihood of being poor, highest education, highest income and lowest likelihood of doing manual work.

When comparing different average users, we see that financially excluded individuals have the highest likelihood of being poor. Next is BK users, follow by the MM users and BM users. Regarding age, BK users are on average oldest (39 years) while MM users and BM users are younger (35 years). The percentage of males is lower in the financially excluded group (45%), next is MM users and BK users, while BM users have the highest representation of males (63%). The financial excluded persons have low education while BM users have the most educated with 41% of them finishing secondary school and 39% completing a diploma. The ratio of urban users is higher in the BM users group (57%) while this ratio is lower in the financial excluded one (29%). The percentages of urban users in the MM and BK groups are 45% and 41%. Users in BM group have the highest income with 43% being medium income earners and 33% being high income earners. BK users have lower income than BM users with 41% having medium income and 33% having high income. The percentages of users at different income levels in the MM group are similar to the financially excluded group with 40% low income, 40% medium income and 18% high income. Thus, the MM group and the financial excluded group have lowest income. The ratio of users doing manual work is lowest in the BM group (68%), increases to 79% in the MM group, 87% in the BK group and

is highest in the financial excluded group (94%).

TABLE 4.1: Characteristics of financial services users

	BK users					
	Mean	Std. Var	Q1	Q2	Q3	Q4
Pov	62.17	29.98	26.30	63.70	86.18	96.38
Age	39.02	14.54	39.20	39.60	39.77	38.70
Male	0.55	0.50	0.55	0.54	0.52	0.51
No Edu	0.19	0.40	0.13	0.17	0.24	0.30
Primary	0.17	0.38	0.15	0.17	0.18	0.21
Secondary	0.44	0.50	0.43	0.48	0.46	0.37
Diploma	0.19	0.39	0.27	0.16	0.09	0.11
Urban	0.41	0.49	0.51	0.40	0.30	0.30
LowIn	0.26	0.44	0.21	0.23	0.30	0.35
MedIn	0.41	0.49	0.37	0.45	0.47	0.40
HighIn	0.33	0.47	0.40	0.31	0.22	0.23
Labourer	0.87	0.33	0.83	0.88	0.91	0.93
Observations	95,576					
	MM users					
	Mean	Std.Var	Q1	Q2	Q3	Q4
Pov	50.70	33.17	19.06	60.30	82.50	96.30
Age	35.21	13.17	34.70	34.40	36.30	36.40
Male	0.51	0.50	0.47	0.55	0.49	0.53
No Edu	0.05	0.22	0.02	0.04	0.06	0.12
Primary	0.40	0.49	0.28	0.37	0.54	0.59
Secondary	0.38	0.48	0.44	0.40	0.31	0.20
Diploma	0.17	0.38	0.24	0.17	0.06	0.07
Urban	0.45	0.50	0.56	0.45	0.33	0.26
LowIn	0.41	0.49	0.31	0.36	0.52	0.62
MedIn	0.41	0.49	0.44	0.43	0.39	0.29
HighIn	0.18	0.38	0.23	0.19	0.08	0.07
Labourer	0.79	0.41	0.74	0.78	0.83	0.88
Observations	20,395					
	BM users					
	Mean	Std.Var	Q1	Q2	Q3	Q4
Pov	38.51	32.19	16.40	60.00	83.20	96.30
Age	35.72	12.63	35.60	35.20	37.20	35.90
Male	0.63	0.48	0.59	0.69	0.65	0.69
No Edu	0.02	0.16	0.01	0.03	0.03	0.05
Primary	0.18	0.38	0.14	0.17	0.32	0.29
Secondary	0.41	0.49	0.40	0.42	0.42	0.33
Diploma	0.39	0.49	0.43	0.36	0.20	0.32
Urban	0.57	0.49	0.63	0.51	0.39	0.50
LowIn	0.24	0.43	0.21	0.20	0.37	0.34
MedIn	0.43	0.49	0.44	0.42	0.45	0.32
HighIn	0.33	0.47	0.34	0.36	0.17	0.32
Labourer	0.68	0.47	0.66	0.64	0.70	0.81
Observations	5,876					
	Excluded users					
	Mean	Std.Var	Q1	Q2	Q3	Q4
Pov	70.67	27.08	27.30	62.80	85.80	97.00
Age	36.71	15.47	37.10	37.20	37.50	35.90
Male	0.41	0.49	0.40	0.41	0.40	0.39
No Edu	0.31	0.46	0.23	0.25	0.32	0.41
Primary	0.26	0.44	0.23	0.25	0.27	0.28
Secondary	0.37	0.48	0.43	0.41	0.35	0.26
Diploma	0.06	0.24	0.10	0.07	0.04	0.03
Urban	0.29	0.46	0.42	0.34	0.24	0.18
LowIn	0.42	0.49	0.32	0.33	0.44	0.56
MedIn	0.39	0.49	0.36	0.43	0.42	0.35
HighIn	0.18	0.39	0.30	0.22	0.12	0.08
Labourer	0.94	0.23	0.92	0.93	0.95	0.97
Observations	199,425					

TABLE 4.1: Characteristics of financial services users (cont.)

	(continued)					
	Mean	Std. Var	Q1	Q2	Q3	Q4
	All					
	Mean	Std.Var	Q1	Q2	Q3	Q4
Pov	67.34	28.66	26.40	63.00	85.70	97.00
Age	37.34	15.14	37.70	37.80	38.02	36.60
Male	0.45	0.50	0.46	0.45	0.43	0.43
No Edu	0.26	0.44	0.17	0.22	0.29	0.37
Primary	0.24	0.43	0.21	0.24	0.26	0.27
Secondary	0.39	0.49	0.43	0.43	0.38	0.29
Diploma	0.10	0.30	0.17	0.10	0.05	0.05
Urban	0.33	0.47	0.46	0.36	0.26	0.21
LowIn	0.38	0.48	0.28	0.30	0.41	0.51
MedIn	0.40	0.49	0.37	0.44	0.43	0.36
HighIn	0.22	0.42	0.33	0.24	0.14	0.11
Labourer	0.92	0.28	0.87	0.91	0.94	0.95
Observations	309,520					

4.3 Empirical framework

To investigate how financial inclusion impact on individual's poverty level, we test the following equation:

$$Pov_{ict} = \alpha + FI'_{ict}\beta + X'_{ict}\gamma + \delta_c + \phi_t + u_{ict}, \tag{4.3.1}$$

where the dependent variable Pov_{ict} is the likelihood of being poor for individual i in country c at time t; FI_{ict} is a dummy treatment variable of interest equal to 1 if individual i in country c at time t has used a financial inclusion product– bank account (BK), or mobile money account (MM), or both (BM) in the last 90 days; X_{ict} contains covariates such as: age, gender, education, location, income, occupation, number of children and financial shock;[1] δ_c captures country fixed effects; ϕ_t is time fixed effects; and u_{ict} is idiosyncratic error.

We estimate equation (4.3.1) using quantile regression method. Quantile regression method provides more robust estimates than the ordinary least squares technique as it minimize the weighted sum of residuals within the tilted absolute value function framework unlike minimizing the sum of squared residuals (Koenker and Bassett Jr, 1978). As quantile regression considers the full distribution properties of the dependent variables, it can provide more useful insights into the relationship between financial inclusion and an individual's poverty at different points in the distribution of dependent variables.

[1] A detailed description of all variables is presented in Table B.1.

Hereafter, the indexation τ $(0 < \tau < 1)$ on the variables and parameters stands for the τth quantile of the dependent variable Pov. Let $Q_\tau(Pov_{ict})$ denotes the quantile function which is defined as:

$$Q_\tau(Pov_{ict}) \equiv Q(\tau|FI_{ict}, X_{ict}, \delta_{\tau c}, \phi_{\tau t}) = \alpha_\tau + FI'_{ict}\beta_\tau + X'_{ict}\gamma_\tau + \delta_{\tau c} + \phi_{\tau t} \tag{4.3.2}$$

where $Q_\tau(Pov_{ict})$ denotes the τ's conditional quantile of poverty Pov_{ict} given the set of control variables FI_{ict} and X_{ict}; β_τ, α_τ and γ_τ are unknown coefficients to be estimated.

Let $\theta_\tau = (\alpha_\tau, \beta'_\tau, \gamma'_\tau)'$. The estimator of θ_τ is a solution of the minimization problem:

$$\min_\theta \left[\sum_{\left(i:Pov_{ict} \geq Q_\tau\right)} \tau \mid Pov_{ict} - Q_\tau \mid + \sum_{\left(i:Pov_{ict} < Q_\tau\right)} (1-\tau) \mid Pov_{ict} - Q_\tau \mid \right]. \tag{4.3.3}$$

We can also write the minimization problem (4.3.3) as:

$$\min_\theta \sum_i \rho_\tau(Pov_{ict} - Q_\tau), \tag{4.3.4}$$

where $\rho_\tau(\cdot)$ is the tilted absolute value function that gives the τ-conditional quantile of Pov_{ict} as a solution.

It is noteworthy that the coefficients of the independent variables vary over quantiles (i.e. different values of τ). Under the assumption that financial inclusion contributed to poverty reduction, one can hypothesize that the coefficient on financial inclusion variable, β_τ, will be higher in lower quantiles and lower in higher quantiles if individuals that are not poor were in better position to reap the benefits of financial inclusion compared to poor individuals (higher quantile of poverty distribution). Thus quantile regression will enable us to investigate how financial inclusion is likely to impact on individuals at the extremes, in the highest and lowest quantiles of the poverty distribution. In the empirical analysis, we focus on five quantiles, i.e., $\tau \in \{0.1, 0.25, 0.5, 0.75, 0.9\}$.

4.4 Results and discussion

Table 4.2 presents the OLS and quantile estimates of (4.3.4) for the BK, MM and BM users separately. First, we see that using financial inclusion services reduces the likelihood of being poor as all estimates are negative along the poverty distribution irrespective of the product

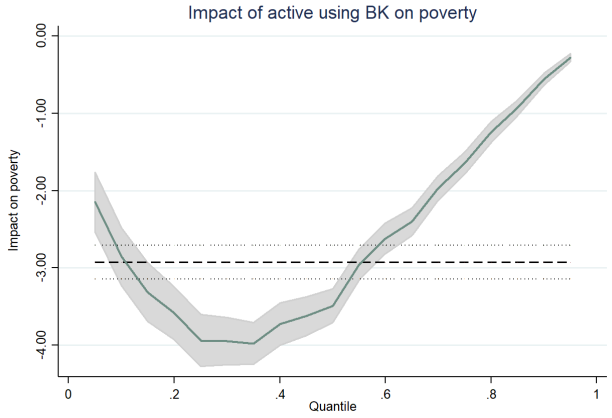
used (BK, MM or BM). For all financial inclusion services, the impact is U-shaped, with the highest magnitude at mid-low and mid-high quantiles. Second, comparing the financial inclusion products, we see that the impact of BK is higher between the 0.25 and 0.5 quantiles, while that of MM and BM are higher around the 0.5 and 0.75 quantiles respectively. These are clearly shown in Figure 4.1. Regarding both MM and BM, their impact on poverty reduction is much stronger than that of BK. Both reduce poverty more for users in the lowest quantiles than BK, and similarly at the higher quantiles of the poverty index distributions (Figure 4.1a vs Figures 4.1b-4.1c). However, the impact of BM is smaller for users in the 0.1 and the 0.25 quantiles, but much higher in the 0.75 quantile. Clearly, the poorest people in the bottom of poverty distribution (0.9 quantile) benefit more from using BM services, follow by the MM services, with the BK services coming last. Third, in most cases, the quantile estimates are different from the OLS estimates, and they are mostly outside the OLS estimate confidence intervals. This illustrates how a mean-type analysis can under or over estimate the impact of financial inclusion on poverty. Our result is similar to number of studies such as Park and Mercado (2015), Burgess and Pande (2005), Jeanneney and Kpodar (2011), Beck, Demirgüç-Kunt, and Levine (2007) and Suri and Jack, 2016. Although the concept of financial inclusion in those papers are different from ours and most of them look at the impact at the macro level, they all confirm that greater availability of financial services or greater access to financial service reduces poverty. However, our paper is the only one looking at the impact at different point in the distribution.

TABLE 4.2: Impact of financial inclusion on poverty

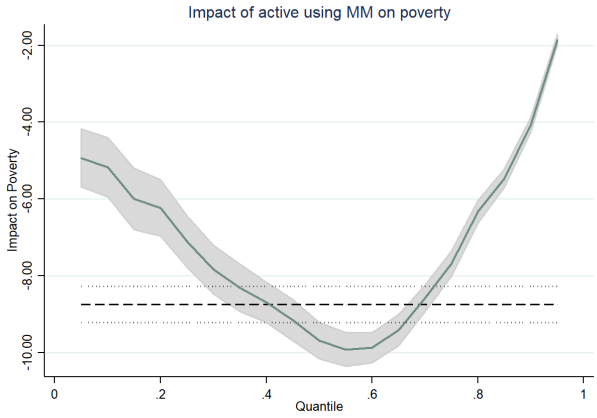
		Quantiles				
	OLS	0.1	0.25	0.5	0.75	0.9
BK	-2.923***	-2.855***	-3.938***	-3.491***	-1.642***	-0.559***
	(0.112)	(0.198)	(0.184)	(0.154)	(0.123)	(0.069)
MM	-8.743***	-5.170***	-7.113***	-9.691***	-7.688***	-4.069***
	(0.240)	(0.437)	(0.392)	(0.340)	(0.265)	(0.155)
BM	-8.260***	-3.817***	-3.945***	-8.355***	-14.257***	-4.594***
	(0.371)	(0.674)	(0.608)	(0.526)	(0.407)	(0.241)

Note: $^*p < 0.1$. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

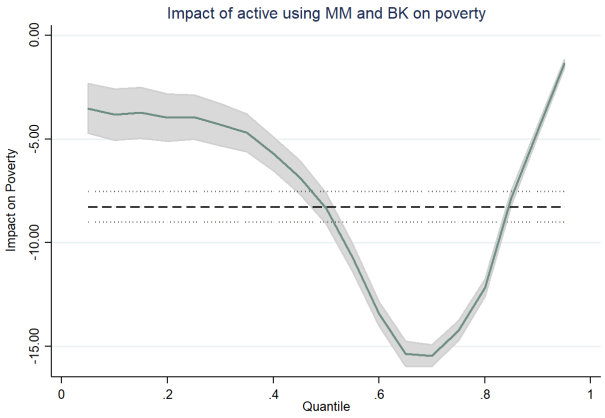
FIGURE 4.1: Quantile estimates of the financial inclusion impact on poverty



(A) BK users



(B) MM users



(C) BM users

4.4.1 Heterogeneity across age groups

Table 4.3 shows the impact of financial products on poverty reduction for different age groups. For BK users, there is not much difference between various age groups. In all age groups, BK impact most on users in the 0.25 quantile and impacts least on users in the 0.9 quantile. Within the same quantile, individuals from 25 to 44 benefit most, while older individuals above 55 years old benefit least. Thus, BK impacts for old, poor users are limited. Relating to MM, the impact for individuals in the same age group is stronger than for BK. MM impact is greatest for individuals in the 0.5 quantile and lowest for individuals in the 0.9 quantile. This implies that MM is more efficient than BK in targeting poorer individuals although MM impact on the bottom of poverty distribution (i.e., the poorest individuals) (individuals in quantile 0.9) remain small. It is interesting that older individuals over 55 years old benefit most from MM compared to other age groups which is in contrast to BK. Take median quantile as an example, MM reduces the chances of being poor for a young user under 25 years old by 10.09% while the impact for users above 55 years old is 13.67%. In terms of BM, its impact is stronger than BK in all age groups. Individuals who benefit most from BM are above 55 years old while young users under 25 years old benefit least. One example is in the 0.9 quantile, BM reduces the probability of being poor for young individuals under 25 years old by 1.57%. This number for older individuals above 55 is much higher at 5.6%. Thus, BK benefits young users more while MM and BM impacts are greater for older users.

Figure B.1, B.2, B.3 present quantile estimations of BK, MM and BM for individuals in different age groups graphically. The results for all age groups are in U-shapes and the bottom of the U-shapes moves to the right as we move from BK to MM and BM. This means the impact for poorest users (users in 0.9 quantile) is small regardless of age.

TABLE 4.3: Quantile estimation of FI impact on poverty across ages

		Quantiles				
	OLS	0.1	0.25	0.5	0.75	0.9
Bank users						
Under 25	-2.22***	-2.25***	-3.67***	-2.69***	-0.88***	0.009
	(0.255)	(0.477)	(0.413)	(0.354)	(0.272)	(0.175)
25 to 34	-3.24***	-3.04***	-4.19***	-3.59***	-1.64***	-0.622***
	(0.217)	(0.359)	(0.338)	(0.300)	(0.258)	(0.129)
35 to 44	-3.25***	-2.94***	-4.27***	-3.44***	-1.74***	-0.648***
	(0.237)	(0.417)	(0.384)	(0.339)	(0.270)	(0.135)
45 to 54	-2.43***	-2.35***	-3.23***	-2.89***	-1.19***	-0.65***
	(0.297)	(0.541)	(0.488)	(0.437)	(0.333)	(0.222)
Above 55	-2.19***	-2.70***	-2.89***	-0.46	-1.50***	-0.63***
	(0.273)	(0.536)	(0.456)	(0.382)	(0.272)	(0.199)
Mobile money users						
Under 25	-8.24***	-4.61***	-5.82***	-10.09***	-8.38***	-4.01***
	(0.455)	(0.846)	(0.721)	(0.647)	(0.473)	(0.315)
25 to 34	-9.44***	-7.56***	-8.68***	-9.71***	-8.21***	-4.25***
	(0.437)	(0.744)	(0.667)	(0.609)	(0.509)	(0.276)
35 to 44	-8.50***	-4.62***	-6.64***	-8.54***	-6.56***	-3.52***
	(0.547)	(0.958)	(0.846)	(0.786)	(0.616)	(0.282)
45 to 54	-9.17***	-7.60***	-8.4***	-9.58***	-7.74***	-4.79***
	(0.728)	(1.211)	(1.216)	(1.049)	(0.811)	(0.552)
Above 55	-11.38***	-8.07***	-11.457***	-13.67***	-9.86***	-4.600
	(0.766)	(1.549)	(1.302)	(1.076)	(0.771)	(0.570)
Bank and mobile money users						
Under 25	-6.13***	-1.24	-2.53*	-6.38***	-12.49***	-1.57***
	(0.833)	(1.525)	(1.375)	(1.169)	(0.877)	(0.584)
25 to 34	-8.14***	-3.57***	-4.26***	-7.30***	-15.51***	-6.07***
	(0.615)	(1.061)	(0.927)	(0.871)	(0.704)	(0.379)
35 to 44	-9.12***	-4.55***	-4.73***	-9.17***	-12.8***	-5.07***
	(0.790)	(1.402)	(1.230)	(1.175)	(0.897)	(0.402)
45 to 54	-9.67***	-6.26***	-6.41***	-10.406***	-12.681***	-5.97***
	(1.092)	(1.856)	(1.825)	(1.598)	(1.242)	(0.815)
Above 55	-11.60***	-6.47***	-7.70***	-13.49***	-17.99***	-5.61***
	(1.166)	(2.400)	(1.978)	(1.659)	(1.153)	(0.830)

Note: $^{*}p < 0.1$. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

4.4.2 Heterogeneity across genders

Financial inclusion impacts on poverty across gender are presented in Table 4.4. In general, MM and BM impacts are greater than BK for both genders in all quantiles. However, in the same quantile, BK impact is greater for males while MM and BM impact females more. Take the 0.25 quantile as an example, females in the 0.25 quantile can reduce their chances of being poor from BK by 3.36% while males can reduce it by 4.89%. For users in the 0.9 quantile, BK reduces the opportunities of being in poverty by 0.52% and 0.70% for females and males respectively. In contrast, MM impacts on females and males in the 0.5 quantile are 7.45% and 5.94%. The numbers for females and males using BM in the same quantile are 10.02% and 7.3%. Thus MM and BM benefit females more than males in the same quantile, which is opposite to BK.

TABLE 4.4: Quantile estimation of FI impact on poverty across genders

		Quantiles				
	OLS	0.1	0.25	0.5	0.75	0.9
Bank users						
Female	-2.64***	-2.55***	-3.36***	-2.93***	-1.40***	-0.52***
	(0.148)	(0.291)	(0.239)	(0.200)	(0.154)	(0.088)
Male	-3.48***	-3.36***	-4.89***	-4.33***	-2.05***	-0.705***
	(0.172)	(0.780)	(0.275)	(0.249)	(0.205)	(0.114)
Mobile money users						
Female	-9.69***	-5.05***	-7.45***	-11.06***	7.59***	-4.23***
	(0.331)	(0.648)	(0.546)	(0.445)	(0.351)	(0.204)
Male	-7.49***	-4.94***	-5.94***	-7.92***	-7.31***	-3.88***
	(0.356)	(0.605)	(0.574)	(0.528)	(0.416)	(0.225)
Bank and mobile money users						
Female	-9.94***	-4.14***	-4.35***	-10.02***	-17.788	-6.93***
	(0.581)	(1.141)	(0.962)	(0.805)	(0.603)	(0.354)
Male	-7.11***	-3.87***	-3.59***	-7.30***	-12.09***	-3.90***
	(0.494)	(0.805)	(0.787)	(0.732)	(0.587)	(0.327)

Note: $^*p < 0.1$. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

Figure B.4 shows the impact of using BK, MM and BM for both males and females. Again, the impacts are in a U-shape for both genders and the bottom of the U-shape moves to the right as we move from BK to MM and BM. In fact, while BK benefits individuals in the 0.25 quantile most, MM benefits individual in the 0.5 quantile most and individuals in the

0.75 quantile gains most from BM. Thus, MM and BM are more efficient than BK both in magnitude and in targeting poorer individuals across gender, and all three tools impact poorest individuals (at the bottom of poverty distribution) least.

4.4.3 Heterogeneity across education

Financial inclusion impacts on poverty for individuals across different education levels are shown in Table 4.5 and Figure B.5.

TABLE 4.5: Quantile estimation of FI impact on poverty across education

		Quantiles				
	OLS	0.1	0.25	0.5	0.75	0.9
Bank users						
Primary	-0.45**	-0.12	-0.52	-0.89***	-0.63***	-0.206***
	(0.209)	(0.372)	(0.339)	(0.343)	(0.134)	(0.056)
Secondary	-2.75***	-3.23***	-4.84***	-3.37***	-0.73***	0.023
	(0.243)	(0.459)	(0.418)	(0.356)	(0.232)	(0.106)
High School	-3.37***	-3.21***	-4.65***	-3.89***	-2.08***	-1.02***
	(0.165)	(0.276)	(0.250)	(0.240)	(0.194)	(0.149)
Above High school	-4.12***	-3.31***	-3.95***	-4.77***	-3.83***	-2.52***
	(0.365)	(0.465)	(0.457)	(0.557)	(0.526)	(0.391)
Mobile money users						
Primary	-8.9***	-7.10***	-8.75***	-7.34***	-2.26***	-1.16***
	(0.821)	(1.435)	(1.306)	(1.320)	(0.554)	(0.216)
Secondary	-8.63***	-7.68***	-10.00***	-8.98***	-5.04***	-2.28***
	(0.365)	(0.670)	(0.634)	(0.553)	(0.342)	(0.163)
High school	-5.81***	-2.13***	-3.44***	-6.24***	-8.49***	-6.02***
	(0.411)	(0.668)	(0.669)	(0.592)	(0.472)	(0.369)
Above high school	-5.81***	-5.30***	-5.76***	-5.42***	-4.49***	-3.42***
	(0.713)	(0.935)	(1.002)	(1.130)	(1.055)	(0.788)
Bank and mobile money users						
Primary	-7.8***	-0.397	-7.53**	-15.07***	-3.48***	-0.710
	(1.935)	(3.476)	(3.138)	(3.085)	(1.313)	(0.507)
Secondary	-9.74***	-7.36***	-8.05***	-13.89***	-6.92***	-2.47***
	(0.814)	(1.496)	(1.447)	(1.247)	(0.776)	(0.362)
High school	-5.23***	-2.26**	-2.90***	-3.95***	-10.11***	-4.62***
	(0.566)	(0.929)	(0.912)	(0.816)	(0.658)	(0.514)
Above high school	-4.73***	-2.70***	-3.05***	-2.94**	-4.29***	-4.34***
	(0.729)	(0.980)	(0.994)	(1.150)	(1.083)	(0.778)

Note: $^{*}p < 0.1$. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

In general, impacts of MM and BM are much greater than those of BK and the impact of the three services remain in a U-shape, which means that the impact for individuals at the bottom of poverty distribution (i.e., the poorest individuals) is small. In the same quantile, BK impacts high educated users more than low educated ones. For example, in the 0.75 quantile, BK reduces the chances of being poor for individuals with primary education by 0.63% and for individuals with high school education by 3.83% . Hence, BK impact is limited for low educated users. In contrast, MM and BM impacts depend on individuals' wealth status. For individuals in low quantile 0.1, 0.25 and 0.5, MM and BM impact the low educated more. For users in high quantiles 0.75 and 0.9, the effects are greater for high educated users. Taking the 0.25 quantile as one example, MM reduces the chances of being poor for users who have primary education by 8.75% and for users with secondary education by 10%. This impact for users having high a school education and above are 3.44% and 5.76% respectively. Taking the 0.9 quantile as another example, individuals with primary and secondary certificates can reduce the chance of being poor from MM by 1.16% and 2.28%, while users who graduate from high school can reduce it by 6.02%. Similarly, BM users in the 0.25 quantile with primary and secondary education can reduce the probability of being poor by 7.53% and 8.53% while this number for users with high school level is 2.9%. In the 0.9 quantile, BM impact for primary educated users is 0.71% while the impact for high school educated ones is 4.62%. In short, BK impact on reducing poverty is greater for high educated individuals while MM and BM are more efficient in getting low educated ones out of poverty.

4.4.4 Heterogeneity across locations

The impacts of financial inclusion on poverty for users in urban and rural areas are presented in Table 4.6. As can be seen, in all quantiles, BK impacts are greater for urban users than for rural users. For example, rural individuals in the 0.1 quantile can reduce by 2.39% the chances of being poor by using BK. This impact for urban individuals is 3.43%. For users in the 0.9 quantile, rural users can reduce the opportunity of being in poverty by 0.42% but urban users can reduce it more by 1.06%. Thus, BK is more efficient for urban individuals regardless of their wealth status. In contrast, MM and BM impacts depend on the location and wealth status of users. For individuals in low quantiles (0.1, 0.25 and 0.5), MM impacts rural individuals more than urban ones. For individuals in high quantiles (0.75 and 0.9), urban users are impacted more by MM. For example, rural citizen in the 0.5 quantile can

reduce chances of being poor by 10.02% by using MM, while this rate for the same user living in urban is 5.33%. Poorest rural MM users in bottom of poverty distribution (the 0.9 quantile) can reduce the probability of being poor by 2.78%. This rate for similar urban MM users is nearly double at 5.65%. In terms of BM, it impacts rural individuals more at all poverty level except for people at the bottom of poverty distribution (i.e., the poorest individuals). For example, BM rural users in the 0.1 quantile can reduce the chance of being poor by 5.84%, compared to 2.39% of similar urban users. However, in the 0.9 quantile, BM rural users can reduce the opportunity of being poor by 4.18% compared to 5.07% for urban users.

TABLE 4.6: Quantile estimation of FI impact on poverty across locations

		Quantiles				
	OLS	0.1	0.25	0.5	0.75	0.9
Bank users						
Rural	-2.42***	-2.39***	-3.32***	-2.67***	-1.237***	-0.424***
	(0.134)	(0.266)	(0.225)	(0.189)	(0.119)	(0.057)
Urban	-3.31***	-3.43***	-3.85***	-3.76***	-2.57***	-1.06***
	(0.196)	(0.282)	(0.295)	(0.287)	(0.284)	(0.203)
Mobile money users						
Rural	-9.28***	-7.05***	-9.00***	-10.02***	-5.84***	-2.78***
	(0.301)	(0.599)	(0.502)	(0.417)	(0.274)	(0.131)
Urban	-5.81***	-2.09***	-2.74***	-5.33***	-8.09***	-5.68***
	(0.403)	(0.591)	(0.592)	(0.581)	(0.582)	(0.429)
Bank and mobile money users						
Rural	-10.32***	-5.844***	-7.40***	-14.875***	-11.77***	-4.18***
	(0.538)	(1.082)	(0.898)	(0.757)	(0.485)	(0.234)
Urban	-5.442***	-2.39***	-1.85**	-2.48***	-9.50***	-5.07***
	(0.518)	(0.771)	(0.754)	(0.755)	(0.730)	(0.549)

Note: $^*p < 0.1$. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

To summarise, BM and MM are more efficient in reducing poverty for individuals in rural areas than in urban areas in low quantiles. In high quantiles, both MM and BM benefit the urban more than the rural. BK, in contrast, is more efficient in reducing poverty for urban users at all wealth levels. Despite this deviation, BM and MM impacts are greater than of BK at all quantiles and the impact of all three tools remain in U-shapes (Figure B.6). This means that financial inclusion impact on poverty reduction is small for the poorest individuals at the bottom of poverty distribution who need it most.

4.4.5 Heterogeneity across occupations

Table 4.7 shows the impact of financial inclusion on poverty for individuals across occupations. Occupations are divided into two groups: manual work and non-manual work. Firstly, BK impact is greater for non-manual employees than for manual employees and the gap is greater for poorer individuals. For example,the gap for individuals in the 0.25 quantile is 1.22%, while the gap for users in the 0.9 quantile is 2.93% in favor of non-manual employees. Using BK reduces the chances of poorest individual being in poverty who do manual work by only 0.46%. MM benefits manual workers most in the 0.5 quantile. In fact, MM reduces the probability of being poor by 10% for these individuals. Comparing between individuals doing manual work and individuals doing non-manual work, MM benefits manual workers more when they are not poor, but benefits individuals who do non-manual work more if they are poor. For example, in quantile 0.1, MM reduces the chances of being poor for manual employees by 5.4% while reduces it for non-manual employees by 2.76%. In quantile 0.9, manual labourers can reduce the chances of being poor by 3.59% and this number for non-manual labourer is 6.91%. Comparing between manual workers and non-manual workers, BM impacts are greater for manual workers in all quantiles except for the 0.9 quantile. For individuals in the 0.9 quantile non-manual workers benefit more from BM than manual employees. In short, MM and BM are more efficient in reducing poverty for manual workers in low quantiles. In high quantiles, MM and BM have more impact for non-manual workers while BK impacts are greater for non-manual employees in all quantiles.

4.4.6 Heterogeneity across income

Table 4.8 shows the impact of financial inclusion on poverty for individuals across various income levels. BK impacts for medium income earners are stronger than for low income earners at all wealth levels. Taking BK users in the 0.9 quantile as an example, BK reduces the likelihood of being poor for medium income users by 0.8% . This number for low income users is 10 times smaller at 0.08%. MM and BM impacts depend on income and wealth levels of users. For those in low quantiles (0.1, 0.25 and 0.5) MM and BM reduce the likelihood of being poor for low income users more than for medium income users. For users in high quantiles (0.75 and 0.9), MM and BM impacts are greater for medium income users. For example, MM reduces the chances of being poor for low income earners in the 0.25 quantile by 9.23%; this number for the medium income earners is 5.94%. Another example is the

TABLE 4.7: Quantile estimation of FI impact on poverty across occupations

		Quantiles				
	OLS	0.1	0.25	0.5	0.75	0.9
Bank users						
Manual Job	-2.67***	-2.46***	-3.70***	-3.21***	-1.41***	-0.46***
	(0.116)	(0.210)	(0.195)	(0.158)	(0.117)	(0.066)
Non-manual job	-4.99***	-4.88***	-4.92***	-5.18***	-4.72***	-3.39***
	(0.427)	(0.618)	(0.580)	(0.581)	(0.711)	(0.586)
Mobile money users						
Manual Job	-8.87***	-5.40***	-7.62***	-10.00***	-6.93***	-3.59***
	(0.260)	(0.485)	(0.433)	(0.362)	(0.268)	(0.151)
Non-manual job	-7.03***	-2.76***	-3.72***	-6.17***	-8.99***	-6.91***
	(0.680)	(1.02)	(0.941)	(0.958)	(1.091)	(0.948)
Bank and mobile money users						
Manual Job	-8.54***	-3.90***	-4.97***	-10.48***	-13.08***	-3.04***
	(0.438)	(0.824)	(0.749)	(0.618)	(0.452)	(0.249)
Non-manual job	-5.76***	-2.41**	-1.706*	-2.837***	-9.82***	-8.26***
	(0.751)	(1.108)	(1.029)	(1.062)	(1.203)	(1.081)

Note: $^*p < 0.1$. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

impact of BM for low income earners in the 0.5 quantile is 17.16% and 7.09% for medium income earners in the same quantile. It is noteworthy that the impact of all three financial tools remain in a U-shape (Figure B.8) and MM and BM impacts are greater than BK impacts in terms of magnitude.

4.4.7 Heterogeneity across regions

Table 4.9 reports the impact of financial inclusion across regions (Africa and Asia). As seen, heterogeneous effects are observed across regions. In general, for all quantiles and across financial inclusion serves provided, financial inclusion is more successful in reducing poverty in Africa compared to Asia. While all financial included services (BK, MM and BM) serve are significant along the poverty distribution, MM and BM are only significant in the Asia region from mid to extreme quantiles. Clearly, BK is more effective in reducing the likelihood of poverty than MM and BM in Asia. Again, the impact of the three services is U-shaped along the distribution of the poverty index, which means that the impact on the poorest individuals at the bottom high of poverty distribution remain limited compared to users in other quantiles (see Figure B.9).

TABLE 4.8: Quantile estimation of FI impact on poverty across income

		Quantiles				
	OLS	0.1	0.25	0.5	0.75	0.9
Bank users						
Low Income	-1.69***	-1.83***	-2.41***	-2.02***	-0.77***	-0.089
	(0.196)	(0.399)	(0.355)	(0.278)	(0.157)	(0.065)
Medium Income	-3.40***	-3.41***	-4.60***	-3.74***	-1.71***	-0.80***
	(0.160)	(0.278)	(0.265)	(0.230)	(0.168)	(0.105)
Mobile money users						
Low Income	-9.47***	-4.92***	-9.23***	-10.85***	-5.33***	-2.19***
	(0.354)	(0.746)	(0.649)	(0.478)	(0.285)	(0.119)
Medium Income	-7.47***	-3.64***	-5.94***	-8.36***	-7.13***	-4.06***
	(0.371)	(0.649)	(0.619)	(0.545)	(0.396)	(0.259)
Bank and mobile money users						
Low Income	-9.92***	-4.70***	-6.71***	-17.16***	-8.80***	-2.36***
	(0.729)	(1.461)	(1.342)	(0.996)	(0.584)	(0.240)
Medium Income	-7.27***	-2.33**	-3.68***	-7.09***	-13.68***	-5.26***
	(0.535)	(0.951)	(0.884)	(0.784)	(0.545)	(0.312)

Note: $^{*}p < 0.1$. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

TABLE 4.9: Quantile estimation of FI impact on poverty across regions

		Quantiles				
	OLS	0.1	0.25	0.5	0.75	0.9
Bank users						
Africa	-5.15***	-2.31***	-3.95***	-5.89***	-6.47***	-4.89***
	(0.387)	(0.695)	(0.589)	(0.506)	(0.482)	(0.490)
Asia	-2.49***	-2.35***	-3.28***	-3.01***	-1.54***	-0.56***
	(0.117)	(0.207)	(0.194)	(0.168)	(0.120)	(0.062)
Mobile money users						
Africa	-8.28***	-6.70***	-9.05***	-8.89***	-6.46***	-3.96***
	(0.271)	(0.524)	(0.417)	(0.361)	(0.350)	(0.341)
Asia	-0.78	-0.39	-0.177	-1.013	-1.16**	-0.779
	(0.448)	(0.798)	(0.741)	(0.656)	(0.460)	(0.249)
Bank and mobile money users						
Africa	-5.32***	-1.15	-2.21***	-5.57***	-10.77***	7.62***
	(0.460)	(0.820)	(0.688)	(0.609)	(0.548)	(0.579)
Asia	-0.802	-0.141	-0.606	-3.21***	-0.582	1.383
	(0.597)	(1.06)	(0.987)	(0.872)	(0.611)	(0.328)

Note: $^{*}p < 0.1$. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

We have seen that when considering the pooled sample of regions, the MM and BM services were more successful in reducing the likelihood poverty than the BK services. An

examination at different segments of the population, as reported in Table 4.9, shows that the BK service is more efficient in reducing poverty for median young educated males who do non-manual work and living in urban areas. In contrast, the MM and BM services exert a greater impacts on disadvantaged older female uneducated users who live in the rural areas with low income, except for the poorest users at the bottom of poverty distribution. Compared with BK, the MM and BM services impact on those poorest users remain greater in magnitude than that of the BK services. Again, this suggests that MM and BM services are more efficient than BK services in reducing the likelihood of poverty for the disadvantaged financial inclusion services users.

Historically, MM services is said to have much more advantages over BK in terms of transaction cost reduction as well as improvement in convenience, security, and time taken for transaction. As the agent networks grow and become denser, it is easier for individuals to make a distant transaction through MM. In fact, number of MM agents is at least tripled that of bank branches in Kenya, Uganda, Tanzania and Bangladesh. In 2015, the average distance to the closest bank branch in Kenya was 6 km while the distance to the nearest MM agent was just 1.4km. As a result, instead of paying 5 dollars to take a bus to the bank, it costed MM users 0.35 dollar fee to do the same transaction (Suri, 2017) with MM. The systems of MM agents impact significantly on rural residents. In fact, building up bank branch in rural areas is typically more costly than in urban areas due to higher travel cost, higher construction cost and low potential of future users. That is why the number of bank branches in urban areas is greater than that of rural areas and it is easier for urban residents to access banks. Therefore, urban individuals tend to use BK services more. In contrast, MM agents who are mostly individual can reside easily in remote rural areas with no extra cost, thus facilitating rural residents to access MM services. Furthermore, to access and use bank services, individuals need minimum literacy requirements as banks typically ask for a number of documents. On the contrary, MM does not need so, thus making it much easier to use. Suri, 2017 describes the process of opening a MM account as "very simply" and "taking a few minutes" as opposed to opening a bank account which could take days or weeks.

MM is especially preferred by many female users. Many studies explain the difficulty for women to obtain formal financing through BK. From the demand side, the first reason for a low uptake of banking services by women is that they are less fond of debt than men (Coleman et al., 2019; Obada and Alaoui, 2018). Therefore, in order to avoid the burden of debt on their families, women tend to resort less to borrowing from banks (Akouwerabou,

2020; Kouvie, 2018). In addition, women trust banks less than men (Akouwerabou, 2020) and prefer to turn to other sources of financing. Other demand factors are women's low level of education and low level of social capital that put them in difficulty while negotiating with bankers (Eriksson, Katila, and Niskanen, 2009; Brana, 2013; Saparito, Elam, and Brush, 2013). The last demand factor is that women often work in the sector that banks do not like to finance such as education and health, and they have low likelihood to have a job and benefit from professional experience (Akouwerabou, 2020; Naidu and Chand, 2017). From the supply side, banks often require a guarantee when considering a loan while women, especially women in Sub-Saharan Africa are less likely to have the necessary guarantees to meet this requirement as they often have no right to inheritance and are pushed into the job market (Ngono, 2020; Kouvie, 2018). In contrast, MM facilitates women to use financial services to overcome poverty in number of ways. Firstly, MM creates a transaction history and build up women's credibility that banks can consider when they apply for future credit. This is especially helpful for women who lack in the guarantees requirement (Aron, 2018). Secondly, women are more receivers than senders of funds through MM, so MM is a potential source of funding that women can benefit a lot from (Ngono and Bita, 2020). Thirdly, Jeanneney and Kpodar, 2011 found that MM pushed women to become self-employed to escape unemployment and from that they can find a route out of poverty. In fact, Suri and Jack, 2016 find that as a result of better access to MM, about 186,000 women in Kenya have changed from their main occupation in agriculture to business and retail. Moreover, Suri and Jack, 2016 also find that MM reduces the poverty rate by around 2% for Kenyan households, among them 196,000 households move out of extreme poverty. These reductions are larger among female with a head of household role. For those reasons, being female is no longer a constrain preventing women from overcoming poverty by using MM or BM.

Moreover, MM also impacts old users dramatically. Akinyemi and Mushunje, 2020 show that receiving payment is the most common use of MM. Older individuals are more likely to use MM to receive payments (Afawubo et al., 2020) and the amount they receive tends to increase with age (Akinyemi and Mushunje, 2020).

Suri, 2017 showed that MM is largely used to make two types of transactions: (a) transactions across space, and (b) transactions where the opportunity cost of holding cash may be high, for example in high-crime cities. Thus MM facilitates trade by making existing transactions more efficient and enabling transactions that would not have happened without MM. With lower transaction cost, more convenience, easy access and use as well as security,

MM supports disadvantaged individuals who are old, uneducated female with low income and manual jobs - who otherwise would unable to access to financial service- to engage in financial activities that help them to reduce poverty. That is why MM is very popular in developing Asia and Africa especially in Sub-Sahara Africa. Data shows that Sub-Sahara Africa accounts for 52% of MM services and more than 50% of MM registered accounts of the world (Suri, 2017).

Despite enormous benefits, MM and BM service impacts on the disadvantage users (old uneducated females living in rural areas) are smaller than that of the non-disadvantaged users at the bottom of poverty distribution. It is said that education, living location, income and hence occupation are the most important factors determining an individual's wealth. Thus, the way out of poverty is hardest for individuals who are uneducated having low income and living in rural areas. MM and BM can reduce the chances of being poor for these users but the impact may not outweigh the impact of education, income and living location. This suggests that to reduce individual poverty more efficiently, government should combine financial inclusion with other tools such as improving individuals' income and education.

4.5 Conclusion

This chapter investigates the contribution of financial inclusion in reducing individuals and households likelihood of being poor. Using a quantile regression analysis and survey data at the micro-level for 8 developing countries in Africa and Asia, we finds that financial inclusion was successful in reducing the likelihood of poverty in both regions. However, Mobile money (MM) and a combination of both Banks and Mobile money services are more efficient than Banking services alone. All three services have smaller impact at the bottom of the poverty distribution, thus implying that financial inclusion services alone cannot successfully combat extreme poverty. Therefore, policy-makers and governments should combine financial inclusion with other tools such as improving individuals' income and education to combat extreme poverty.

Heterogeneous effects impacts are observed across financial inclusion services and different segments of the population. In particular, we find that the impact of BK services are different from that of MM and BM services. Regardless of wealth status, the BK services

benefits young educated non-manual males workers with medium income who live in urban areas. In contrast, the MM and BM service exert greater impact on older uneducated low-income females in rural areas. This study focuses banking and mobile money. A comparison to informal financial which is very popular in rural Africa and Asia may lead to a better results. Future research should focus on how to increase the effectiveness of financial inclusion for individuals at the bottom of poverty distribution.

Chapter 5

Revisiting the relationship between firm size and firm performance: Evidence from Viet Nam

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Principal Author

Name of Principal Author (Candidate)	Ha Trang Vo		
Contribution to the Paper	Contribute to initiate reseach idea, planning the paper, analyse the data, interpreted the results and wrote the manuscripts.		
Overall percentage (%)	100%		
Certification:	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.		
Signature		Date	23/09/2021

Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:

i. the candidate's stated contribution to the publication is accurate (as detailed above);

ii. permission is granted for the candidate in include the publication in the thesis; and

iii. the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

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Abstract

Firm size is known to be an factor of firm performance as it often shows the profitability of a business (Opeyemi, 2019). With economies of scale, big enterprises can produce more efficiently, reduce costs, easily upgrade production technologies, negotiate with suppliers and access capital, which in turns will increase its competitiveness. According to the 2019 Global Competitiveness Report, the competitiveness of Vietnamese firms is low, ranked 67 out of 141 countries and territories. One reason is that 95% of firms in Vietnam are of small and medium sizes. In fact, only 21% of Vietnam's small and medium- sized firms participate in global chain, much lower compared to neighbouring countries such as Thailand and Malaysia. Using firm level longitudinal data from 2004 to 2014, this chapter investigates the relationship between firm size and its growth in Vietnam. Specifically, the chapter examines the development of Vietnamese firms over time and identifies factors preventing them from growing. We find that besides industry, type of ownership impacts on the relationship between firm size and growth. In fact, before the global financial crisis (GFC), Vietnamese small firms grew faster than larger ones regardless of their initial size, industries and types of ownership except for the biggest State and Joint Stock companies. After the crisis, the results are not much different when using number of employees as firm size measure. However, when firm size is measured in assets and turnover, we find that large firms grew faster than smaller ones post GFC except for 25% of the smallest firms in the first quantile. All three measures of firm size show that small private and collective firms grow faster than larger ones regardless of their initial size and industries.

5.1 Introduction

Firm size is one determinant factor of firm performance and shows the profitability of a business (Opeyemi, 2019, Ozcan, Unal, and Yener, 2017). With economies of scale, enterprises can produce more efficiently, reduce costs, easy to apply technology to production, negotiate with suppliers and access capital (Voulgaris and Lemonakis, 2014, Fiegenbaum and Karnani, 1991, Lee, 2009). As a result, firm competitiveness will increase. According to 2019 Global Competitiveness Report, Vietnam competitiveness ranked 67 out of 141 countries and territories, up to ten places (77) from 2018 (Schwab, 2019). Although there has been an improvement in its competitiveness ranking, Vietnam's position is still low compared to many countries. One reason why Vietnamese firms can not compete on the global market is because most of them are of small size. Among 758.610 firms and businesses in 2019, 95% are of small and medium size. Moreover, among small and medium enterprises, 77% are super small and 69% developed from household businesses. Despite this, small and medium size enterprises contribute 60% to national GDP and employ 90% of the labour force. This fact implies that small and medium firms play an important role in the economy (Planning and Ministry, 2020).

Most Vietnamese small and medium firms operate in domestic market, with only 3% of super small firms, 4% of small and 9% of medium firms having connection with oversea clients. In fact, only 21% of Vietnamese small and medium firms participate in global chain, while this figure is 30% for Thailand and 46% for Malaysia. During the Covid panademic, small and medium firms face more difficulties than larger ones. It is estimated that 84% of small and medium firms face difficulties during Covid. Among them 40% lack operating capital, 80% have to scale down the business, 52% have to reduce the number of employees, 14% are impacted by delay in the supply chain, and 50% are impacted by social distancing. Many factors impact on business growth but for small and medium firms lack of capital is said to be the main factor. According to the Insight Asia Market report, 62% of firms in the survey report that they lack capital. 60% find it difficult to find clients, while 50% face difficulties in infrastructure. According to the Provincial Competitiveness Index (PCI) only 40% of super small- firms have access to banks. This figure for small firms is 60% and increase to 81% for large firms. Small and medium firms also have to pay higher cost to access bank capital. In fact 90% of small and medium firms need collateral assets to get credit from bank, a much higher ratio compared to large firms.

Despite the fact that being small makes firms more vulnerable to market shock, makes it more difficult to compete in international market and to access the capital market, the number of small and medium firms in Vietnam remains unchanged over time. This raises the question why most firms in Vietnam are small and what prevent them from growing? The relationship between firm size and growth is often discussed using Gibrat's law. According to this law, all firms grow at the same rate over a period of time regardless of their initial size. This paper aims to investigate the relationship between size and growth for Vietnamese firms by checking against Gibrat's law. From that, it examines the development of Vietnamese firms over time and identifies factors preventing Vietnamese firm from growing. With firm panel data from 2004 to 2014, we look at the dependence of growth on size for firms across different industries and across different types of ownership taking annual assets, annual turnover and number of employees as firm size measures alternatively. We find that before the financial crisis, small firms grow faster than larger ones. This is true for most Vietnamese firm regardless of their initial size, industries and types of ownership except for the largest State and Joint Stock companies. The results after the crisis do not change much when using number of employees as a firm size measure. However, when using assets and turnover as a size measure, we find that after the crisis big firms grow faster than smaller ones . Only 25% of the smallest firms remain reluctant to grow as being small gives them higher growth rates. More especially, all three measures of firm size show that small private and collective firms grow faster than larger ones regardless of their initial size and industries.

The paper contributes to the literature in many ways. Firstly, an enormous amount of empirical research examines the correctness of Gibrat's law. However, most of them applied to developed economies such as America (Blonigen and Tomlin, 2001), Denmark (Bentzen, Madsen, and Smith, 2012, the United Kingdom (Hardwick and Adams, 2002 and Dunne and Hughes, 1994), Sweden (Heshmati, 2001, Greece (Fotopoulos and Giotopoulos, 2010)and Portugal (Oliveira and Fortunato, 2006, etc. This paper is one of the few papers studying the case of a developing country. Secondly, industry is an important factor impacting on firm growth that has been included in the literature when investigating Gibrat's law. Besides industry, this paper finds that type of firm ownership also impacts on firm growth but this factor has not been mentioned in the literature. Thirdly, this paper is one of the few studies in the literature using all three factors asset, turnover and number of employees as a measures for firm size alternatively.

The paper is structured as follows: Chapter 5.2 is the literature review; Chapter 5.4 describes the data; Chapter 5.3 presents the empirical framework; Chapter 5.5 discusses the results and Chapter 5.6 concludes.

5.2 Literature review

Gibrat's law is known as " The Law of Proportionate Effect". According to this law, large firms can sell in a larger market so the absolute growth of firms is proportional to its size. However, Gibrat law can be criticised for focusing too much on the market potential of firms and for ignoring competitive disadvantage due to firm size. Firstly, conventional firm theory assumes that small firms grow faster than large firm as they have optimal size with economies of scale. In contrast, large firms typically have higher costs due to management hierarchy and due to coordinating and controlling transactions within the larger firms. However, they can outsource their production which can reduce management cost and increase firm growth rate. Thus, arguments in both directions concerning growth rates of small firms versus large firms are relevant and important to study.

Papers testing the correctness of Gibrat's law are numerous in the literature and the findings are mixed. Many papers find evidence in favor of Gibrat' s law, such as Hart, 1962, Hart and Prais, 1956, Simon and Bonini, 1958 and Hymer and Pashigian, 1962 while others (Kumar, 1985, Mansfield, 1962, Evans, 1987 and Elston, 2002) reject it. Lotti, Santarelli, and Vivarelli, 2009 make an especially big contribution to the investigation of Gibrat's law. In their paper, they perform year to year estimations and finds that Gibrat's law tends to be correct. However, when examining firms over the entire period (1987-1994) they reject the hypothesis of the independence between firm growth and size.

In terms of methodology, many authors follow the random walk model when examining Gibrat's law. Kumar, 1985, Dunne and Hughes, 1994, Singh and Whittington, 1975 and Contini and Revelli, 1989 regressed growth rates on lagged growth rate for surviving firms to find some persistence in firm growth. However, those papers assumes that there is no autocorrelation in the error terms. When studying the relationship between firm growth and size, Chesher, 1979 highlighted that any autocorrelation in growth rate may lead to inconsistent estimators. Chesher's study has motivated a number of authors to investigate Gibrat's law taking into account the present of autocorelation such as Wagner, 1992 and Almus, 2000. In recent years, Bentzen, Madsen, and Smith, 2012 and Audretsch et al., 2004 consider second

order autocorrelation when testing Gibrat'law. While Bentzen, Madsen, and Smith, 2012 find a positive relationship between firm size and firm growth Audretsch et al., 2004 find firm growth and size are independent.

Many empirical papers studying Gibrat's law suggest that the growth of firms depends on three factors: (i) the effect of the industry growth rate which is constant and common to all firms in the same industry; (ii) the effect of firm's initial size and (iii) the effect of random growth rate. As a result, most papers look at firms in various industries such as Bentzen, Madsen, and Smith, 2012, Weinzimmer, Nystrom, and Freeman, 1998, Fujiwara et al., 2004 and Hedija et al., 2017. Some narrow to firms in one single sector like insurance industry (Hardwick and Adams, 2002), manufacturing (Fotopoulos and Giotopoulos, 2010, Daunfeldt and Elert, 2013, Park, Shin, and Kim, 2010), hospitality (Park and Sydnor, 2011, Serrasqueiro and Nunes, 2016, Piergiovanni et al., 2003), tourism (Rufin, 2007) and trading (Leitão, Serrasqueiro, and Nunes, 2010). In the history, Vietnam was in a subsidized economy in which all companies owned by the government. Since the reform and opening up, Vietnam has established a market economy in which firms under all types of ownership are equal but state companies play the dominant role. This fact implies that ownership may impact on firm size and firm growth. In fact, China which has the same situation as Vietnam witnesses different firm growth rate across different types of ownership (Zhu et al., 2021). Hung, Vinh, and Thai, 2021 investigates the impact of firm size on performance for Vietnam private enterprise. They find that profitability of Vietnamese firm is affected by number of employee, revenue growth and mostly by total asset. They focus on the profit as firm performance. In contrast, this paper focus on the growth of firm size. To increase firm competitiveness especially on international market, firm size is more important than profit as they can take advantage of scale to produce more efficiently, invest more on research, development and technology and easier to negotiates with suppliers. Although, big firm may have lower marginal profit. Furthermore, this paper studies all types of firms in Vietnam including private, state, foreign, joint stock, etc.

5.3 Empirical framework

The main aim of this paper is to test the Gibrat's law for Vietnamese firms before and after the financial crisis. To analyze the dynamics of growth and size relationship, this paper follows a method adopted by Bentzen, Madsen, and Smith, 2012. The growth process of firms

in two subsequent periods $(t-1, t)$ can be specified by random walk model as follow:

$$z_{t,i} = \beta z_{t-1,i} + \epsilon_{t,i} \tag{5.3.1}$$

where $z_{t,i}$ is the logarithm of the size of firm i at time t; $z_{t-1,i}$ is the logarithm of the size of firm i at time t-1; $\epsilon_{t,i}$ is error term and β is the coefficient to be estimated . In this formulation, Gibrat's law holds when $\beta = 1$, firm growth then is determined by $\epsilon_{t,i}$. By contrast, if $\beta < 1$ small firms grow faster than larger firms. When $\beta > 1$ the opposite is true which means large firms grow faster than smaller ones. Subtracting from both sides of equation (1) by $z_{t-1,i}$ we have:

$$\Delta z_{t,i} = \gamma z_{t-1,i} + \epsilon_{t,i} \tag{5.3.2}$$

In equation 5.3.2, Gibrat's law holds when $\gamma = 0$ (or $\beta = 1$). This formulation also implies that growth rate is persistent overtime if $\gamma = 0$. This paper applied the empirical framework rooted from equation 5.3.2. Equation 5.3.2 is consistent if $\epsilon_{t,i}$ is independently distributed overtime. However, if serial correlation presents in $\epsilon_{t,i}$ the estimation of γ hence β from equation 5.3.2 will be biased and firm growth rate will depend on firm size. A number of papers have extended to deal with first order auto-correlation in the residuals such as Chesher, 1979, Bentzen, Madsen, and Smith, 2006. However, Audretsch et al., 2004 noted that first order auto-correlation may not be sufficient to deal with correlation problems. As a result, this paper considers a second order process as in Audretsch et al., 2004 and Bentzen, Madsen, and Smith, 2012 where:

$$\epsilon_{t,i} = \rho \epsilon_{t-1,i} + \omega \epsilon_{t-2,i} + u_{t,i} \tag{5.3.3}$$

Adding this to the error term in equation 5.3.2 we have:

$$\Delta z_{t,i} = (\beta - 1 + \rho) z_{t-1,i} + (\omega - \beta\rho) z_{t-2,i} - (\beta\omega) z_{t-3,i} + u_{t,i} \tag{5.3.4}$$

In Equation 5.3.4, Gibrat's law holds when $(\beta, \rho, \omega) = (1, 0, 0)$ and $z_{t,i}$ is the logarithm of firm size such as the logarithm of firm turnover or the logarithm of firm assets. $\Delta z_{t,i}$ is the difference between the logarithm of firm size in year t $(z_{t,i})$ and the logarithm of firm size in year t-1 $(z_{t-1,i})$ which is firm growth rate. Firm size can be calculated in real terms or as

the deviation of the logarithm from the firm size to the average log size of companies. This paper follows the first option. Three variables typically used in the literature as a measure for firm size are asset, turnover and number of employees. In this paper, we use total deflated asset, total deflated turnover and average number of total employees as measurements of firm size alternatively. Jovanovic, 1982 proposes a theory of "noisy selection". This theory assumes that firms are heterogeneous about their true efficiency and cost levels. In fact, firms learn about their true efficiencies as they operate in the industry. Through experience, firms update their expectation regarding the value of their efficiency. Firms that make positive discoveries about their true efficiency survive and grow while other decline and exit. With firm size and age, failure and growth rate decrease. This model has motivated the inclusion of firm age along with firm size in empirical models dealing with firm growth. As a result, age is included in this paper and the estimated equation is:

$$\Delta z_{t,i} = (\beta - 1 + \rho) z_{t-1,i} + (\omega - \beta\rho) z_{t-2,i} - (\beta\omega) z_{t-3,i} + u_{t,i} + \alpha Age_{t,i} \tag{5.3.5}$$

in which $z_{t,i}$ is the logarithm of the total deflated asset, total deflated turnover and average number of total employees of firm i at time t; $z_{t-1,i}$ is the logarithm of the total deflated asset, total deflated turnover and average total of employees of firm i at time t-1; Age is the age of firm from year of establishment to year t; $\epsilon_{t,i}$ is error term and β, ρ, ω and α are the coefficients to be estimated. Gibrat's law is fullfilled when $(\beta, \rho, \omega) = (1, 0, 0)$. Equation 5.3.5 is estimated using non-linear iteration procedure in two separate periods: before the financial crisis from 2004 to 2007 and after the financial crisis from 2010 to 2014. Furthermore, β, ρ, ω in equation 5.3.5 are also estimated in a whole sample and in each quantile separately. As the results of the second and third quantiles are not much different, we will summarise the findings for four samples: whole sample, first quantile sample, second and third quantile sample and fourth quantile sample across different industries and different firm types.

5.4 Data

The paper uses panel data from the Vietnam Planning and Investment Ministry, which covers 10,482 companies all over the country from 2004 to 2014. The data set contains information about firm financial accounts such as assets, revenue, liability, capital, total employees, etc. The global financial crisis occurred during this period so to avoid distortions made by

the crisis, we divide the data into two periods: Before the financial crisis (from 2004 to 2007) and after the financial crisis (from 2010 to 2014). We use annual asset, annual turnover and number of total employees as firm size measures, and examine firm growth across industries and across different types of ownership.

Table 5.1 shows average assets, average turnover and the average number of employees of firms across industries before the financial crisis. Asset and turnover are adjusted to the inflation rate and are in 2003 monetary value while the number of employees are in persons. Before the crisis, firms in banking and mining industries have largest assets at more than 400 thousand million VND. Real estate is the third largest industry with average firm asset equal to 358 thousand million VND. The total number of firms in the three biggest industries are 582 firms, accounting for about 5% of total firms. Manufacturing, construction, agriculture and transportation have average firm asset ranking from 54 thousand million VND to 88 thousand million VND. These four industries account for 5,192 firms equal to 49% of the total number of firms. Three smallest- asset - firms are in hospitality, retail and public service sectors. The mean assets of these firms is below 40 thousand million VND. The three smallest industries include 4,525 enterprises which is equal to 43% of total firms. Relating to turnover, mining firms have the highest turnover at more than 660 thousand million VND. It is noticeable that the turnover of mining firms is much higher than that of other firms. In fact, the turnover of the second highest firm- real estate - is around 130 thousand million VND. Manufacturing firms have assets below 100 thousand million VND but their turnover is 123 thousand million VND, ranked at third highest. Banking companies have the highest assets but turnover is not the largest at 87 thousand million VND. Despite their small assets, retail firms have fourth highest turnover at 84 thousand million VND. Transportation, construction and agriculture firms have turnover ranking from 35 thousand million VND to 50 thousand million VND. Hospitality and public services firms have the smallest turnovers as well as assets. Regarding the number of employees, three firms employing the most staffs are in mining , manufacturing and agriculture. The average numbers of staffs in these three firms are 592 employees, 358 employees and 316 employees respectively. The fourth position is construction firms which hire 245 employees on average. With lowest asset and turnover, retail, hospitality and public service firms also employ the least staffs. The number of employees in banking firms is lowest with 55 employees.

After the financial crisis, both firm assets and turnover in all firms increased dramatically

TABLE 5.1: Mean assets, turnover and number of employees of firms across industries before the financial crisis (2004-2007)

Industry	No. of firms	Mean asset	Mean turnover	Mean employees
Agriculture, Forestry and fishing	478	69,780 (194,688)	35,812 (142,869)	316.8 (1113.4)
Mining and Quarrying	139	416,158 (4,034,269)	668,473 (6,662,535)	592 (1323.3)
Manufacturing	3,068	88,009 (322,662)	123,784 (514,378)	358 (1327)
Construction	1,151	77,726 (302,265)	46,629 (140,238)	245 (488.1)
Retail and wholesale	3,843	28,125 (175,811)	84,769 (568,368)	49 (220.9)
Transportation	501	54,705 (187,623)	50,498 (171,273)	168.2 (349.8)
Hospitality	422	40,324 (181,747)	23,494 (107,180)	78.1 (255.1)
Banking	383	476,062 3,059,755	87,241 355,026	55.2 313.3
Real estate	59	358,023 (844,320)	130,021 (507,523)	138.4 (232.5)
Public service	260	20,375 (75,771)	16,376 (40,368)	106 (239.4)
Total	10,482	80,159 (797,906)	91,431 (895,323)	194.3 (824.7)

Note: Asset and turnover are in million VND and are adjusted to inflation indexes to 2003 money value.Employees are in persons. Standard error are given in round parentheses

(Table 5.2). Banking and real estate remain the two biggest asset firms with firm average assets rising four to five times compared to before the crisis, reaching 2,862 thousand million VND and 1,665 thousand million VND respectively. The third biggest asset firms are mining firm with assets after the crisis doubled at 867 thousand million VND. Firm average assets of other industries increases from two to three times. Assets of public services, hospitality and retail firms are below 100 thousand million VND and they are firms with the lowest assets both before and after the crisis. Regarding turnover, mining remains the highest with 1,006 thousand million VND. Banking firms earn 471 thousand million VND on average, ranking second. With 206 thousand million VND, retail firms rank third highest turnover despite their low asset. After the crisis, the assets of real estate firm increase nearly five

times, but their turnover increased slightly from 130 thousand million VND to 199 thousand million VND. Construction, agriculture and transportation firms earn from 88 to 105 thousand million VND. Hospitality and public services firms have the lowest turnover at 42 and 32 thousand million VND, respectively. In contrast, the number of employees do not change much after the crisis. Mining, manufacturing and agriculture firms remain the three biggest employers. Public services, hospitality and retail are the three smallest employers and employ fewer than 100 employees. Hence, these firms have smallest asset, turnover and employees. After the crisis, banking is no longer the smallest employer with 134 staffs on average.

TABLE 5.2: Mean assets, turnover and number of employees of firms across industries after the financial crisis (2010-2014)

Industry	No. of firms	Mean asset	Mean turnover	Mean employees
Agriculture, Forestry and fishing	476	160,244 (462,473)	88,897 (303,728)	328.6 (1070.4)
Mining and Quarrying	138	867,056 (8,163,661)	1,006,522 (8,916,835)	597 (1425.5)
Manufacturing	3,066	214,842 (849,880)	301,942 (1,450,106)	336.3 (173,1)
Construction	1,148	189,699 (685,603)	105,743 (291,328)	207.1 (447.1)
Retail and wholesale	3,837	94,783 (891,290)	206,594 (1,739,719)	44.6 (191.7)
Transportation	501	128,914 (463,011)	102,532 (316,685)	142.5 (300.3)
Hospitality	422	78,970 (388,340)	42,553 (171,754)	77.7 (315.6)
Banking	383	2,862,044 (17,800,000)	471,286 (2,992,058)	134.7 (795.2)
Real estate	59	1,665,288 (15,800,000)	199,296 (607,798)	141.5 (319.2)
Public services	260	53,412 (225,010)	32,778 (68,863)	82.1 (136.6)
Total	10,290	266,258 (3,826,887)	219,541 (1,764,636)	183.7 (1023.3)

Note: Assets and turnover are in millions VND and are adjusted to inflation indices to 2003 money value. Employees are in persons. Standard errors are given in round parentheses

Table 5.3 presents mean assets, turnover and number of employees of firm across different types of ownership before the crisis. Firms owned by both state and foreigners have the greatest assets at 699 thousand million VND, much higher than the second largest which is foreign enterprises. State firms on average own 193 thousand million VND of assets and is the third biggest group. Next is joint stock firms with 122 thousand million VND in assets. Private and collective firms are the smallest ones and own 12 thousand million VND and 7 thousand million VND, respectively. There are 6,190 private firms accounting for 61,3% of total firms. Regarding turnover, with the greatest assets, state and foreign firms have highest turnover at 847 thousand million VND. The second position is state firms, which earn 247 thousand million VND on average. The turnover of foreign firms ranked third with 235 thousand million VND. With smallest assets, private and collective firms earn lowest revenue at 23 thousand million VND and 6 thousand million VND, respectively. Three biggest employers are foreign, state and state and foreign firms which employ 725 employees, 543 employees and 315 employees respectively. Joint stock firms employ 215 staffs on average. Private and collective firms are the smallest employers, each employing around 50 employees on average.

TABLE 5.3: Mean assets, turnover and number of employees of firms across types of firm ownership before the financial crisis(2004-2007)

Company type	No. of firms	Mean asset	Mean turnover	Mean employees
State	2,021	193,790 (537,921)	247,116 (947,362)	543.1 (1052.2)
Private	6,190	12,567 (73,957)	23,437 (105,971)	56.8 (276.1)
Joint Stock	700	122,608 (1,348,471)	65,611 (224,313)	215.4 (448.5)
Foreign	490	243,671 (785,621)	235,948 (777,157)	725.4 (2861.2)
State and Foreign	208	699,219 (3,527,754)	874,576 (5,770,927)	315.3 (592)
Collective	856	7,382 (15,639)	6,122 (21,600)	50.4 (116.3)
Total	10,465	70,548 (658,979)	85,447 (928,279)	194.3 (824.7)

Note: Assets and turnover are in millions VND and are adjusted to inflation indices to 2003 money value. Employees are in persons. Standard errors are given in round parentheses

After the crisis, there is not much change in ranking between firms but the value of asset and turnover increase significantly. State and foreign firms remain the largest in terms of assets and turnover, while State firms move to the second position. State firms own 620 thousand million VND assets and earn 762 thousand million in revenue on average. Foreign and Joint Stock firms are the next in size. Private and collective firms remain the smallest enterprises in both assets and turnover. It is noteworthy that the number of firms after the crisis is about 500 fewer than before the crisis and the reduction occurs mostly in state firms. In fact, number of state firms decreases from 2,021 firms before the crisis to 811 firms after the crisis. This is due to mergers and due to state firms becoming joint stock firms. Actually, joint stock firms increase from 700 firms before the crisis to 1,428 firms after the crisis. Thus, many joint stock firms originate from state ones.

In short, assets and turnover ranking of firms across industries and firms types does not change before and after the crisis. However, the value of assets and turnover of all firms increased significantly. Both before and after the crisis, highest asset firms tend to earn highest turnover and they are owned by state, foreign or both and are operating in the real estate, banking, and mining industries. In contrast, small firms operate in retail, hospitality and public services, with most of them owned privately or collectively.

TABLE 5.4: Mean assets, turnover and number employees of firms across types of firm ownership after the financial crisis (2010-2014)

Company type	No. of firms	Mean asset	Mean turnover	Mean employees
State	811	620,519 (1,974,528)	762,465 (3,788,731)	506.3 (1,064.9)
Private	6,052	33,729 (195,887)	51,530 (228,310)	50.2 (292)
Joint Stock	1,428	497,960 (6,132,951)	219,364 (991,238)	239.2 (725.5)
Foreign	508	590,782 (2,307,997)	614,852 (1,727,670)	819.4 (3,899.7)
State and Foreign	172	2,699,001 (16,500,000)	2,194,974 (10,200,000)	452.1 (1,070.2)
Collective	847	25,509 (54,212)	15,400 (75,144)	33.3 (84.3)
Total	9,818	203,502 (3,047,435)	184,414 (1,732,288)	183.7 (1,023.3)

Note: Assets and turnover are in millions VND and are adjusted to inflation indices to 2003 money value. Employees are in persons. Standard errors are given in round parentheses

5.5 Results

5.5.1 Annual assets as a measure of firm size

5.5.1.1 Differences cross industries

Table 5.5 shows the estimates of β before the financial crisis across ten industries. β is estimated for the whole sample and 3 smaller groups which are the first quantile, the second and third quantile and the fourth quantile. An examination of the whole sample set shows that all industries except for real estate have β significantly lower than 1. This means that small firms grow faster than larger ones. When looking at each quantile separately, β increases from the first quantile to the fourth quantile. In the first quantile, β ranges from 0.71 in hospitality to 0.93 in real estate and all are significantly smaller than 1. In the second and third quantile, β is higher than in the first quantile, again ranking lowest at 0.86 in hospitality and highest at 0.97 in real estate. β in the second and third quantiles are significantly smaller than 1 in all industries except for real estate. In the fourth quantile, transportation and banking have β significantly lower than 1. Construction is the only sector that has β significantly larger than 1, while the rest do not significantly deviate from 1. The estimations of ρ and ω in Table C.1 show that first and second order auto correlation exist in most industries, which justified the estimation procedure based on Equation 5.3.5. The results imply that Gibrat's law is correct for only a few big companies in Vietnam. In fact, Gibrat's law is incorrect for the 75% of smallest enterprises across all industries. For those small enterprises, the smaller they are the higher growth rate they have. This explains why most firms in Vietnam stay small, as becoming bigger does not benefit their growth. It is noteworthy that small firms in low asset industries have smallest β. For example, hospitality and public services firms are the two smallest firm and these two firms in the first quantile also have smallest β value.

There are numerous reasons why small firms in Vietnam do not want to grow. Firstly, 69% of small firms are household business. Those firms exist as they offer individuals a livelihood and a source of independent revenue. In many cases, new small businesses are founded as a last resort rather than as a first choice (Beck, Demirguc-Kunt, and Levine, 2005). In fact, many papers found that small firms in developing countries turn to self-employment simply because they have no other option and are more interested in survival and remaining at a small scale (Coad and Tamvada, 2012) . Secondly, in those firms the work is typically labour-intensive, and levels of labor productivity (and also capital productivity) are

typically low. Little, 1987 found that small firms in developing countries generally do not correspond to the most efficient scale of production that reduces their ability to compete in larger markets and prevents them from increasing in size. Thirdly, with limited access to formal financial markets, it is more difficult for small firms to enlarge their size. While small firms find it more difficult to upgrade their size, being small makes firms more flexible and they can respond to market change faster than large firms. As a result, small firms have a higher growth rate than large firms and small firms do not want to increase their size.

TABLE 5.5: Annual assets: parameter estimates of β across industries before the financial crisis (2004-2007)

Industry	No. of firms in whole sample	Whole sample	1st quantile	2nd,3rd quantile	4th quantile
Agriculture, Forestry and fishing	478	0.962* (0.004)	0.91* (0.006)	0.957* (0.004)	1.003 (0.006)
Mining and Quarrying	140	0.969* (0.007)	0.88* (0.012)	0.962* (0.008)	1.027 (0.015)
Manufacturing	3,075	0.959* (0.001)	0.881* (0.002)	0.956* (0.001)	1.001 (0.002)
Construction	1,150	0.956* (0.002)	0.878* (0.004)	0.97* (0.003)	1.011* (0.004)
Retail and wholesale	3,844	0.928* (0.001)	0.833* (0.002)	0.916* (0.001)	0.9998 (0.002)
Transportation	501	0.94* (0.005)	0.836* (0.010)	0.952* (0.005)	0.986* (0.007)
Hospitality	423	0.885* (0.006)	0.71* (0.016)	0.859* (0.008)	0.995 (0.007)
Banking	383	0.924* (0.006)	0.827* (0.015)	0.888* (0.009)	0.982* (0.009)
Real estate	59	0.979 (0.012)	0.931* (0.02)4	0.979 (0.017)	0.999 (0.021)
Public services	260	0.919* (0.005)	0.812* (0.012)	0.941* (0.006)	0.984 (0.009)
Total	10,313	0.946* (0.001)	0.858* (0.001)	0.947* (0.001)	1.001 (0.001)

Note: Standard errors are given in round parentheses; * indicates that the parameter deviates significantly from 1 at the 5% level.

Table 5.6 presents β estimates across industries after the financial crisis. Across the whole sample, eight in ten industries have β significantly greater than 1. β in the real estate sector does not deviates from 1, while transportation is the only industry to have β significantly smaller than 1. Thus in general, big firms in almost all industries have higher growth rate

than smaller ones. In each quantile, β increases from the first quantile to the fourth quantile in all industries. In the first quantile, β ranges from 0.93 in transportation to 0.99 in agriculture. All industries have β lower than 1 with six of them being significant. In the second and third quantiles, β in five industries is significantly bigger than 1. Only retail and transportation have β significantly lower than 1, while real estate and public service have β not significantly different from 1. In the fourth quantile, most industries have β significantly greater than 1. Hospitality and banking have β greater than 1 but not significantly. The value of ρ and ω in Table C.2 significantly deviates from 0 in most of industries which confirms the existence of first and second order correlation. In short, after the crisis, β increases in all industries but the smallest firms (firms in the first quantile) still do not have incentive to grow as small firms in the first quantile have higher growth rate than larger ones. Large firms in all industries find it beneficial for growth together with size.

After the crisis, Gibrat's law holds for more firms than before the crisis but remains invalid for most firms, as the results imply that most large firms grow faster than smaller ones. As firm assets in all industries increase dramatically after the crisis, firms now can benefit more from economies of scale, therefore β increasing (from below 1 to 1 and greater than 1) is reasonable. Furthermore, after the financial crisis, the Vietnamese government launched a number of policies to support small and medium business. In 2009 the government issued Decree 56 ND/CP which identifies in detail 8 ways to help small and medium enterprises. For example, small and medium companies can access bank credit at lower interest rates and with fewer paper-work requirements. Besides, financial institutions have to provide more suitable products to small firms, such as payment guarantees. All provinces have to reserve certain areas of land and spaces in industrial zones for small and medium firms. Provinces have to publish public information about those areas annually. Moreover, many small and medium firms are exempt from land tax, land rental fee, etc. As a result, small and medium firms have opportunities to grow after the crisis (except for smallest firms in the first quantile). It is noteworthy that β of real estate and mining firms in the fourth quantile is equal to 0.58 and 0.47 respectively. The reason for the exceptional low values is the collapse of Vietnam's real estate market and the sharp reduction of oil price due to the global financial crisis. Before the financial crisis, real estate speculation had pushed the price of Vietnamese real estate too high compared with the real value. The Market became a virtual fever; virtual demand increased. After the crisis, the economy met many difficulties, the increased inflation made people tighten on purchases, the real estate market had been frozen, the price of

TABLE 5.6: Annual assets: parameter estimates of β across industries after the financial crisis (2010-2014)

Industry	No. of firms in whole sample	Whole sample	1st quantile	2nd, 3rd quantile	4th quantile
Agriculture, Forestry and fishing	476	1.009* (0.001)	0.997 (0.004)	1.01* (0.002)	1.011* (0.002)
Mining and Quarrying	138	1.006* (0.002)	0.987* (0.006)	1.011* (0.003)	0.472* (0.120)
Manufacturing	3,066	1.006* (0.001)	0.975* (0.002)	1.009* (0.001)	1.011* (0.001)
Construction	1,148	1.006* (0.001)	0.985* (0.004)	1.01* (0.001)	1.011* (0.001)
Retail and wholesale	3,837	1.006* 0.001	0.962* 0.002	0.994* 0.001	1.016* 0.001
Transportation	501	0.996* (0.002)	0.932* (0.008)	0.991* (0.003)	1.009* (0.002)
Hospitality	422	1.004* (0.002)	0.973* (0.009)	0.999 (0.003)	1.003 (0.004)
Banking	383	1.006* (0.002)	0.994 (0.009)	1.015* (0.003)	1.003 (0.003)
Real estate	59	0.994 (0.007)	0.974 (0.020)	0.992 (0.005)	0.588* (0.080)
Public services	260	1.006* (0.002)	0.991 (0.007)	1.002 (0.002)	1.018* (0.005)
Total	10,290	1.007* (0.002)	0.974* (0.007)	1.005* (0.002)	1.012* (0.005)

Note: Standard errors are given in round parentheses; * indicates that the parameter deviates significantly from 1 at the 5% level.

real estate decreased by 40% and real estate enterprises fell into difficulty and could not sell their products, incurring a high interest rate because of the tightening monetary policies. The global financial crisis not only impacted on real estate but also on the global oil price. The largest companies in the mining industry operate in the oil extracting area. Before the financial crisis, exporting oil was the sector earning highest value for Vietnam, reaching 7,5 billion USD in 2007 and 10,5 billion USD in 2008. However, due to the financial crisis, oil prices in international market reduced sharply from 147 USD/bbl mid 2008 to 100 USD/bbl and even 40 USD/bbl at the end of 2008. This fact reduces the export value of oil exporting to 6.2 billion USD in 2009 and 4.9 billion USD in 2010. Furthermore, after 30 to 40 years of exploitation, the capacity of oil mining in Vietnam is declining and that impacts on the oil extracting volume of those firms as well.

5.5.1.2 Heterogeneity across firm ownership

The estimates of β across different types of firm ownership before the financial crisis are shown in Table 5.7 . If we look at a whole sample, all industries have β significantly lower than 1 which means small firms in all types have higher growth rates than larger ones. Looking at each quantile, β in the first quantile is significantly lower than 1 in all firm types. Specifically, β is lowest for private and collective companies (0.79 and 0.80 respectively) and highest for State and Joint stock companies (at 0.91 and 0.92). In the second and third quantiles, β is higher than in the first quantile but remain significantly smaller than 1. The ranking between different firm types does not change much, with β lowest in private and highest in joint stock firms. In the fourth quantile, state and joint stock firms have β significantly greater than 1. Collective firms have β equal to 1, while β in the other three firm types (foreign firms, private firms and state and foreign firms) remain significantly lower than 1. The estimation values of ρ and ω are shown in Table C.3 and are significantly different from 0 for almost firm types. This justifies the estimation procedure due to first and second autocorrelation. In brief, before the financial crisis, small firms have higher growth rate than larger ones regardless of their types of ownership. Exceptions are state and joint stock firms in the fourth quantile- larger joint stock and state firms- of which the growth rate is larger for larger firms. As can be seen in Section 5.4, state and joint stock firms have the biggest average asset. Therefore, the largest state and joint stock enterprises are largest firms in Vietnam. As being large, those firms can benefit from economies of scale. Besides, state firms and joint stock firms of which most are originated from state ones are considered as dominant player in the economy and receive much support from government such as lower tax rate, lower interest rate,etc. As a result, they can achieve higher growth rate than smaller firms.

After the financial crisis, β estimates are presented in Table 5.8. Private and collective firms have β significantly lower than 1 in the whole sample and in each quantile. This means small private and collective firms grow faster than larger ones regardless of their initial size. State, foreign, and state and foreign firms have β greater than 1 (most of them are significant) in all quantiles. Thus, large state, foreign and state and foreign enterprises grow faster than smaller ones. β of joint stock company increases from 0.99 in the first quantile to 1 in the second and third quantiles and 1.016 in the fourth quantile. Thus, for joint stock firms, the small firms in the first quantile grow faster than larger ones. There are number reasons for the changes in β after the crisis. Firstly, after the financial crisis, the absolute

TABLE 5.7: Annual assets: parameter estimates of β across types of firm ownership before the financial crisis (2004-2007)

Company type	No. of firms in whole sample	Whole sample	1st quantile	2nd, 3rd quantile	4th quantile
State	2,021	0.967*	0.911*	0.966*	1.021*
		(0.002)	(0.004)	(0.003)	(0.004)
Private	6,190	0.898*	0.798*	0.889*	0.956*
		(0.001)	(0.002)	(0.001)	(0.002)
Joint Stock	700	0.986*	0.926*	0.991*	1.022*
		(0.003)	(0.005)	(0.003)	(0.004)
Foreign	490	0.921*	0.841*	0.941*	0.956*
		(0.006)	(0.010)	(0.006)	(0.012)
State and Foreign	208	0.937*	0.846*	0.936*	0.941*
		(0.012)	(0.018)	(0.016)	(0.019)
Collective	856	0.942*	0.805*	0.938*	1.001
		(0.003)	(0.006)	(0.003)	(0.005)
Total	10,456	0.943*	0.853*	0.941*	0.998
		(0.001)	(0.001)	(0.001)	(0.001)

Note: Standard errors are given in round parentheses; * indicates that the parameter deviates significantly from 1 at the 5% level.

value of firm asset in all types increases dramatically. With larger assets, firms can now take advantage of economies of scale so they can grow faster with greater size. However, despite assets increasing, private and collective firms remain the smallest firms in the country. It is possible that asset increases in private and collective firms is not great enough for scale advantages to out-weigh the benefits of small size. As a result, small private and collective firms still grow faster than larger ones. Furthermore, despite the support of government for medium and small enterprises, the help that firms actually receive is limited. In fact, 75% of the money from the stimulus package due to global financial crisis is reserved for stated owned companies. Being private and collective also makes it more difficult for firms to get that support because of more paper- work, increased eligibility criteria, etc. As a result, even private and collective firms in the fourth quantile find small size is better for growth than larger size.

TABLE 5.8: Annual assets: parameter estimates of β across types of firm ownership after the financial crisis (2010-2014)

Company type	No. of firms in whole sample	Whole sample	1st quantile	2nd, 3rd quantile	4th quantile
State	811	1.007* (0.00)1	1.005* (0.001)	1.007* (0.001)	1.006* (0.001)
Private	6,052	1.005* (0.001)	0.955* (0.001)	0.994* (0.001)	0.997* (0.001)
Joint Stock	1,428	1.008* (0.001)	0.994* (0.002)	1.004* (0.001)	1.016* (0.001)
Foreign	508	1.012* (0.001)	1.003 (0.004)	1.005* (0.002)	1.014* (0.003)
State and Foreign	172	0.567* (0.041)	1.021 (0.014)	1.005 (0.004)	0.833 (0.148)
Collective	847	1.004* (0.002)	0.919* (0.006)	1.003 (0.002)	0.991* (0.004)
Total	9,818	1.007* (0.0004)	0.971* (0.001)	1.004 (0.001)	1,013* (0.001)

Note: Standard errors are given in round parentheses; * indicates that the parameter deviates significantly from 1 at the 5% level.

5.5.2 Annual revenue as a measure of firm size

5.5.2.1 Differences across industries

Table 5.9 shows the results of β across industries before the financial crisis using annual turnover as a firm size measure. In the first three quantiles and in the whole sample, β is significantly lower than 1 in all industries. The results indicate that for 75% of the smallest firms, small firms grow faster than larger ones. In other words, 75% of the smallest firms in all industries do not want to be bigger as this does not benefit their growth rate. In contrast, firms in the fourth quantile show some different results. In this quantile, half of the industries have β not significantly deviating from 1. Three industries (agriculture, hospitality and banking) have β significantly smaller than 1. Manufacturing and retail are two sectors which have β greater than 1 significantly. Thus, similar to assets, when taking turnover as a firm size measure, Gibrat's law only holds for some of the largest firms.

After the crisis, the results are different (Table 5.10). In the first quantile, β is smaller than 1 in all industries ranging from 0.90 in real estate to 0.98 in agriculture. In the second and third quantiles, half of the industries have β greater than 1 and three industries have β not significantly deviating from 1. The transportation and hospitality sectors have β significantly

TABLE 5.9: Annual turnover: parameter estimates of β across industries before the financial crisis (2004-2007)

Industry	No. of firms in Whole sample	Whole sample	1st quantile	2nd,3rd quantile	4th quantile
Agriculture, Forestry and fishing	478	0.928* (0.005)	0.842* (0.008)	0.949* (0.005)	0.985* (0.007)
Mining and Quarrying	139	0.971* (0.007)	0.869* (0.016)	0.982* (0.009)	0.998 (0.017)
Manufacturing	3,068	0.962* (0.001)	0.876* (0.003)	0.958* (0.002)	1.007* (0.002)
Construction	1,151	0.948* (0.003)	0.86* (0.006)	0.973* (0.003)	0.996 (0.004)
Retail and wholesale	3,843	0.962* (0.001)	0.871* (0.003)	0.957* (0.002)	1.02* (0.002)
Transportation	501	0.942* (0.005)	0.836* (0.010)	0.949* (0.006)	0.99 (0.007)
Hospitality	422	0.827* (0.008)	0.682* (0.014)	0.782* (0.009)	0.966* (0.009)
Banking	383	0.822* (0.008)	0.65* (0.021)	0.69* (0.014)	0.94* (0.009)
Real estate	59	0.939* (0.015)	0.84* (0.045)	0.943* (0.018)	1.001 (0.020)
Public services	260	0.911* (0.006)	0.779* (0.016)	0.9368* (0.008)	0.984 (0.011)
Total	10,482	0.955* (0.001)	0.857* (0.002)	0.961* (0.001)	1.007* (0.001

Note: Standard errors are given in round parentheses; * indicates that the parameter deviates significantly from 1 at the 5% level.

lower than 1. In the fourth quantile, all industries have β larger than 1; and among them seven are significant and three are not. The results mean that most Vietnamese firms find a size increase will lead to a higher growth rate. In fact, the smallest firms - firms in the first quantile- do not have incentive to grow as being larger will reduce their growth rate. This result is not much different from the results derived from measuring by assets above.

5.5.2.2 Heterogeneity across firm ownership

Table 5.11 and Table 5.12 show β estimates across different types of firm ownership before and after the crisis. As can be seen, before the crisis only the largest State and Joint Stock companies have β significantly greater than 1. Other firm types have β significantly smaller than 1 regardless of their initial size. This means only largest State and Joint-stock enterprises

TABLE 5.10: Annual turnover: parameter estimates of β across industries after thee financial crisis (2010-2014)

Industry	No. of firms in whole sample	whole sample	1st quantile	2nd,3rd quantile	4th quantile
Agriculture, Forestry and fishing	476	1.007* (0.002)	0.974* (0.007)	1.016* (0.002)	1.009* (0.003)
Mining and Quarrying	138	0.999 (0.003)	0.943* (0.013)	0.999 (0.004)	1.015* (0.003)
Manufacturing	3,066	1.005* (0.001)	0.946* (0.003)	1.005* (0.001)	1.012* (0.001)
Construction	1,148	0.999 (0.001)	0.933* (0.008)	1.01* (0.001)	1.013* (0.001)
Retail and wholesale	3,837	1.002* (0.001)	0.92* (0.003)	1.001 (0.001)	1.012* (0.001)
Transportation	501	0.999 (0.002)	0.927* (0.008)	0.987* (0.003)	1.011* (0.002)
Hospitality and food service	422	1.004* (0.002)	0.947* (0.012)	0.988* (0.004)	1.005 (0.003)
Banking	383	1.001 (0.003)	0.954* (0.014)	1.001 (0.006)	1.000 (0.004)
Real estate	59	0.994 (0.005)	0.902* (0.021)	0.995 (0.005)	1.006 (0.007)
Public services	260	1.004* (0.002)	0.948* (0.014)	1.004* (0.002)	1.014* (0.002)
Total	10,290	1.002* (0.0005)	0.932* (0.002)	1.004 (0.005)	1.012* (0.0005)

Note: Standard errors are given in round parentheses; * indicates that the parameter deviates significantly from 1 at the 5% level.

have incentive to grow, as the larger they are the faster they can grow. For the rest, small firms grow faster than larger ones. After the crisis, all firms in the first quantile have β significantly lower than 1. Firms in other quantiles have β significantly greater than 1. The results indicate that smallest firms- firms in the first quantile- prefer to remain small as their growth rate is higher when they are small. Private firms are an exception. Private firms in the first three quantiles have β lower than 1. Only the largest private firm- private firms in the fourth quantile- have β greater than 1. This implies that for 75% of the smallest private firms, small firms grow faster than larger ones. Again, the result is not much different from the results above when assets are used for firm size measurement.

TABLE 5.11: Annual turnover: parameter estimates of β across types of firm ownership before the financial crisis (2004-2007)

	No-of firms in whole sample	whole sample	1st quantile	2nd, 3rd quantile	4th quantile
State	2,021	0.959*	0.893*	0.961*	1.011*
		(0.003)	(0.005)	(0.003)	(0.005)
Private	6,190	0.915*	0.797*	0.908*	0.97*
		(0.002)	(0.003)	(0.002)	(0.003)
Joint Stock	700	0.988*	0.921*	0.994	1.019*
		(0.003)	(0.007)	(0.004)	(0.005)
Foreign	490	0.902*	0.783*	0.933*	0.956*
		(0.007)	(0.014)	(0.007)	(0.011)
State and Foreign	208	0.9*	0.805*	0.916*	0.947*
		(0.016)	(0.022)	(0.016)	(0.021)
Collective	856	0.915*	0.803*	0.914*	0.98*
		(0.004)	(0.006)	(0.004)	(0.006)
Total	10,465	0.951*	0.853*	0.955*	1.005*
		(0.001)	(0.002)	(0.001)	(0.001)

Note: Standard errors are given in round parentheses; * indicates that the parameter deviates significantly from 1 at the 5% level.

TABLE 5.12: Annual turnover: parameter estimates of β across types of firm ownership after the financial crisis (2010-2014)

Firm type	No. of firms in whole sample	Whole sample	1st quantile	2nd, 3rd quantile	4th quantile
State	811	1.006*	0.984*	1.006*	1.01*
		(0.001)	(0.005)	(0.001)	(0.001)
Private	6,052	1.002*	0.893*	0.992*	1.004*
		(0.001)	(0.003)	(0.001)	(0.001)
Joint Stock	1,428	1.000	0.951*	1.004*	1.011*
		(0.001)	(0.004)	(0.001)	(0.001)
Foreign	508	1.013*	0.959*	1.011*	1.013*
		(0.002)	(0.011)	(0.003)	(0.003)
State and Foreign	172	1.018*	0.994	1.009	1.008
		(0.005)	(0.020)	(0.006)	(0.007)
Collective	847	1.001	0.891*	1.005*	1.003
		(0.002)	(0.006)	(0.002)	(0.003)
Total	9,818	1.002*	0.924*	1.002*	1.012*
		(0.0005)	(0.002)	(0.0006)	(0.0006)

Note: Standard errors are given in round parentheses; * indicates that the parameter deviates significantly from 1 at the 5% level.

5.5.3 Number employees as a measure of firm size

5.5.3.1 Differences across industries

Table 5.13 presents the estimates of β across industries before the financial crisis. β is significantly lower than 1 in most industries in the whole sample ranging from 0.77 in banking to 0.97 in mining. Looking at each quantile, β is smaller than 1 for all firms in all industries in the first three quantiles. This means that small firms grow faster than larger ones. In the fourth quantile, firms in half of the industries have β lower than 1. Manufacturing is the only sector having β significantly greater than 1, while β in four other sectors (mining, construction, real estate and public service) does not significantly deviate from 1. The results imply that Gibrat's law is correct for only a few of the largest Vietnamese firms but incorrect for most firms. In fact, for all firms in the first three quantiles and half of the firms in the fourth quantile, small firms have higher growth rates than larger ones.

After the financial crisis, the estimates of β are shown in Table 5.14. The results are not much different compared to before the financial crisis. In fact, all firms in the first three quantiles have β smaller than 1 regardless of their industries. For firms in the fourth quantile, β is greater than 1 in almost all industries. Only largest firms in three industries (retail, hospitality and public service) have β smaller than 1. The results imply that after the financial crisis, except for a few biggest companies in certain industries, small firms grow faster than larger ones. The result is different compared to above when taking assets and turnover as the firm size measures. When firm size is measured in assets and turnover, firms move from small ones that have higher growth rates to large ones that have higher growth rates except for the smallest firms in the first quantile. In contrast, when firm size is measured by number of employees, there is not much difference between before and after the crisis: small firms grow faster than larger ones except for the largest firms in certain industries.

5.5.3.2 Heterogeneity across firm ownership

The estimates of β for firms across different types of ownership are presented in Table 5.15 and Table 5.16. As can be seen, before the financial crisis β is smaller than 1 for most firm types. This means that small firms grow faster than larger ones regardless of their type of ownership. The only exception is the largest joint stock firms, of which large firms have higher growth than smaller ones. After the financial crisis, the results do not vary much. In

TABLE 5.13: Number of employees: parameter estimates of β across industries before the financial crisis (2004-2007)

Industry	No. of firms in whole sample	Whole sample	1st quantile	2nd,3rd quantile	4th quantile
Agriculture, Forestry and fishing	478	0.932* (0.008)	0.811* (0.012)	0.94* (0.01)	0.987 (0.014)
Mining and Quarrying	140	0.978 (0.013)	0.833* (0.027)	0.971 (0.015)	1.033 (0.028)
Manufacturing	3,075	0.962* (0.002)	0.802* (0.006)	0.94* (0.003)	1.011* (0.004)
Construction	1,150	0.944* (0.005)	0.744* (0.012)	0.956* (0.006)	1.013 (0.008)
Retail and wholesale	3,844	0.877* (0.003)	0.512* (0.008)	0.758* (0.005)	0.958* (0.005)
Transportation	501	0.937* (0.009)	0.702* (0.02)	0.945* (0.01)	0.993 (0.016)
Hospitality	423	0.784* (0.017)	0.509* (0.028)	0.681* (0.023)	0.966* (0.015)
Banking	383	0.776* (0.012)	0.502* (0.028)	0.456* (0.058)	0.876* (0.017)
Real estate	59	0.862* (0.03)	0.783* (0.052)	0.726* (0.053)	1.041 (0.046)
Public services	260	0.904* (0.012)	0.578* (0.033)	0.911* (0.015)	1.019 (0.017)
Total	10,313	0.934* (0.001)	0.641* (0.004)	0.898* (0.002)	1.00004 (0.002)

Note: Standard errors are given in round parentheses; * indicates that the parameter deviates significantly from 1 at the 5% level.

fact, most firms still have β significantly smaller than 1. This implies that small firms continue to grow faster than larger ones. For the largest state, joint- stock and state and foreign firms, β is significantly greater than 1, which means large firms grow faster than smaller ones for those three firm types. With the development of technology, the role of human capital in firms declines overtime. Firms tend to invest more in research and development and employ more machines with modern technology to increase their growth and size instead of hiring more employees. That is why β of firms across industries and types of ownership do not change much after the crisis compared to before the crisis.

TABLE 5.14: Number of employees: parameter estimates of β across industries after the financial crisis (20010-2014)

Industry	No. of firms in whole sample	whole sample	1st quantile	2nd,3rd quantile	4th quantile
Agriculture, Forestry and fishing	476	0.099* 0.002	0.443* 0.071	0.984* 0.004	1.01* 0.003
Mining and Quarrying	138	0.981* 0.004	0.868* 0.015	0.97* 0.006	1.001 0.002
Manufacturing	3,066	0.991* 0.001	0.824* 0.007	0.978* 0.001	1.002* 0.001
Construction	1,148	0.979* 0.002	0.804* 0.011	0.969* 0.003	1.012* 0.003
Retail and wholesale	3,837	0.986* 0.001	0.562* 0.013	0.914* 0.002	0.995* 0.001
Transportation	501	0.984* 0.003	0.752* 0.016	0.964* 0.004	1.005* 0.002
Hospitality	422	0.996 0.003	0.782* 0.02	0.941* 0.008	0.996 0.004
Banking	383	1.007* 0.002	0.948* 0.009	0.931* 0.009	1.007 0.004
Real estate	59	0.981 0.012	0.776* 0.073	0.921* 0.014	1.033 0.023
Public services	260	0.988* 0.003	0.888* 0.022	0.974* 0.004	0.998 0.003
total	10,290	0.988* 0.0006	0.743* 0.004	0.957* 0.001	1.002* 0.0008

Note: Standard errors are given in round parentheses; * indicates that the parameter deviates significantly from 1 at the 5% level.

TABLE 5.15: Number of employees: parameter estimates of β across types of firm ownership before the financial crisis (2004-2007)

Firm type	No. of firms in whole sample	Whole sample	1st quantile	2nd, 3rd quantile	4th quantile
State	2,021	0.951*	0.83*	0.966*	0.993
		(0.005)	(0.011)	(0.006)	(0.009)
Private	6,190	0.887*	0.575*	0.743*	0.903*
		(0.003)	(0.006)	(0.004)	(0.006)
Joint Stock	700	0.984*	0.895*	0.98*	1.028*
		(0.005)	(0.011)	(0.007)	(0.009)
Foreign	490	0.845*	0.66*	0.83*	0.963*
		(0.014)	(0.023)	(0.016)	(0.017)
State and Foreign	208	0.781*	0.637*	0.754*	0.9*
		(0.034)	(0.038)	(0.042)	(0.026)
Collective	856	0.908*	0.714*	0.88*	0.989
		(0.007)	(0.013)	(0.008)	(0.012)
Total	10,465	0.934*	0.641*	0.898*	1.000
		(0.001)	(0.004)	(0.002)	(0.002)

Note: Standard error are given in round parentheses; * indicates that the parameter deviates significantly from 1 at the 5% level.

TABLE 5.16: Number of employees: parameter estimates of β across types of firm ownership after the financial crisis (2010-2014)

Firm type	No. of firms in whole sample	Whole sample	1st quantile	2nd, 3rd quantile	4th quantile
State	811	0.996*	0.94*	0.991*	1.007*
		(0.001)	(0.007)	(0.002)	(0.002)
Private	6,052	0.981*	0.61*	0.892*	0.971*
		(0.001)	(0.009)	(0.002)	(0.002)
Joint Stock	1,428	0.987*	0.897*	0.98*	1.008*
		(0.001)	(0.007)	(0.001)	(0.002)
Foreign	508	1.002	0.947*	0.965*	0.398*
		(0.003)	(0.012)	(0.005)	(0.061)
State and Foreign	172	1.014*	0.901*	0.998	1.011*
		(0.007)	(0.044)	(0.008)	(0.005)
Collective	847	0.958*	0.75*	0.951*	0.982*
		(0.003)	(0.014)	(0.004)	(0.005)
Total	9,818	0.988*	0.743*	0.957*	1.002*
		(0.0006)	(0.004)	(0.001)	(0.0008)

Note: Standard errors are given in round parentheses; * indicates that the parameter deviates significantly from 1 at the 5% level.

5.6 Conclusion

This chapter investigates the relationship between firm size and firm growth for Vietnamese firms before and after the global financial crisis using panel firm data over a period 2004-2014. Taking the number of employees as a measure of firm size, we find that small firms grow faster than larger ones. This is true for most Vietnamese firms both before and after the crisis. The results are different when using assets and turnover as firm size measurements. Before the financial crisis, small firms grow faster than larger ones regardless of their initial size, their industries and their types of ownership. After the crisis, large firms grow faster than smaller ones. However, 25% of the smallest firms in most industries remain reluctant to grow as being small gives them higher growth rates. Moreover, all three measures of firm size show that being small is better for the growth rates of private and collective firms, regardless of their initial size. Our results suggest that besides industry, type of ownership is important when studying the relationship between firm size and growth, and future research should focus more on this factor. From this, the paper also suggests that government need to provide more support for smallest private and collective firms if they want those firms to be larger to increase their competitiveness in the international market.

Chapter 6

Conclusion

This thesis contributes to our understanding of financial inclusion in developing Africa and Asia and firm growth in Vietnam. The first two papers use different techniques to find users characteristics of various financial services provided (Bank, Mobile money and both), this dynamic over time and how those financial services reduce individual's poverty probability. The findings further our comprehension about why many adults around the world remain unbank, the difference of the financial excluded users in Africa vs Asia, what financial service is preferred by different groups of users and what financial service can reduce users' poverty most efficiently. The third chapter employs non- linear regression to find the relationship between firm size and firm growth for Vietnamese firms. From that, we understand more about the dynamic of firm development before and after the financial crisis and what factors prevent Vietnamese firms from growing.

The first chapter explores the relationship between financial inclusion services provided (bank account, mobile money, or both) and the characteristics of their users in eight developing countries in Africa and Asia. The countries considered are Keynia, Nageria, Uganda, Tanzania in Africa; and Bangladesh, India, Indonesia, Pakistan in Asia. Using survey data from Financial Inclusion Insights (FII) over five years (2013-2017), we find that poverty, education, age, gender, and location are the main determinants of financial service usage in these countries. While the dynamic of financial service usage in the African countries seems to be shifted from banking service (BK) toward mobile money (MM), the Asian countries has seen a steady increase in all financial services usage (BK, MM, or both– BM) since 2013. Besides, we employ cluster analysis to provide a typology of each financial inclusion service users in both regions, as well as its dynamic over time. We find that young, rural and females financial service users in Africa seem to move toward mobile money service (MM), the same

Asian groups prefer either banking service (BK) or mobile money service (MM). In both regions, financial service users who are not poor, live in urban area, and have basic education combine both banking service and mobile money service (BM). BK services is preferred by poor males and young females under 45 years old who live mostly in rural area, while the same groups tend toward MM service usage in the African.

In the second chapter, we study whether financial inclusion can reduce individuals' probability of being poor. Using quantile regression on the same data set of Chapter 1, we find that Banks (BK), Mobile money (MM) or both Banks and Mobile money (BM) were successful in getting people out of poverty and the impacts of three services are in U-shape. In fact, MM and BM are more efficient than BK as their impacts are greater in magnitude and they target poorer users. However,the impact of all three services are smaller at the bottom of poverty distribution (i.e., the poorest individuals). Furthermore, we find heterogeneous impacts when looking across financial inclusion services and different segments of the population. BK benefits young educated males who lives in the urban doing non-manual work with medium income more regardless of their wealth status. In contrast, MM and BM have greater impact for older uneducated low income females in rural areas.

The third chapter investigates the relationship between firm size and firm growth for Vietnamese firms before and after the global financial crisis using panel firm data over a period 2004-2014. Taking number of employees as a measure of firm size, we find that small firms grow faster than larger ones. This is true for most of Vietnamese firms both before and after the crisis. The results are different when using assets and turnover as firm size measurement. Before the financial crisis, small firms grow faster than larger ones regardless of their initial size, their industries and their types of ownership. After the crisis, large firms grow faster than smaller ones. However, 25% of the smallest firms in most industries remain reluctant to grow as being small gives them higher growth rates. Moreover, we find that being small is better for growth rate of private and collective firms regardless of their initial size. This findings is the same when using assets, turnover and number of employees as a measurement of firm size.

Appendix A

Chapter 1

A.1 Cluster Descriptive Statistics in 2013

TABLE A.1: Clusters descriptive statistics: 2013 financial users-Africa

Variables	**Cluster 1**		**Cluster 2**	
	Mean	Std. Dev.	Mean	Std. Dev.
Age	35.55	13.589	33.13	11.799
Age24Less	21%	0.411	24%	0.426
Age 25-34	33%	0.470	41%	0.491
Age 35-44	23%	0.419	18%	0.388
Age 45-54	11%	0.313	10%	0.298
Age 55Plus	11%	0.308	7%	0.248
Male	32%	0.465	76%	0.430
Literacy	81%	0.396	96%	0.200
Numeration	85%	0.359	94%	0.242
Poverty	41%	0.493	92%	0.271
Rural poor	22%	0.411	53%	0.499
Rural female	34%	0.473	10%	0.298
No education	5%	0.216	2%	0.155
Primary	44%	0.497	15%	0.359
Secondary	38%	0.487	41%	0.493
High education	12%	0.322	40%	0.489
Observation	3,655		3,412	

TABLE A.2: Clusters descriptive statistics: 2013 financial users-Asia

Variables	**Cluster 1**		**Cluster 2**		**Cluster 3**	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Age	40.25	15.281	42.58	15.937	38.60	15.087
Age24Less	16%	0.370	13%	0.341	17%	0.378
Age 25-34	24%	0.428	19%	0.396	26%	0.438
Age 35-44	22%	0.413	24%	0.428	25%	0.434
Age 45-54	18%	0.380	17%	0.376	13%	0.341
Age 55Plus	20%	0.401	26%	0.438	18%	0.386
Urban	81%	0.396	1%	0.105	0%	0.000
Male	55%	0.497	100%	0.000	0%	0.045
Literacy	85%	0.359	67%	0.470	47%	0.499
Numeration	90%	0.294	84%	0.368	63%	0.483
Poverty	38%	0.485	100%	0.000	90%	0.302
Rural poor	0%	0.020	97%	0.179	90%	0.305
Rural female	5%	0.211	0%	0.000	100%	0.060
No education	10%	0.305	24%	0.425	45%	0.498
Primary	11%	0.308	20%	0.401	14%	0.350
Secondary	51%	0.500	48%	0.500	37%	0.482
High education	28%	0.450	8%	0.274	4%	0.195
Observation	9,983		5,931		6,542	

A.2 Cluster Descriptive Statistics in 2017

TABLE A.3: Clusters descriptive statistics: 2017 financial users-Africa

Variables	**Cluster 1**		**Cluster 2**		**Cluster 3**	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Age	37.41	13.890	34.96	12.473	37.64	14.898
Age24Less	20%	0.396	22%	0.411	18%	0.381
Age 25-34	26%	0.439	36%	0.479	35%	0.477
Age 35-44	26%	0.438	21%	0.408	19%	0.393
Age 45-54	17%	0.375	12%	0.330	11%	0.315
Age 55Plus	11%	0.318	9%	0.284	17%	0.374
Urban	13%	0.341	27%	0.444	79%	0.406
Male	100%	0	0%	0	64%	0.481
Literacy	77%	0.421	73%	0.443	82%	0.381
Numeration	99%	0.112	98%	0.150	98%	0.131
Poverty	73%	0.445	46%	0.498	8%	0.271
Rural poor	62%	0.485	36%	0.479	0%	0.050
Rural female	0%	0	73%	0.444	2%	0.124
No education	4%	0.190	7%	0.251	5%	0.210
Primary	58%	0.493	50%	0.500	16%	0.362
Secondary	32%	0.465	38%	0.485	43%	0.495
High education	5%	0.227	5%	0.220	36%	0.479
Observation	1,478		2,634		3,172	

TABLE A.4: Clusters descriptive statistics: 2017 financial users-Asia

Variables	**Cluster 1**		**Cluster 2**	
	Mean	Std. Dev.	Mean	Std. Dev.
Age	38.39	15.015	38.59	14.607
Age24Less	19%	0.395	17%	0.378
Age 25-34	25%	0.431	27%	0.444
Age 35-44	23%	0.420	23%	0.420
Age 45-54	15%	0.359	15%	0.361
Age 55Plus	18%	0.383	17%	0.379
Urban	0%	0.000	56%	0.496
Male	48%	0.500	51%	0.500
Literacy	61%	0.488	70%	0.459
Numeration	93%	0.251	92%	0.274
Poverty	100%	0.000	33%	0.472
Rural poor	100%	0.000	0%	0.000
Rural female	52%	0.500	22%	0.416
No education	33%	0.469	27%	0.446
Primary	33%	0.471	26%	0.441
Secondary	26%	0.439	32%	0.466
High education	8%	0.270	14%	0.347
Observation	15,872		23,304	

Appendix B

Chapter 2

B.1 Descriptive Statistics

TABLE B.1: Description of the variables

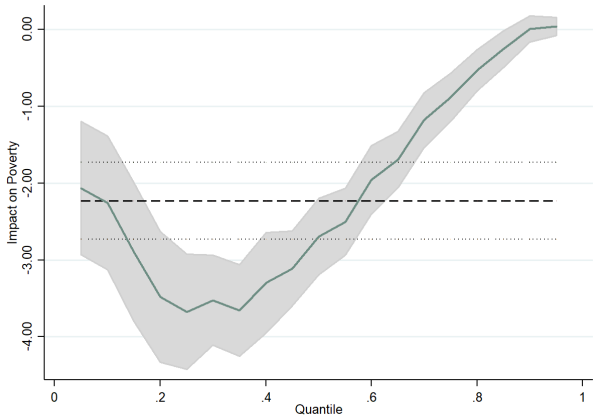
Variables	Description
Pov	Probability to be poor of respondents.
FI	= 1 if respondents use Bank (*BK*), Mobile money (*MM*) or both = 0 otherwise
Age	The age of respondents.
Male	= 1 if respondent is male = 0 otherwise
Marriage	= 1 if respondent is married or live with partner = 0 otherwise
Primary	=1 if respondents do not have formal education or have formal education but do not finish primary education = 0 otherwise
Secondary	=1 if respondents finish primary education but do not finish secondary = 0 otherwise
High school	=1 if respondents have secondary education but does not finish High school = 0 otherwise
Above high school	=1 if respondents finish High school and above = 0 otherwise
Urban	= 1 if respondents live in the urban = 0 if respondent lives the rural
LowIn	= 1 if respondent does not have enough money to buy food/or have enough money to buy food but buy clothes is difficult = 0 otherwise
MidIn	= 1 if respondents have enough money to buy clothes and food but not expensive things

TABLE B.1: Respondents characteristics. (continued)

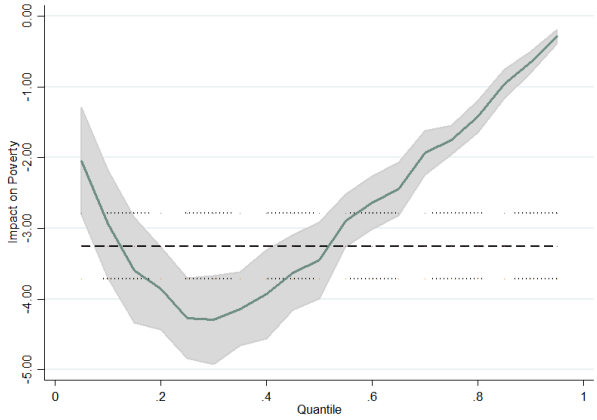
Variables	Description
	= 0 otherwise
HighIn	= 1 if respondents have enough money to buy expensive things like TV, fridge or/and respondents have enough money to buy whatever they want
	= 0 otherwise
Kids	number of children under 18 years old in the house
Labourer	= 1 if respondent does not work or occasionally works or does manual job
	= 0 otherwise
FiShock	= 1 if respondent experiences financial shock in the last 6 months
	= 0 otherwise
IND	= 1 if respondents are from India
	= 0 otherwise
BAN	= 1 if respondents are from Bangladesh
	= 0 otherwise
TAZ	= 1 if respondents are from Tanzania
	= 0 otherwise
PAK	= 1 if respondents are from Pakistan
	= 0 otherwise
IDO	= 1 if respondents are from Indonesia
	= 0 otherwise
UGA	=1 if respondents are from Uganda
	= 0 otherwise
NIG	= 1 if respondents are from Nigeria
	= 0 otherwise
KEN	= 1 if respondents are from Kenya
	= 0 otherwise
Y14	= 1 if respondents are surveyed in 2014
	= 0 otherwise
Y15	= 1 if respondents are surveyed in 2015
	= 0 otherwise
Y16	= 1 if respondents are surveyed in 2016
	= 0 otherwise
Y17	= 1 if respondents are surveyed in 2017
	= 0 otherwise

B.2 Quantile estimates of FI impact across different age groups

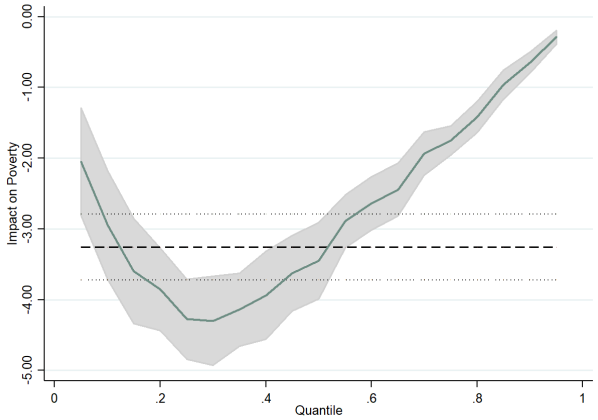
FIGURE B.1: Quantile estimates of BK impact across different age groups



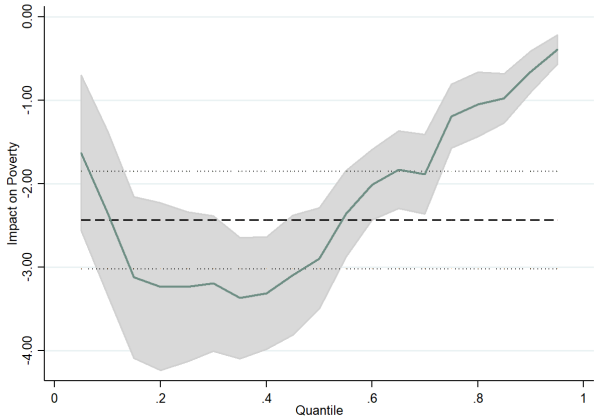
(A) Under 25



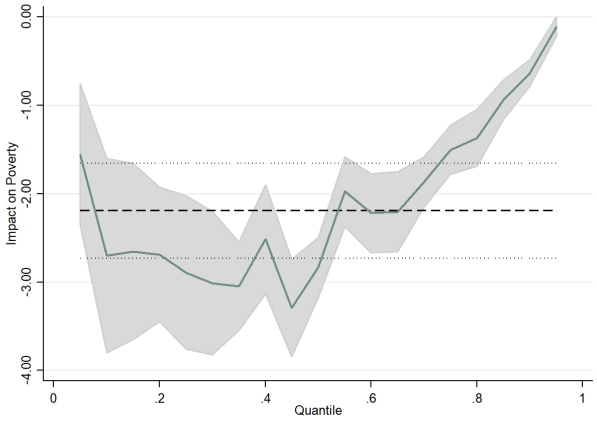
(B) From 25 to 34



(C) From 35 to 44

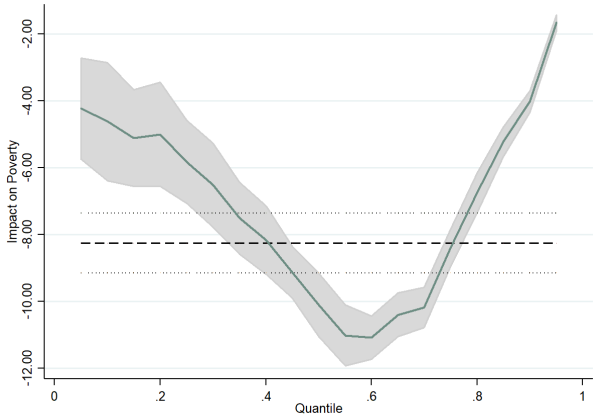


(D) From 45 to 54

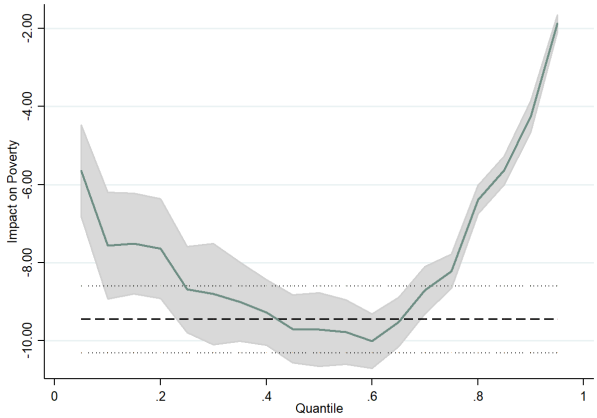


(E) Above 55

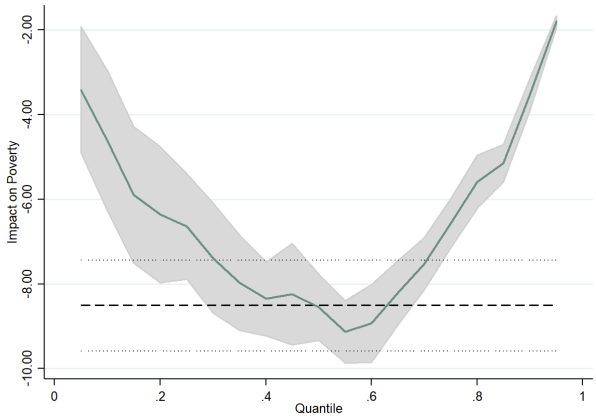
FIGURE B.2: Quantile estimates of MM impact across different age groups



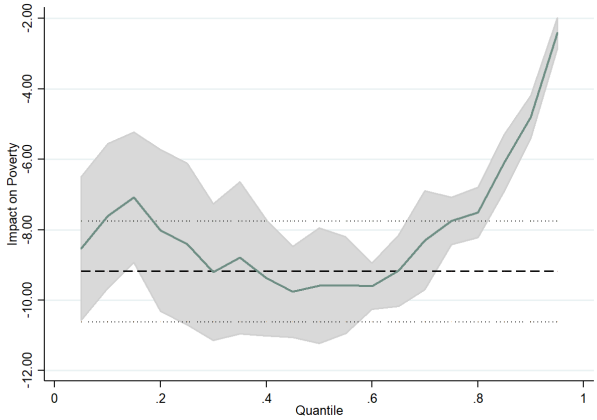
(A) Under 25



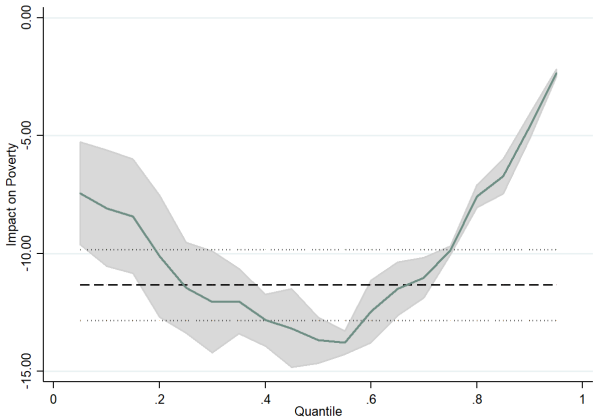
(B) From 25 to 34



(C) From 35 to 44

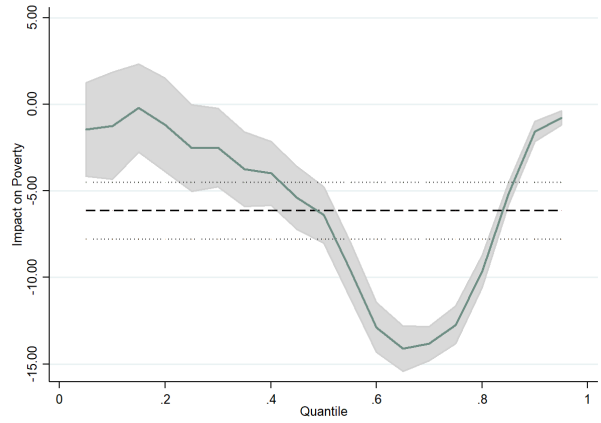


(D) From 45 to 54

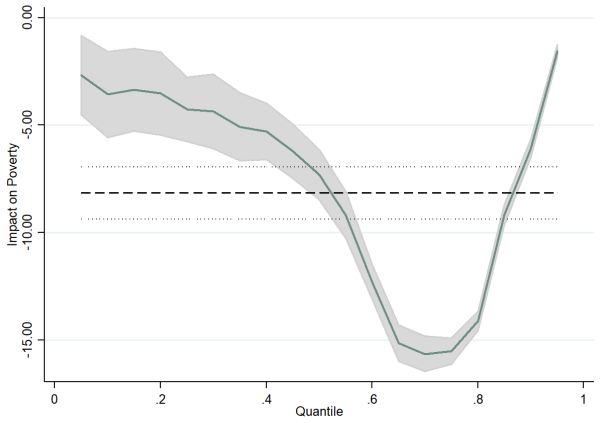


(E) Above 55

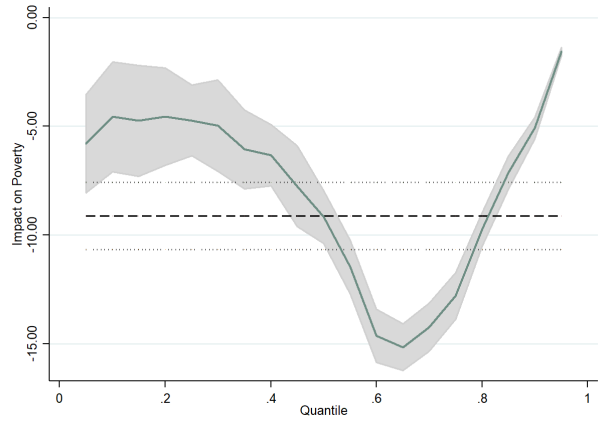
FIGURE B.3: Quantile estimates of BM impact across different age groups



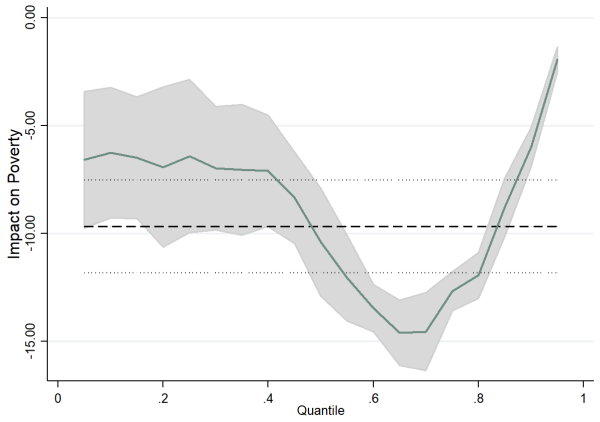
(A) Under 25



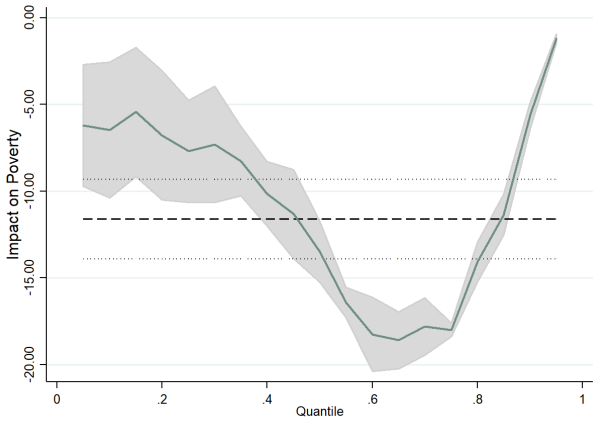
(B) From 25 to 34



(C) From 35 to 44



(D) From 45 to 54

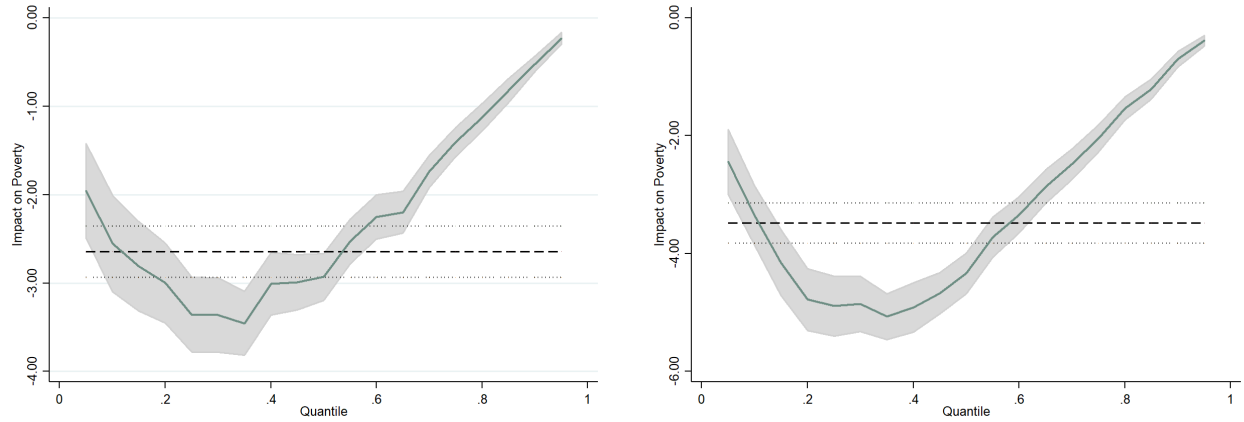


(E) Above 55

B.3 Quantile estimates of FI impact across genders

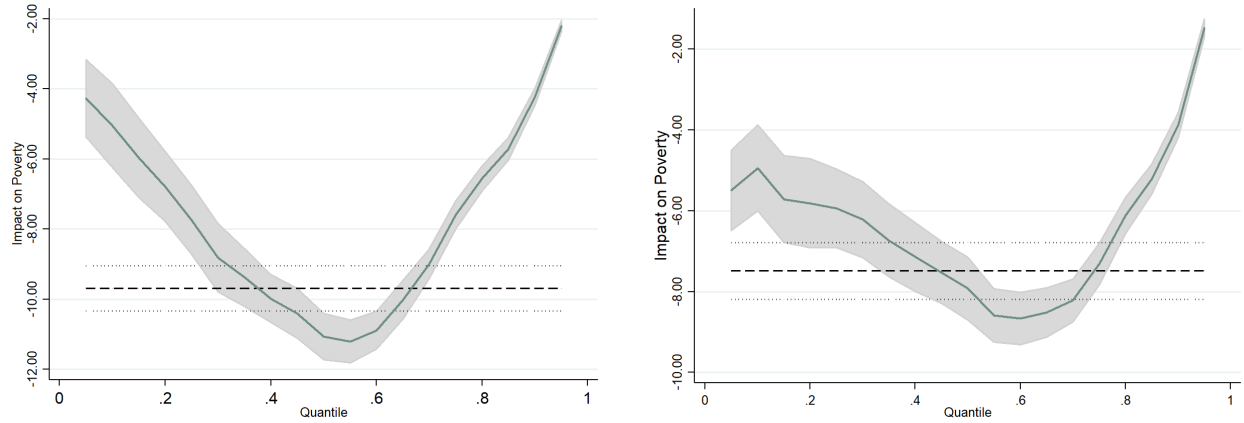
FIGURE B.4: Quantile estimates of FI impact across genders

BK impact



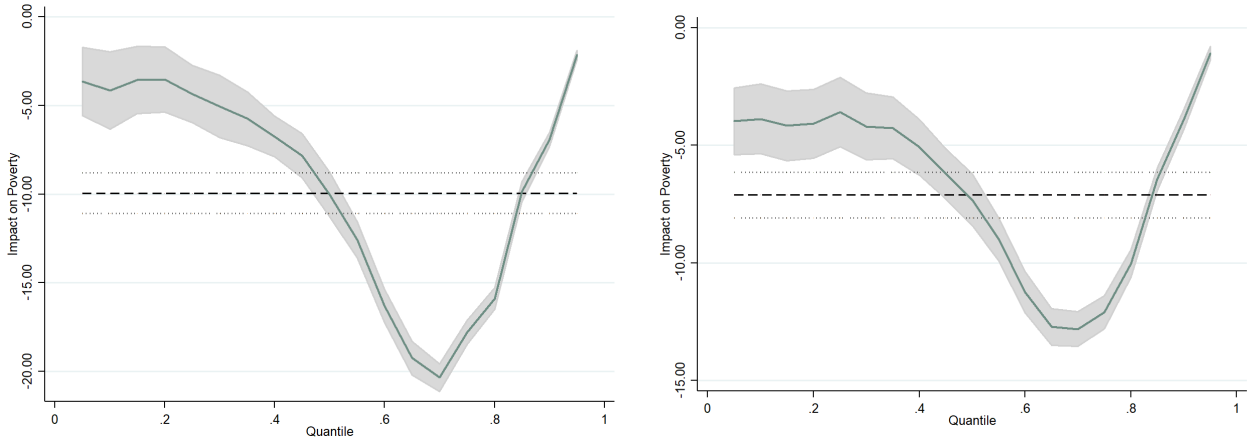
(A) Female (B) Male

MM impact



(C) Female (D) Male

BM impact

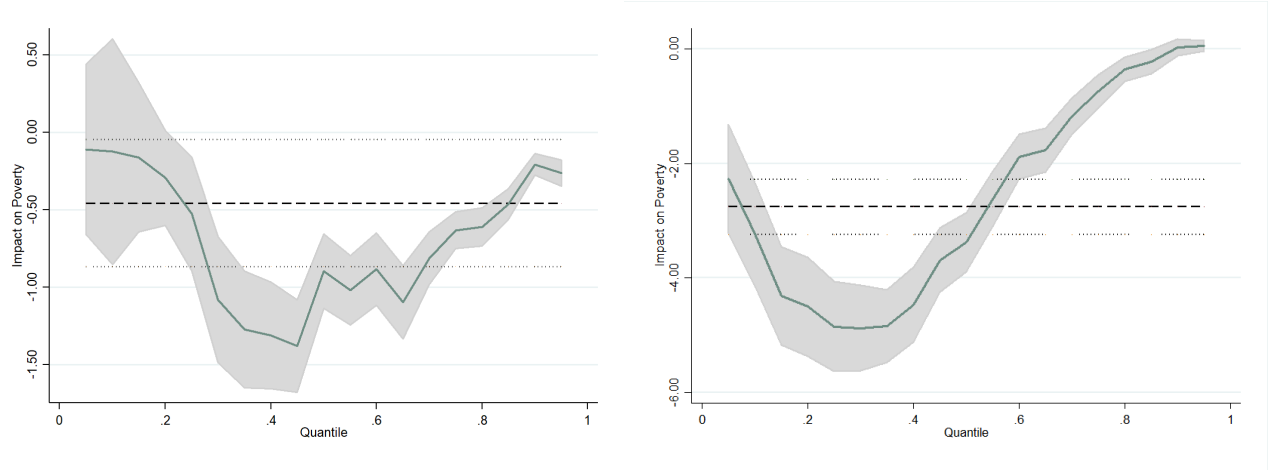


(E) Female (F) Male

B.4 Quantile estimates of FI impact across different education levels

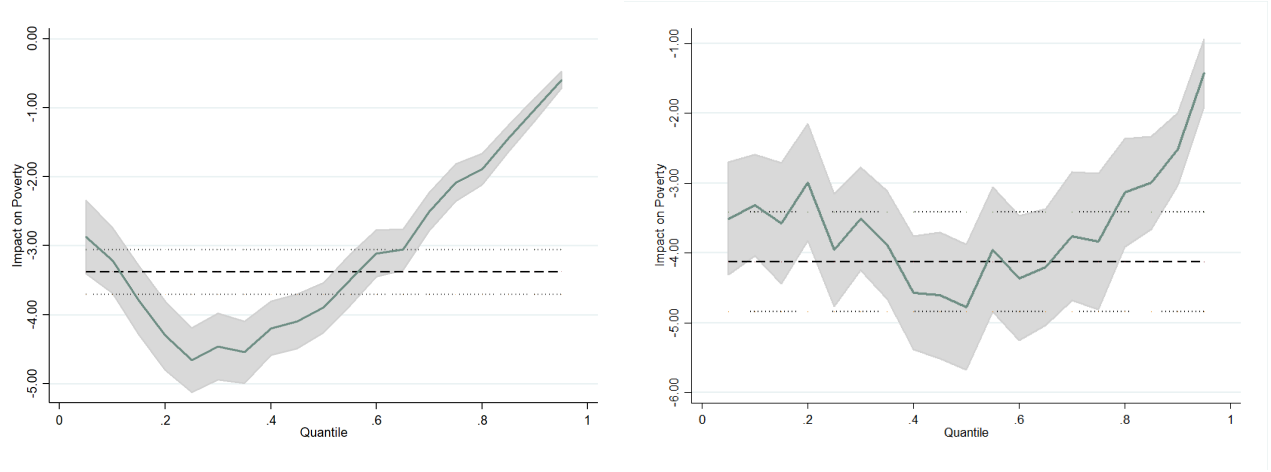
FIGURE B.5: Quantile estimates of FI impact across different education levels

BK impact



(A) Primary

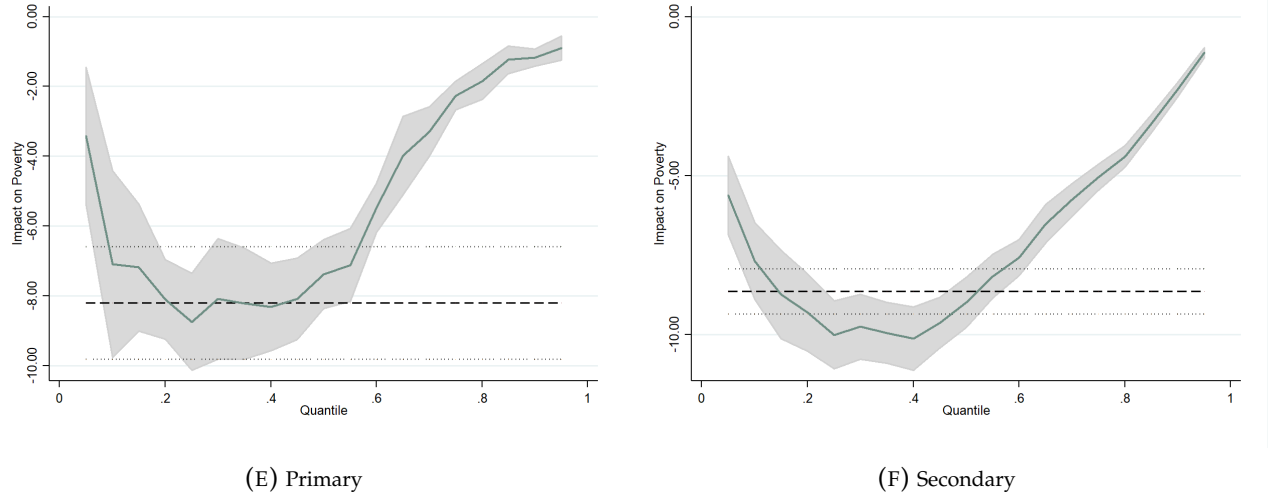
(B) Secondary



(C) High school

(D) Above High school

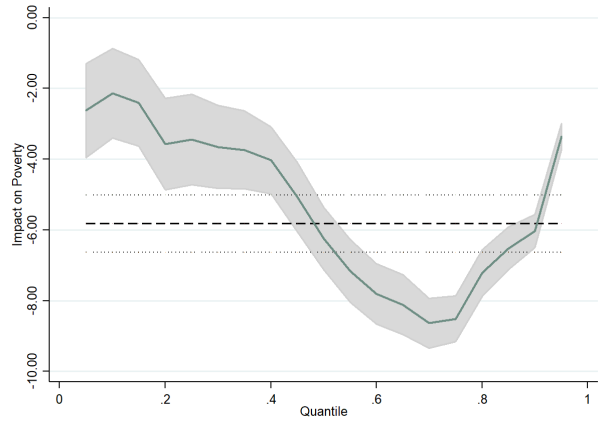
MM impact



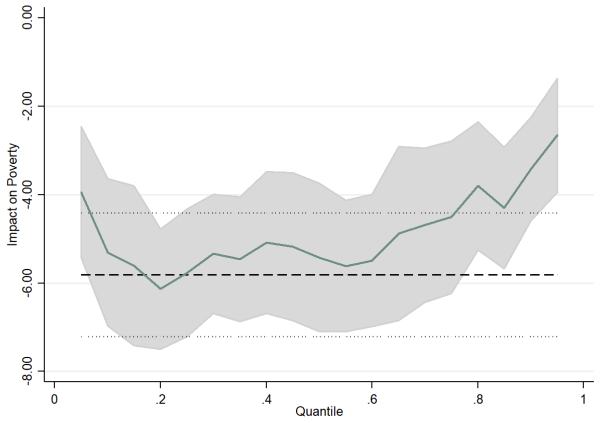
(E) Primary

(F) Secondary

FIGURE B.5: Quantile estimates of FI impact across different education levels (cont.)

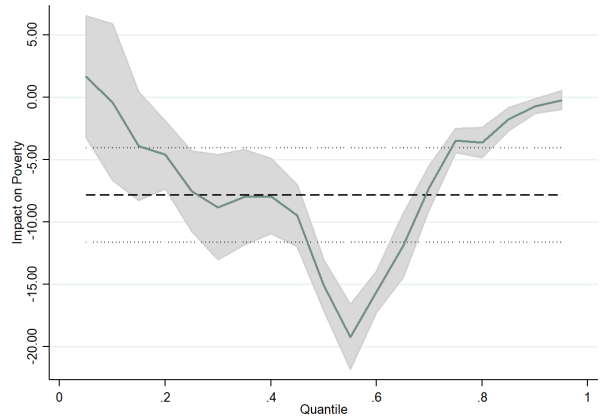


(G) High School

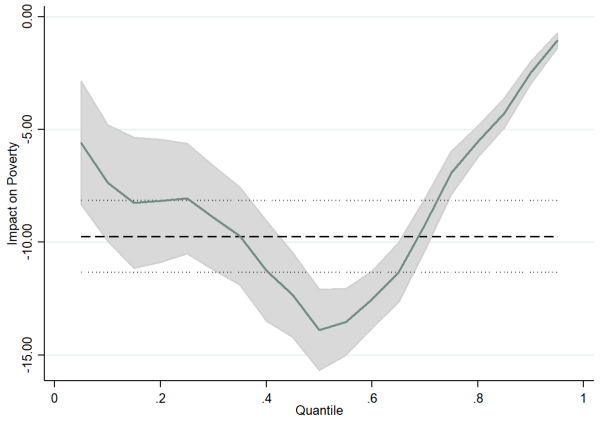


(H) Above high school

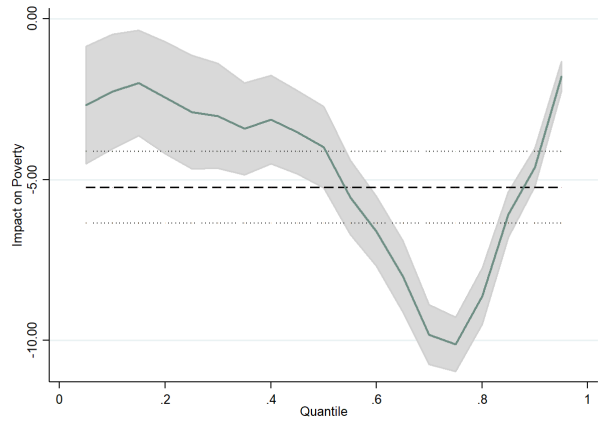
BM impact



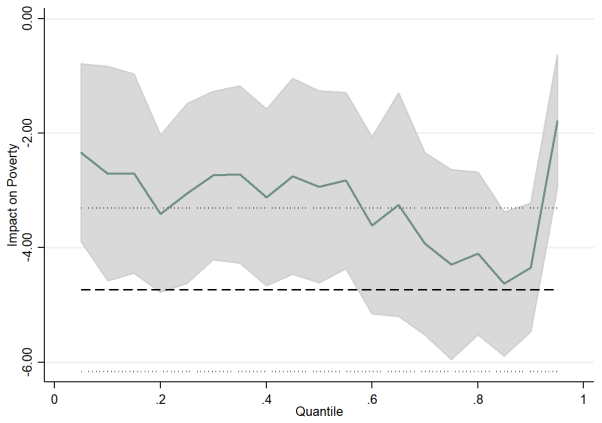
(I) Primary



(J) Secondary



(K) High school

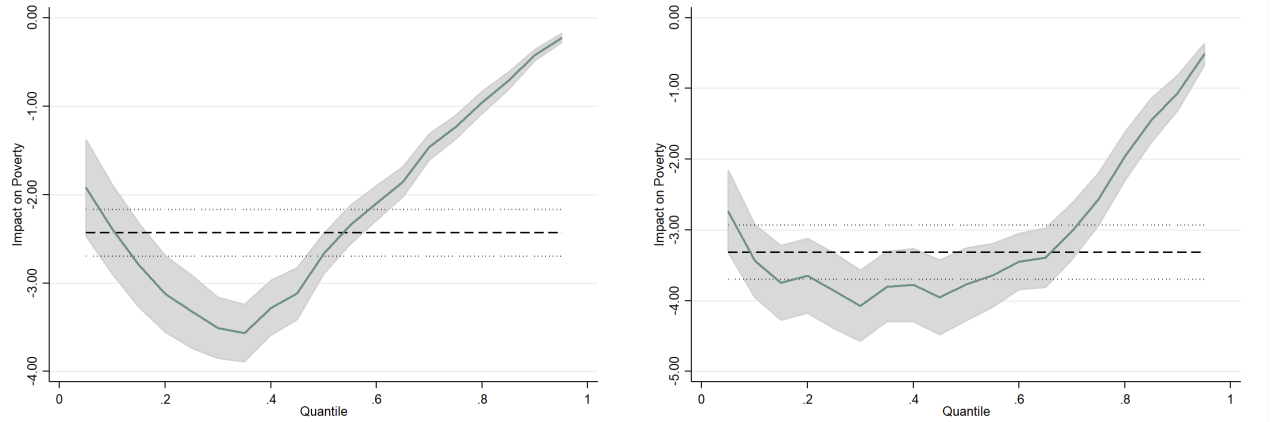


(L) Above High school

B.5 Quantile estimates of FI impact across locations

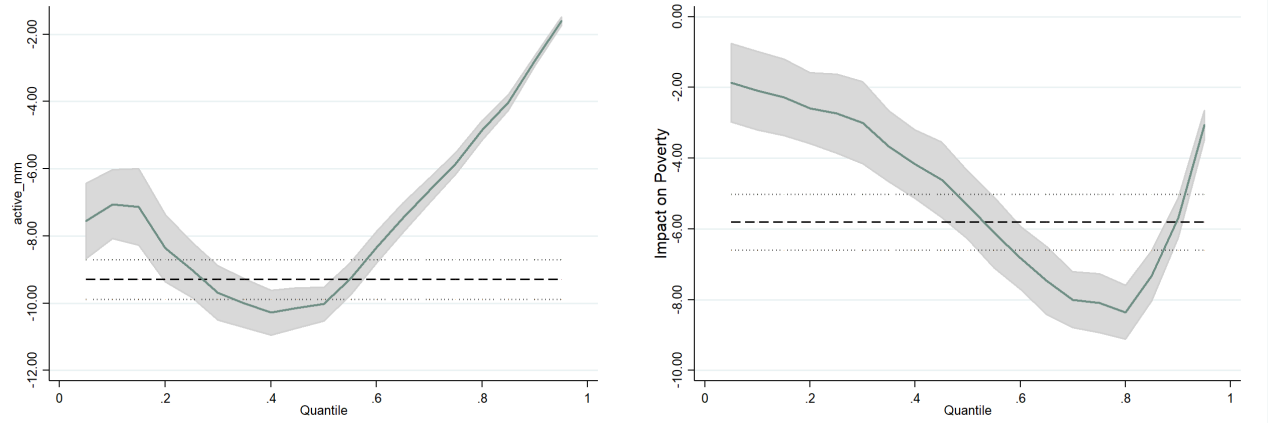
FIGURE B.6: Quantile estimates of FI impact across locations

BK impact



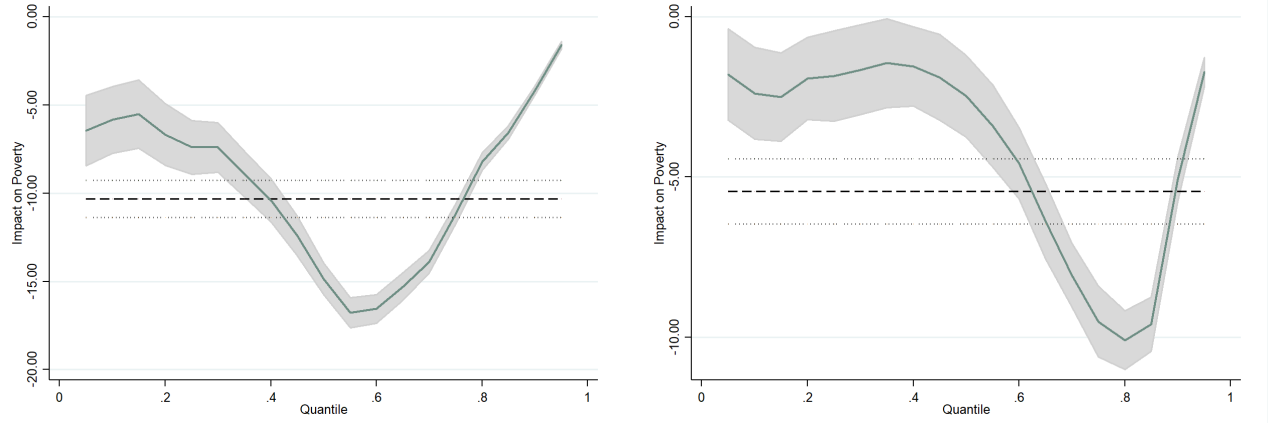
(A) Rural (B) Urban

MM impact



(C) Rural (D) Urban

BM impact

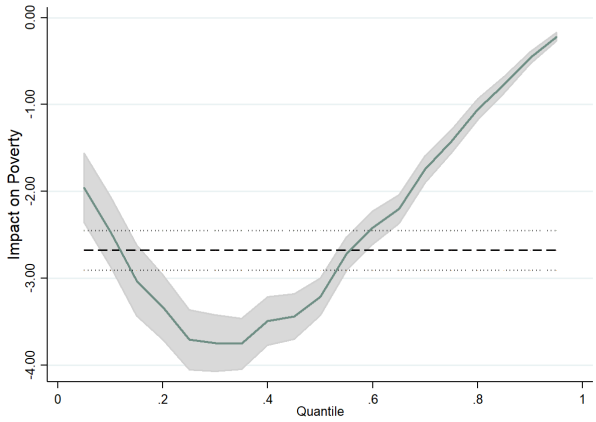


(E) Rural (F) Urban

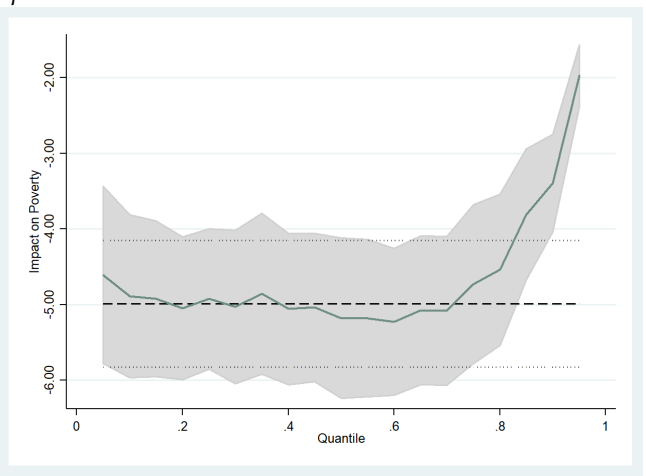
B.6 Quantile estimates of FI impact across occupations

FIGURE B.7: Quantile estimates of FI impact across occupations

BK impact

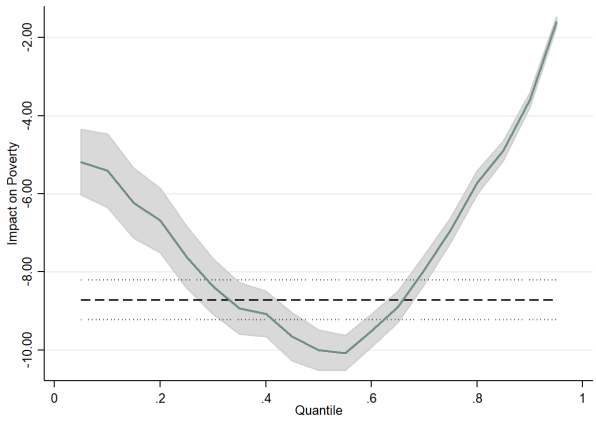


(A) Manual job

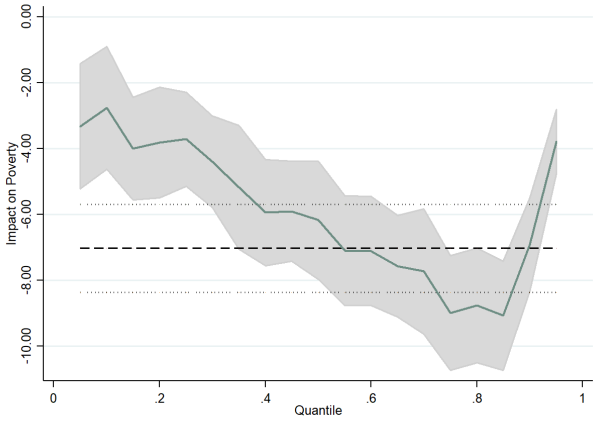


(B) Non-manual job

MM impact

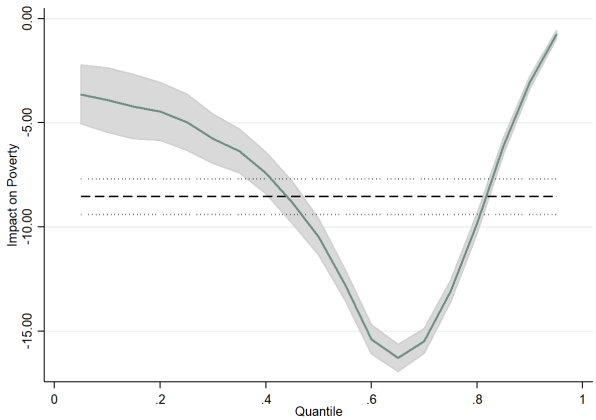


(C) Manual job

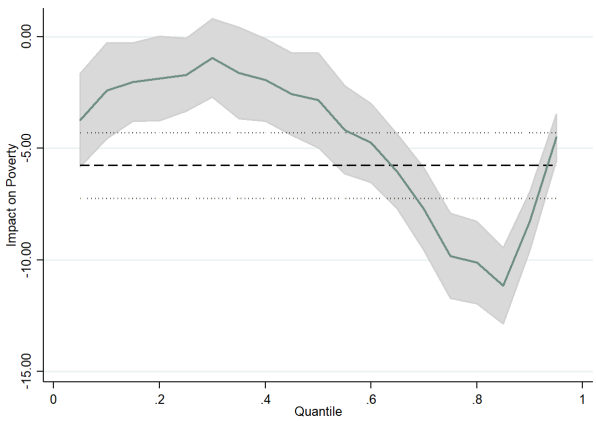


(D) Non- manual job

BM impact



(E) Manual job

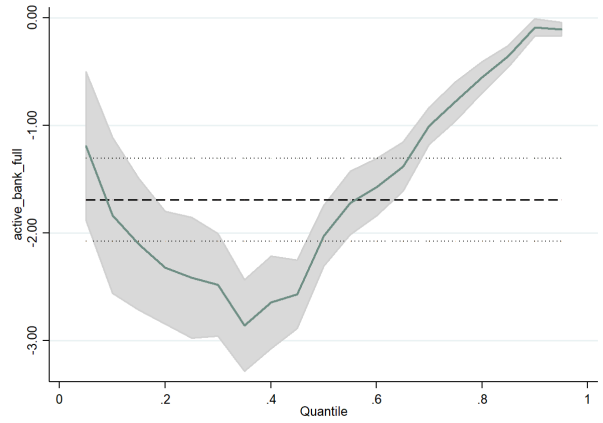


(F) Non-manual job

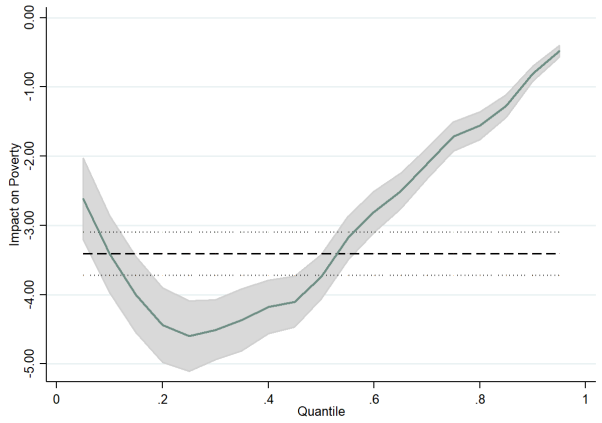
B.7 Quantile estimates of FI across different income levels

FIGURE B.8: Quantile estimates of FI impact across different income levels

BK impact

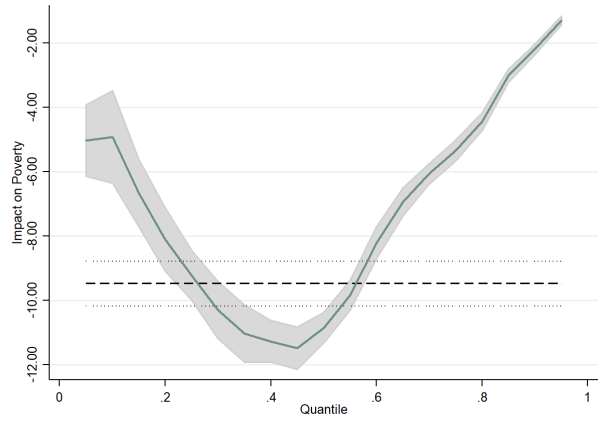


(A) Low income

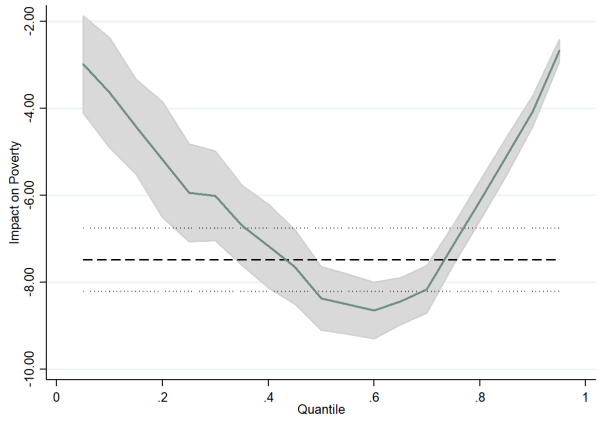


(B) Medium income

MM impact

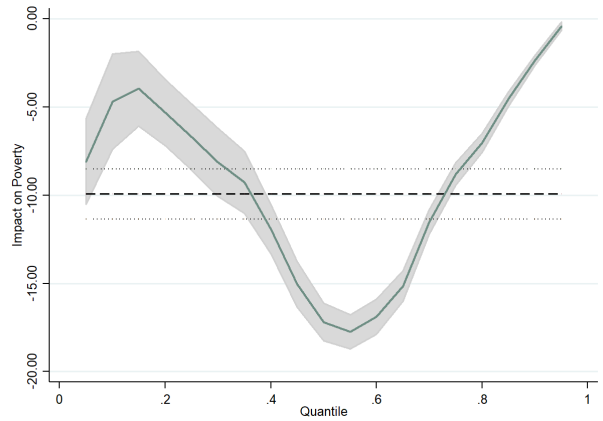


(C) Low income

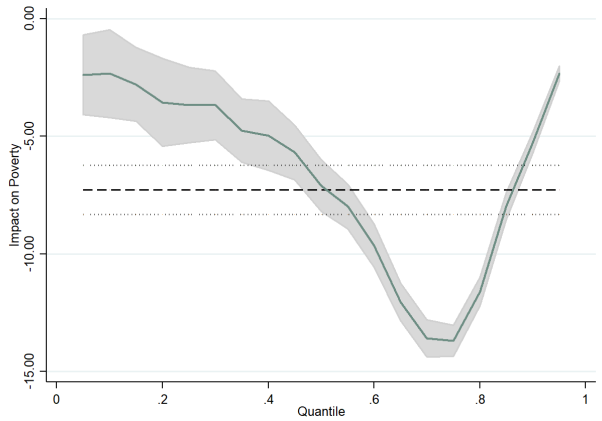


(D) Medium income

BM impact



(E) Low income

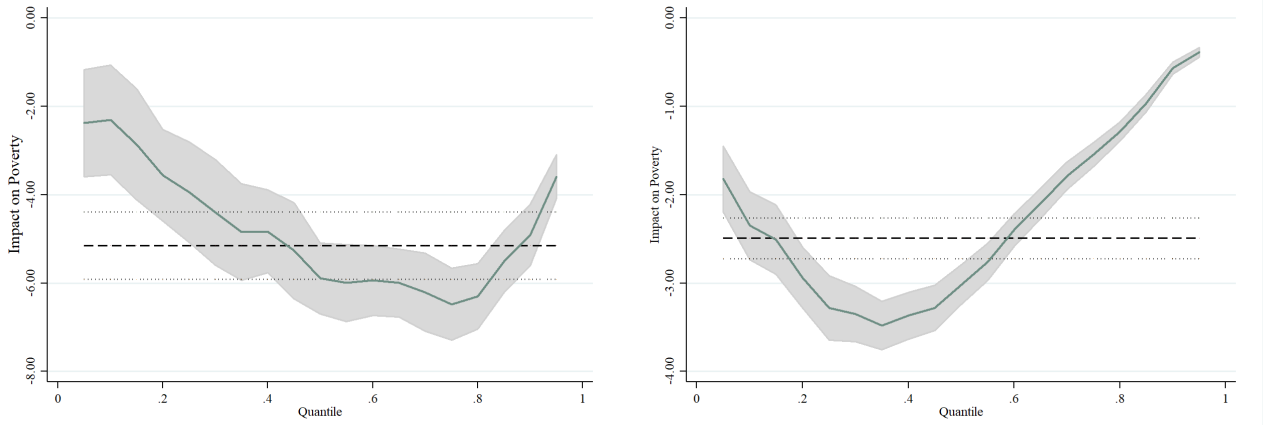


(F) Medium income

B.8 Quantile estimates of FI impact across continents

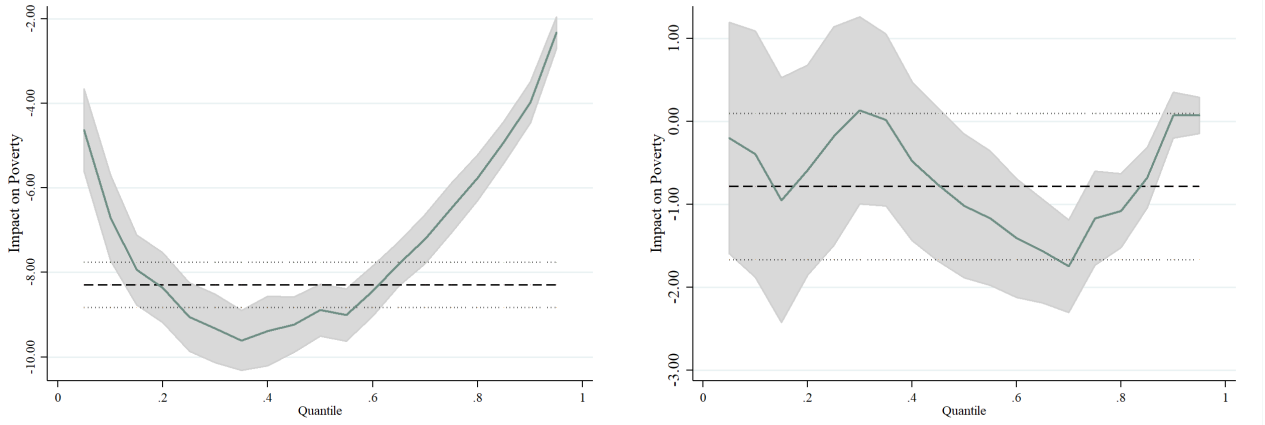
FIGURE B.9: Quantile estimates of FI impact across continents

BK impact



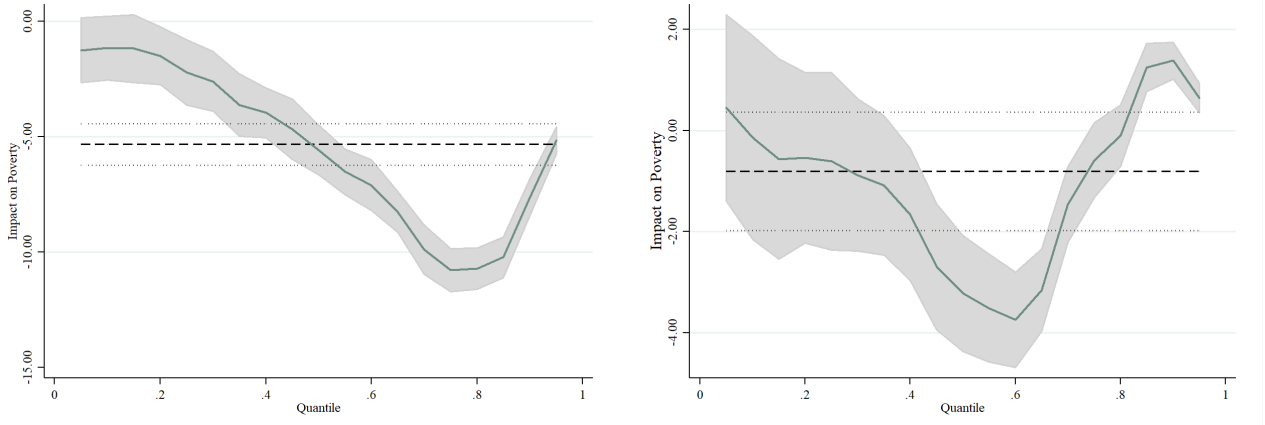
(A) Africa (B) Asia

MM impact



(C) Africa (D) Asia

BM impact



(E) Africa (F) Asia

Appendix C

Chapter 3

C.1 Annual asset: parameter estimates of ω and ρ

C.1.1 Across industries

TABLE C.1: Annual asset: parameter estimates of ω and ρ across industries before the financial crisis (2004-2007)

	Whole sample		1st quantile		2nd,3rd quantiles		4th quantile	
	ρ	ω	ρ	ω	ρ	ω	ρ	ω
Agriculture,	-0.079*	-0.034	-0.386*	-0.336*	-0.129*	-0.103*	-0.168*	-0.074
Forestry and fishing	(0.023)	(0.023)	(0.044)	(0.043)	(0.033)	(0.033)	(0.045)	(0.044)
Mining and	-0.053	-0.072	-0.355*	-0.270*	-0.099*	-0.131	-0.009	-0.055
Quarrying	(0.042)	(0.042)	(0.079)	(0.082)	(0.060)	(0.057)	(0.076)	(0.074)
Manufacturing	-0.111*	-0.079*	-0.397*	-0.319*	-0.144*	-0.111*	-0.063*	-0.006
	(0.009)	(0.008)	(0.016)	(0.016)	(0.012)	(0.012)	(0.017)	(0.017)
Construction	-0.110*	-0.092*	-0.409*	-0.364*	-0.130*	-0.095*	-0.076*	-0.042
	(0.014)	(0.014)	(0.026)	(0.026)	(0.020)	(0.019)	(0.028)	(0.027)
Retail and wholesale	-0.165*	-0.178*	-0.501*	-0.388*	-0.232*	-0.249*	-0.112*	-0.063*
	(0.008)	(0.008)	(0.012)	(0.015)	(0.010)	(0.009)	(0.015)	(0.014)
Transportation	-0.129*	-0.087*	-0.415*	-0.288*	-0.191*	-0.150*	-0.005	-0.047
	(0.023)	(0.022)	(0.040)	(0.040)	(0.030)	(0.029)	(0.048)	(0.042)
Hospitality	-0.136*	-0.100*	-0.369*	-0.207*	-0.260*	-0.172*	-0.010*	-0.071*
	(0.025)	(0.024)	(0.042)	(0.043)	(0.033)	(0.032)	(0.046)	(0.044)
Banking	-0.150*	-0.071*	-0.447*	-0.213*	-0.214*	-0.050	-0.040	-0.115
	(0.026)	(0.026)	(0.050)	(0.054)	(0.030)	(0.029)	(0.049)	(0.050)
Real estate	-0.058	-0.089*	-0.073	-0.406*	-0.142	-0.008	-0.069	-0.085
	(0.068)	(0.074)	(0.112)	(0.155)	(0.111)	(0.103)	(0.140)	(0.141)
Public services	-0.182*	-0.205*	-0.453*	-0.375*	-0.164*	-0.215*	-0.154*	-0.062
	(0.031)	(0.030)	(0.052)	(0.055)	(0.042)	(0.039)	(0.062)	(0.056)
Total	-0.125*	-0.111*	-0.401*	-0.341*	-0.178*	-0.173*	-0.067*	-0.032
	(0.004)	(0.004)	(0.008)	(0.009)	(0.006)	(0.006)	(0.009)	(0.009)

Note: Standard error are given in round parentheses; * indicates that the parameter deviates significantly from 0 at the 5% level.

TABLE C.2: Annual asset: parameter estimated of ρ and ω across industries after the financial crisis (2010-2014)

	Whole sample		1st quantile		2nd,3rd quantile		4th quantile	
	ρ	ω	ρ	ω	ρ	ω	ρ	ω
Agriculture,	-0.090*	-0.056*	-0.113*	-0.144*	-0.136*	0.136*	0.077	-0.032
Forestry and fishing	(0.021)	(0.021)	(0.041)	*(0.043)	(0.000)	(0.033)	(0.046)	(0.037)
Mining and	-0.451*	-0.218*	-0.619*	-0.355*	-0.216*	-0.160*	0.071	0.935*
Quarrying	(0.043)	(0.019)	(0.077)	(0.093)	90.061)	(0.061)	(0.146)	(0.145)
Manufacturing	-0.345*	-1.109*	-0.470*	-0.178*	-0.244*	-0.055*	-0.205*	-0.029
	(0.008)	(0.008)	(0.016)	(0.017)	(0.012)	(0.012)	(0.015)	(0.015)
Construction	-0.300*	-0.123*	-0.408*	-0.184*	-0.233*	-0.112*	-0.214*	0.008
	(0.014)	(0.015)	(0.029)	(0.034)	(0.019)	(0.019)	(0.025)	(0.303)
Retail and wholesale	-0.501*	-0.250*	-0.611*	-0.371*	-0.466*	-0.213*	-0.441*	-0.109*
	(0.007)	(0.007)	(0.013)	(0.013)	(0.008)	(0.009)	(0.016)	(0.016)
Transportation	-0.447*	-0.087*	-0.522**	-0.111*	-0.396*	-0.100*	-0.108*	-0.001
	(0.021)	(0.022)	(0.039)	(0.039)	(0.035)	(0.037)	(0.041)	(0.054)
Hospitality	-0.158*	-0.063*	-0.133*	-0.016	-0.261*	-0.135	-0.044	-0.042
	(0.023)	(0.022)	(0.045)	(0.041)	(0.029)	(0.031)	(0.054)	(0.049)
Banking	-0.479*	-0.169*	-0.637*	-0.239*	-0.482*	-0.249*	-0.236*	0.094*
	(0.022)	(0.023)	(0.056)	(0.058)	(0.024)	(0.025)	(0.046)	(0.040)
Real estate	-0.045*	-0.070	-0.547*	-0.440*	-0.584*	-0.300*	-0.698*	1.756*
	(0.064)	(0.066)	(0.141)	(0.145)	(0.057)	(0.064)	(0.232)	(0.230)
Public services	-0.430*	-0.112*	-0.588*	-0.024*	-0.454*	-0.087*	-0.269*	0.040
	(0.029)	(0.031)	(0.059)	(0.053)	(0.037)	(0.040)	(0.061)	(0.089)
Total	-0.433*	-0.175*	-0.576*	-0.272*	-0.372*	-0.131*	-0.262*	0.029
	(0.004)	(0.004)	(0.008)	(0.008)	(0.006)	(0.006)	(0.009)	(0.009)

Note: Standard errors are given in round parentheses; * indicates that the parameter deviates significantly from 0 at the 5% level.

C.1.2 Across types of firm ownership

TABLE C.3: Annual asset: parameter estimates of ρ and ω across types of firm ownership before the financial crisis (2004-2007)

	Whole sample		1st quantile		2nd,3rd quantile		4th quantile	
	ρ	ω	ρ	ω	ρ	ω	ρ	ω
State	-0.06*	-0.021	-0.257*	-0.217*	-0.082*	-0.038	-0.157*	-0.072*
	(0.014)	(0.016)	(0.029)	(0.032)	(0.020)	(0.022)	(0.026)	(0.028)
Private	-0.176*	-0.16*	-0.477*	-0.347*	-0.267*	-0.240*	-0.114*	-0.085*
	(0.006)	(0.006)	(0.009)	(0.011)	(0.008)	(0.007)	(0.012)	(0.011)
Joint Stock	-0.081*	-0.038*	-0.270*	-0.215*	-0.058	-0.059	-0.157*	-0.035
	(0.02)	(0.019)	(0.041)	(0.039)	(0.028)	(0.023)	(0.038)	(0.035)
Foreign	-0.031	-0.016	-0.313*	-0.195*	-0.124*	-0.075	-0.035	-0.034
	(0.023)	(0.023)	(0.043)	(0.044)	(0.031)	(0.030)	(0.046)	(0.046)
State_Foreign	-0.01	0.002	-0.250*	-0.261*	-0.052	-0.001	-0.086	-0.097
	(0.038)	(0.039)	(0.068)	(0.078)	(0.055)	(0.057)	(0.075)	(0.072)
Collective	-0.188*	-0.145*	-0.482*	-0.342*	-0.275*	-0.217*	-0.170*	-0.041
	(0.017)	(0.016)	(0.027)	(0.027)	(0.021)	(0.019)	(0.031)	(0.030)
Total	-0.132*	-0.119*	-0.411*	-0.348*	-0.193*	-0.186*	-0.072*	-0.037
	(0.005)	(0.005)	(0.008)	(0.009)	(0.007)	(0.006)	(0.010)	(0.010)

Note: Standard errors are given in round parentheses; * indicates that the parameter deviates significantly from 0 at the 5% level.

TABLE C.4: Annual asset: parameter estimates of ρ and ω across types of firm ownership after the financial crisis (2010-2014)

	Whole sample		1st quantile		2nd,3rd quantile		4th quantile	
	ρ	ω	ρ	ω	ρ	ω	ρ	ω
State	0.062	-0.01*	0.029	0.026	0.190*	-0.085*	-0.015	0.019
	(0.017)	(0.016)	(0.033)	(0.036)	(0.027)	(0.025)	(0.030)	(0.025)
Private	-0.472*	-0.213*	-0.580*	-0.318*	-0.456*	-0.191*	-0.368*	-0.085*
	(0.005)	(0.006)	(0.011)	(0.011)	(0.007)	(0.007)	(0.012)	(0.012)
Joint Stock	-0.331*	-0.106*	-0.341*	-0.319*	-0.254*	-0.006	-0.418*	-0.116*
	(0.013)	(0.014)	(0.031)	(0.030)	(0.019)	(0.021)	(0.024)	(0.026)
Foreign	-0.113*	-0.02	-0.121	-0.050	-0.244*	-0.025	0.245*	-0.026
	(0.018)	(0.018)	(0.044)	(0.038)	(0.026)	(0.028)	(0.031)	(0.027)
State_Foreign	0.41*	0.611*	0.612*	-0.120	-0.344*	-0.081*	0.169	0.771*
	(0.038)	(0.037)	(0.101)	(0.090)	(0.042)	(0.038)	(0.116)	(0.146)
Collective	-0.476*	-0.19*	-0.495*	-0.179*	-0.493*	-0.243*	-0.337*	-0.159*
	(0.016)	(0.016)	(0.027)	(0.028)	(0.023)	(0.023)	(0.033)	(0.034)
Total	-0.443*	-0.183*	-0.580*	-0.281*	-0.039*	-0.145*	-0.280*	-0.047*
	(0.004)	(0.004)	(0.008)	(0.008)	(0.006)	(0.006)	(0.009)	(0.010)

Note: Standard error are given in round parentheses; * indicates that the parameter deviates significantly from 0 at the 5% level.

C.2 Annual turnover: parameter estimates of ω and ρ

C.2.1 Across industries

TABLE C.5: Annual turnover: parameter estimates of ρ and ω across industries before the financial crisis (2004-2007)

	Whole sample		1st quantile		2nd,3rd quantile		4th quantile	
	ρ	ω	ρ	ω	ρ	ω	ρ	ω
Agriculture,	-0.152*	-0.115*	-0.426*	-0.378*	-0.23*	-0.162*	-0.118*	-0.02*
Forestry and fishing	(0.023)	(0.023)	(0.04)	(0.041)	(0.03)	(0.029)	(0.046)	(0.042)
Mining and	-0.153*	-0.153*	-0.286*	-0.26*	-0.288*	-0.157*	-0.007*	-0.036*
Quarrying	(0.042)	(0.041)	(0.08)	(0.076)	(0.061)	(0.055)	(0.073)	(0.078)
Manufacturing	-0.097*	-0.069*	-0.326*	-0.262*	-0.121*	-0.1*	-0.101*	-0.059*
	(0.009)	(0.009)	(0.017)	(0.017)	(0.012)	(0.012)	(0.017)	(0.016)
Construction	-0.137*	-0.083*	-0.329*	-0.247*	-0.165*	-0.96*	-0.088*	-0.07
	(0.014)	(0.015)	(0.028)	(0.029)	(0.019)	(0.019)	(0.029)	(0.028)
Retail and wholesale	-0.141*	-0.085*	-0.315*	-0.202*	-0.204*	-0.139*	-0.168*	-0.085*
	(0.007)	(0.007)	(0.015)	(0.016)	(0.01)	(0.009)	(0.014)	(0.014)
Transportation	-0.124*	-0.095*	-0.365*	-0.291*	-0.175*	-0.129*	-0.022	-0.074
	(0.023)	(0.023)	(0.042)	(0.045)	(0.031)	(0.03)	(0.043)	(0.039)
Hospitality	-0.149*	-0.108*	-0.452*	-0.257*	-0.277*	-0.196*	-0.045	-0.054
	(0.025)	(0.025)	(0.039)	(0.041)	(0.031)	(0.03)	(0.048)	(0.045)
Banking	-0.22*	-0.111*	-0.417*	-0.211*	-0.251*	0.094*	-0.291*	-0.117*
	(0.024)	(0.024)	(0.04)	(0.043)	(0.029)	(0.025)	(0.0476)	(0.0458)
Real estate	-0.142*	-0.189*	-0.385*	-0.165	-0.191*	-0.184*	-0.056	-0.237*
	(0.064)	(0.068)	(0.014)	(0.218)	(0.083)	(0.081)	(0.094)	(0.084)
Public services	-0.153*	-0.125*	-0.369*	-0.233*	-0.16*	-0.147*	-0.096	0.011*
	(0.03)	(0.03)	(0.052)	(0.049)	(0.041)	(0.042)	(0.059)	(0.059)
Total	-0.116*	-0.076*	-0.326*	-0.241*	-0.166*	-0.122*	-0.111	0.057*
	(0.004)	(0.004)	(0.009)	(0.009)	(0.006)	(0.006)	(0.009)	(0.009)

Note: Standard error are given in round parentheses; * indicates that the parameter deviates significantly from 0 at the 5% level.

TABLE C.6: Annual turnover: parameter estimates of ρ and ω across industries after the financial crisis (2010-2014)

	Whole sample		1st quantile		2nd,3rd quantile		4th quantile	
	ρ	ω	ρ	ω	ρ	ω	ρ	ω
Agriculture, Forestry and fishing	-0.196* (0.02)	-0.046 (0.021)	-0.279* (0.045)	-0.043 (0.045)	-0.21* (0.024)	-0.1* (0.026)	-0.066 (0.048)	-0.076 (0.044)
Mining and Quarrying	-0.29* (0.044)	-0.065 (0.044)	-0.343* (0.086)	-0.102 (0.092)	-0.375* (0.074)	-0.137 (0.062)	0,066 (0.083)	-0.171 (0.074)
Manufacturing	-0.222* (0.008)	-0.095* (0.008)	-0.244* (0.017)	-0.103* (0.017)	-0.28* (0.011)	-0.138* (0.01)	-0.208* (0.014)	-0.124* (0.014)
Construction	-0.363* (0.014)	-0.151* (0.015)	-0.423* (0.032)	-0.178* (0.034)	-0.445* (0.016)	-0.222* (0.018)	-0.179* (0.024)	-0.133* (0.021)
Retail and wholesale	-0.376* (0.007)	-0.183* (0.007)	-0.428* (0.016)	-0.217* (0.016)	-0.444* (0.008)	-0.236* (0.008)	-0.421* (0.012)	-0.218* (0.012)
Transportation	-0.388* (0.02)	-0.178* (0.02)	-0.486* (0.036)	-0.232* (0.037)	-0.37* (0.03)	-0.154* (0.029)	-0.113* (0.038)	-0.252* (0.033)
Hospitality	-0.234* (0.02)	-0.141* (0.02)	-0.037 (0.054)	-0.087 (0.051)	-0.331* (0.026)	-0.15* (0.027)	-0.203* (0.039)	-0.2* (0.037)
Banking	-0.67* (0.023)	-0.332* (0.025)	-0.807* (0.054)	-0.383* (0.066)	-0.686* (0.022)	-0.419* (0.025)	-0.259* (0.053)	-0.014 (0.046)
Real estate	-0.29* (0.062)	-0.22* (0.058)	-0.271 (0.143)	-0.053 (0.125)	-0.377* (0.065)	-0.26* (0.063)	-0.048 (0.248)	-0.875* (0.19)
Public services	-0.336* (0.026)	-0.151* (0.024)	-0.296* (0.058)	-0.153* (0.052)	-0.444* (0.032)	-0.164* (0.033)	-0.362* (0.048)	-0.253* (0.039)
Total	-0.336* (0.004)	-0.149* (0.004)	-0.363* (0.009)	-0.153* (0.010)	-0.403* (0.005)	-0.205* (0.005)	-0.329* (0.007)	-0.171* (0.007)

Note: Standard error are given in round parentheses; * indicates that the parameter deviates significantly from 0 at the 5% level.

C.2.2 Across types of firm ownership

TABLE C.7: Annual turnover: parameter estimates of ρ and ω across types of firm ownership before the financial crisis (2004-2007)

	Whole sample		1st quantile		2nd,3rd quantile		4th quantile	
	ρ	ω	ρ	ω	ρ	ω	ρ	ω
State	-0.08*	-0.058*	-0.277*	-0.231*	-0.128*	-0.091*	-0.131*	-0.125*
	(0.014)	(0.015)	(0.027)	(0.029)	(0.019)	(0.021)	(0.026)	(0.028)
Private	-0.129*	-0.082*	-0.346*	-0.246*	-0.224*	-0.159*	-0.155*	-0.072*
	(0.006)	(0.006)	(0.011)	(0.012)	(0.008)	(0.008)	(0.011)	(0.011)
Joint Stock	-0.067*	-0.04*	-0.196*	-0.2*	-0.107*	-0.066*	-0.100*	-0.031
	(0.02)	(0.019)	(0.042)	(0.043)	(0.027)	(0.025)	(0.035)	(0.031)
Foreign	-0.074*	-0.034*	-0.274*	-0.157*	-0.122*	-0.121*	-0.178*	-0.066
	(0.024)	(0.024)	(0.045)	(0.046)	(0.031)	(0.031)	(0.041)	(0.041)
State_Foreign	-0.024	-0.028	-0.339*	-0.266*	-0.072	-0.107*	-0.135	-0.096
	(0.04)	(0.041)	(0.064)	(0.08)	(0.054)	(0.052)	(0.077)	(0.069)
Collective	-0.182*	-0.131*	-0.478*	-0.299*	-0.224*	-0.165*	-0.099*	-0.089*
	(0.017)	(0.016)	(0.028)	(0.03)	(0.02)	(0.019)	(0.033)	(0.031)
Total	-0.12*	-0.081*	-0.337*	-0.252*	-0.176*	-0.134*	-0.114*	-0.059*
	(0.005)	(0.005)	(0.009)	(0.010)	(0.006)	(0.006)	(0.009)	(0.009)

Note: Standard error are given in round parentheses; * indicates that the parameter deviates significantly from 0 at the 5% level.

TABLE C.8: Annual turnover: parameter estimates of ρ and ω across types of firm ownership after the financial crisis (2010-2014)

	Whole sample		1st quantile		2nd,3rd quantile		4th quantile	
	ρ	ω	ρ	ω	ρ	ω	ρ	ω
State	-0.216*	-0.055*	-0.297*	-0.055	-0.145*	-0.039	-0.038	-0.168*
	(0.016)	(0.017)	(0.033)	(0.036)	(0.022)	(0.023)	(0.031)	(0.027)
Private	-0.35*	-0.158*	-0.365*	-0.133*	-0.44*	-0.237*	-0.392*	-0.203*
	(0.005)	(0.005)	(0.013)	(0.013)	(0.007)	(0.006)	(0.01)	(0.009)
Joint Stock	-0.295*	-0.135*	-0.295*	-0.153*	-0.383*	-0.202*	-0.419*	-0.229*
	(0.014)	(0.015)	(0.031)	(0.035)	(0.018)	(0.019)	(0.02)	(0.022)
Foreign	-0.114*	-0.092*	0.052	-0.041	-0.218*	-0.16*	-0.258*	-0.141*
	(0.019)	(0.018)	(0.047)	(0.043)	(0.025)	(0.023)	(0.035)	(0.034)
State_Foreign	-0.257*	-0.141*	-0.339*	-0.192	-0.115*	-0.074*	-0.188	-0.164*
	(0.037)	(0.037)	(0.078)	(0.085)	(0.046)	(0.048)	(0.103)	(0.027)
Collective	-0.448*	-0.209*	-0.488*	-0.253*	-0.519*	-0.256*	-0.463*	-0.217*
	(0.015)	(0.016)	(0.031)	(0.03)	(0.018)	(0.019)	(0.031)	(0.032)
Total	-0.346*	-0.154*	-0.377*	-0.155*	-0.420*	-0.219*	-0.345*	-0.179*
	(0.004)	(0.004)	(0.001)	(0.001)	(0.005)	(0.005)	(0.008)	(0.008)

Note: Standard error are given in round parentheses; * indicates that the parameter deviates significantly from 0 at the 5% level.

C.3 Number of employees: parameter estimates of ω and ρ

C.3.1 Across industries

TABLE C.9: Number of employees: parameter estimates of ω and ρ across industries before the financial crisis (2004-2007)

	Whole sample		1st quantile		2nd,3rd quantiles		4th quantile	
	ρ	ω	ρ	ω	ρ	ω	ρ	ω
Agriculture,	-0.035	-0.042	-0.278*	-0.209*	-0.037	-0.059	-0.161*	-0.151*
Forestry and fishing	(0.024)	(0.024)	(0.043)	(0.043)	(0.033)	(0.032)	(0.047)	(0.047)
Mining and	-0.073	-0.074	-0.163	-0.094	-0.117	-0.109	-0.071	-0.129
Quarrying	(0.044)	(0.044)	(0.081)	(0.098)	(0.061)	(0.058)	(0.093)	(0.091)
Manufacturing	-0.061*	-0.054*	-0.207*	-0.119*	-0.067*	-0.06*	-0.117*	-0.128*
	(0.009)	(0.009)	(0.018)	(0.018)	(0.013)	(0.012)	(0.018)	(0.019)
Construction	-0.144*	-0.109*	-0.294*	-0.142*	-0.168*	-0.122*	-0.173*	-0.198*
	(0.015)	(0.016)	(0.029)	(0.03)	(0.021)	(0.021)	(0.031)	(0.034)
Retail and Wholesale	-0.068*	-0.032*	-0.33*	-0.185*	-0.16*	-0.081*	-0.098*	-0.103*
	(0.009)	(0.008)	(0.014)	(0.013)	(0.012)	(0.011)	(0.016)	(0.017)
Transportation	-0.08*	-0.063*	-0.27*	-0.208*	-0.105*	-0.079*	-0.185*	-0.136*
	(0.025)	(0.025)	(0.049)	(0.048)	(0.033)	(0.032)	(0.046)	(0.05)
Hospitality	0.012	0.01	-0.308*	-0.121*	-0.095	-0.036	-0.087*	-0.111*
	(0.03)	(0.028)	(0.046)	(0.043)	(0.039)	(0.037)	(0.05)	(0.049)
Banking	-0.085*	0.091*	-0.231	-0.112	-0.081	-0.003*	-0.086*	-0.17*
	(0.027)	(0.027)	(0.045)	(0.037)	(0.068)	(0.048)	(0.054)	(0.055)
Real estate	-0.106	-0.049	-0.169	-0.185	-0.218*	-0.061	-0.082	-0.085
	(0.074)	(0.075)	(0.141)	(0.135)	(0.101)	(0.109)	(0.132)	(0.13)
Public service	-0.107*	-0.046	-0.305*	-0.155*	-0.059	-0.053	-0.247*	-0.135*
	(0.033)	(0.034)	(0.058)	(0.059)	(0.048)	(0.047)	(0.064)	(0.063)
Total	-0.068*	-0.046*	-0.266*	-0.145*	-0.111*	-0.074*	-0.122*	-0.123*
	(0.005)	(0.005)	(0.009)	(0.009)	(0.007)	(0.007)	(0.01)	(0.01)

Note: Standard errors are given in round parentheses; * indicates that the parameter deviates significantly from 0 at the 5% level.

TABLE C.10: Number of employees: parameter estimates of ω and ρ across industries after the financial crisis (2010-2014)

	Whole sample		1st quantile		2nd,3rd quantiles		4th quantile	
	ρ	ω	ρ	ω	ρ	ω	ρ	ω
Agriculture,	-0.356*	0.078*	0.397*	0.464*	-0.24*	0.103*	-0.603*	-0.056
Forestry and fishing	(0.02)	(0.02)	(0.056)	(0.043)	(0.028)	(0.027)	(0.036)	(0.038)
Mining and	-0.257*	-0.205*	-0.49	-0.308	0.034*	-0.067*	-0.68*	-0.564*
Quarrying	(0.042)	(0.04)	(0.093)	(0.077)	(0.06)	(0.051)	(0.048)	(0.066)
Manufacturing	-0.116*	-0.038*	-0.151*	-0.089*	-0.126*	-0.042*	-0.162*	-0.045*
	(0.008)	(0.008)	(0.019)	(0.019)	(0.01)	(0.01)	(0.014)	(0.014)
Construction	-0.21*	-0.102*	-0.315*	-0.175*	-0.257*	-0.129*	-0.236*	-0.067*
	(0.013)	(0.014)	(0.028)	(0.028)	(0.018)	(0.018)	(0.026)	(0.027)
Retail and Wholesale	-0.277*	-0.101*	-0.38*	-0.189*	-0.302*	-0.116*	-0.206*	-0.053*
	(0.007)	(0.007)	(0.022)	(0.021)	(0.008)	(0.009)	(0.013)	(0.012)
Transportation	-0.248*	-0.129*	-0.318*	-0.124*	-0.286 *	-0.149*	-0.241*	-0.246*
	(0.019)	(0.018)	(0.039)	(0.036)	(0.026)	(0.026)	(0.037)	(0.033)
Hospitality	-0.175*	-0.06*	-0.243*	-0.157*	-0.199*	-0.027	-0.014	0.047
	(0.023)	(0.024)	(0.048)	(0.049)	(0.031)	(0.034)	(0.059)	(0.054)
Banking	-0.1*	-0.066*	-0.272*	-0.22*	-0.273*	-0.281*	0.047	0.061
	(0.024)	(0.022)	(0.047)	(0.046)	(0.039)	(0.041)	(0.043)	(0.035)
Real estate	-0.251*	-0.095	-0.145	0.009	-0.474*	-0.14	0.034	-0.086
	(0.07)	(0.067)	(0.188)	(0.136)	(0.07)	(0.077)	(0.184)	(0.222)
Public service	-0.226*	-0.066*	-0.208*	-0.013	-0.262*	-0.167*	-0.363*	0.049
	(0.026)	(0.027)	(0.055)	(0.055)	(0.039)	(0.041)	(0.045)	(0.047)
Total	-0.215*	-0.072*	-0.247*	-0.112*	-0.224*	-0.083*	-0.23*	-0.05*
	(0.004)	(0.004)	(0.01)	(0.01)	(0.005)	(0.005)	(0.008)	(0.008)

Note: Standard errors are given in round parentheses; * indicates that the parameter deviates significantly from 0 at the 5% level.

C.3.2 Across types of firm ownership

TABLE C.11: Number of employees: parameter estimates of ρ and ω across types of firm ownership before the financial crisis (2004-2007)

	Whole sample		1st quantile		2nd,3rd quantile		4th quantile	
	ρ	ω	ρ	ω	ρ	ω	ρ	ω
State	-0.094*	-0.109*	-0.069*	-0.08*	-0.121*	-0.159*	0.993*	-0.216*
	(0.015)	(0.017)	(0.029)	(0.03)	(0.021)	(0.024)	(0.009)	(0.03)
Private	-0.063*	-0.027*	-0.287*	-0.155*	-0.158*	-0.08*	0.903*	-0.11*
	(0.007)	(0.007)	(0.011)	(0.01)	(0.01)	(0.01)	(0.006)	(0.014)
Joint Stock	-0.076*	-0.048*	-0.18*	-0.091*	-0.085*	-0.054*	1.028*	-0.11*
	(0.019)	(0.018)	(0.041)	(0.036)	(0.028)	(0.026)	(0.009)	(0.036)
Foreign	0.029	0.018	-0.226*	-0.11*	-0.023	-0.037	0.963*	-0.078
	(0.027)	(0.025)	(0.045)	(0.044)	(0.037)	(0.036)	(0.017)	(0.045)
State_Foreign	0.035	0.07	-0.273*	-0.13	-0.512	0.048	0.9*	-0.168
	(0.052)	(0.047)	(0.076)	(0.072)	(0.069)	(0.067)	(0.026)	(0.073)
Collective	-0.097*	-0.052*	-0.237*	-0.166*	-0.189*	-0.119*	0.989*	-0.185*
	(0.019)	(0.019)	(0.034)	(0.033)	(0.025)	(0.025)	(0.012)	(0.035)
Total	-0.068*	-0.046*	-0.266*	-0.145*	-0.111*	-0.074*	-0.122*	-0.123*
	(0.005)	(0.005)	(0.009)	(0.009)	(0.007)	(0.007)	(0.01)	(0.01)

Note: Standard errors are given in round parentheses; * indicates that the parameter deviates significantly from 0 at the 5% level.

TABLE C.12: Number of employees: parameter estimates of ρ and ω across types of firm ownership after the financial crisis (2010-2014)

	Whole sample		1st quantile		2nd,3rd quantile		4th quantile	
	ρ	ω	ρ	ω	ρ	ω	ρ	ω
State	-0.359*	0.03	-0.29*	0.114*	-0.176*	0.018	-0.543*	-0.072*
	(0.016)	(0.017)	(0.038)	(0.038)	(0.023)	(0.021)	(0.028)	(0.031)
Private	-0.219*	-0.086*	-0.29*	-0.137*	-0.263*	-0.118*	-0.173*	-0.049*
	(0.005)	(0.005)	(0.017)	(0.017)	(0.007)	(0.007)	(0.011)	(0.01)
Joint Stock	-0.182*	-0.045*	-0.124*	-0.064*	-0.253*	-0.137*	-0.365*	-0.107*
	(0.013)	(0.014)	(0.03)	(0.031)	(0.017)	(0.018)	(0.026)	(0.025)
Foreign	-0.059*	0.00001	-0.046	0.064	-0.142*	-0.11*	0.609*	0.381 *
	(0.02)	(0.02)	(0.039)	(0.04)	(0.029)	(0.028)	(0.061)	(0.059)
State_Foreign	0.129*	0.012*	0.125	-0.011	0.353*	-0.173*	-0.198*	0.094*
	(0.046)	(0.035)	(0.108)	(0.09)	(0.057)	(0.051)	(0.077)	(0.034)
Collective	-0.28*	-0.151*	-0.252*	-0.073*	-0.38*	-0.24*	-0.304*	-0.187*
	(0.015)	(0.015)	(0.032)	(0.031)	(0.022)	(0.019)	(0.028)	(0.029)
Total	-0.215*	-0.072*	-0.247 *	-0.112*	-0.224*	-0.083*	-0.23*	-0.05*
	(0.004)	(0.004)	(0.01)	(0.01)	(0.005)	(0.005)	(0.008)	(0.008)

Note: Standard errors are given in round parentheses; * indicates that the parameter deviates significantly from 0 at the 5% level.

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