

# UNIVERSITÀ DEGLI STUDI DELL'INSUBRIA

**DEPARTMENT OF ECONOMICS**


# ESSAYS ON INCOME INEQUALITY AND POVERTY REDUCTION

**BY**


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## SUMMARY

Worldwide, socioeconomic development has been very uneven. Alongside remarkable advances in human progress, there remain serious concerns of persistent poverty and heightened inequalities. The United Nations' World Summit for Social Development, Copenhagen Declaration, Sustainable Development Goals (SDGs) have all expressed, renewed commitment to help eradicate poverty and inequality. The scientific and research community have argued that providing effective social policies that evaluate the scale of poverty and inequality are imperative for understanding their societal impacts. This dissertation focuses mainly on examining three empirical themes in the literature put into three manuscripts.

The first chapter examined the impact of innovation and entrepreneurship on income inequality using longitudinal data from 2000 to 2016 for middle-and low-income countries (64) and high income countries (25). Evidence from the literature have shown that entrepreneurship and innovation are primary drivers of income inequality, particularly in the "Global North". Given the nature of entrepreneurship and the pace of technological progress in the "Global South" and the lack of research focus in the literature, we investigated if spatial spillovers innovation and entrepreneurship impact income inequality in the same way they affect economic growth. We applied spatial panel regression models to address potential issues of spatial dependency among neighboring countries. Our findings show that entrepreneurship and innovation exhibit Tobler's effect and their spillovers have direct impact on income inequality.

The second chapter investigated if there is an institutional quality threshold effect on income distributions. In the literature, scholars have argued on institutional quality as a tool

for socioeconomic development, but one question that comes into play, is how much institutional change is necessary and if it is indeed possible to identify a specific threshold level. Since institutional quality is fragile and varies across the world, we compare the level in developing countries with that of the developed world by employing a dynamic panel threshold model by Kremer et al., (2013) on longitudinal data from 1995 to 2017. We estimate the threshold and marginal impact for institutional quality and compare tresults on different measures of institutions. Our findings suggest that institutional quality and income inequality relationship varies with the measure of institutional quality. More specifically, we find two pronged results (i) For World Governance Indicators (WBGI) proxy, we find quadratic effect for advanced countries, but a monotonic negative effect for developing countries; (ii) For ICRG-based measure of institutional quality, we find a Kuznets inverted Ushaped relationship between institutions and income inequality for both advanced and developing countries. The results also show a higher threshold value for developing countries compared to advanced economies. The effect of the individual institutional indicators show that government effectiveness has strong effect on income inequality in developing countries while rule of law is important when it comes to the relationship between institutional quality and income inequality in advanced countries.

The third chapter investigated the effect of financial development on poverty reduction in developing economies by assessing the sensitivity of financial development to the choice of financial development and poverty indicators. This is important for the finance-poverty literature considering the exclusion of non-formal financial institutions such as microfinance institutions from the measure of financial development. Tests based on a fixed effects 2SLS and dynamic panel estimation were used on a panel data of 49 developing

countries from 2000 to 2017. We found significant support for the role of microfinance institutions on poverty reduction, while commercial banks do not induce non-monetary based poverty reduction. The multidimensional poverty index confirms the sensitivity of the effect of the choice of a financial development proxy. Further evidence using the social performance indicators of microfinance institutions revealed that only access to finance has poverty reducing effect.

The following policy implications were deduced from the study.

1. Middle-and low-income countries should continue to explore/pursue inclusive technological advancements that have potential to promote productivity and economic growth in the long run. This said, technology sharing policies can be adopted to reduce the impact of market dominance or monopoly power attributed to intellectual property rights enforceability. This can help eliminate some of the societal injustices (income inequality) that have saddled technological advancement in the advanced countries.
2. To foster strong business and innovative economy, better institutional environment will be needed. Institutional framework poised toward zero tolerance for corruption, clientelism and favoritism can improve both the accessibility and use of needed resources to boost enterprise creation and hence, provide attractive job opportunities to move people out of poverty.
3. One possible solution to increase entrepreneurial activities while reducing inequality is for governments in developing countries to offer various schemes targeting the poor, especially preferential financing. Finance is a key ingredient that smoothen the wheels of production. As such providing accessibility to both small and medium

enterprise alike could reduce the burden of poverty among the less privileged of the society who have entrepreneurial intentions. A look at the social performance policy of the microfinance institutions revealed that only access to finance, have strong poverty reducing impact. This said, tax holidays can be used to motivate both commercial and microfinance institutions to increase their outreach in poverty zones.

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**CHAPTER 1**

# Spillover effects of innovation and entrepreneurship on income inequality in developing countries: a spatial panel approach

# **CHAPTER 1:** SPILLOVER EFFECTS OF INNOVATION AND ENTREPRENEURIAL ACTIVITY ON INCOME INEQUALITY IN DEVELOPING COUNTRIES: A SPATIAL PANEL APPROACH

## 1.1 Introduction

Sustained economic growth remains a critical pathway out of poverty and a core driver of economic development. Yet, evidence show that it is not enough as an impetus for equal wealth distribution. The World Inequality Report in 2018 showed a marked rise in the Gini coefficient, income inequality, by more than 10% during the past two to three decades. Incomes of the top 10% in Middle East accounted for 61% of the share of national income; 55% in Sub-Saharan Africa and 37% in Europe (Alvaredo, Chancel, Piketty, Saez, & Zucman, 2018). This trend in income inequality has persisted alongside global trend in economic growth (Alvaredo *et al.*, 2018; Piketty, 2015). Based on these facts, enterprise creation and technical change, key drivers of economic growth, have generally been accused to have induced societal injustices of inequality and heightened poverty, as an outgrowth of the capitalist system (Piketty, 2015). Some evidence further suggests that efficiency in innovation have promoted entrepreneurial successes and wage polarization at a much larger scale than before and therefore produced larger swings in the distribution of income (Frey & Osborne, 2017; Packard & Bylund, 2018). Yet nowadays, there is general support for innovation and entrepreneurship. Governments and policy experts across the world are focused on promoting enterprise creation and technological innovation in order to achieve profitable growth. In this context, innovation and entrepreneurship are considered as agents of change, but not drivers of income inequality, the reward to technological advancement and risk-taking (entrepreneurship). Innovation and entrepreneurship drive productivity, and in turn, productivity drives the flows of real income (Aghion, Akcigit, Bergeaud, Blundell, &

Hemous, 2019; Frey & Osborne, 2017; Halvarsson, Korpi, & Wennberg, 2018; Piketty, 2015). While economist demonstrate the relevance of innovation as key element of economic progress, it is also imperative to stress the importance of the person who introduces innovation into the production process. This is because someone has to bear the risk of making a decision to incorporate an innovation in the firm. This person is the entrepreneur, and his activity has a positive effect on income distribution. The incentive to engage in enterprise creation is expected to be influenced by an array of factors that may inform the intentions, motivation and actions of an entrepreneur. The paramount of which is profit maximization, which has been argued to produce large swings in the incomes of entrepreneurs (Acs, Braunerhjelm, Audretsch, & Carlsson, 2009). While for many years, scholars have almost uncritically (save for few) considered innovation and entrepreneurship as means to economic growth, it is only in recent times evidence has shown entrepreneurship and innovation can under certain conditions exacerbate societal injustice, by creating imbalances in income distribution (income inequality) and deepen poverty (Cozzens & Kaplinsky, 2009; Cozzens et al., 2010; Piketty, 2015).

In this study, we investigate the effect of entrepreneurial activities and innovation on income inequality and attempt to unravel how potential spillovers may impact the distribution of income in middle- and low-income countries. In this regard, we address the following hypotheses.

(1) High entrepreneurial activities increase income inequality.

(2) High rate of innovation increases income inequality.

(3) Spillovers increase income inequality.

Nevertheless, we believe that the impacts of innovation and entrepreneurial activities on income inequality might vary with different settings of institutional quality. Particularly, given the lag in

the institutional environment of middle- and low-income countries, we contend that profit maximizing entrepreneurs will support mechanisms that restrict market entry but promote rent-seeking activities. Entrepreneurs with foreign partners will require strong institutions to avoid risk or expropriation or imitation of their innovation by other entities. Thus, maintaining market dominance to create wealth. In this regard, we further test if institutional quality plays an important role in governing such relationship. Spillovers from these effects could influence income inequality in other countries given the rise in globalization of firms and regional agglomerations (Tobler, 1970). Considering the presence of spatial dependence, we distinguish our paper from prior studies by using spatial panel models to address the issues of spatial autocorrelation and unknown heterogeneity when using country-level data.

The rest of the study proceeds as follows: a review of related literature in section 2 and a discussion of methodology in section 3. In section 4, we present our data analysis and discussion, and finally, section 5 concludes.

## 1.2 Review of related literature

### 1.2.1 Innovation and income inequality nexus

The concept of innovation is not new in economics. Innovation is the process of creating new technologies and using them in the economy. Economists usually use broad definition of technology, so when they are talking about innovation, economists are not just thinking about new machines or inventions, but also new ways of doing things (including knowledge). When the classical economists described market behavior and mechanical advances in economic growth, they meant innovation (Galindo & Méndez-Picazo, 2013). These idiosyncratic attributions were however conceptualized to suit the purpose of their studies, thus leading to a wide range of definitions. From modern economic perspective, technological diffusion and the

catch-up process (innovation) were the main drivers of growth (Aghion & Howitt, 1998; Lucas, 1988; Romer, 1990). A large body of empirical work has evolved from this focus on technological progress and innovation. These studies have established that the level of innovation is a "sine qua non" for economic performance, particularly at the firm and industry level. These can either be product innovation or process innovation (Bloch, 2007). In developing countries, evidence show that most firms simply imitate or adapt existing production techniques (Unctad, 2007). This is because policies that attract foreign innovation to developing countries do not make it easily available for capture. And as such multinational firms have incentives to engage in technology transfers only if they do not face high risk of expropriation (Mansfield & Romeo, 1980). Evidence from Branstetter (2006) also show that technology transfers to developing countries only increase with the quality of intellectual property rights. The decision of foreign firms between licensing a technology and establishing a subsidiary through FDI depends heavily on the capacity of the host country to demonstrate that if the technology is licensed, it will not be easily copied through industrial espionage or worker turnover. Also, firms importing improved technology to incorporate into their production processes may not make it available domestically due to licensing issues or quest for market dominance (Grossman & Helpman, 1991). In this sense, importing firms will be more innovative than those who source from domestic market (Keller, 2004). Several studies have investigated their implication on growth, but the same conclusion, however, cannot be drawn for income inequality because economic growth and income inequality are two different concepts. Researchers have not treated innovation and income inequality in great detail, and thus, deserves attention in the context of middle-and low-income countries.

Prior studies including Aghion *et al*, (2019), Antonelli & Gehringer, (2017), Breau *et al.*, (2014), Lee & Rodríguez-Pose, (2013), Acemoglu & Autor, (2011) and Lee, (2011) examined the innovation-inequality debate and concluded that intellectual property rights, skilled-biased technological changes, and capital gains (mark-up) are some of the drivers of modern day income inequality. In the spirit of Schumpeterian growth model, Aghion et al. (2019) examined the linkage between innovation, top-income inequality and social mobility in the U.S.. The authors showed that innovation (measured with patents and citations) contributes positively to top income inequality, but not to broad measures of inequality. They found that the correlation between entrant innovation and top income inequality is lower in states with higher lobbying intensity. Antonelli & Gehringer (2017) investigated the role of technological change on the levels of income inequality in 36 OECD countries over the period 1996 – 2011. Breau *et al.* (2014) employed census data of Canada over the period 1996 – 2006 to examine the relationship between innovation and wage inequality among Canadian cities. Their findings revealed a positive effect of innovation on inequality after controlling for other possible factors that may determine income inequality. Lee (2011) also assessed the innovation-inequality nexus across a panel of European economies from the European Community Household Panel and the Eurostat Regio database over the period 1996 - 2001. Using fixed-effect regression methods, the author showed a positive effect of innovation on income inequality. Lee further revealed that the nexus was robust when patent count is used as a measure of innovation. Buttressing these results, Lee & Rodríguez-pose (2013) also confirmed a positive innovation-inequality association in Europe after extending the analysis to other 80 U.S. cities, using microdata from the IPUMS Current Population Survey. Evidence of less-flexible labor market conditions and lower levels of migration were seen to drive the nexus between innovation and inequality in Europe than in the U.S. Rodríguez-Pose & Crescenzi (2008) analyzed the link between investment in R&D, patents, and economic growth in

Europe. They found that R&D investment is more conducive to economic growth because of its impact on performance in both local and neighboring regions. In the case of developing countries, Adams (2008) investigated the effects of globalization and intellectual property rights on income inequality for 62 developing countries from 1985 – 2001 using seemingly unrelated regression. The findings demonstrated that strengthening patent protection indeed impacted positively on income inequality. Seo et al. (2020) tested the impact of income inequality on growth of 43 countries from 1991 to 2014 using 3SLS regression. They found negative relationship between inequality and investment but did not find correlation between technological innovation and income inequality. Zhang & Zhang (2015) investigated the role of innovation on income inequality in China using instrument variable regression on longitudinal data from 1995 to 2011. The authors found U-shaped relationship between innovation and the ratio of urban-rural income. They further revealed that large amounts of innovation may increase income inequality. Given that institutional quality and governance play an important role in economic development (Azman-Saini, Hook Law, & Azman-Saini, 2012), some degree of influence may govern the relationship between innovation and income inequality. Innovators may prefer send their innovations to countries where their inventions will be safeguarded.

### 1.2.2 Entrepreneurship and income inequality nexus

Entrepreneurship as a concept has been defined and conceptualized in different ways. Various scholars have often adopted different definitions and conceptualizations that suit the purpose of their studies, thus leading to a wide range of definitions. While some envisage entrepreneurship as a transforming process turning innovative ideas into an enterprise and/or managing the enterprise to create value, others are of the view that entrepreneurship entails the risk bearing

decisions about coordination of scarce resources (Casson, 2003). From Schumpeter's perspective, entrepreneurship is the foundation for the commencement of innovative activity and the creation of new products to market. According to Kirzner, entrepreneurship consists of competitive behaviours that drive market process. This includes the introduction of new economic activity. Such entrepreneurship is manifested not only by market entry of new firms, but also by innovative and imitative entries into new markets by established firms. As noted in Wong et al. (2005), innovation is in fact one aspect of entrepreneurship, that of innovative entry. Another aspect of entrepreneurship is the new firm entry or new business creation. In spite of the numerous conflicting views characterizing the definition and conceptualization of entrepreneurship, scholars have begun to re-examine how the decisions of profit-maximizing agents (entrepreneurs) influence the impact of technological advancement on both growth and income inequality. The latest class of empirical models which conceptualized the issue of entrepreneurship, along the lines of Schumpeterian growth model, rose from the works of (Aghion & Howitt, 1998; Romer, 1990). In the entrepreneurship literature, Schumpeterian theories show the importance of entrepreneurial skills in economic transformation, and how an increase in the number of entrepreneurs leads to economic growth. These theories have led to a differentiation between entrepreneurs stemming out of the lack of opportunities, and "Schumpeterian" entrepreneurs who exploit some latent market opportunities (Stephens, Partridge, & Faggian, 2013). Acs (2006) examined that "entrepreneurship of necessity" may not necessarily translate into long-term economic growth compared to "entrepreneurship of opportunity". Evidence from Stephens & Partridge (2011) showed stronger effects for opportunity entrepreneurship; they found that all forms of business creation are also associated with faster Appalachian job growth. Scholars such as Lippmann et al. (2015) show that high-income inequality occurs when majority of the population is found in the lower income spectrum

and, as such, necessity entrepreneurship becomes the only means for low-income individuals to maintain a certain level of wellbeing. Others, also demonstrated that positive returns that the rich receive from their investments in entrepreneurial activities further worsen the income gap between high-and-low income earners, creating vicious cycle of wealth concentration at the top and poverty at the bottom of the income distribution (Alvaredo et al. 2017; Piketty, 2015). Based on Schumpeterian growth theory, Aghion *et al.* (2019) proposed an economic model that assumes that national income is divided between workers and entrepreneurs. The authors demonstrated that in some economic sectors, such as the high-technological ones where capital gains (mark-up) exist, entrepreneurs and business leaders earn the largest share of the capital gains that accrue to the firms (Benos & Tsiachtsiras, 2019) and this top income share increases when it is owned by all the entrepreneurs who have innovated successfully. Stephens et al. (2013) showed that regardless of the source, new business creation has three general effects on the economy: (i) the direct effect of creating jobs, (ii) the displacement effect (new businesses take jobs away from existing businesses; and (iii) the indirect (or spillover) effects on other businesses (Fritsch & Mueller, 2004). The direct and indirect effects should increase total employment and the displacement effects should lower total employment. Self-employment may have greater direct employment and income distributive effects due to its more labor-intensive production. The indirect effects include the "multiplier" effects caused by creation of subsidiary firms across countries. Likewise, intangible spillovers can arise when knowledge or business model created by one business "spills over" into the immediate geographic region (Puga, 2010). In examining the impacts of entrepreneurs, it is important to recognize that because the indirect effects may take time to materialize, the full effects from entrepreneurial development may only be realized over the longer term.

Empirically, studies including (Cagetti & Nardi, 2006; Halvarsson et al., 2018; Lewellyn, 2018; Lippmann et al., 2015; Ragoubi & El Harbi, 2018) have examined the entrepreneurship – inequality linkages. They find that high entrepreneurial activity is associated with upward social mobility (Bruton, Ketchen, & Ireland, 2013; Halvarsson et al., 2018). Aligned with this view is that entrepreneurship leads to job creation for those at the bottom of the income distribution (Hathaway, Bell-Masterson, & Stangler, 2013; Stangler & Litan, 2009). Thus, job-creating entrepreneurial activities that enhance opportunities for those at the bottom of the distribution to increase their income and thereby increasing the level of income dispersion. Despite this, others are of the view that the 'rich' people possess incentive mechanisms that limit access to resources that engenders income redistribution (Acemoglu & Johnson, 2005; Stiglitz, 2012) and therefore increasing inequality at the expense of social mobility for the disenfranchised. Employing data from the Global Entrepreneurship Monitor, Lippmann et al., (2015) examined the relationship between workforce income inequality and the rate of entrepreneurship. The authors found higher rates of entrepreneurship among economies with high income inequality. Their evidence was suggestive of the fact that structural factors, including the level of economic development, government policies, foreign direct investment, service sector growth, increasing labor market flexibility, wealth-transfer programs and variation in worker unionization have a significant influence on the entrepreneurship-income inequality relationship. Employing a system GMM model with U.S. state-level data, Atems & Shand (2018) examined the relationship between entrepreneurship and income inequality for the period from 1989 to 2013. Their findings showed a positive relationship between entrepreneurship and income inequality. In a fuzzy-set qualitative comparative analysis, Lewellyn (2018) found a positive association between income

inequality and the high presence of high-growth (opportunity) and necessity entrepreneurship1. Deutsch & Silber (2004) found that income inequality only increased with a rise in labor income share and declined with a fall in the share of entrepreneurial income, revealing a positive relationship between entrepreneurial income and income inequality. Aligned with this argument, Quadrini (2000) shows that entrepreneurship leads to a larger concentration of wealth due to a higher savings rate of entrepreneurs. In terms of low-and-middle income countries, (Ragoubi & El Harbi, 2018) examined entrepreneurship and income inequality dynamics, using spatial panel data analysis for 33 high-income countries and 39 middle and low-income countries over the period from 2004 to 2014. They found strong support for the negative spillover effect of income inequality on entrepreneurial activity in developing economies. Kimhi (2010) analyzed the impact of entrepreneurship on household income inequality in southern Ethiopia using inequality decomposition technique. The findings showed a decreasing effect of entrepreneurial income (income from self-employment) on household income inequality. However, this study fails to account for the spatial effect of entrepreneurship on household income inequality. Employing a two-stage least squares regression, Berkowitz & Jackson, (2006) also show that higher rates of entry of new enterprises led to a more equitable distribution of income in Russia and Poland. Mohamad et al. (2021) examine the role of entrepreneurship on income inequality in developing countries using a sample of 47 countries over the period 2009 – 2017. Results from the Generalized Method of Moments (GMM) show that increasing the level of entrepreneurship may decrease income inequality.

1 Opportunity entrepreneur is defined to include individuals who start businesses to exploit a potential opportunity to increase their income and are mostly associated with more growth-oriented businesses. Necessity entrepreneurs, on the other hand, are individuals who are pushed into entrepreneurship out of necessity or seek only to maintain their income (Bosma & Kelley, 2019).

## 1.3 Research Method

### 1.3.1 Data Sources

In this paper, we test the hypotheses for two groups of countries. The list of countries is based on income. We employ World Bank 2020 country classifications[2]. Due to the low number of low-income countries, we merged middle-and low-income countries to form one set of countries called the middle-and low-income countries and high-income countries. The justification of these categorization is based on socioeconomic and political differences, hence eliminating to some extent the level of heterogeneity that otherwise might influence the models (see Ragoubi & El Harbi, 2018). Thus, the middle-and low-income countries are 64 and high-income countries are 25. We use annual macroeconomic data covering the period 2000 – 2016. The limiting constraints to our sample size was the availability of reliable data on the various indicators for the period of analysis, specifically income inequality, entrepreneurship indicator and innovation. Our dependent variable is the Gini coefficient of disposable income, which measures the degree of within-country income inequality. The Gini coefficient of disposable income ranges between 0 and 100, with a value of hundred expressing maximum concentration of income, and zero, implying egalitarian distribution of income. The income inequality indicator is obtained from the Standardized World Income Inequality Database (SWIID v8.3). We control for the effect of real income (GDP per capita) and trade openness, all extracted from the World Development Indicators (WDI). We also control for institutional quality which is derived from the World Bank Governance Indicators (WBGI).

2 See Appendix 1. 2 for list of countries.

A key variable in this paper is the innovation. This indicator has been measured in prior studies using different indicators including patent count, research and development (R&D) as a share of GDP, product and process innovation, total factor productivity, and innovation in exports. In this study, we use patent applications based on equivalized counts. Statistics on the patent applications are extracted from the World Intellectual Property Organization (WIPO). Another relevant variable considered in this paper is entrepreneurship. Various scholars in the entrepreneurship literature have used unique indicators, including self-employment (Atems & Shand, 2018; Halvarsson et al., 2018; Kimhi, 2010; Stephens & Partridge, 2011; Stephens et al., 2013), the number of new business density (Ragoubi & El Harbi, 2018), total entrepreneurship activities (TEA) from Global Entrepreneurship Monitor (Galindo & Méndez-Picazo, 2013; Wennekers & Thurik, 1999; Wong et al., 2005) the data for TEA is limited particularly in the case of middle-and-low income countries, only 60 countries across the world are sampled for this survey. This inappropriate for this study due to the absence of contiguity among some of the countries covered. Similarly, the new business density which measures formal entrepreneurship is also limited in scope (both time and number of countries). Self-employment, although may not connote modern day definition of entrepreneurship but is the most widely available proxy for all countries. It must be noted that though self-employment data can be used across countries when collected from standardized sources, it is arguably not an appropriate measure of (actual) formal entrepreneurship (see Desai, 2011) but rather a good proxy for entrepreneurial activity (Wennekers & Thurik, 1999) as such can be interpreted to some extent as a measure of entrepreneurial potential. For brevity, we dwell on self-employment as a measure of entrepreneurial activity in this study and use the new business density data for sensitivity analysis. See Appendix 1. 1 for summary of variables description.

### 1.3.2 Econometric Model

To test our hypotheses, we use a neo-classical growth model based on a variant of the Cobb–Douglas production function with constant return to scale (see Wong et al., 2005). Entrepreneurial activity and innovation are entered explicitly as exogenous determinants of income, representing two aspects of entrepreneurial activities. In this formulation, new firm creation and innovation may be considered as augmenting factors of production, with innovation representing knowledge capital and new firm creation representing a form of entrepreneurial capital. The Cobb Douglas production function for cross section is derived as follows:

$$Y = A^0 K^\alpha L^\beta \tag{1}$$

where $Y$ = output or income; $A^0$ = disembodied factor productivity; $K$ = stock of physical capital and $L$ = labor employed.

$$y = A^0 K^\alpha L^{\beta-1} \tag{2}$$

Multiplying right hand side by $\frac{L^\alpha}{L^\alpha}$

$$y = A^0 \left(\frac{K}{L}\right)^\alpha L^{\alpha+\beta-1} \tag{3}$$

Assuming Constant Returns to Scale, $\alpha + \beta - 1$. Hence

$$y = A^0 \left(\frac{K}{L}\right)^\alpha \tag{4}$$

Taking natural logs on both sides:

$$\ln y = \ln A^0 + \alpha \ln \left(\frac{K}{L}\right) \tag{5}$$

We assume the growth in disembodied factor productivity, $A^0$, to be explained by stock of knowledge capital (innovation) and entrepreneurial activity:

$$\ln A^0 = \beta^0 + \phi PCT + \lambda ENT, \tag{6}$$

where $\beta^0$ = constant; Innov = innovation index measuring innovation; ENT = self-employment rate measuring entrepreneurial activity. Substituting (6) into (5):

$$\ln y = \beta^0 + \phi PCT + \lambda ENT + \alpha \ln\left(\frac{K}{L}\right) \tag{7}$$

We control for real income, government spending and institutional quality in the (7). The generic form of regression model used is;

$$\ln y = \beta^0 + \phi PCT + \lambda ENT + \alpha \ln\left(\frac{K}{L}\right) + \delta \ln(GDPC) + \gamma \ln(OPN) + \theta \ln(INSTQ) \tag{8}$$

To examine the moderating role of institutional quality with both innovation and entrepreneurial activity in influencing income inequality, we extend (8) to include the interaction term. The new model is specified as follows:

$$\begin{aligned} \ln y = \beta^0 + \phi IPCT + \lambda ENT + \alpha \ln\left(\frac{K}{L}\right) + \delta \ln(GDPC) + \gamma \ln(OPN) + \theta Instq \\ + \tau(PCT * INST) + ב(ENT * INST) \end{aligned} \tag{9}$$

Real income is included in the model because it has been demonstrated empirically to have moderating effect on income inequality (Law, Naseem, Lau & Trinugroho, 2020). Institutional quality is included because better institutions tend to reduce income inequality (Chong & Gradstein, 2007; Lin & Fu, 2016) and better institution motivate profit maximizing entrepreneurs to innovate (Keller, 2004). Trade openness is also controlled because it has been found to influence income inequality particularly in middle and low income countries following the Stopler and Samuelson's theorem of international trade (Mazur, 2000).

### 1.3.3 Methodological Approach

In this study, we adopt the spatial panel regression model to test our hypotheses. The spatial model addresses data with spatial dependence and temporal heterogeneity. In this paper, three of the spatial panel specifications would be considered. The spatial lag model (SAR), spatial error model (SEM) and the spatial Durbin model (SDM). The SAR model is of the form:

$$y = \rho(I_T \otimes W_N)y + X\beta + (\iota_T \otimes I_N)\mu + (I_T \otimes \iota_N)\eta + u \quad (10)$$

where $\rho$ is the SAR coefficient. where y is an ($NT \times 1$) vector of observations on the dependent variable; $X$ is an ($NT \times k$) matrix of observations on the non-stochastic exogenous regressors. $\iota_T$ denotes a ($T \times 1$) column vector of ones of length $T$. The coefficient $\mu$ denotes the individual effect (or heterogeneity) for each country, and $\eta$ denotes the time-period effect. $\iota_N$ denotes a ($N \times 1$) column vector of ones of length $N$. $I_N$ denotes an ($N \times N$) identity matrix, and $I_T$ is an identity matrix of dimensions ($T \times T$). $\otimes$ denotes the Kronecker product. Since we are dealing with a spatial panel, the weights are extended to the entire panel as follows:

$$W_{NT} = (I_T \otimes W_N) \quad (11)$$

where $I_T$ denotes an (T × T) identity matrix, $\otimes$ is the Kronecker product, and $W_N$ is an (N × N) positive non-stochastic cross-sectional spatial weighting matrix whose diagonal elements are set to zero. Following the general convention, the weights $W_{ij}$ are standardized so that each row of the matrix $W_N$ sums to unity. The SEM is also expressed as follows:

$$y = X\beta + (\iota_T \otimes I_N)\mu + (I_T \otimes \iota_N)\eta + u \quad (12)$$
$$u = \lambda(\iota_T \otimes I_N)u + \varepsilon$$

where $u$ reflects the spatially autocorrelated error term and $\lambda$ denotes the coefficient on the error term. The SDM model extends the SAR/SEM model with spatially lagged independent variables, and is specified as follows:

$$y = \delta(I_T \otimes W_N)y + X\beta + \gamma(I_T \otimes W_N)X + (\iota_T \otimes I_N)\mu + (I_T \otimes \iota_N)\eta + u \quad (13)$$

where the parameters are the same as before but the parameter $\gamma$ denotes a coefficient on the explanatory variables.

The SDM model can be used to check if the model is nested in a SAR model or a SEM model since the models nesting depends on both the disturbances and the dependent variable (LeSage & Pace, 2009; Elhorst, 2014). Then, this model can be used to test the hypotheses H0 :$\gamma = 0$ and H0 :$\gamma + \delta\beta = 0$. The first hypothesis examines whether the SDM model is nested in the SAR model, and the second hypothesis whether it is nested in the SEM model. Both tests follow a chi-square distribution with K degrees of freedom. If the SAR and the SEM models are estimated separately, these tests can take the form of a likelihood ratio (LR) test in order to determine which model provides the best fit for the data (Elhorst 2014). If these models are not estimated, the LR tests can also be complemented with Wald tests. It must be noted that if both hypotheses H0: $\gamma = 0$ and H0 :$\gamma + \delta\beta = 0$ are rejected, then the SDM model best describes the data. On the contrary, if the first hypothesis cannot be rejected, then the SAR model best describes the data, provided that the (robust) LM tests also pointed to the SAR model. Likewise, if the second hypothesis cannot be rejected, then the SEM model best describes the data, provided that the (robust) LM tests also pointed to the SEM model. Elhorst (2014) argue that if one of these conditions is not satisfied, that is, if the (robust) LM tests point to another model than the Wald/LR tests, then the SDM model should be adopted. This is because this model generalizes both the SAR model and the SEM model.

### 1.4 Empirical results and discussions

Here, we present the empirical results. Table 1. 1 reports a summary of the descriptive statistics of the variables. We report mean self-employment rate of 14.94% of total employment for high income countries and 24.20% for the middle-and low-income countries. Particularly, the results show higher percentage of self-employment activities in the middle-and low-income countries than seen in the high-income countries. This is supported by the mean of employers in high

income countries to that in the middle-and low-income countries. Also, we find that on the average the percentage of own-account workers are higher in middle and low-income countries than we see in high income countries.

Table 1. 1: Descriptive Statistics

| | High-income countries | | | | | Middle-and low-income countries | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Variable** | *Obs* | *Mean* | *Std. Dev.* | *Min* | *Max* | *Obs* | *Mean* | *Std. Dev.* | *Min* | *Max* |
| *Self-employment* | *425* | *14.94* | *6.61* | *6.39* | *46.11* | *1,088* | *54.44* | *24.20* | *4.06* | *94.66* |
| *Employer* | *425* | *4.00* | *1.36* | *1.04* | *7.49* | *1,088* | *2.98* | *2.62* | *0.21* | *17.88* |
| *Own-account* | *425* | *9.26* | *4.32* | *2.24* | *24.58* | *1,088* | *35.68* | *18.02* | *2.07* | *88.52* |
| *Entry rate* | *425* | *2.14* | *0.68* | *0.45* | *3.66* | *1,088* | *0.73* | *0.72* | *0.21* | *3.09* |
| *Government spending* | *425* | *19.71* | *3.26* | *10.91* | *27.94* | *1,088* | *13.77* | *4.27* | *0.95* | *28.01* |
| *Gini coefficient* | *425* | *29.17* | *3.85* | *22.60* | *38.50* | *1,088* | *42.22* | *7.78* | *23.00* | *66.90* |
| *GDP per capita* | *425* | *38,007.37* | *24,310.01* | *4,899.18* | *111,968.40* | *1,088* | *3,462.66* | *3,104.16* | *194.87* | *14,920.45* |
| *Institutional quality* | *425* | *3.14* | *1.26* | *-0.48* | *5.11* | *1,088* | *-1.36* | *1.15* | *-4.87* | *1.25* |
| *Innovation* | *425* | *33146.89* | *85322.46* | *19.00* | *530659* | *1,088* | *6919.43* | *64888.63* | *0.00* | *1257425.0* |
| *Capital per worker* | *425* | *0.35* | *0.17* | *0.05* | *0.95* | *1,088* | *0.07* | *0.06* | *0.002* | *0.30* |

*Source: authors computation*

For new business density (entry rate), we report a mean value of 2.14 for high income countries and a mean of 0.73 for middle and low-income countries. In this regard, we hypothesize that lower rate of self-employment signifies a higher entrepreneurship while higher values of self-employment denote a lower level of entrepreneurship. In line with prior studies (Halvarsson et al., 2018),we expect that a higher proportion of self-employed increases income dispersion, while lower self-employed in the workforce contribute to income dispersion at the top end of the distribution. This is in line with Desai (2011) that suggest a strong small business sector and entrepreneurship are generally linked to a strong economy. On income inequality, the Gini coefficient of disposable income show high inequality for middle-and low-income countries, recording a mean of 42.22. The results show a minimum and maximum of Gini coefficient of 23.00 and 66.90, respectively. For high income countries, the Gini coefficient of income inequality shows a mean of 29.17 with a minimum (maximum) of 22.60 (38.50). Figure 1. 1 shows the plot

of the Gini coefficient of disposable income. This shows the pattern of income inequality in both the high income and the middle and low-income countries.

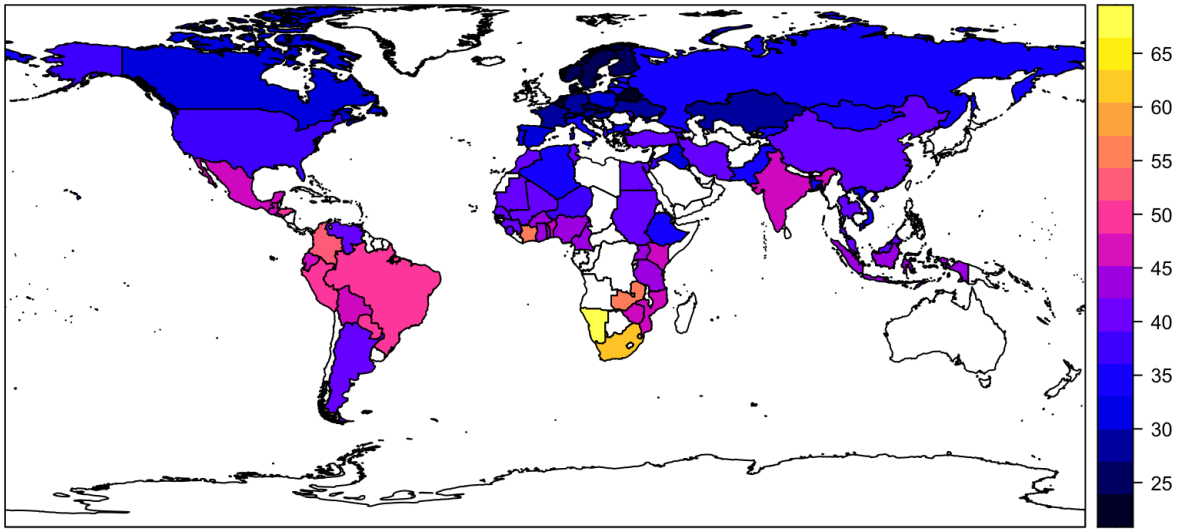


Figure 1. 1: Plot of average Gini coefficient of disposable, 2000 – 2016

In terms of innovation, we record a mean of 0.56 for high income countries and a mean of -0.19 for middle- and low-income countries. For capital per worker, we report mean of 0.35 for high income countries and 0.07 for middle- and low-income countries. Also, we find higher GDP per capita in high income countries (US$ 38,007.37) compared to a mean of US$ 3,462.66 for the middle- and low-income countries. Similar, we find higher government spending (measured by government final consumption expenditure) 19.71% in high income countries and 13.77% in middle- and low-income countries. We report a mean of 3.14 (-1.36) for high income countries (middle- and low-income countries) for institutional quality. Figure 1. 2**Errore. L'origine riferimento non è stata trovata.** shows the scatterplot of Gini coefficient of income inequality and innovation, and with self-employment.

Table 1. 2 presents the results of the non-spatial regression based on pooled OLS. The estimated coefficients on self-employment (*lnSELF*) conform with expectations. Specifically, we find

evidence of positive relationship between self-employment and income inequality for middle- and low-income countries.

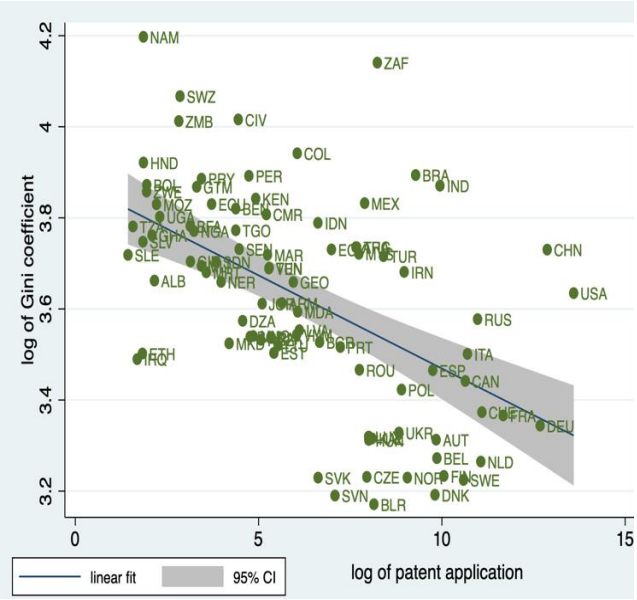


Figure 1. 2**:** Scatterplot of Gini and Innovation

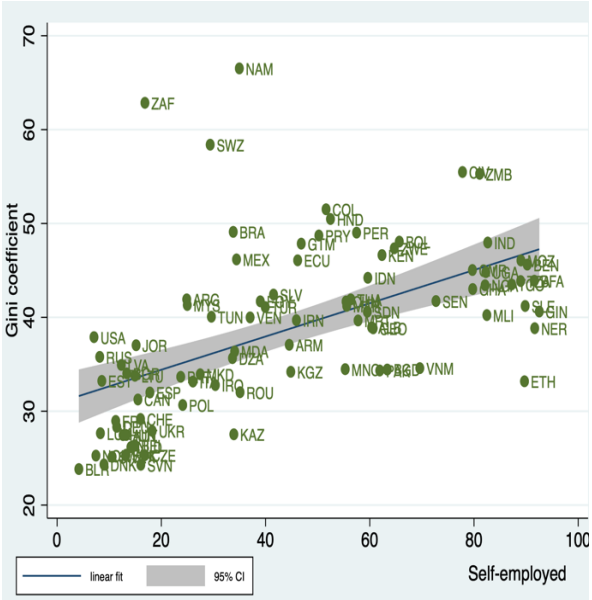


Figure 1. 3: Scatterplot of Gini and Self-employment.

But negative relationship for high-income countries. Also, for middle- and low-income countries, coefficients of innovation (*lnPCT*) are all negative suggesting low levels of innovation reduces income inequality. For high income countries, the coefficient shows negative innovation-inequality nexus. Except the relationship between innovation and income inequality for high income countries, all the other findings are in line with our expectations. The coefficient on real income is consistent with prior studies (see Dulani, Mattes, & Logan, 2013). The negative relationship between trade openness (*lnOPN*) and income inequality is in line with the Stolper–Samuelson theorem (Esquivel & Rodrıguez-López, 2003) but contrary to (Bergh & Nilsson, 2010; Mazur, 2000). The coefficients on institutional quality and its interactive terms also conform with general expectation of the behavior of institutions in both high income and middle-and-low income countries. The Moran's I which is the correlation between income inequality in the focal

country and that of its neighbors is positive and significant at 1% level. This shows the presence of strong spatial dependence, implying that countries with similar income distribution (high or low) tend to be concentrated geographically.

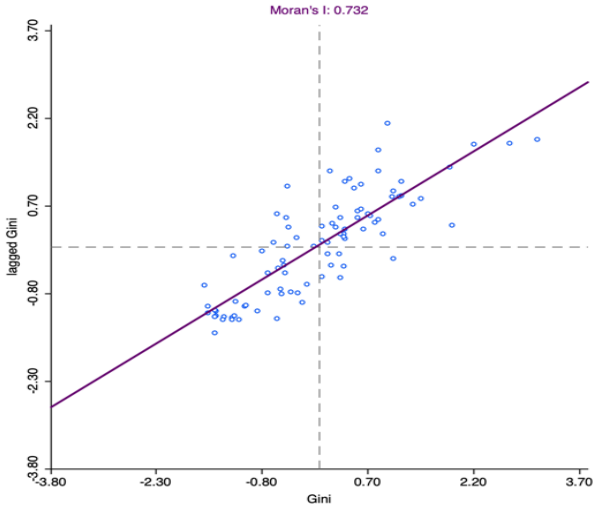


Figure 1. 4**:** Moran's I plot of average Gini coefficient of disposable, 2000 - 2016.

Figure 1. 4, illustrate the graphical representation of the Moran I test. Due to the presence of spatial autocorrelation, the non-spatial panel model may suffer from misspecification if spatial dependence exists within the data. From policy standpoint, the results of the non-spatial model may lead policy makers to believe that adopting a particular policy stands, such as encouraging both innovation and entrepreneurship, will result in higher economic growth but at the expense of inequality.

Table 1. 2: Results of non-spatial panel model

| **Models** | **Model without interaction** | | | **Model with Interaction** | | |
|---|---|---|---|---|---|---|
| | ***Overall Sample*** | ***High income*** | ***Middle-and low income*** | ***Overall Sample*** | ***High income*** | ***Middle-and low income*** |
| *ln[K/L]* | -0.3422*** | 0.3478*** | -0.9614*** | -0.4783*** | 0.3627*** | -0.9620*** |
| | [0.0550] | [0.0570] | [0.1268] | [0.0529] | [0.0581] | [0.1296] |
| *lnPCT* | -0.0188*** | -0.0339*** | -0.0185*** | -0.0146*** | -0.0079** | -0.0156*** |
| | [0.0021] | [0.0121] | [0.0028] | [0.0021] | [0.0040] | [0.0020] |
| *lnSELF* | 0.1513*** | -0.1614*** | 0.0664*** | 0.1454*** | -0.0524*** | 0.1454*** |
| | [0.0105] | [0.0273] | [0.0144] | [0.0106] | [0.0152] | [0.0110] |
| *lnRGDPC* | 0.0652*** | -0.0439* | 0.1183*** | 0.0676*** | -0.0941*** | 0.1165*** |
| | [0.0081] | [0.0264] | [0.0085] | [0.0082] | [0.0243] | [0.0086] |
| *lnOPN* | -0.0871*** | -0.1696*** | -0.0531*** | -0.0673*** | -0.1578*** | -0.0559*** |
| | [0.0105] | [0.0145] | [0.0107] | [0.0104] | [0.0147] | [0.0110] |

| | | | | | | |
|---|---|---|---|---|---|---|
| *INST* | -0.0121 | -0.2212*** | 0.2667*** | -0.0139*** | -0.0196** | 0.0442*** |
| | [0.0158] | [0.0468] | [0.0300] | [0.0033] | [0.0098] | [0.0042] |
| *lnPCT*INST* | | | | -0.0039*** | 0.0072** | -0.0026 |
| | | | | [0.0008] | [0.0034] | [0.0016] |
| *lnSELF*INST* | | | | 0.0092** | 0.0436*** | -0.0568*** |
| | | | | [0.0038] | [0.0089] | [0.0070] |
| Constant | 3.1118*** | 5.3255*** | 2.9765*** | 2.9892*** | 5.1920*** | 2.7019*** |
| | [0.1103] | [0.2321] | [0.1150] | [0.1113] | [0.2372] | [0.1135] |
| Observation | 1513 | 425 | 1088 | 1513 | 425 | 1088 |
| R-squared | 0.5297 | 0.4449 | 0.4039 | 0.5104 | 0.4099 | 0.3654 |
| AIC | -1200.7194 | -761.1573 | -1134.0707 | -1143.8625 | -739.1477 | -1070.0264 |
| F- stat | 261.6[0.000] | 48.4[0.000] | 103.8[0.000] | 211.7[0.000] | 41.68[0.000] | 91.39[0.000] |
| Moran I statistic | 7.784[0.000] | 8.572[0.000] | 11.397[0.000] | 9.074[0.000] | 8.616[0.000] | 9.851[0.000] |
| LM spatial error | 59.476[0.000] | 69.753[0.000] | 127.38[0.000] | 80.767[0.000] | 69.892[0.000] | 94.819[0.000] |
| LM spatial lag | 41.185[0.000] | 64.29[0.000] | 90.148[0.000] | 49.313[0.000] | 73.183[0.000] | 76.525[0.000] |
| Robust LM spatial error | 18.918[0.000] | 8.548[0.003] | 37.318[0.000] | 31.563[0.000] | 4.932[0.026] | 19.462[0.000] |
| Robust LM spatial lag | 0.626[0.4287] | 3.085[0.079] | 0.084[0.773] | 0.109[0.7406] | 8.222[0.004] | 1.1681[0.279] |

*$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$*

We proceed to test for the presence of spatial dependence by conducting the classical Lagrange Multiplier (LM) tests. These results are listed at the bottom of

Table 1. 2. From the diagnostics, the results favor spatially autocorrelated error terms since we find consistent rejection of the hypothesis of no spatially autocorrelated error dependence except for column 6. Since the LM test is not enough to pick the best model, a further test using the LR tests are reported to find the appropriate specification. We estimate a spatial durbin model, reported in

Table 1. 3. The LR test on the hypothesis whether spatial durbin model is nested in the spatial error model is rejected: overall sample (LR test: 85.569, p<0.01), high income countries (LR test: 65.474, p<0.01) and middle- and low-income countries (LR test: 54.878, p<0.01). The first hypothesis (H0: $\gamma = 0$) could not be rejected, implying that spatial durbin model is the most appropriate specification. The test results indicate that the second hypothesis (H0 :$\gamma + \delta\beta = 0$) could be also rejected, which implies that the SEM is not appropriate based on tests conducted on the overall sample. These LR tests pre-suggest that the SDM with an error component is most

appropriate specification for this relationship.

Table 1. 3**:** Results of Spatial Durbin Model (SDM)

| Model | Model without interaction | | | Model with interaction | | |
|---|---|---|---|---|---|---|
| | *Overall Sample* | *High income* | *Middle-and low income* | *Overall Sample* | *High income* | *Middle-and low income* |
| **Lambda (*λ*)** | 0.1894*** | 0.3657*** | 0.3100*** | 0.2222*** | 0.3701*** | 0.2685*** |
| | [0.0284] | [0.0426] | [0.0297] | [0.0279] | [0.0425] | [0.0304] |
| *ln[K/L]* | -0.4472*** | 0.2787*** | -1.0249*** | -0.2799*** | 0.2381*** | -1.0222*** |
| | [0.0515] | [0.0517] | [0.1243] | [0.0532] | [0.0508] | [0.1221] |
| *lnPCT* | -0.0159*** | 0.0038 | -0.0175*** | -0.0213*** | 0.0009 | -0.0223*** |
| | [0.0020] | [0.0038] | [0.0019] | [0.0021] | [0.0120] | [0.0027] |
| *lnSELF* | 0.1327*** | -0.0262* | 0.1241*** | 0.1348*** | -0.1297*** | 0.0579*** |
| | [0.0106] | [0.0147] | [0.0109] | [0.0104] | [0.0244] | [0.0140] |
| *lnRGDPC* | 0.0615*** | -0.1043*** | 0.1129*** | 0.0554*** | -0.0720*** | 0.1151*** |
| | [0.0082] | [0.0218] | [0.0082] | [0.0081] | [0.0256] | [0.0081] |
| *lnOPN* | -0.0875*** | -0.1422*** | -0.0797*** | -0.1095*** | -0.1443*** | -0.0769*** |
| | [0.0104] | [0.0136] | [0.0108] | [0.0104] | [0.0133] | [0.0105] |
| *INST* | -0.0123*** | -0.0056 | 0.0452*** | -0.0102 | -0.1314*** | 0.2432*** |
| | [0.0033] | [0.0090] | [0.0041] | [0.0154] | [0.0456] | [0.0281] |
| *lnPCT*INST* | | | | -0.0045*** | 0.0008 | -0.0041*** |
| | | | | [0.0008] | [0.0033] | [0.0015] |
| *lnSELF*INST* | | | | 0.0107*** | 0.0396*** | -0.0484*** |
| | | | | [0.0037] | [0.0078] | [0.0066] |
| *W*ln[K/L]* | -0.1059 | 0.1668** | 0.2827* | -0.1984*** | 0.1624** | 0.2847* |
| | [0.0755] | [0.0739] | [0.1684] | [0.0761] | [0.0721] | [0.1657] |
| *W*lnPCT* | 0.0086*** | -0.0174*** | 0.0121*** | 0.0123*** | -0.0331** | 0.0161*** |
| | [0.0029] | [0.0048] | [0.0025] | [0.0029] | [0.0143] | [0.0037] |
| *W*lnSELF* | 0.0074 | -0.0401** | 0.0007 | 0.0037 | -0.0054 | -0.0209 |
| | [0.0150] | [0.0171] | [0.0147] | [0.0149] | [0.0345] | [0.0181] |
| *W*lnRGDPC* | 0.0105 | 0.0350 | -0.0278** | 0.0148 | 0.0370 | -0.0216* |
| | [0.0114] | [0.0294] | [0.0117] | [0.0112] | [0.0319] | [0.0117] |
| *W*lnOPN* | 0.0869*** | 0.0204 | 0.0771*** | 0.0974*** | 0.0070 | 0.0739*** |
| | [0.0140] | [0.0182] | [0.0140] | [0.0140] | [0.0184] | [0.0138] |
| *W*INST* | -0.0035 | -0.0115 | -0.0175*** | -0.0036 | -0.0174 | 0.0511 |
| | [0.0046] | [0.0113] | [0.0055] | [0.0209] | [0.0560] | [0.0407] |
| *W* [lnPCT*INST]* | | | | 0.0028** | 0.0041 | 0.0027 |
| | | | | [0.0011] | [0.0040] | [0.0021] |
| *W*[lnSELF*INST]* | | | | -0.0067 | -0.0107 | -0.0214** |
| | | | | [0.0050] | [0.0111] | [0.0093] |
| Constant | 1.9652*** | 3.5953*** | 1.5578*** | 1.9295*** | 3.7001*** | 1.9688*** |
| | [0.1759] | [0.3635] | [0.1730] | [0.1725] | [0.3685] | [0.1809] |
| Observation | 1513 | 425 | 1088 | 1513 | 425 | 1088 |
| R-squared | 0.5431 | 0.5885 | 0.4590 | 0.5712 | 0.6154 | 0.4872 |
| Log Likelihood | 623.6471 | 441.9769 | 610.9293 | 668.3151 | 456.0200 | 644.9055 |
| AIC [Spatial model] | -1217.2941 | -853.9538 | -1191.8586 | -1298.6301 | -874.0401 | -1251.8110 |

*$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$*

We now turn to the economic interpretation of the results based on the SDM model. All

the values of ($\lambda$) are positive and statistically significant at the conventional level of 1%. An interpretation suggests that the pattern of income inequality in neighboring countries, averagely exert a positive effect on local income inequality. Since income inequality is estimated based on income/consumption across countries, this coefficient implies that economic distance across countries is affecting local income distribution or vice versa. Economic distance in the high-income countries could potentially represent movement of wealth while that of the middle-and low-income countries could represent movement of food commodity (if income inequality is consumption-based approach). Note that coefficients of the SDM model do not directly reflect the marginal effects of the covariates (LeSage & Pace 2009), hence we interpret the results of the marginal effects presented in Table 1. 4.

Table 1. 4: Marginal impact of innovation, self-employment and income inequality

**Model without interaction terms**

| *Model* | *Overall Sample* | | | *High income* | | | *Middle-and low income* | | |
|---|---|---|---|---|---|---|---|---|---|
| *Impacts* | *Direct* | *Indirect* | *Total* | *Direct* | *Indirect* | *Total* | *Direct* | *Indirect* | *Total* |
| *ln[K/L]* | -0.4590*** | -0.2233** | -0.6823*** | 0.3241*** | 0.3782*** | 0.7024*** | -1.0290*** | -0.0466 | -1.0756*** |
| | [0.0447] | [0.1034] | [0.1407] | [0.0309] | [0.1143] | [0.0952] | [0.0274] | [0.2455] | [0.2484] |
| *lnPCT* | -0.0156*** | 0.0065* | -0.0091** | 0.0011 | -0.0226*** | -0.0215* | -0.0167*** | 0.0088*** | -0.0079* |
| | [0.0023] | [0.0042] | [0.0042] | [0.0055] | [0.0063] | [0.0091] | [0.0029] | [0.0021] | [0.0042] |
| *lnSELF* | 0.1347*** | 0.0382*** | 0.1729*** | -0.0346*** | -0.0700*** | -0.1046*** | 0.1287*** | 0.0521*** | 0.1808*** |
| | [0.0172] | [0.0139] | [0.0291] | [0.0137] | [0.0269] | [0.0240] | [0.0104] | [0.0124] | [0.0149] |
| *lnRGDPC* | 0.0629*** | 0.0260*** | 0.0888*** | -0.1048*** | -0.0044*** | -0.1092*** | 0.1138*** | 0.0096 | 0.1234*** |
| | [0.0092] | [0.0078] | [0.0089] | [0.0163] | [0.0344] | [0.0297] | [0.0089] | [0.0126] | [0.0195] |
| *lnOPN* | -0.0831*** | 0.0825*** | -0.0007 | -0.1475*** | -0.0445*** | -0.1921*** | -0.0735*** | 0.0697*** | -0.0038 |
| | [0.0149] | [0.0143] | [0.0288] | [0.0162] | [0.0228] | [0.0180] | [0.0103] | [0.0123] | [0.0194] |
| *INST* | -0.0126*** | -0.0068 | -0.0194** | -0.0079* | -0.0190* | -0.0270*** | 0.0448*** | -0.0046 | 0.0402*** |
| | [0.004] | [0.0064] | [0.0098] | [0.0055] | [0.0095] | [0.0047] | [0.0028] | [0.0069] | [0.0073] |

*$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$*

‹

**Model with interaction terms**

| *Model* | *Overall Sample* | | | *High income* | | | *Middle-and low income* | | |
|---|---|---|---|---|---|---|---|---|---|
| *Impacts* | *Direct* | *Indirect* | *Total* | *Direct* | *Indirect* | *Total* | *Direct* | *Indirect* | *Total* |
| *ln[K/L]* | -0.2991*** | -0.3159*** | -0.6150*** | 0.2811*** | 0.3547** | 0.6359*** | -1.0212*** | 0.0130 | -1.0082*** |
| | [0.0386] | [0.1015] | [0.1060] | [0.0164] | [0.1354] | [0.1378] | [0.1669] | [0.2191] | [0.3356] |
| *lnPCT* | -0.0208*** | 0.0091*** | -0.0116*** | -0.0047 | -0.0463*** | -0.0510*** | -0.0213*** | 0.0129*** | -0.0084** |
| | [0.0023] | [0.0030] | [0.0039] | [0.0111] | [0.0083] | [0.0068] | [0.0019] | [0.0026] | [0.0040] |
| *lnSELF* | 0.1373*** | 0.0408* | 0.1781*** | -0.1388*** | -0.0755** | -0.2144*** | 0.0573*** | 0.0068 | 0.0506 |
| | [0.0042] | [0.0186] | [0.0189] | [0.0257] | [0.0233] | [0.0464] | [0.0205] | [0.0309] | [0.0295] |
| *lnRGDPC* | 0.0574*** | 0.0329** | 0.0903*** | -0.0703*** | 0.0147* | -0.0556 | 0.1161*** | 0.0118 | 0.1279*** |
| | [0.0055] | [0.0109] | [0.0110] | [0.0218] | [0.0263] | [0.0451] | [0.0075] | [0.0171] | [0.0207] |
| *lnOPN* | -0.1042*** | 0.0885*** | -0.0157*** | -0.1522*** | -0.0657*** | -0.2179*** | -0.0715*** | 0.0675*** | -0.0040 |
| | [0.0097] | [0.0156] | [0.0162] | [0.0158] | [0.0059] | [0.0202] | [0.0041] | [0.0199] | [0.0213] |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *INST* | -0.0106 | -0.0071 | -0.0178 | -0.1427*** | -0.0935*** | -0.2362*** | 0.2548*** | 0.1475*** | 0.4022*** |
| | [0.0213] | [0.0284] | [0.0440] | [0.0362] | [0.0267] | [0.0478] | [0.0204] | [0.0341] | [0.0308] |
| *lnPCT*INST* | -0.0044*** | 0.0022 | -0.0022* | 0.0015 | 0.0061*** | 0.0076*** | -0.0039*** | 0.0020 | -0.0019 |
| | [0.0013] | [0.0010] | [0.0020] | [0.0023] | [0.0031] | [0.0019] | [0.0010] | [0.0019] | [0.0028] |
| *lnSELF*INST* | 0.0104** | -0.0052 | 0.0052 | 0.0403*** | 0.0056 | 0.0459*** | -0.0518*** | -0.0436*** | -0.0954*** |
| | [0.0041] | [0.0083] | [0.0106] | [0.0073] | [0.0085] | [0.0127] | [0.0059] | [0.0099] | [0.0092] |

*$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$*

The direct effect represents the impact due to changes in the regressors on the income inequality of the local country. The indirect effect is the impact attributed to the changes in the regressors of neighboring countries on the income inequality of the local country. The total effect is simply the aggregation of the direct and indirect effects. We can observe differences between the coefficients of the direct effect and the coefficients of the point estimates. The reason is the feedback effects that arise because of the impacts passing through neighboring countries and back to the countries themselves. These are due to the coefficients of the spatially lagged dependent variable and that of the spatially lagged independent regressors. Here, it must be noted that the estimation is based on the queen contiguity weight matrix.

In Table 1. 4, the marginal effects for the overall sample, high income countries and middle-and low-income countries are reported. For the overall sample, innovation has negative direct effect on income inequality, which is significant at 1% level. The indirect effect however shows positive spillover effect from neighboring countries. This is significant at 10% level. The total effect is negative and statistically significant at the 1% level. In terms of high-income countries, we find a positive but statistically insignificant relationship between innovation and income inequality. This means that there is no dependence between innovation and income inequality in these countries. The indirect effect is, however, negative, and significant at the 1% level. The total effect also shows negative relationship between innovation and income inequality but is statistically significant at 10%. For Middle and low-income countries, we find negative direct effect between innovation and income inequality. The indirect effect of innovation on the

income inequality is positive. Both the direct and indirect effects are statistically significant at the 1% level. The total effect shows a negative relationship between innovation and income inequality. This is significant at the 10% level.

We proceed to examine the relationship between self-employment and income inequality, the results for high income countries show negative effects. The negative spillover effect (indirect effect) shows that entrepreneurial activities from neighboring economies have negative effect on the focal country. This can be possible if the entrepreneurial activity is mainly driven by a strong business sector which is linked to job creation. However, it must be noted that the indirect effect may take time to materialize, the full effects from entrepreneurial development may only be realized over the longer term but mostly when factors that promote free movement of investment and doing business across borders are properly enforced (Puga, 2010). The results of Middle- and low-income countries show positive relationship between self-employment and income inequality, significant at the 1% level. The results of the Middle and low-income countries are consistent with reviews of Desai (2011) and other studies (Atems & Shand, 2018; Cagetti & Nardi, 2006; Halvarsson et al., 2018; Lewellyn, 2018), who also used self-employment as a measure of entrepreneurial activity. These studies attributed the positive nexus to the large informal nature of entrepreneurial activities in developing countries. The difference between the direct effect and the point estimates yields the feedback effect equal to 0.1549. The positive feedback effect shows that over time income inequality in the focal country will increase due to an increase in self-employment.

The results of the overall sample show positive dependence between self-employment and income inequality. We further investigated the indirect channels in the role of innovation, entrepreneurial activity, and income inequality by interacting with institutional quality given the

level of heterogeneity between these income groupings. The results are presented in Table 4b. The relationship between innovation and income inequality, and self-employment and income inequality are qualitatively like our results in Table 1. 4. For the overall sample, we find that the direct effect for the interactive term between innovation and institutional quality is negative and statistically significant, implying that institutional quality influence innovation to reduce income inequality. The indirect effect is positive but not significant. The total effect also reiterates negative spatial dependence. The results for the high-income countries are positive but only statistically significant for the indirect effect and total effect. For the case of Middle and low-income countries, the direct effect is negative and statistically significant. The indirect and total effects show no dependence. In terms of the interaction between self-employment and institutional quality, the direct effect shows positive relationship with income inequality for both the high-income countries and the overall sample. This shows that entrepreneurial activities in the high-income countries are correlated with income inequality. This may be due to displacement effect in which some businesses may take jobs away from others due to their newfound innovation or size. These newfound innovations are mainly supported by institutional mechanisms that give some level of autonomy (monopoly) to the inventors to make their profits before others can imitate. Contrarily, we find evidence of negative effect for middle- and low-income countries. Since the motive for partaking in entrepreneurial activity differs from one person to another (Bosma & Kelley, 2019). We disentangle the self-employment into opportunity and necessity entrepreneurs. The opportunity entrepreneurs are those who start businesses to exploit a potential opportunity to increase their income and are mostly associated with more growth-oriented businesses. These group of individuals are associated with employers in the self-employment classifications as they fulfil the entrepreneurial function of risk-bearing. The other group which is the own-account self-employed are like individuals who are pushed into

entrepreneurial activities who seek only to maintain their income. This group is known as the necessity entrepreneurs. The panel SDM is reported in Table 1. 5 and the marginal impact in Table 1. 6. We report only the marginal effects of the model with the interactive terms.

For high income countries, the overall results of the direct effects of the coefficient for opportunity show negative effect but no dependence on income inequality. The indirect effect however, real presence of positive dependence between opportunity entrepreneurs in neighboring countries and income inequality of the focal country. This notwithstanding, we also find negative correlation between necessity and income inequality for the high-income countries. The coefficient is, however, high than the coefficient of opportunity entrepreneurship. For middle- and low-income countries, both the direct and indirect effects show positive dependence of opportunity entrepreneurship on income inequality. But the coefficient for necessity entrepreneurs shows otherwise, with the direct effect and indirect effect being positive. This relationship is not statistically significant. On the control variables, the coefficients of real income for middle- and low-income countries is positively correlated with income inequality. This result is consistent with the views of Dulani et al. (2013) suggesting that the impact of the high reported growth do not trickle down to the poorest citizens and as such may be worsening income inequality.

Table 1. 5**: Results based on disaggregated self-employment**, innovation and income inequality**.**

| | Opportunity-based self-employment[employers] | | | | | | Necessity-based self-employment [Own-account workers] | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Model without interaction | | | Model with interaction | | | Model without interaction | | | Model with interaction | | |
| **Model** | **Overall Sample** | **High Income** | **Middle and low income** | **Overall Sample** | **High Income** | **Middle and low income** | **Overall Sample** | **High Income** | **Middle and low income** | **Overall Sample** | **High Income** | **Middle and low income** |
| Lambda (***λ***) | 0.2265*** | 0.3936*** | 0.3196*** | 0.2553*** | 0.3954*** | 0.2959*** | 0.2065*** | 0.3830*** | 0.2875*** | 0.2384*** | 0.3843*** | 0.2524*** |
| | [0.0279] | [0.0416] | [0.0294] | [0.0274] | [0.0414] | [0.0299] | [0.0282] | [0.0420] | [0.0301] | [0.0277] | [0.0420] | [0.0306] |
| *ln[K/L]* | -0.3004*** | 0.2709*** | -1.2484*** | -0.1860*** | 0.2647*** | -1.1843*** | -0.4415*** | 0.2579*** | -1.2133*** | -0.2646*** | 0.2217*** | -1.2187*** |
| | [0.0518] | [0.0529] | [0.1281] | [0.0527] | [0.0520] | [0.1283] | [0.0522] | [0.0529] | [0.1275] | [0.0536] | [0.0519] | [0.1254] |
| *lnPCT* | -0.0165*** | 0.0019 | -0.0195*** | -0.0214*** | 0.0020 | -0.0187*** | -0.0161*** | 0.0031 | -0.0185*** | -0.0215*** | 0.0036 | -0.0239*** |
| | [0.0020] | [0.0038] | [0.0020] | [0.0021] | [0.0133] | [0.0028] | [0.0020] | [0.0037] | [0.0019] | [0.0021] | [0.0118] | [0.0028] |
| *lnSELF* | 0.0713*** | 0.0180 | 0.0289*** | 0.0614*** | -0.0286 | 0.0487*** | 0.1046*** | -0.0035 | 0.0630*** | 0.1102*** | -0.1064*** | -0.0069 |
| | [0.0060] | [0.0124] | [0.0059] | [0.0074] | [0.0255] | [0.0098] | [0.0094] | [0.0133] | [0.0098] | [0.0094] | [0.0240] | [0.0137] |
| *lnRGDPC* | -0.0272*** | -0.0961*** | 0.0618*** | -0.0268*** | -0.0804*** | 0.0568*** | 0.0450*** | -0.0951*** | 0.0941*** | 0.0394*** | -0.0717*** | 0.0934*** |
| | [0.0074] | [0.0221] | [0.0087] | [0.0073] | [0.0259] | [0.0087] | [0.0078] | [0.0222] | [0.0082] | [0.0076] | [0.0254] | [0.0081] |
| *lnOPN* | -0.1237*** | -0.1420*** | -0.1226*** | -0.1394*** | -0.1497*** | -0.1235*** | -0.0971*** | -0.1408*** | -0.1029*** | -0.1155*** | -0.1391*** | -0.1052*** |
| | [0.0098] | [0.0137] | [0.0105] | [0.0099] | [0.0136] | [0.0104] | [0.0103] | [0.0139] | [0.0109] | [0.0103] | [0.0136] | [0.0106] |
| *INST* | -0.0137*** | -0.0055 | 0.0466*** | 0.0254*** | -0.0161 | 0.0350*** | -0.0085** | -0.0041 | 0.0495*** | -0.0158 | -0.0939** | 0.2249*** |
| | [0.0033] | [0.0093] | [0.0043] | [0.0062] | [0.0386] | [0.0081] | [0.0034] | [0.0091] | [0.0042] | [0.0131] | [0.0409] | [0.0257] |
| *lnPCT*INST* | | | | -0.0046*** | -0.0021 | 0.0002 | | | | -0.0039*** | 0.0001 | -0.0044*** |
| | | | | [0.0007] | [0.0038] | [0.0015] | | | | [0.0008] | [0.0033] | [0.0015] |
| *lnSELF*INST* | | | | -0.0035 | 0.0236** | 0.0123** | | | | 0.0144*** | 0.0362*** | -0.0468*** |
| | | | | [0.0036] | [0.0092] | [0.0050] | | | | [0.0033] | [0.0072] | [0.0065] |
| *W*ln[K/L]* | -0.1503** | 0.1630** | 0.3635** | -0.2211*** | 0.1399* | 0.4583*** | -0.0749 | 0.1696** | 0.2550 | -0.1690** | 0.1536** | 0.2918* |
| | [0.0760] | [0.0752] | [0.1760] | [0.0759] | [0.0740] | [0.1762] | [0.0762] | [0.0751] | [0.1746] | [0.0762] | [0.0743] | [0.1720] |
| *W*lnPCT* | 0.0114*** | -0.0144*** | 0.0131*** | 0.0147*** | -0.0446*** | 0.0183*** | 0.0086*** | -0.0167*** | 0.0136*** | 0.0123*** | -0.0377*** | 0.0178*** |
| | [0.0029] | [0.0049] | [0.0026] | [0.0031] | [0.0165] | [0.0038] | [0.0029] | [0.0048] | [0.0026] | [0.0029] | [0.0142] | [0.0038] | |
| *W*lnSELF* | -0.0231*** | -0.0400** | 0.0203*** | -0.0104 | 0.0900** | 0.0444*** | -0.0051 | -0.0379** | 0.0405*** | -0.0076 | -0.0018 | 0.0220 |
| | [0.0086] | [0.0157] | [0.0076] | [0.0106] | [0.0356] | [0.0127] | [0.0132] | [0.0157] | [0.0126] | [0.0132] | [0.0323] | [0.0176] |
| *W*lnRGDPC* | 0.0191* | 0.0303 | -0.0398*** | 0.0200* | 0.0276 | -0.0471*** | 0.0055 | 0.0296 | -0.0119 | 0.0109 | 0.0444 | -0.0096 |
| | [0.0108] | [0.0294] | [0.0117] | [0.0106] | [0.0321] | [0.0118] | [0.0108] | [0.0298] | [0.0116] | [0.0105] | [0.0326] | [0.0115] |
| *W*lnOPN* | 0.0905*** | 0.0274 | 0.0781*** | 0.1000*** | 0.0350* | 0.0744*** | 0.0940*** | 0.0168 | 0.0897*** | 0.1022*** | 0.0076 | 0.0856*** |
| | [0.0135] | [0.0182] | [0.0138] | [0.0138] | [0.0182] | [0.0138] | [0.0140] | [0.0186] | [0.0142] | [0.0140] | [0.0183] | [0.0139] |
| *W*INST* | -0.0007 | -0.0005 | -0.0214*** | -0.0315*** | -0.0519 | -0.0522*** | -0.0036 | -0.0095 | -0.0184*** | -0.0039 | -0.0434 | 0.0158 |
| | [0.0046] | [0.0113] | [0.0057] | [0.0087] | [0.0462] | [0.0112] | [0.0046] | [0.0114] | [0.0057] | [0.0180] | [0.0507] | [0.0366] |
| *W* [lnPCT*INST]* | | | | 0.0032*** | 0.0117** | 0.0041* | | | | 0.0027** | 0.0055 | 0.0034 |
| | | | | [0.0010] | [0.0047] | [0.0021] | | | | [0.0011] | [0.0040] | [0.0022] |
| *W*[lnSELF*INST]* | | | | 0.0066 | -0.0480*** | 0.0141** | | | | -0.0075 | -0.0087 | -0.0146 |
| | | | | [0.0052] | [0.0117] | [0.0064] | | | | [0.0046] | [0.0104] | [0.0091] |
| Constant | 3.0682*** | 3.2462*** | 2.6424*** | 2.9838*** | 3.2896*** | 2.7594*** | 2.2811*** | 3.4166*** | 1.8519*** | 2.2141*** | 3.4427*** | 2.2868*** |
| | [0.1574] | [0.3517] | [0.1593] | [0.1574] | [0.3504] | [0.1603] | [0.1662] | [0.3607] | [0.1661] | [0.1626] | [0.3577] | [0.1783] |
| Observation | 1513 | 425 | 1088 | 1513 | 425 | 1088 | 1513 | 425 | 1088 | 1513 | 425 | 1088 |
| R-squared | 0.5384 | 0.5830 | 0.4110 | 0.5597 | 0.6010 | 0.4211 | 0.5338 | 0.5821 | 0.4249 | 0.5645 | 0.6080 | 0.4548 |
| Log Likelihood | 612.0121 | 437.0397 | 563.4231 | 644.2394 | 446.2904 | 575.8032 | 606.7721 | 437.4011 | 580.4693 | 654.6782 | 450.9095 | 613.2762 |
| AIC [Spatial model] | -1194.0242 | -844.0794 | -1096.8462 | -1250.4789 | -854.5809 | -1113.6064 | -1183.5441 | -844.8022 | -1130.9387 | -1271.3564 | -863.8191 | -1188.5524 |

*****p < 0.01; **p < 0.05; *p < 0.1**

Table 1. 6: Marginal impact of **disaggregated self-employment**, innovation and income inequality**.**

**Marginal impact of innovation, opportunity entrepreneurship on income inequality**

| *Model* | *Overall Sample* | | | *High income* | | | *Middle-and low income* | | |
|---|---|---|---|---|---|---|---|---|---|
| **Impacts** | **Direct** | **Indirect** | **Total** | **Direct** | **Indirect** | **Total** | **Direct** | **Indirect** | **Total** |
| *ln[K/L]* | -0.2091*** | -0.3376*** | -0.5467*** | 0.3105*** | 0.3588** | 0.6692*** | -1.1722*** | 0.1412 | -1.0310*** |
| | [0.0375] | [0.0640] | [0.0780] | [0.1169] | [0.1415] | [0.2452] | [0.1152] | [0.1834] | [0.1781] |
| *lnPCT* | -0.0206*** | 0.0117*** | -0.0089*** | -0.0062 | -0.0643*** | -0.0705*** | -0.0173*** | 0.0166*** | -0.0007 |
| | [0.0007] | [0.0031] | [0.0025] | [0.0114] | [0.0162] | [0.0146] | [0.0027] | [0.0057] | [0.0077] |
| *lnSELFOPP* | 0.0619*** | 0.0066 | 0.0685*** | -0.0138 | 0.1154*** | 0.1016 | 0.0553*** | 0.0770*** | 0.1323*** |
| | [0.0079] | [0.0095] | [0.0076] | [0.0224] | [0.0355] | [0.0526] | [0.0096] | [0.0115] | [0.0074] |
| *lnRGDPC* | -0.0257*** | 0.0166 | -0.0091 | -0.0811* | -0.0061 | -0.0873 | 0.0534*** | -0.0396*** | 0.0138 |
| | [0.0063] | [0.0109] | [0.0118] | [0.0459] | [0.0661] | [0.1000] | [0.0098] | [0.0036] | [0.0109] |
| *lnOPN* | -0.1338*** | 0.0809*** | -0.0529*** | -0.1542*** | -0.0354*** | -0.1896*** | -0.1193*** | 0.0496*** | -0.0697*** |
| | [0.0084] | [0.0082] | [0.0138] | [0.0202] | [0.0120] | [0.0282] | [0.0091] | [0.0136] | [0.0188] |
| *INST* | 0.0232*** | -0.0315*** | -0.0083 | -0.0270 | -0.0854* | -0.1124* | 0.0304*** | -0.0547*** | -0.0243* |
| | [0.0073] | [0.0060] | [0.0069] | [0.0361] | [0.0524] | [0.0581] | [0.0081] | [0.0195] | [0.0236] |
| *lnPCT*INST* | -0.0045*** | 0.0025** | -0.0019 | 0.0000 | 0.0160*** | 0.0160*** | 0.0007* | 0.0054 | 0.0061 |
| | [0.0010] | [0.0011] | [0.0017] | [0.0030] | [0.0040] | [0.0043] | [0.0011] | [0.0042] | [0.0048] |
| *lnSELFOPP*INST* | -0.0030 | 0.0071 | 0.0041 | 0.0163 | -0.0567*** | -0.0404* | 0.0143*** | 0.0231** | 0.0374*** |
| | [0.0035] | [0.0031] | [0.0060] | [0.0113] | [0.0080] | [0.0179] | [0.0048] | [0.0088] | [0.0087] |

**Marginal impact of innovation, necessity entrepreneurship on income inequality**

| *Model* | *Overall Sample* | | | *High income* | | | *Middle-and low income* | | |
|---|---|---|---|---|---|---|---|---|---|
| **Impacts** | **Direct** | **Indirect** | **Total** | **Direct** | **Indirect** | **Total** | **Direct** | **Indirect** | **Total** |
| *ln[K/L]* | -0.2831*** | -0.2863*** | -0.5694*** | 0.2647*** | 0.3448** | 0.6095** | -1.2194*** | -0.0205 | -1.2399*** |
| | [0.0472] | [0.0486] | [0.0789] | [0.1016] | [0.1853] | [0.2819] | [0.1514] | [0.2526] | [0.2664] |
| *lnPCT* | -0.0209*** | 0.0089*** | -0.0120*** | -0.0029 | -0.0524** | -0.0553 | -0.0234*** | 0.0152*** | -0.0081 |
| | [0.0010] | [0.0029] | [0.0029] | [0.0146] | [0.0234] | [0.0292] | [0.0014] | [0.0035] | [0.0039] |
| *lnSELFNEC* | 0.1117*** | 0.0230*** | 0.1347*** | -0.1141*** | -0.0616 | -0.1758 | -0.0059 | 0.0261 | 0.0202 |
| | [0.0085] | [0.0045] | [0.0118] | [0.0252] | [0.0864] | [0.1104] | [0.0115] | [0.0212] | [0.0171] |
| *lnRGDPC* | 0.0410*** | 0.0250 | 0.0660*** | -0.0686*** | 0.0243 | -0.0443 | 0.0941*** | 0.0181 | 0.1122*** |
| | [0.0034] | [0.0124] | [0.0133] | [0.0172] | [0.0465] | [0.0581] | [0.0103] | [0.0071] | [0.0083] |
| *lnOPN* | -0.1095*** | 0.0920*** | -0.0175 | -0.1473*** | -0.0661*** | -0.2135*** | -0.1025*** | 0.0762*** | -0.0263 |
| | [0.0130] | [0.0206] | [0.0265] | [0.0209] | [0.0198] | [0.0281] | [0.0072] | [0.0235] | [0.0239] |
| *INST* | -0.0164 | -0.0095 | -0.0259 | -0.1082 | -0.1148 | -0.2231 | 0.2282*** | 0.0937** | 0.3219*** |
| | [0.0147] | [0.0150] | [0.0183] | [0.0438] | [0.0797] | [0.1053] | [0.0293] | [0.0379] | [0.0604] |
| *lnPCT*INST* | -0.0038*** | 0.0021* | -0.0016** | 0.0011 | 0.0080 | 0.0092 | -0.0043*** | 0.0029*** | -0.0014 |
| | [0.0004] | [0.0010] | [0.0012] | [0.0043] | [0.0063] | [0.0089] | [0.0015] | [0.0011] | [0.0024] |
| *lnSELFNEC*INST* | 0.0140*** | -0.0050 | 0.0090* | 0.0371*** | 0.0075 | 0.0447 | -0.0480*** | -0.0341*** | -0.0821*** |
| | [0.0042] | [0.0040] | [0.0047] | [0.0108] | [0.0296] | [0.0402] | [0.0075] | [0.0098] | [0.0161] |

*****p < 0.01; **p < 0.05; *p < 0.1**

As expected, we find negative relationship between real incomes of high-income countries and income inequality. Generally, we find positive relationship between institutional quality and income inequality for the middle- and low-income countries. This results is in line with Perera and Lee (2013) and Gyimah-Brempong and Camacho (2006). Although, positive relationship is not surprising, we investigate this relationship further in a more dynamic approach in chapter 2. The institutional quality and income inequality nexus are negative for high income countries. The negative nexus for high income countries corroborates evidence from Scully (1988), Bourguignon and Verdier (2000), Acemoglu and Robinson (2008), and Gwama (2014), who validated that countries with well-developed institutional mechanisms have the potential to foster reductions in income inequality. The findings for the middle and low income countries however, corroborates evidence of Dobson & Ramlogan (2010), Amendola *et al.* (2013), Perera & Lee (2013), Brunori *et al.* (2013), Hartmann *et al.* (2017) and Aiyar & Ebeke (2019), who found similar results in Latin America, Africa and among the Asian tigers. The positive relationship between institutional quality and inequality reiterates that some institutional reformations in these economies may be misguided as argued by Andres & Ramlogan-Dobson (2011). Thus, institutional quality in these economies such as property rights, may preserve the interest of influential elites who can control key markets, access to investment opportunities, and enjoy disproportionate political influence via political clientelism. Also, contrary to Kaldor and Barro's prediction of positive relationship between investment and inequality in developing countries, the result for capital per worker is significant and negative for middle- and low-income countries but positive for high income countries. It is worth noting that the coefficients of the SDM model do not directly reflect the marginal effects of the corresponding explanatory variables on the dependent variable.

For sensitivity, we rerun the spatial durbin model with number of new businesses are the dependent variables. We replaced missing values with zeros, as a criterion of the spatial panel models, only balanced datasets are allowed. Countries with missing data (e.g OECD countries) were extracted from the dataset on birthrate of businesses. The results of the point estimates of the SDM are presented in Table 1. 7 and the marginal coefficients in Table 1. 8. Consistent with the results in Table 1.4, the relationship between innovation and income inequality are qualitatively similar for both high income and middle-and low-income countries. However, the difference only exists on the measure of entrepreneurship. When we use the new business density proxy of entrepreneurship (*lnENTRY*), we find the direct effect for high income countries is positive and the indirect effect is negative, both are statistically significant at 1%. The feedback effect for high income countries is negative 0.0125 for the model with contiguity matrix and negative 0.0131 for the model with inverse distance matrix. Although we find positive dependence between new business density and income inequality, the negative feedback suggests entrepreneurial activities (proxied by new business density) will reduce income inequality over time. For middle-and low-income countries, the results show both negative direct and indirect effects of entrepreneurship (proxied by new business density) on income inequality. The feedback effect using the model with contiguity matrix is negative 0.1041 and that of the model with the inverse matrix is negative 0.0014.

Table 1. 7: Results of Spatial Durbin model: innovation, entry rate and income inequality

| | Queen contiguity matrix | | | | | | Inverse distance matrix | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Model without interaction | | | Model with interaction | | | Model without interaction | | | Model with interaction | | |
| **Model** | **Overall Sample** | **High income** | **Middle and low income** | **Overall Sample** | **High income** | **Middle and low income** | **Overall Sample** | **High income** | **Middle and low income** | **Overall Sample** | **High income** | **Middle and low income** |
| Lambda ($\lambda$) | 0.2227*** | 0.3892*** | 0.3634*** | 0.2654*** | 0.4000*** | 0.3443*** | 0.3784*** | 0.5903*** | 0.5568*** | 0.4183*** | 0.5933*** | 0.5287*** |
| | [0.0279] | (0.0418) | (0.0285) | (0.0272) | (0.0413) | (0.0288) | (0.0324) | (0.0456) | (0.0291) | (0.0308) | (0.0452) | (0.0304) |
| *ln[K/L]* | -0.3867*** | 0.3034*** | -1.2676*** | -0.1765*** | 0.2972*** | -1.2245*** | -0.3611*** | 0.2863*** | -1.2335*** | -0.1294** | 0.2742*** | -1.2026*** |
| | [0.0538] | (0.0498) | (0.1278) | (0.0549) | (0.0498) | (0.1281) | (0.0523) | (0.0466) | (0.1229) | (0.0533) | (0.0466) | (0.1232) |
| *lnPCT* | -0.0211*** | 0.0154*** | -0.0210*** | -0.0280*** | 0.0424*** | -0.0159*** | -0.0215*** | 0.0178*** | -0.0209*** | -0.0294*** | 0.0521*** | -0.0181*** |
| | [0.0021] | (0.0039) | (0.0019) | (0.0021) | (0.0121) | (0.0029) | (0.0020) | (0.0038) | (0.0019) | (0.0020) | (0.0120) | (0.0028) |
| *lnENTRY* | -0.0075 | 0.0601*** | -0.0383*** | -0.0113* | 0.1140*** | -0.0515*** | -0.0099 | 0.0550*** | -0.0391*** | -0.0142** | 0.1132*** | -0.0493*** |
| | [0.0068] | (0.0086) | (0.0076) | (0.0067) | (0.0256) | (0.0091) | (0.0067) | (0.0086) | (0.0075) | (0.0065) | (0.0255) | (0.0090) |
| *lnRGDPC* | 0.0081 | -0.1452*** | 0.0838*** | 0.0097 | -0.1665*** | 0.0812*** | 0.0079 | -0.1538*** | 0.0818*** | 0.0102 | -0.1777*** | 0.0804*** |
| | [0.0074] | (0.0217) | (0.0080) | (0.0070) | (0.0242) | (0.0081) | (0.0073) | (0.0211) | (0.0077) | (0.0069) | (0.0237) | (0.0078) |
| *lnOPN* | -0.1289*** | -0.1450*** | -0.1171*** | -0.1481*** | -0.1409*** | -0.1167*** | -0.1420*** | -0.1438*** | -0.1216*** | -0.1606*** | -0.1403*** | -0.1216*** |
| | [0.0104] | (0.0132) | (0.0106) | (0.0102) | (0.0132) | (0.0106) | (0.0103) | (0.0128) | (0.0103) | (0.0099) | (0.0128) | (0.0104) |
| *INST* | -0.0101*** | 0.0030 | 0.0592*** | 0.0462*** | 0.1158*** | 0.0511*** | -0.0087** | 0.0096 | 0.0611*** | 0.0514*** | 0.1471*** | 0.0600*** |
| | [0.0037] | (0.0086) | (0.0046) | (0.0066) | (0.0419) | (0.0081) | (0.0037) | (0.0085) | (0.0045) | (0.0065) | (0.0429) | (0.0079) |
| *lnPCT*INST* | | | | -0.0048*** | -0.0078** | 0.0037** | | | | -0.0050*** | -0.0101*** | 0.0020 |
| | | | | (0.0007) | (0.0033) | (0.0015) | | | | (0.0007) | (0.0033) | (0.0014) |
| *lnENTRY*INST* | | | | -0.0158*** | -0.0158** | -0.0108** | | | | -0.0173*** | -0.0173** | -0.0099* |
| | | | | (0.0026) | (0.0073) | (0.0054) | | | | (0.0025) | (0.0074) | (0.0052) |
| *W*ln[K/L]* | -0.1238 | 0.0660 | 0.5019*** | -0.2488*** | 0.0933 | 0.5243*** | -0.1279 | 0.0143 | 0.8284*** | -0.3656*** | 0.0448 | 0.9302*** |
| | [0.0789] | (0.0711) | (0.1754) | (0.0784) | (0.0724) | (0.1758) | (0.1098) | (0.0866) | (0.2118) | (0.1091) | (0.0902) | (0.2165) |
| *W*lnPCT* | 0.0114*** | -0.0203*** | 0.0111*** | 0.0174*** | -0.0524*** | 0.0192*** | 0.0155*** | -0.0247*** | 0.0128*** | 0.0235*** | -0.0606*** | 0.0248*** |
| | [0.0030] | (0.0048) | (0.0026) | (0.0030) | (0.0150) | (0.0039) | (0.0040) | (0.0055) | (0.0032) | (0.0039) | (0.0184) | (0.0048) |
| *W*lnENTRY* | 0.0054 | -0.0267*** | 0.0239** | 0.0133 | -0.1114*** | 0.0089 | 0.0122 | -0.0295*** | 0.0336*** | 0.0205* | -0.1043*** | 0.0205 |
| | [0.0095] | (0.0098) | (0.0097) | (0.0093) | (0.0296) | (0.0115) | (0.0123) | (0.0108) | (0.0116) | (0.0118) | (0.0334) | (0.0144) |
| W* *lnRGDPC* | 0.0133 | 0.0742*** | -0.0402*** | 0.0109 | 0.0889*** | -0.0443*** | 0.0102 | 0.1157*** | -0.0536*** | 0.0096 | 0.1310*** | -0.0650*** |
| | [0.0104] | (0.0286) | (0.0110) | (0.0099) | (0.0309) | (0.0111) | (0.0130) | (0.0329) | (0.0141) | (0.0124) | (0.0353) | (0.0144) |
| *W*lnOPN* | 0.0942*** | 0.0552*** | 0.0799*** | 0.1096*** | 0.0514*** | 0.0780*** | 0.1396*** | 0.0739*** | 0.1052*** | 0.1599*** | 0.0706*** | 0.0961*** |
| | [0.0142] | (0.0176) | (0.0139) | (0.0142) | (0.0177) | (0.0140) | (0.0176) | (0.0204) | (0.0168) | (0.0175) | (0.0214) | (0.0170) |
| *W*INST* | -0.0052 | -0.0131 | -0.0278*** | -0.0470*** | -0.1539*** | -0.0464*** | -0.0044 | -0.0185 | -0.0448*** | -0.0667*** | -0.1690*** | -0.0813*** |
| | [0.0052] | (0.0107) | (0.0062) | (0.0090) | (0.0496) | (0.0113) | (0.0062) | (0.0124) | (0.0073) | (0.0111) | (0.0595) | (0.0143) |
| *W*(lnPCT*INST)* | | | | 0.0041*** | 0.0092** | 0.0066*** | | | | 0.0059*** | 0.0107** | 0.0094*** |
| | | | | (0.0010) | (0.0041) | (0.0022) | | | | (0.0013) | (0.0051) | (0.0027) |
| *W*(lnENTRY*INST)* | | | | 0.0088*** | 0.0244*** | -0.0120 | | | | 0.0144*** | 0.0220** | -0.0038 |
| | | | | (0.0034) | (0.0083) | (0.0075) | | | | (0.0044) | (0.0094) | (0.0092) |
| Constant | 2.9209*** | 3.0682*** | 2.3449*** | 2.7915*** | 3.1882*** | 2.4371*** | 2.2164*** | 2.0175*** | 1.5964*** | 2.0451*** | 2.1281*** | 1.7824*** |
| | [0.1542] | (0.3337) | (0.1524) | (0.1529) | (0.3738) | (0.1530) | (0.1700) | (0.3574) | (0.1592) | (0.1654) | (0.4196) | (0.1652) |
| Observation | 1513 | 425 | 1088 | 1513 | 425 | 1088 | 1513 | 425 | 1088 | 1513 | 425 | 1088 |
| R-squared | 0.4959 | 0.6231 | 0.4089 | 0.5381 | 0.6359 | 0.4169 | 0.5248 | 0.6748 | 0.4812 | 0.5707 | 0.6841 | 0.4855 |
| Log Likelihood | 545.8039 | 458.8539 | 555.1783 | 606.6135 | 465.3581 | 565.4263 | 583.3087 | 490.4960 | 616.6915 | 655.2474 | 496.5231 | 625.6000 |
| AIC (Spatial model) | -1061.6078 | -887.7077 | -1080.3567 | -1175.2271 | -892.7162 | -1092.8526 | -1136.6175 | -950.9919 | -1203.3831 | -1272.4948 | -955.0462 | -1213.2000 |

***p < 0.01; **p < 0.05; *p < 0.1

Table 1. 8: Results of innovation, entry rate and income inequality

**Spatial weight matrix based on queen contiguity matrix**

| | Overall Sample | | | High income | | | Middle and low income | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Direct** | **Indirect** | **Total** | **Direct** | **Indirect** | **Total** | **Direct** | **Indirect** | **Total** |
| *ln[K/L]* | -0.2031*** | -0.3758*** | -0.5789*** | 0.3375*** | 0.3133*** | 0.6508*** | -1.2107*** | 0.1429 | -1.0678*** |
| | [0.0372] | [0.0418] | [0.0604] | [0.0712] | [0.1044] | [0.0428] | [0.1309] | [0.2513] | [0.2784] |
| *lnPCT* | -0.0271*** | 0.0127*** | -0.0145*** | 0.0357** | -0.0523*** | -0.0165 | -0.0141*** | 0.0191** | 0.0050 |
| | [0.0014] | [0.0025] | [0.0018] | [0.0176] | [0.0096] | [0.0220] | [0.0034] | [0.0097] | [0.0129] |
| l*nENTRY* | -0.0103** | 0.0131 | 0.0027 | 0.1015*** | -0.0971*** | 0.0044 | -0.0526*** | -0.0122 | -0.0649*** |
| | [0.0036] | [0.0138] | [0.0174] | [0.0208] | [0.0263] | [0.0402] | [0.0067] | [0.0109] | [0.0154] |
| *lnRGDPC* | 0.0109* | 0.0171 | 0.0280 | -0.1622*** | 0.0330 | -0.1293*** | 0.0790*** | -0.0227 | 0.0564*** |
| | [0.0057] | [0.0158] | [0.0184] | [0.0267] | [0.0324] | [0.0072] | [0.0100] | [0.0171] | [0.0202] |
| *lnOPN* | -0.1417*** | 0.0894*** | -0.0523*** | -0.1419*** | -0.0073 | -0.1491*** | -0.1116*** | 0.0526*** | -0.0590* |
| | [0.0058] | [0.0130] | [0.0146] | [0.0184] | [0.0163] | [0.0177] | [0.0144] | [0.0218] | [0.0265] |
| *INST* | 0.0430*** | -0.0442*** | -0.0011 | 0.0953** | -0.1588*** | -0.0634 | 0.0472*** | -0.0401* | 0.0071 |
| | [0.0036] | [0.0077] | [0.0103] | [0.0479] | [0.0251] | [0.0589] | [0.0106] | [0.0298] | [0.0373] |
| *lnPCT*INST* | -0.0045*** | 0.0037*** | -0.0008 | -0.0066 | 0.0090*** | 0.0024 | 0.0048*** | 0.0109* | 0.0157** |
| | [0.0006] | [0.0009] | [0.0010] | [0.0048] | [0.0022] | [0.0054] | [0.0017] | [0.0058] | [0.0072] |
| *lnENTRY*INST* | -0.0154*** | 0.0058 | -0.0096*** | -0.0124* | 0.0266*** | 0.0143 | -0.0129*** | -0.0219 | -0.0349 |
| | [0.0030] | [0.0051] | [0.0033] | [0.0072] | [0.0064] | [0.0108] | [0.0040] | [0.0160] | [0.0160] |

**Spatial weight matrix based on inverse distance matrix**

| | Overall Sample | | | High income | | | Middle and low income | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Direct** | **Indirect** | **Total** | **Direct** | **Indirect** | **Total** | **Direct** | **Indirect** | **Total** |
| *ln[K/L]* | -0.1957*** | -0.6552*** | -0.8509*** | 0.3475*** | 0.4368 | 0.7843* | -1.1302*** | 0.5522 | -0.5780 |
| | [0.0377] | [0.1542] | [0.1533] | [0.0976] | [0.2884] | [0.3761] | [0.1926] | [0.3494] | [0.4685] |
| *lnPCT* | -0.0276*** | 0.0175*** | -0.0101 | 0.0415** | -0.0627** | -0.0211 | -0.0143*** | 0.0286** | 0.0143 |
| | [0.0027] | [0.0035] | [0.0058] | [0.0184] | [0.0260] | [0.0392] | [0.0021] | [0.0101] | [0.0085] |
| l*nENTRY* | -0.0119 | 0.0228 | 0.0109 | 0.1001** | -0.0782*** | 0.0219 | -0.0507*** | -0.0105 | -0.0612*** |
| | [0.0061] | [0.0285] | [0.0329] | [0.0438] | [0.0294] | [0.0600] | [0.0113] | [0.0151] | [0.0188] |
| *lnRGDPC* | 0.0124*** | 0.0217 | 0.0341** | -0.1686*** | 0.0539 | -0.1148 | 0.0748*** | -0.0423 | 0.0325 |
| | [0.0033] | [0.0182] | [0.0190] | [0.0325] | [0.0922] | [0.1138] | [0.0112] | [0.0261] | [0.0341] |
| *lnOPN* | -0.1460*** | 0.1448*** | -0.0012 | -0.1447*** | -0.0266 | -0.1713*** | -0.1138*** | 0.0597*** | -0.0541** |
| | [0.0148] | [0.0372] | [0.0456] | [0.0115] | [0.0290] | [0.0271] | [0.0083] | [0.0136] | [0.0194] |
| *INST* | 0.0442*** | -0.0706*** | -0.0263** | 0.1182* | -0.1720** | -0.0538 | 0.0479*** | -0.0929*** | -0.0450 |
| | [0.0047] | [0.0168] | [0.0127] | [0.0723] | [0.1065] | [0.1412] | [0.0050] | [0.0233] | [0.0210] |
| *lnPCT*INST* | -0.0044*** | 0.0060*** | 0.0015* | -0.0084 | 0.0100 | 0.0016 | 0.0046** | 0.0196*** | 0.0242*** |
| | [0.0006] | [0.0017] | [0.0015] | [0.0056] | [0.0093] | [0.0131] | [0.0017] | [0.0047] | [0.0045] |
| *lnENTRY*INST* | -0.0162*** | 0.0111 | -0.0051 | -0.0131 | 0.0248*** | 0.0117 | -0.0122 | -0.0170** | -0.0291*** |
| | [0.0016] | [0.0074] | [0.0080] | [0.0121] | [0.0061] | [0.0148] | [0.0088] | [0.0080] | [0.0112] |

*$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$*

We further replaced our spatial weight matrix with the inverse distance matrix (with k-nearest neighbor of 5). The results of the point estimates of the SDM are presented in Table 1. 9 and the marginal coefficients in Table 1. 10. Qualitatively, we find that results in Table 1. 10 are compares favorably to the results in Table 1. 4. For middle- and low-income countries, we find that the feedback effect for innovation using the first part of Table 1. 10 is negative 0.0356, suggesting a possible 3.56% decline in income inequality if middle and low-income countries engage in more

innovation. In terms of self-employment, the feedback effect, for middle- and low-income countries, is positive 0.0048. This shows about 0.48% increase in income inequality whenever there is an increase in self-employment.

Table 1. 9: Results of innovation, self-employment, and income inequality: based on inverse distance matrix.

| | Model without interaction | | | Model with interaction | | |
|---|---|---|---|---|---|---|
| **Model** | **Overall Sample** | **High income** | **Middle and low income** | **Overall Sample** | **High income** | **Middle and low income** |
| Lambda ($\lambda$) | 0.3344*** | 0.5684*** | 0.5152*** | 0.3628*** | 0.5724*** | 0.4570*** |
| | [0.0340] | [0.0471] | [0.0311] | [0.0329] | [0.0466] | [0.0337] |
| *ln[K/L]* | -0.4223*** | 0.2576*** | -0.9671*** | -0.2388*** | 0.2168*** | -0.9782*** |
| | [0.0504] | [0.0482] | [0.1205] | [0.0522] | [0.0468] | [0.1186] |
| *lnPCT* | -0.0163*** | 0.0071* | -0.0181*** | -0.0220*** | 0.0073 | -0.0243*** |
| | [0.0020] | [0.0036] | [0.0018] | [0.0020] | [0.0116] | [0.0026] |
| *lnSELF* | 0.1270*** | -0.0195 | 0.1182*** | 0.1267*** | -0.1324*** | 0.0598*** |
| | [0.0107] | [0.0150] | [0.0108] | [0.0105] | [0.0232] | [0.0138] |
| *lnRGDPC* | 0.0602*** | -0.1133*** | 0.1070*** | 0.0517*** | -0.0776*** | 0.1090*** |
| | [0.0083] | [0.0211] | [0.0079] | [0.0081] | [0.0249] | [0.0078] |
| *lnOPN* | -0.1025*** | -0.1395*** | -0.0873*** | -0.1255*** | -0.1386*** | -0.0849*** |
| | [0.0103] | [0.0132] | [0.0105] | [0.0103] | [0.0127] | [0.0104] |
| *INST* | -0.0120*** | 0.0018 | 0.0476*** | -0.0186 | -0.1307*** | 0.2248*** |
| | [0.0033] | [0.0088] | [0.0040] | [0.0154] | [0.0446] | [0.0274] |
| *lnPCT*INST* | | | | -0.0044*** | 0.0000 | -0.0047*** |
| | | | | [0.0008] | [0.0032] | [0.0014] |
| *lnSELF*INST* | | | | 0.0132*** | 0.0436*** | -0.0418*** |
| | | | | [0.0037] | [0.0072] | [0.0064] |
| *W*ln[K/L]* | -0.0432 | 0.1190 | 0.4804** | -0.2132** | 0.1495* | 0.5276** |
| | [0.1059] | [0.0908] | [0.2042] | [0.1068] | [0.0899] | [0.2058] |
| *W*lnPCT* | 0.0121*** | -0.0209*** | 0.0143*** | 0.0168*** | -0.0396** | 0.0209*** |
| | [0.0039] | [0.0055] | [0.0031] | [0.0039] | [0.0164] | [0.0047] |
| *W*lnSELF* | 0.0060 | -0.0376* | -0.0227 | 0.0056 | 0.0304 | -0.0465** |
| | [0.0196] | [0.0203] | [0.0174] | [0.0195] | [0.0410] | [0.0230] |
| *W*lnRGDPC* | -0.0028 | 0.0696** | -0.0434*** | 0.0081 | 0.0557 | -0.0361** |
| | [0.0140] | [0.0338] | [0.0149] | [0.0137] | [0.0359] | [0.0154] |
| *W*lnOPN* | 0.1253*** | 0.0420* | 0.1006*** | 0.1408*** | 0.0240 | 0.0949*** |
| | [0.0173] | [0.0215] | [0.0171] | [0.0173] | [0.0229] | [0.0170] |
| *W*INST* | -0.0012 | -0.0150 | -0.0336*** | 0.0123 | 0.0195 | 0.0438 |
| | [0.0054] | [0.0131] | [0.0066] | [0.0284] | [0.0638] | [0.0537] |
| *W* [lnPCT*INST]* | | | | 0.0033** | 0.0046 | 0.0040 |
| | | | | [0.0015] | [0.0045] | [0.0028] |
| *W*[lnSELF*INST]* | | | | -0.0123* | -0.0246* | -0.0255** |
| | | | | [0.0065] | [0.0134] | [0.0123] |
| Constant | 1.4568*** | 2.5278*** | 0.9614*** | 1.3792*** | 2.6755*** | 1.4123*** |
| | [0.1895] | [0.3996] | [0.1840] | [0.1836] | [0.4107] | [0.1991] |
| Observation | 1513 | 425 | 1088 | 1513 | 425 | 1088 |
| R-squared | 0.5653 | 0.6476 | 0.5213 | 0.5941 | 0.6790 | 0.5422 |
| Log Likelihood | 655.2606 | 474.7021 | 666.6939 | 704.1999 | 494.3107 | 698.4089 |
| AIC [Spatial model] | -1280.5211 | -919.4043 | -1303.3877 | -1370.3999 | -950.6214 | -1358.8177 |

****p < 0.01; **p < 0.05; *p < 0.1*

Table 1. 10: Marginal impact based on inverse distance matrix.

**Model without interactions**

| *Model* | **Overall Sample** | | | **High income** | | | **Middle and low income** | | |
|---|---|---|---|---|---|---|---|---|---|
| ***Impacts*** | ***Direct*** | ***Indirect*** | ***Total*** | ***Direct*** | ***Indirect*** | ***Total*** | ***Direct*** | ***Indirect*** | ***Total*** |
| *ln[K/L]* | -0.4340*** | -0.2653*** | -0.6993*** | 0.2916*** | 0.5811*** | 0.8727*** | -0.9694*** | -0.0345 | -1.0038* |
| | [0.0386] | [0.0604] | [0.0882] | [0.0440] | [0.0780] | [0.0891] | [0.0879] | [0.6581] | [0.6564] |
| *lnPCT* | -0.0159*** | 0.0096* | -0.0062 | 0.0049 | -0.0370*** | -0.0321** | -0.0175*** | 0.0096*** | -0.0079*** |
| | [0.0037] | [0.0061] | [0.0094] | [0.0052] | [0.0133] | [0.0152] | [0.0003] | [0.0028] | [0.0025] |
| *lnSELF* | 0.1301*** | 0.0697*** | 0.1997*** | -0.0257 | -0.1065*** | -0.1322*** | 0.1230*** | 0.0739*** | 0.1969*** |
| | [0.0169] | [0.0152] | [0.0185] | [0.0163] | [0.0363] | [0.0309] | [0.0079] | [0.0223] | [0.0279] |
| *lnRGDPC* | 0.0613*** | 0.0250** | 0.0863** | -0.1126*** | 0.0115 | -0.1011 | 0.1085*** | 0.0227 | 0.1312*** |
| | [0.0075] | [0.0126] | [0.0092] | [0.0272] | [0.0538] | [0.0728] | [0.0069] | [0.0374] | [0.0379] |
| *lnOPN* | -0.0967*** | 0.1310*** | 0.0344** | -0.1443*** | -0.0817 | -0.2259*** | -0.0801*** | 0.1077*** | 0.0276 |
| | [0.0089] | [0.0215] | [0.0242] | [0.0150] | [0.0565] | [0.0427] | [0.0109] | [0.0274] | [0.0297] |
| *INST* | -0.0123*** | -0.0075 | -0.0198** | -0.000013 | -0.0306** | -0.0306** | 0.0464*** | -0.0175 | 0.0289** |
| | [0.0018] | [0.0090] | [0.0083] | [0.0119] | [0.0265] | [0.0248] | [0.0045] | [0.0114] | [0.0132] |

*$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$*

**Model with interactions**

| *Model* | **Overall Sample** | | | **High income** | | | **Middle and low income** | | |
|---|---|---|---|---|---|---|---|---|---|
| ***Impacts*** | ***Direct*** | ***Indirect*** | ***Total*** | ***Direct*** | ***Indirect*** | ***Total*** | ***Direct*** | ***Indirect*** | ***Total*** |
| *ln[K/L]* | -0.2601*** | -0.4493** | -0.7094*** | 0.2522*** | 0.6045** | 0.8567*** | -0.9698*** | 0.1399 | -0.8298 |
| | [0.0426] | [0.2062] | [0.2301] | [0.0424] | [0.2999] | [0.3219] | [0.1428] | [0.4438] | [0.5567] |
| *lnPCT* | -0.0214*** | 0.0132*** | -0.0082** | 0.0027 | -0.0782*** | -0.0755*** | -0.0233*** | 0.0170*** | -0.0063 |
| | [0.0012] | [0.0031] | [0.0030] | [0.0095] | [0.0255] | [0.0302] | [0.0024] | [0.0047] | [0.0061] |
| *lnSELF* | 0.1304*** | 0.0773*** | 0.2077*** | -0.1383*** | -0.1003 | -0.2386** | 0.0578*** | -0.0334 | 0.0244 |
| | [0.0087] | [0.0129] | [0.0179] | [0.0159] | [0.0878] | [0.1017] | [0.0102] | [0.0500] | [0.0566] |
| *lnRGDPC* | 0.0536*** | 0.0402* | 0.0938*** | -0.0762*** | 0.0250 | -0.0512 | 0.1105*** | 0.0239 | 0.1344*** |
| | [0.0046] | [0.0205] | [0.0214] | [0.0153] | [0.0882] | [0.0956] | [0.0091] | [0.0198] | [0.0277] |
| *lnOPN* | -0.1188*** | 0.1427*** | 0.0239 | -0.1458*** | -0.1222** | -0.2680*** | -0.0790*** | 0.0974*** | 0.0184 |
| | [0.0116] | [0.0265] | [0.0239] | [0.0204] | [0.0443] | [0.0499] | [0.0094] | [0.0209] | [0.0228] |
| *INST* | -0.0182** | 0.0083 | -0.0099 | -0.1378*** | -0.1222 | -0.2600** | 0.2402*** | 0.2546** | 0.4947*** |
| | [0.0134] | [0.0377] | [0.0365] | [0.0327] | [0.0857] | [0.1110] | [0.0155] | [0.0981] | [0.1125] |
| *lnPCT*INST* | -0.0043*** | 0.0025 | -0.0018*** | 0.0006 | 0.0102** | 0.0108* | -0.0045*** | 0.0032 | -0.0014 |
| | [0.0006] | [0.0028] | [0.0030] | [0.0019] | [0.0063] | [0.0074] | [0.0010] | [0.0052] | [0.0060] |
| *lnSELF*INST* | 0.0127*** | -0.0112 | 0.0015 | 0.0436*** | 0.0008 | 0.0444 | -0.0464*** | -0.0774*** | -0.1239*** |
| | [0.0039] | [0.0056] | [0.0058] | [0.0071] | [0.0256] | [0.0317] | [0.0042] | [0.0243] | [0.0283] |

*$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$*

## 1.5 Concluding remarks.

This study aims to analyze the effect of innovation and entrepreneurial activity on income inequality in middle- and low-income countries. The current study examined the feedback and spillover effects using spatial econometric techniques on longitudinal data spanning the period 2000 to 2016. The econometric methodology adopted in this study takes into account the important country heterogeneity. The empirical results indicate that innovation is significant in widening income inequality, especially for high income countries. A positive innovation-

inequality dependence is only statistically significant if we measure entrepreneurial activity by new business density. The findings also demonstrate that the effect of entrepreneurial activity on income inequality in middle and low income differs depending on the proxy used. While we find evidence of positive nexus between self-employment and income inequality, the relationship between new business density and income inequality is negative. This may be due to how each of them is measured. Thus, the high number of informal self-employed (necessity entrepreneurs) in the measure of self-employment may have necessitated this nexus. While self-employment produced positive feedback effect, the new business density shows a negative feedback effect which suggest that entrepreneurial activity in the middle and low income is linked to rising income inequality when self-employment is used but negative when proxied by new business density. In terms of high-income countries, we find no dependence between our self-employment and income inequality but positive with new business density. Our findings suggest that entrepreneurial activities (proxied by new business density) are linked to rising income inequality in high income countries. This study also examined whether institutional quality act as mediator in influencing the innovation–income inequality or entrepreneurship-income inequality nexus. The findings demonstrate that institutional quality act as mediator to increase income inequality in high income countries when interacted with innovation but contrary in the middle and low income in the model with self-employment. But the model with new business density shows otherwise. The interaction between institutional quality and entrepreneurial activity is only found to strongly reduce income inequality in middle- and low-income countries but not in high income countries. Although, it is puzzling to observe a positive relationship between institutional quality and inequality. We explore further the relationship in the next chapter.

For policy implications, to reduce income inequality, the national "cake" needs to be shared, and all talents need opportunities for innovation. Innovation should be encouraged because all technological advancements have the potential to promote productivity and economic growth in the long run. This said, to reduce the negative effects associated with innovations, technology sharing policies can be adopted to reduce monopoly power attributed to intellectual property rights enforceability. In addition better institutional quality are needed to address income inequality, particularly institutions that opt for zero tolerance for corruption, so that both small and medium enterprises can have equal access to resources and technological advances. This will encourage individuals to create enterprises and provide attractive job opportunities. One possible solution to increase entrepreneurial activities while reducing inequality is for governments in developing countries to offer various schemes targeting the poor, especially finance. Our findings use only patent applications, it is vital to explore other innovations such as technological upgrading in exports, a mixture of trademark and industrial design which are highly sought after in the middle and low countries, and innovation in services before arriving at a generalization. Also, exploring how potential sources of research and development funding and their performing sectors influence income distribution is very relevant to advancing the literature. Also, we foresee a possible link between entrepreneurship and poverty which might explain the entrepreneurship-inequality nexus. Using large datasets covering entrepreneurial propensity at the micro-level may further inform policy decisions in middle- and low-income countries.

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Appendix 1. 1**: Summary of the explanatory variables**

| Variable | Description | Source |
|---|---|---|
| Gini | Gini index of disposable income | SWIID 8.3 |
| Innovation [PCT] | Patent applications | WIPO |
| Entrepreneurial activity (ENT) | Entrepreneurial activity is measured by self-employment and entry rate of new business.<br>1. Self-employment is measured as the number of self-employed people [% of total employment]. This is further disaggregated into employers and own account workers.<br>2. Entry rate is measured as number of newly registered corporations per 1,000 working-age people [those ages 15–64]. | WDI /Doingbusiness.org |
| GDP per capita (RGDPC) | GDP per capita based on purchasing power parity [PPP]. Data are in constant 2017 international dollars. | WDI |
| Trade Openness (OPN) | Sum of exports and imports as a percent of GDP | WDI |
| Institutional quality (INST) | Is the score from principal component analysis of the six governance variables – control of corruption, government effectiveness, regulatory quality, rule of law, voice and accountability and political stability and absence of violence/terrorism [Kaufmann, Kraay, & Mastruzzi, 2011]. | WBGI |
| Capital per worker (K/L) | Is the ratio of capital stock to labor force | PWT 9.1/ WDI |

Appendix 1. 2**: List of sampled countries**

| High income country | Middle and low-income countries | | |
|---|---|---|---|
| Austria | Benin | Albania | Mozambique |
| Belgium | Bolivia | Algeria | Namibia |
| Canada | Brazil | Argentina | Russian Federation |
| Czech Republic | Bulgaria | Armenia | Senegal |
| Denmark | Burkina Faso | Bangladesh | Sierra Leone |
| Estonia | Belarus | Cameroon | Tanzania |
| Finland | China | Ecuador | Thailand |
| France | Colombia | Egypt, Arab Rep. | Togo |
| Germany | Ethiopia | El Salvador | Tunisia |
| Italy | Georgia | Ghana | Turkey |
| Latvia | Poland | Guatemala | Uganda |
| Lithuania | India | Guinea | Ukraine |
| Luxembourg | Indonesia | Honduras | Pakistan |
| Netherlands | Iran, Islamic Rep. | Iraq | Paraguay |
| Norway | Ivory Coast | Malaysia | Peru |
| Portugal | Jordan | Mali | South Africa |
| Romania | Kazakhstan | Mauritania | Sudan |
| Slovak Republic | Kenya | Mexico | Swaziland |
| Slovenia | Kyrgyz Republic | Moldova | Venezuela, RB |
| Spain | Niger | Mongolia | Vietnam |
| Sweden | Nigeria | Morocco | Zambia |
| Switzerland | North Macedonia | Zimbabwe | |
| United States | | | |
| Hungary | | | |

*Note: This definition is based on World Bank new country classifications 2020*

**CHAPTER 2**

**Institutional quality and income inequality in developing countries: a dynamic panel threshold analysis.**

**CHAPTER 2:** INSTITUTIONAL QUALITY AND INCOME INEQUALITY IN DEVELOPING COUNTRIES: A DYNAMIC PANEL THRESHOLD ANALYSIS.

## 2.1 Introduction

One critical issue facing economists and policymakers worldwide is the persistent problem of poverty and income inequality. Recent evidence demonstrates that many countries with high economic growth rates have also witnessed an increase in income inequality (Dulani, Mattes, and Logan, 2013; Piketty, 2015; Jain-Chandra et al., 2016). Lived poverty continues to worsen as the reported high economic growth rates do not trickle down to the grassroots, thereby exacerbating the distortion in the income distribution. This has cast doubt on the efficacy of various economic policy prescriptions designed to minimize the impact of poverty and income inequality. Data show global inequality has declined over the last three decades, but within-country inequality remains relatively high in regions such as Sub-Saharan Africa and Latin America (Easterly, 2007; Bourguignon, 2018; Alvaredo et al., 2018; Ravallion, 2019). For example, a report by the African Development Bank in 2012 showed that 6 out of the 10 countries with the greatest inequality worldwide are found in Sub-Saharan Africa; with Gini indices above 0.50, countries such as Botswana, South Africa, and Namibia top the list of countries with unequal income distributions (Odusola, Cornia, Bhorat, & Conceição, 2019). Anecdotal evidence shows that institutional processes have paved the way for corruption, political clientelism, political instability, and other irregularities that undermine property rights and, hence, contribute to rising income inequality in these countries. Prominent institutional economists such as Trebing (1987) and North (1990), among others, have demonstrated that the proper functioning of a market economy is dependent on appropriate institutions that embody societal norms (Dolfsma, 2013).

An institution is defined as a set of working rules that can be thought of as stable agreements that channel, constrain, and regulate the behaviors of firms, workers, and other stakeholders in society, and hence contribute to economic performance in a nation-state (Ostrom, 1990; North, 1990; Fabro and Aixalá, 2009; Campbell, 2010). These incentive structures include formal and informal rules, laws, and policies that define a range of market actors' legitimate actions. An institutional framework's performance may depend on the aggregate preferences that underlie institutional reforms (Ravallion, 2014; Acemoglu and Robinson, 2013). It is widely accepted that a poor institutional regime has a deleterious effect on income distributions (Wisman, 2013; Albertus and Menaldo, 2014). Prior studies, including Daniel, Fu, and Dolfsma (2018) and Lee and Kim (2009), hold the view that the private sectors in developing economies would benefit if western forms of formal institutions were implemented in those countries, and hence, the concentration of wealth among a few elites would be reduced. Without such institutions, Daniel et al. (2018) demonstrate that an "institutional void" may arise and hamper policy efforts to reduce income inequality through efficient market operations. In contrast, others suggest that even the absence of such formal institutions may affect market functioning. Studies have found a positive relationship between low institutional quality and high income inequality, including Perera and Lee (2013), Chong and Gradstein (2007), Gyimah-Brempong and Camacho (2006), Gyimah-Brempong (2002), and Alesina and Perotti (1996). In particular, Alesina and Perotti (1996) found that income inequality is relatively high in countries with social unrest and political instability. Chong and Gradstein (2007) also found that weaker institutional quality worsens income distribution, while Gyimah-Brempong (2002) demonstrated that corruption is the source of high income inequality in Africa. Perera and Lee (2013) also reported evidence of a

positive relationship between the Gini index and institutional measures, corruption, democratic accountability, and bureaucratic quality in nine Asian economies. Studies that also found negative effects include Scully (1988), Bourguignon and Verdier (2000), Acemoglu and Robinson (2008), and Gwama (2014), who validated that countries with well-developed institutional mechanisms have the potential to foster reductions in income inequality, as well as long-term growth through avenues for shared capital accumulation. Others, including Chong and Calderón (2000) and Li, Xu, and Zou (2000), emphasized the nonlinearity of the relationship between institutions and income inequality, mimicking the famous Kuznets inverted U-shaped curve. For example, Li, Xu, and Zou (2000) found an inverted U-shaped effect of corruption on income inequality, with corruption alone explaining a large proportion of the Gini differential across developing and industrial countries. This evidence was supported by Andres and Ramlogan-Dobson (2011) after examining the effects of corruption on income inequality in Latin America. Although there are numerous explanations that stress the salience of institutions for economic growth and development, arguably, there are no coherent institutional explanations for the institutions–income inequality nexus found in the literature. It is impossible to draw a conclusion on the extent to which institutions impact income inequality in developing economies. In the theoretical literature, maintenance of property rights is considered one of the most important pillars of a capitalist economy. Well-defined property rights are an important step in reducing inequality through efficient resource allocation and investment (North, 1990). There is a strong perception that institutions play a mediating role in understanding the causes and challenges of poverty and income inequality, but little has been done to investigate the existence of an institutional threshold. In addition, the econometric approaches used are not robust for finding

the threshold effects of institutions on income inequality (Ibrahim, 2020). This study, therefore, examines the impact of institutions on income inequality in developing countries, given the institutional level. Developing countries are of particular importance for two reasons. First, they are saddled with high lived poverty and income inequality (Perera and Lee, 2013; Chong and Gradstein, 2007). Second, due to sluggish growth rates and high poverty, weak institutions are inherent in most developing countries. There is a consensus that weak institutions are the primary cause of high levels of income inequality due to corruption, political clientelism, lax legal regimes, or political interferences, as they tend to divert productive resources for private gains.

In this study we extend the literature in four respects. First, from previous chapter, we found positive relationship between income inequality and institutional quality of developing countries. We extend this study further by examining the relationship using a dynamic approach as static analysis may not capture the time influence. Also, most of the results of prior studies in the literature are based on dynamics analysis. Second, we examine the institution–inequality nexus in which the level of institutions acts as a regime-switching trigger, bifurcating the relationship between institutions and income inequality. Through this, our study highlights the impact of institutions on income inequality when institutions are below and above an estimated threshold level. While institutional quality is fragile and varies in the developing world, the appropriate level of institutional target is unclear. Hence, we compare the level in developing countries with that in the developed world. Third, by using institutions as a regime-switching trigger, we employ two broad institutional data sets gleaned from the World Governance Indicators (WGI) and the International Country Risk Guide (ICRG). This allows us to show the relative effect of institutions on income inequality in developing countries using different proxies

for institutions. In discussing institutions, we consider three indicators of institutional quality: control of corruption, government effectiveness, and the rule of law (Bekaert, Harvey, and Lundblad, 2005). The emphasis on these measures is based on their contribution to preserving property rights. An environment with poor respect for the rule of law, government ineffectiveness, and high corruption enhances opportunistic behavior that allows segments of economic actors to accumulate wealth. Four, we use Kremer, Bick, and Nautz's (2013) dynamic threshold regression, a dynamic version of Hansen's panel threshold model, to shed more light on the institution–income inequality nexus. By applying the forward orthogonal deviations transformation suggested by Arellano and Bover (1995), the model combines the instrumental variables estimation of the cross-sectional threshold model introduced by Caner and Hansen (2004) with Hansen's (1999) panel threshold model. In the dynamic model, the endogeneity of important control variables is no longer an issue. This permits us to estimate the critical level of institutions for income inequality for both advanced and developing countries despite the endogeneity problem of income inequality.

The rest of the paper is structured as follows. The following subsection provides stylized facts about institutional quality and income inequality in developing countries. Section 2 offers a brief literature review on the subject. Section 3 describes the methodology, while section 4 discusses the results. The final section presents concluding remarks and policy implications.

### 2.2 Institutions and income inequality in developing countries: An overview

In this subsection, we discuss the trend of income inequality and institutions in developing countries. The aim is to situate the institutions and income distributions of developing economies

in the context of the global trend. We proceed with an overview of income inequality, as illustrated in *Figure 2. 1*[3].

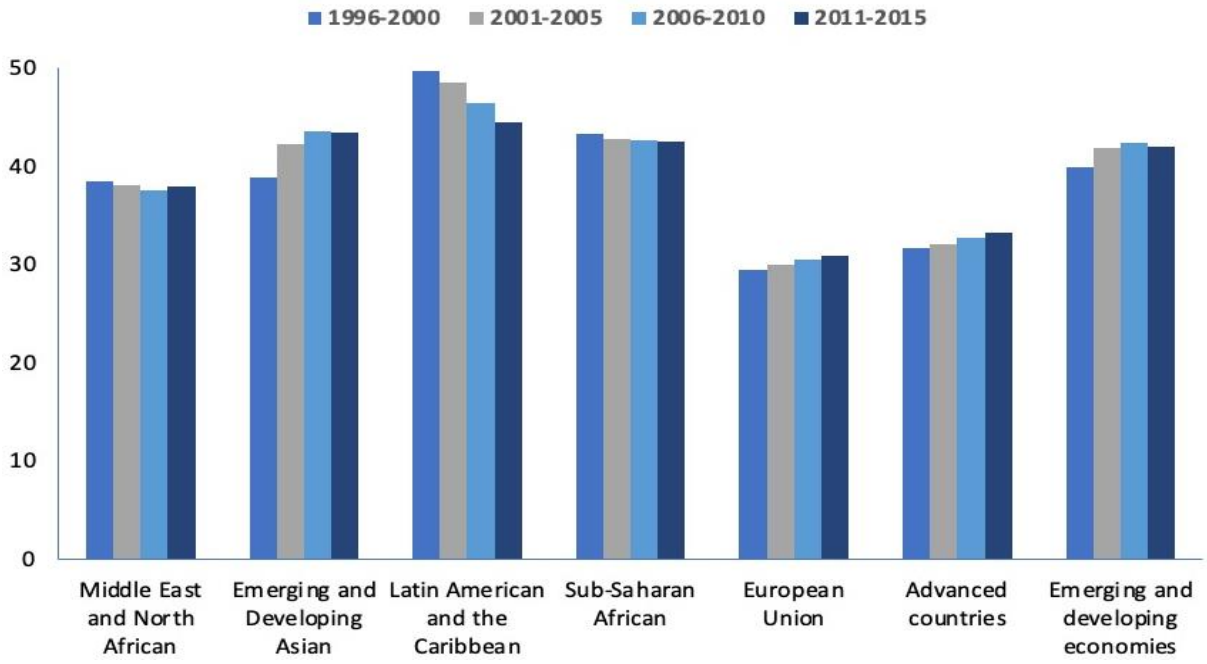


Figure 2. 1: Gini coefficient of Disposable income around the world

The bulk of recent global economic data showing fewer people at risk of extreme poverty, but economic gaps continue to grow as the very rich continue to accumulate unprecedented levels of wealth, deepening within-country inequality. **Errore. L'origine riferimento non è stata trovata.** reports much higher average income inequality for emerging and developing countries compared to that of advanced and European Union countries. Generally, income inequality is high in developing countries, with Sub-Saharan Africa having the most unequal countries, preceded only by those in Latin America. South Africa[4], for example, tops the income inequality chart with a

[3] Computed using the population-weighted average of country-specific Gini coefficients from the global income inequality database (Darvas, 2019). This measure of income inequality is based on GDP per capita and GNI per capita.

[4] It must be noted that income inequality in SSA is measured using the consumption-based approach, except for South Africa whose income inequality is based on income approach. Hence, this could explain why we observe higher inequality in South Africa than in other SSA countries.

Gini index above 0.70, followed by Botswana and Namibia. Inequality in the Middle East and North Africa is stable, remaining below 0.40. We see an upward drift in the average income inequality of emerging and developing Asia, which is most likely due to the economic development in China and India, where within-country income inequality has increased very sharply since the economic boom in the 1990s. According to Milanovic and Roemer (2016), the rise in income inequality in emerging and developing Asia was mostly driven by the very high income growth rates in China and India and the economic transformation in relatively poor populous countries, such as Vietnam, Thailand, and Indonesia. According to Lustig, Lopez-Calva, & Ortiz-Juarez, (2013), the decline in the Gini indexes of countries in Latin America is a result of the decrease in the earnings gap between skilled and low-skilled workers and an increase in government transfers to the poor. Nonetheless, Darvas (2019) emphasized that institutional development toward redistribution in advanced countries, particularly in Europe, influenced the dynamics of income inequality, and the situation in emerging and developing economies appears to yield the least impact. In this regard, we question if this could be traceable to the quality of institutional mechanisms in these regions. To understand how institutions influence income distribution, Bates (2006) argued that it is important to examine the role of both economic and non-economic institutions to understand how the institutional configuration of power relationships affects the control of resource flow in developing economies. We examine the institutional dynamics in these regions (see Figure 2. 2). In Figure 2. 2, North America, Europe, and Central Asia performed better in all three institutional indicators, with scores ranging above 60 percent. East Asia and the Pacific, Latin America and the Caribbean, and the Middle East and North Africa also scored between 40 and 60 percent. The lowest performers were Sub-Saharan

Africa and South Asia, scoring below 40 percent in all indicators. Compared to South Asia, Sub-Saharan Africa countries lag in terms of corruption control, government effectiveness, and the rule of law. Comparatively, while East Asia and the Pacific performed better than Latin America and the Caribbean on the rule of law, we see the opposite in government effectiveness and corruption control. The issue of low institutional quality in Sub-Saharan Africa remains a fundamental problem, masking her developmental progress. This includes the quality of policies and legal frameworks that are expected to encourage redistribution of income and the desired resource allocation. The linkage between high inequality and the extent of institutional development in most developing economies can be clearly seen when making country-specific references (see **Errore. L'origine riferimento non è stata trovata.**).

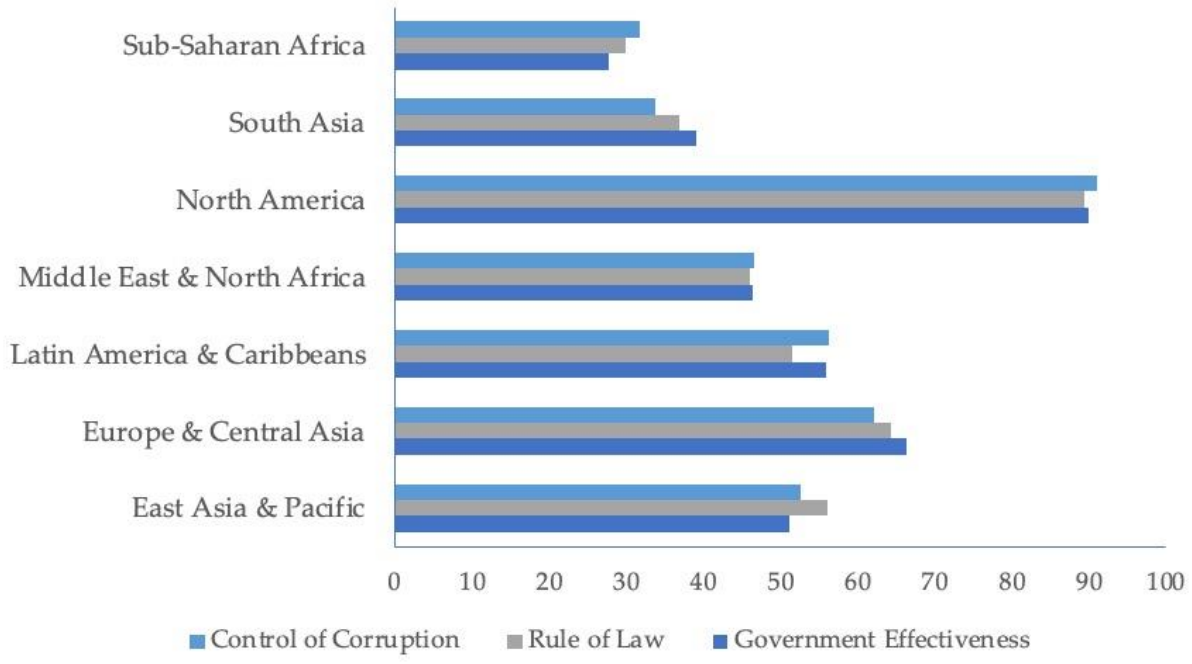


Figure 2. 2: Indicators of institutional quality

In column 2, we find countries such as Namibia, South Africa, Costa Rica, Malaysia, Poland, Botswana, Hungary, Uruguay, and Chile, in descending order, scored above 60 percent. In Sub-Saharan Africa, for instance, South Africa represents one of the economies with very high institutional development, but it surprisingly also tops the list of the most unequal countries in the world. The country's shortfall in the political environment (in terms of the rule of law) appears to aggravate the level of inequality. Côte d'Ivoire also recorded an average score of 19.11%, largely due to political instabilities that undermined the country's progress in the early 1990s. Like the situation in South Africa, the country has a lower rating on the rule of law, scoring 15.15% on average. This situation is also unique to Latin America and the Caribbean. Chile, a model economy with a good institutional regime, suffers from relatively high inequality. We also find countries with low institutions, including Venezuela and Paraguay, score below 20 percent on average in all indicators.

### 2.3 Literature Review

The subject of how institutions impact income distribution has been a notable debate in the economic literature for more than four decades, as most scholars suspect economic reform failures may have compromised the outcomes of political circumstances by protecting the interests of economic and social elites rather than those of the poor and disenfranchised (Batuo & Asongu, 2015). Recent interest in institutions by the international community and researchers coincides with a paradigm shift in global affairs to corruption control and transparency in the fight against poverty and unequal opportunities in developing countries. This fight started with the introduction of a second generation of reforms that targeted structural and institutional

constraints, such as improvements in legal, regulatory, supervisory, and other institutional environments. Despite limited knowledge and inconclusive evidence on the interrelationship between institutions and inequality, it is widely acknowledged that poor institutions have a deleterious effect on egalitarian income distribution. Studies that found such relationships have largely focused on the corruption–inequality nexus due to compounding cases of corruption over the last three decades (Gyimah-Brempong, 2002; Gyimah-Brempong and Camacho, 2006; Andres and Ramlogan-Dobson, 2011). Contemporary studies, however, point out that weak institutional factors such as government ineffectiveness and absence of the rule of law could contribute to deterioration in the income distributions of developing countries (Chong and Gradstein, 2007; Acemoglu, Johnson, and Robinson, 2001; Knack and Keefer, 1995). These studies demonstrate that institutional quality, notwithstanding the rule of law and government effectiveness, is imperative for economic growth, which is also necessary for poverty alleviation and the distribution of economic benefits across the social and economic ladder's various levels (Dollar & Kraay, 2003). In this regard, poor institutions not only deter economic growth but may also impact poverty incidence and contribute to the path dependence of institution-driven poverty traps. Empirically, several studies have examined the link between institutions and income inequality, but the debate remains inconclusive because there is no specific threshold to inform policy decisions.

Using a dynamic panel and linear feedback analysis on data from 121 countries, Chong and Gradstein (2007) found that weaker institutions contribute to higher income inequality. Likewise, Gyimah-Brempong (2002) employed a dynamic panel estimator using data from selected African countries to investigate the effects of corruption on income distribution. The

author demonstrated that higher corruption adversely impacted income distribution efforts. Further evidence from Gyimah-Brempong and Camacho (2006), who use a panel of 61 countries, shows that corruption has a much larger effect on income distributions in Africa and Latin America compared to countries in Asia. In a study of institutions and income distribution, Chong and Calderón (2000) found a quadratic relationship between institutions and income inequality. Their findings further showed that for poor countries, institutions are positively linked to income inequality, while institutions in advanced economies are negatively associated with income inequality. Using simple ordinary least squares and instrumental variable regression, Li et al. (2000) established the existence of an inverted U-shaped relationship between corruption and income inequality. Given their findings, the authors argued that inequality declines with moderations in the level of corruption, but only when the level of corruption exceeds a threshold of 2.91 in the OLS model and 4.7 for the 2SLS specification. These findings are in line with evidence from Bourguignon and Verdier (2000) and Acemoglu and Robinson (2006), who also argued the probable existence of an augmented Kuznets curve between institutional quality and income inequality. Andres and Ramlogan-Dobson (2011) suggested that there may exist a trade-off between corruption and income inequality such that at a lower level of corruption, income inequality may be at its highest in Latin America. Similarly, Blackburn and Forgues-Puccio (2009) find corruption less harmful in countries where individual rent-seeking behavior is well-coordinated and more internalized. Perera and Lee (2013) investigated the implications of economic growth and institutions on poverty and income inequality using data from nine developing countries in Asia from 1985 to 2009. Using a generalized method of moments (SGMM) estimation, they showed that while growth does not appear to affect income inequality,

improvements in corruption control, democratic accountability, and bureaucratic quality are associated with high income inequality. This finding supports prior studies that found the Kuznets inverted U-shape between institutions and income inequality. Notwithstanding this, employing both cross-country and panel data specifications, Davis and Hopkins (2011) found no support for the commonly held belief that democratic political institutions are an important determinant of income inequality, but reported strong evidence of a negative relationship between property rights and income inequality.

## 2.4 Research Method

### 2.4.1 Data sources and description

We perform a dynamic threshold regression using a balanced sample of 52 developing and 24 developed countries for the period 1996–2017. The choice of countries and time period is based on data availability. Our original sample included all countries, but countries with insufficient data were excluded to enhance the smoothness of the data and allow for fluctuations in the data set. We use the Gini index of disposable income from the Standardized World Income Inequality Database (SWIID), as our preferred measure of income inequality. The Gini index of disposable income is based on the inequality in disposable (post-tax, post-transfer) income. Thus, for countries where inequality is derived from consumption-based approaches, it is assumed that household consumption equals household disposable income. On institutions, we use two data sources, first the World Bank governance indicators and second, the International Country Risk Guide (ICRG) datasets. The ICRG datasets include bureaucratic quality, corruption control and rule of law (Bekaert et al., 2005). These indicators are comparable to the World Bank governance

indicators government effectiveness, rule of law and control of corruption, and have been used in prior studies (Chong and Calderón, 2000; Butkiewicz and Yanikkaya, 2006; Chong and Gradstein, 2007; Law, Tan, and Azman-Saini, 2014). In the theoretical literature, maintenance of property rights is considered one of the most important pillars of a capitalist economy. Well-defined property rights are important determinant of economic growth and income distribution through efficient resource allocation and investment (North, 1990). Efficient resource allocations is impeded by corruption; weak law enforcement; the lack of clear rules, transparency, and accountability in public officials; and concentration of unlimited discretionary governmental power (Butkiewicz and Yanikkaya, 2006; Gyimah-Brempong and Camacho, 2006; Farrington, 2009). We choose these measures based on their links to efficient resource allocation and how they influence opportunity creation. The relevance of the first measure is aligned with the assertion that government effectiveness is necessary for implementing and protecting rules and regulations (Acemoglu, Johnson, and Robinson, 2002). Likewise, we include control of corruption based on anecdotal findings that suggest corruption is still a major problem undermining the realization of actual societal outcomes in most developing and emerging economies. This reflects the likelihood that officials will demand illegal payments or use their positions for political clientelism (Markussen, 2011). The rule of law, on the other hand, emphasizes citizens' willingness to accept established institutions for socioeconomic justice and fair resource allocation (Berg & Desai, 2013). The absence of the rule of law may increase opportunistic behavior by some economic agents to accumulate more wealth, widening the inequality gap. Consistent with prior studies such as Adams and Klobodu (2016) and Jauch and Watzka (2016), we control for the effects of real GDP per capita, fiscal deficits, trade openness, and human capital.

Appendix 2. 1 provides a brief description of the variables. We illustrate the reinforcing effect of institutions on income inequality in a cross-country setup in Figure 2. 3.

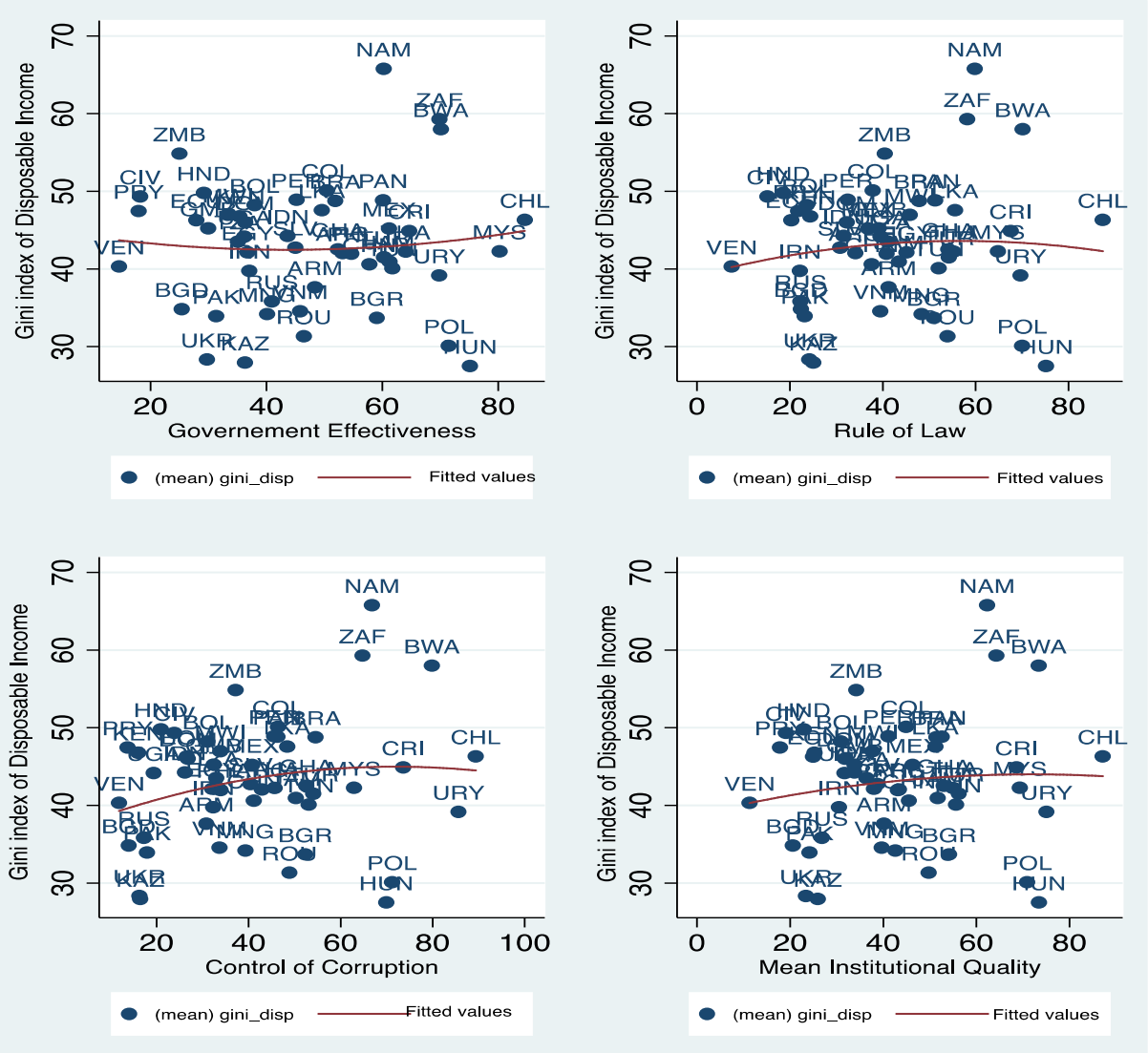


*Figure 2. 3: Institutions and income inequality*

### 2.4.2 Measurement of governance indicators

Various institutional indicators exist. However, for this study we dwell on the WGI and ICRG institutional indicators. The WGI institutional indicators are compiled from expert opinions and survey sources that report the views and experiences of citizens, entrepreneurs, and experts in

the public, private and NGO sectors from around the world, on the quality of various aspects of governance. These sources include surveys of households and firms (such as Afrobarometer surveys, Gallup World Poll, and Global Competitiveness Report survey), Commercial business information providers (such as Economist Intelligence Unit, IHS Markit, Political Risk Services), Non-governmental organizations (including Global Integrity, Freedom House, Reporters Without Borders) and Public sector organizations (including the CPIA assessments of World Bank and regional development banks, the EBRD Transition Report, French Ministry of Finance Institutional Profiles Database). The government effectiveness captures perceptions of the quality of public services. Rule of law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and control of corruption, that captures perceptions of the extent to which public power is exercised for private gain. The indicators from the various data sources are then rescaled from 0 – 1, after which it is weighted using the Unobserved Components Model (UCM) to range between -2.5 and +2.5. Due to its data sources, many researchers have argued that the WGI institutional indices are "subjective" and based on expert assessment and opinions that may be biased (see Knack and Keefer 1995). Another concern among prior studies, is its comparability overtime and across countries (Bardhan 2008). The ICRG institutional indicators on the other hand are based on country risk assessments and more objective than the WGI indices. For instance, control of corruption index is measured on a six-points scale. It measured from actual or potential corruption in the form of excessive patronage, nepotism, job reservations, 'favor-for-favors', secret party funding, and suspiciously close ties between politics and business. Bureaucracy quality is measured on a four-points scale. It measures the institutional strength and quality of the bureaucracy. High points are given to countries where the

bureaucracy has the strength and expertise to govern without drastic changes in policy or interruptions in government services. Countries that lack the cushioning effect of a strong bureaucracy receive low points because a change in government tends to be traumatic in terms of policy formulation and day-to-day administrative functions. Law and Order is also measured on a six-point scale. This measure is based on two indicators, (i) law which assesses the strength and impartiality of the legal system. (ii) Order is based on assessment of popular observance of the law.

In this Figure *2. 3*, both income inequality and institutions are captured as averages from 1996 to 2017. **Errore. L'origine riferimento non è stata trovata.** and **Errore. L'origine riferimento non è stata trovata.** reports the descriptive statistics and list of countries used in the study.

Table 2. 1: Mean of institutional quality of all sampled countries

| Country | Gini Index | Institutional Quality | Government Effectiveness | Rule of Law | Control of Corruption |
|---|---|---|---|---|---|
| Argentina | 43.11 | 43.40 | 53.20 | 34.12 | 42.89 |
| Armenia | 49.24 | 40.13 | 48.38 | 41.23 | 30.79 |
| Bangladesh | 38.88 | 20.57 | 25.37 | 22.40 | 13.93 |
| Bolivia | 47.34 | 30.85 | 37.87 | 23.64 | 31.04 |
| Botswana | 63.07 | 73.36 | 70.11 | 70.15 | 79.83 |
| Brazil | 57.86 | 51.44 | 51.91 | 47.87 | 54.54 |
| Bulgaria | 44.52 | 54.14 | 59.11 | 51.01 | 52.30 |
| Chile | 51.67 | 87.11 | 84.59 | 87.38 | 89.35 |
| China | 41.08 | 45.52 | 57.81 | 37.59 | 41.15 |
| Colombia | 51.9 | 44.89 | 50.46 | 37.85 | 46.36 |
| Costa Rica | 48.69 | 68.60 | 64.63 | 67.58 | 73.59 |
| Côte d'Ivoire | 50.34 | 19.11 | 18.33 | 15.15 | 23.85 |
| Dominican Republic | 44.65 | 31.80 | 36.38 | 32.26 | 26.76 |
| Ecuador | 47.62 | 24.94 | 27.92 | 20.31 | 26.57 |
| Egypt, Arab Rep. | 46.75 | 37.94 | 36.73 | 45.13 | 31.97 |
| El Salvador | 43.92 | 38.74 | 44.97 | 30.84 | 40.41 |
| Gambia, The | 48.06 | 33.76 | 29.91 | 39.10 | 32.27 |
| Ghana | 45.01 | 52.92 | 52.16 | 54.14 | 52.46 |

| | | | | | |
|---|---|---|---|---|---|
| Honduras | 49.64 | 22.90 | 29.19 | 18.57 | 20.94 |
| Hungary | 50.26 | 73.41 | 75.15 | 75.17 | 69.92 |
| Indonesia | 41.27 | 33.80 | 43.70 | 31.56 | 26.15 |
| Iran, Islamic Rep. | 44.09 | 30.49 | 37.09 | 22.11 | 32.26 |
| Jamaica | 42.76 | 51.66 | 61.24 | 43.50 | 50.25 |
| Kazakhstan | 36.19 | 25.93 | 36.34 | 25.02 | 16.42 |
| Kenya | 49.87 | 25.24 | 35.39 | 24.36 | 15.98 |
| Malawi | 49.86 | 37.66 | 33.22 | 45.81 | 33.94 |
| Malaysia | 45.72 | 69.34 | 80.29 | 64.86 | 62.88 |
| Mexico | 47.40 | 46.27 | 61.18 | 36.86 | 40.75 |
| Moldova | 50.64 | 33.20 | 31.70 | 41.19 | 26.73 |
| Mongolia | 36.54 | 42.58 | 40.09 | 48.35 | 39.30 |
| Namibia | 69.51 | 62.30 | 60.27 | 59.84 | 66.81 |
| Pakistan | 35.76 | 24.16 | 31.39 | 23.17 | 17.93 |
| Panama | 53.09 | 52.52 | 60.03 | 51.29 | 46.24 |
| Paraguay | 48.80 | 17.81 | 17.97 | 21.79 | 13.67 |
| Peru | 52.61 | 41.08 | 45.22 | 32.46 | 45.55 |
| Philippines | 46.20 | 43.12 | 54.64 | 40.81 | 33.91 |
| Poland | 48.44 | 70.89 | 71.45 | 70.03 | 71.18 |
| Romania | 41.68 | 49.73 | 46.43 | 53.94 | 48.83 |
| Russian | 47.02 | 26.80 | 40.91 | 22.27 | 17.23 |
| South Africa | 67.93 | 64.25 | 69.81 | 58.21 | 64.73 |
| Sri Lanka | 44.83 | 51.18 | 49.56 | 55.58 | 48.38 |
| Tanzania | 40.44 | 36.34 | 34.98 | 41.14 | 32.90 |
| Thailand | 45.83 | 54.97 | 64.04 | 55.24 | 45.64 |
| Tunisia | 42.39 | 55.63 | 61.76 | 52.06 | 53.06 |
| Turkey | 44.3 | 56.20 | 60.30 | 54.24 | 54.05 |
| Uganda | 46.68 | 31.68 | 36.15 | 39.54 | 19.35 |
| Ukraine | 23.57 | 23.37 | 29.70 | 24.19 | 16.21 |
| Uruguay | 50.15 | 75.02 | 69.79 | 69.67 | 85.59 |
| Venezuela | 42.65 | 11.29 | 14.58 | 7.44 | 11.85 |
| Vietnam | 40.14 | 39.63 | 45.76 | 39.46 | 33.66 |
| Zambia | 58.28 | 34.21 | 24.94 | 40.44 | 37.25 |

*Source: Computation from Worldwide Governance Indicators (2019)*

Table 2. 2: Descriptive statistics all sampled countries, 1996–2017.

| | Developing countries | | | Advanced countries | | |
|---|---|---|---|---|---|---|
| Variable | Mean | Min | Max | Mean | Min | Max |

| | | | | | | |
|---|---|---|---|---|---|---|
| Gini Index | 42.80 | 26.30 | 66.40 | 29.54 | 21.80 | 38.20 |
| Per capita income | 9804.88 | 743.00 | 27049.30 | 37380.14 | 8613.20 | 98537.40 |
| Trade openness | 72.27 | 15.64 | 220.41 | 94.83 | 22.15 | 408.36 |
| Human capital | 2.42 | 1.28 | 3.40 | 3.23 | 2.11 | 3.81 |
| Fiscal policy | -2.54 | -16.61 | 16.91 | -1.64 | -32.03 | 18.68 |
| Institution ICRG | 0.00 | -2.44 | 3.34 | -0.00 | -2.79 | 0.73 |
| Institution WBGI | 0.00 | -2.37 | 2.89 | 0.00 | -2.56 | 1.87 |

Argentina, Armenia, Australia, Austria, Bangladesh, Belgium, Bolivia, Botswana, Brazil, Bulgaria, Canada, Chile, China, Colombia, Costa Rica, Cote d'Ivoire, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Finland, France, Gambia, Germany, Ghana, Greece, Honduras, Hungary, Indonesia, Islamic Republic of Iran, Ireland, Israel, Italy, Jamaica, Kazakhstan, Kenya, Latvia, Lithuania, Luxembourg, Malawi, Malaysia, Mexico, Mongolia, Namibia, Netherlands, New Zealand, Norway, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, South Africa, South Korea, Spain, Sri Lanka, Sweden, Switzerland, Tanzania, Thailand, Tunisia, Turkey, Uganda, Ukraine, United Kingdom, United States, Uruguay, Venezuela, Vietnam, Zambia

### 2.4.3 Model specification

In this study, we use an extended endogenous growth model with specifications based on North (1990). Endogenous growth theory provided insight into the significance of institutional effects on economic growth after it became obvious that growth models (e.g., Lucas, 1988; Romer, 1990) were theoretically inadequate to explain economic prosperity. These theories ignored the fact that economies could converge to a steady state of shared economic prosperity if they had a working institutional framework to support productive activities. However, endogenous growth theory recognizes that quality institutions are part of an economic system and, hence, an important factor in resource allocation and distribution. Our empirical model is based on Acemoglu et al.'s (2001) augmented endogenous growth model, which formalizes the relationship between institutional quality and income inequality. Our baseline econometric model is specified as follows:

$$\boldsymbol{y_{it} = \beta_0 + \beta_1 INS_{it} + \beta_2 X_{it} + \varepsilon_{it}, \qquad \varepsilon \sim N(0, \sigma^2)} \tag{2.1}$$

where $\boldsymbol{y_{it}}$ represents income inequality, measured by the Gini index of disposable income; $\boldsymbol{INS_{it}}$ is institutional quality; $\boldsymbol{X_{it}}$ is vector of controls; $\boldsymbol{\beta}$ represents the parameters to be estimated; and $\boldsymbol{\varepsilon_{it}}$ is a white noise error term. In examining the threshold effect, a frequently used basic approach is to include a quadratic institutional term in the baseline equation (Chong and Calderón, 2000; Li, Xu, and Zou, 2000). This approach comes with limitations, as emphasized in Ibrahim (2020); for example, a quadratic term of the threshold variable does not illustrate how the relationship between institutions and income inequality can be mediated by institutions. In addition, this approach does not provide the precise impact of institutions when they are below or above the threshold. Standard threshold regressions such as Hansen's (1999) non-dynamic panel threshold regression and Caner and Hansen's (2004) cross-sectional threshold regression are used to address these limitations, but both econometric techniques suffer from endogeneity bias. To overcome this, we adopt Kremer, Bick, and Nautz's (2013) dynamic panel threshold regression. This econometric technique is an improvement over the Hansen (1999) and Caner and Hansen (2004) threshold regressions. It is robust to the potential endogeneity bias of the previous models and unlike Gonzalez, Teräsvirta, Van Dijk, and Yang's (2017) panel smooth transition model, which is only applicable to balanced panels, allows for unbalanced panels. The baseline threshold model is specified as follows:

$$\boldsymbol{y_{it} = \mu_i + I(INS_{it} \leq \gamma) + \delta_1 I(INS_{it} \leq \gamma) + \beta_2 INS_{it} I(INS_{it} > \gamma) + \alpha Z_{it} + \varepsilon_{it}} \qquad \textbf{(2.2)}$$

where the parameters $\mu_i$ and $\gamma$ are individual effects and the threshold value, respectively; I(.) is the indicator function, $y_{it}$ (the Gini coefficient) is the dependent variable, $INS_{it}$ (institutional quality) is the threshold variable, and $Z_{it}$ is the m-dimensional vector of explanatory regressors, which may include lagged values of y and other endogenous variables. The vector of explanatory

variables is partitioned into a subset $Z_{1it}$ of exogenous variables uncorrelated with $\varepsilon_{it}$ and a subset of endogenous variables $Z_{2it}$ correlated with $\varepsilon_{it}$; $\delta_1$ is the regime intercept, which is common for all the cross-sections. $\varepsilon_{it}$ is the error term assumed to be $iid \sim (0, \sigma^2)$. The parameters $\beta_1$ and $\beta_2$ represent the marginal impact of institutions on income inequality when the institutional quality value is below the threshold and above the threshold, respectively. Following Arellano and Bover (1995), the slope of the dynamic threshold regression is derived using the specifications of the generalized method of moments (GMM). The lag values of the endogenous variable, income inequality, are used as instruments to correct for endogeneity bias. We reduced the instrument count to 2 (p = 2) to avoid overfitting instrumented variables, which might lead to biased coefficient estimates. The next approach is to eliminate individual fixed effects, $\mu_i$, without violating the underlying distributional assumptions of Hansen (1999, 2000) and Caner and Hansen (2004). As argued in Kremer, Bick, and Nautz (2013), applying a standard within transformation (Hansen 1999) to a dynamic model such as equation (2.2) leads to inconsistent estimates, as the lagged dependent variable is correlated with the mean of the individual errors. This also holds for all the transformed individual errors. However, using first-differencing also implies negative serial correlation of the error terms, which violates the underlying distribution theory developed by Hansen (1999), making it inapplicable to panel data. To solve this problem, Kremer et al. (2013) applied a forward orthogonal deviations transformation to eliminate individual fixed effects. The transformation ensures that the error terms in the model are not autocorrelated when applying Caner and Hansen's (2004) cross-sectional threshold model to a dynamic panel model. The forward orthogonal deviation transformation of the error term is specified as

$$\boldsymbol{\varepsilon_{it}^{*}} = \sqrt{\frac{\boldsymbol{T-1}}{\boldsymbol{T-t+1}}}\left[\boldsymbol{\varepsilon_{it}} - \frac{\boldsymbol{1}}{\boldsymbol{T-t}}(\boldsymbol{\varepsilon_i(t+1)} + \cdots + \boldsymbol{\varepsilon_{iT}})\right]$$

The error term remains uncorrelated after applying the forward orthogonal deviation transformation, that is:

$$\boldsymbol{Var(\varepsilon_i) = \sigma^2 I_T \;\; \Rightarrow Var(\varepsilon_i^{*}) = \sigma^2 I_{T-1}}$$

To estimate the dynamic panel threshold model, Kremer et al. (2013) estimate a reduced-form regression for the endogenous variable $Z_{2it}$ as a function of the instruments $X_{it}$ (Caner and Hansen, 2004). Ordinary least squares (OLS) is used to estimate equation 2.2 for a fixed threshold, γ, where $Z_{2it}$ is substituted with its predicted values from the first-step regression. The residual sum of squares is denoted by $S(\gamma)$, where γ is the common threshold value. The step is repeated for a strict subset of the support of the threshold variable $q$ from which, in the third step, the estimator of the threshold value γ is selected as the one associated with the smallest sum of squared residuals, that is, $\hat{\gamma} = \underset{\gamma}{argmin}\, S_n(\gamma)$. Following Hansen (1999) and Caner and Hansen (2004), the critical values for determining the 95% confidence interval of the threshold value are given by

$$\boldsymbol{\Gamma = \{\gamma : LR(\gamma) \leq C(\alpha)\}},$$

where C($\alpha$) is the 95% percentile of the asymptotic distribution of the likelihood ratio statistic LR ($\gamma$). The likelihood ratio is adjusted to accommodate the number of time periods used for each cross-section. Once $\hat{\gamma}$ is determined, the slope coefficient is then estimated using the GMM.

## 2.4 Empirical Results and Discussion

In this section of the paper, we present and discuss the results of the dynamic threshold regression. **Errore. L'origine riferimento non è stata trovata.**, reports the baseline results for both

advanced and developing economies using WBGI institutional quality indicators. The upper part of the tables displays the estimated institutional quality threshold, and the corresponding 95% confidence intervals. The middle part shows regime-dependent coefficients of institutional quality on income inequality. Parameters $\beta_1$ *and* $\beta_2$ are the marginal effects of institutional quality on income inequality, below (above) the institutional regime, that is, when institutional quality is either below or above the estimated threshold value. The coefficients of the control variables are presented in the lower part of the tables. The institutional quality index is derived from the scores of the principal components of the three governance indicators namely government effectiveness, control of corruption and rule of law. The results are reported in **Errore. L'origine riferimento non è stata trovata.**.

The WBGI institutional index shows the inequality-reducing effect is disproportionate, given the level of development. We find quadratic effect for advanced countries but a monotonic negative effect for developing countries, irrespective of whether developing country is below or above the threshold. The estimated threshold value of 0.1866 with a corresponding 95% confidence interval [0.1766, 0.6211] for advanced countries. The marginal effect shows a positive relationship between institutional quality and income inequality if institutional quality is below the threshold ($\beta_1$= 0.0416, p<0.01), and negative if institutional quality is above the threshold ($\beta_2$= -0.0071, p>0.1). In column 2 of **Errore. L'origine riferimento non è stata trovata.**, however, the results show an estimated threshold value of 1.1889 and a corresponding 95% confidence interval of [1.1284, 1.2216] for our sample of developing economies. The marginal effect shows negative relationship between institutional quality and income inequality if institutional quality is below the threshold ($\beta_1$= -0.0320, p<0.01), and negative if institutional quality is above the threshold ($\beta_2$=

-0.0310, p<0.01). Although this may appear counterintuitive, we argue that institutional reforms across the developing countries, particularly in the late 1990's, may have triggered an inequality reducing effect, such that marginal improvements in the overall institutional development produced a positive impact for the reduction of poverty and inequality of opportunities to the extent that a larger negative effect of institutional quality is observed for countries with weak institutions. Example can be said of Mexico's Progresa/Oportunidades which provided large-scale, well-targeted program that makes transfers conditional on investments in human capital (World Bank 2001) and South Africa's adoption of OECD guidelines in 2011 to control corruption in tenders and procurement processes in its public sector. Other reforms that also facilitated the eradication of barriers such as bureaucracy and regulatory inadequacies, were the financial sector reforms, public sector management reforms and structural adjustment reforms. There is also a convincing argument that the impact of institution on income distribution varies by indicators. After, applying the individual institutional variables in the same framework for both developed and developing economies.

Table 2. 3: Results of WBGI Institution threshold

| Estimated threshold | Advanced Countries | Developing Countries |
|---|---|---|
| $\boldsymbol{\gamma}$ | 0.1865746 | 1.188985 |
| 95% Confidence interval | [0.1766168, 0.6211474] | [1.128371, 1.221611] |
| Impact of institutional quality | Estimated Coefficient | Estimated Coefficient |
| $\boldsymbol{\beta_1}$ | 0.0416*** | -0.0320*** |
| | (0.0139) | (0.0066) |
| $\boldsymbol{\beta_2}$ | -0.0071 | -0.0310*** |
| | (0.0048) | (0.0069) |
| Impact of regime-independent regressors | Estimated Coefficient | Estimated Coefficient |
| Lag of Gini | 0.0018 | 0.0036* |
| | (0.0018) | (0.0019) |
| Real GDP per capita | -0.0314* | 0.0404*** |

| | | |
|---|---|---|
| | (0.0187) | (0.0133) |
| Fiscal policy | -0.0001 | -0.0002 |
| | (0.0010) | (0.0011) |
| Human capital | 0.0910*** | -0.1709*** |
| | (0.0158) | (0.0161) |
| Trade openness | 0.0414*** | 0.0204** |
| | (0.0117) | (0.0096) |
| $\boldsymbol{\delta_1}$ | 0.0708** | -0.0276*** |
| | (0.0281) | (0.0060) |
| Regime 1 | 204 | 524 |
| Regime 2 | 508 | 363 |
| Linearity test | | |
| Wald test (LM) | 33.101[0.000] | 15.655 [0.016] |
| Fisher test (F) | 2653.563[0.000] | 2037.703[0.000] |
| Likelihood Ratio test (LM) | 34.210[0.000] | 15.803[0.015] |

Notes: *, ** and *** denote significance at 10%, 5% and 1% levels; Standard errors in parentheses

The results are presented in **Errore. L'origine riferimento non è stata trovata.** and **Errore. L'origine riferimento non è stata trovata.**. In the context of the advanced countries, we find that below the threshold, individual indicators are positively correlated with income inequality. Above the threshold, only rule of law is significant. Also, the results show a negative marginal effect of control of corruption on income inequality, but the association is not statistically significant. For developing countries, we find two divergent results. First, a quadratic effect for rule of law and control of corruption, and second, a negative monotonic association for government effectiveness. Although, developing economies are mostly found to exhibit weaker governance institutions, significant increase in the proportion of countries with surplus in government effectiveness occurred much earlier to support the several reforms that transformed some of these economies. This confirms our claim that the introduction of public sector reforms and structural adjustment policies that eliminated bureaucracy and reduced procurement breaches in the public sector had significant impact on the institutional environment in the

developing world. This finding is in line with evidence from (Gradstein & Chong, 2004) who also found that government effectiveness has the largest impact (among all the WGI governance indicators) on income inequality in developing countries. This may be attributed to the fact that the World Banks's focus on developing countries have remained on trying to find accountability and transparency in the public sectors. We do not neglect the argument of prior studies on the choice of governance indicators as most institutional quality measures are "subjective" and based on expert assessment and opinions that may be biased (see Knack and Keefer 1995). Also, there is a concern among prior studies over the comparability of the WBGI governance indicators overtime and across countries (Bardhan 2008). Since the WBGI is also based on expert perceptions and opinions rather than actual institutional development, we replaced the WBGI institutional quality index with ICRG institutional quality index.

In column 1 of Comparatively, while the results suggest the presence of a quadratic or Kuznets inverted U-shaped relationship between institutional quality and income inequality for developing economies, we find that the threshold value for developing countries is higher than that of advanced countries, suggesting that more effort is needed for developing economies to reach a higher level of institutional quality, that is, income inequality reducing. This is because institutional quality in the developing countries is far from optimum (Lee and Kim, 2009; Perera and Lee, 2013; Adams and Klobodu, 2016). This evidence is particularly consistent with existing literature, which demonstrates that well-defined institutions are important for efficient resource allocation and redistribution (Butkiewicz & Yanikkaya, 2006; Gyimah-Brempong & Muñoz, 2006; North, 1990). According to the 95% confidence interval, for developing economies to minimize income inequality, the conclusion at least holds for high institutional quality. This contradicts

evidence from Perera and Lee (2013) for developing economies but supports the findings of recent studies, such as Aiyar and Ebeke (2019), Hartmann et al., (2017), Jauch and Watzka (2016), and Brunori et al. (2013), who show that weak institutions have a deleterious impact on income distribution in developing economies. The negative institution-inequality relationship also supports the broad theoretical arguments of new institutional economics (Acemoglu & Johnson, 2005), and empirical evidence from Acemoglu and Robinson (2006), Gwama, (2014) and Gundlach and Paldam (2009), that implies strong institutions are necessary to moderate income inequality by improving the efficiency of desired resource allocation and distribution for economic prosperity.

we report an estimated threshold value of 0.3579 with a corresponding 95% confidence interval [0.1484, 0.3579] for advanced countries. The marginal effect shows a positive relationship between institutional quality and income inequality if institutional quality is below the threshold ($\beta_1$= 0.0361, p<0.01), and negative if institutional quality is above the threshold ($\beta_2$= -0.0233, p<0.01). Qualitatively, we find quadratic relationship for the advanced economies which bears resemblance to our findings in **Errore. L'origine riferimento non è stata trovata.**. In column 2 of Comparatively, while the results suggest the presence of a quadratic or Kuznets inverted U-shaped relationship between institutional quality and income inequality for developing economies, we find that the threshold value for developing countries is higher than that of advanced countries, suggesting that more effort is needed for developing economies to reach a higher level of institutional quality, that is, income inequality reducing. This is because institutional quality in the developing countries is far from optimum (Lee and Kim, 2009; Perera

and Lee, 2013; Adams and Klobodu, 2016). This evidence is particularly consistent with existing literature, which demonstrates that well-defined institutions are important for efficient resource allocation and redistribution (Butkiewicz & Yanikkaya, 2006; Gyimah-Brempong & Muñoz, 2006; North, 1990). According to the 95% confidence interval, for developing economies to minimize income inequality, the conclusion at least holds for high institutional quality. This contradicts evidence from Perera and Lee (2013) for developing economies but supports the findings of recent studies, such as Aiyar and Ebeke (2019), Hartmann et al., (2017), Jauch and Watzka (2016), and Brunori et al. (2013), who show that weak institutions have a deleterious impact on income distribution in developing economies. The negative institution-inequality relationship also supports the broad theoretical arguments of new institutional economics (Acemoglu & Johnson, 2005), and empirical evidence from Acemoglu and Robinson (2006), Gwama, (2014) and Gundlach and Paldam (2009), that implies strong institutions are necessary to moderate income inequality by improving the efficiency of desired resource allocation and distribution for economic prosperity.

, however, the results show an estimated threshold value of 2.1652 and a corresponding 95% confidence interval of [1.0819, 2.1652] for our sampled developing economies. The marginal effect shows a positive relationship between institutional quality and income inequality if the quality of institution is below the threshold ($\beta_1$= 0.0179, p<0.01), and negative if the quality of institution is above the threshold ($\beta_2$= -0.0168, p<0.01).

Table 2. 4: Results of the individual WBGI institution threshold for advanced countries

| Estimated threshold | Government Effectiveness | Control of Corruption | Rule of Law |
|---|---|---|---|
| $\boldsymbol{\gamma}$ | 1.7955 | 2.2363 | 2.2746 |
| 95% Confidence interval | [1.7471, 2.2705] | [1.2508, 2.3782] | [1.9094, 2.4186] |
| Impact of institutional quality | Estimated Coefficient | Estimated Coefficient | Estimated Coefficient |
| $\boldsymbol{\beta_1}$ | 0.0914*** | 0.0548*** | 0.0825*** |
| | (0.0279) | (0.0141) | (0.0177) |
| $\boldsymbol{\beta_2}$ | 0.0142 | -0.0089 | 0.0308* |
| | (0.0097) | (0.0099) | (0.0179) |
| Impact of regime-independent regressors | Estimated Coefficient | Estimated Coefficient | Estimated Coefficient |
| Lag of Gini | 0.0018 | 0.0028 | 0.0028 |
| | (0.0018) | (0.0018) | (0.0018) |
| Real GDP per capita | -0.0314* | -0.0194 | -0.0536** |
| | (0.0187) | (0.0193) | (0.0220) |
| Fiscal policy | -0.0001 | -0.0008 | 0.0003 |
| | (0.0010) | (0.0010) | (0.0011) |
| Human capital | 0.0910*** | 0.0840*** | 0.1073*** |
| | (0.0158) | (0.0161) | (0.0168) |
| Trade openness | 0.0414*** | 0.0369*** | 0.0378*** |
| | (0.0117) | (0.0119) | (0.0116) |
| $\boldsymbol{\delta_1}$ | -0.0794*** | -0.0205 | -0.0320 |
| | (0.0148) | (0.0149) | (0.0271) |
| Regime 1 | 37 | 142 | 157 |
| Regime 2 | 508 | 403 | 388 |
| Linearity test | | | |
| Wald test (LM) | 33.100[0.000] | 27.780[0.000] | 27.618[0.000] |
| Fisher test (F) | 2653.526[0.000] | 2227.022[0.000] | 2214.038[0.000] |
| Likelihood Ratio test (LM) | 34.209[0.000] | 28.556[0.000] | 28.385[0.000] |

Notes: *, ** and *** denote significance at 10%, 5% and 1% levels; Standard errors in parentheses

Table 2. 5: Results of the individual WBGI institution threshold for developing countries

| Estimated threshold | Government Effectiveness | Control of Corruption | Rule of Law |
|---|---|---|---|
| $\boldsymbol{\gamma}$ | 0.9293 | 0.8039 | 1.4168 |
| 95% Confidence interval | [0.9043, 0.9425] | [0.8026, 0.8569] | [1.2770, 1.6815] |
| Impact of institutional quality | Estimated Coefficient | Estimated Coefficient | Estimated Coefficient |
| $\boldsymbol{\beta_1}$ | -0.0614*** | 0.0077 | 0.0083 |
| | (0.0128) | (0.0109) | (0.0087) |
| $\boldsymbol{\beta_2}$ | -0.0596*** | -0.0694*** | -0.1207*** |
| | (0.0133) | (0.0130) | (0.0196) |
| Impact of regime-independent regressors | Estimated Coefficient | Estimated Coefficient | Estimated Coefficient |
| Lag of Gini | 0.0036* | 0.0041** | 0.0050** |
| | (0.0019) | (0.0018) | (0.0018) |
| Real GDP per capita | 0.0404*** | 0.0334** | 0.0267* |
| | (0.0133) | (0.0144) | (0.0139) |
| Fiscal policy | -0.0002 | 0.0004 | 0.0001 |
| | (0.0011) | (0.0012) | (0.0012) |
| Human capital | -0.1709*** | -0.1660*** | -0.1641*** |
| | (0.0161) | (0.0172) | (0.0167) |
| Trade openness | 0.0204** | 0.0235** | 0.0225** |
| | (0.0095) | (0.0093) | (0.0097) |
| $\boldsymbol{\delta_1}$ | -0.0279*** | -0.0187*** | -0.0818*** |
| | (0.0058) | (0.0067) | (0.0120) |
| Regime 1 | 524 | 614 | 754 |
| Regime 2 | 363 | 273 | 133 |
| Linearity test | | | |
| Wald test (LM) | 15.655[0.016] | 51.250[0.000] | 21.369[0.002] |
| Fisher test (F) | 2037.746[0.000] | 6671.031[0.000] | 2781.473[0.000] |
| Likelihood Ratio test (LM) | 15.803[0.015] | 52.886[0.000] | 21.646[0.001] |

Notes: *, ** and *** denote significance at 10%, 5% and 1% levels; Standard errors in parentheses

Comparatively, while the results suggest the presence of a quadratic or Kuznets inverted U-shaped relationship between institutional quality and income inequality for developing economies, we find that the threshold value for developing countries is higher than that of advanced countries, suggesting that more effort is needed for developing economies to reach a higher level of institutional quality, that is, income inequality reducing. This is because institutional quality in the developing countries is far from optimum (Lee and Kim, 2009; Perera and Lee, 2013; Adams and Klobodu, 2016). This evidence is particularly consistent with existing literature, which demonstrates that well-defined institutions are important for efficient resource allocation and redistribution (Butkiewicz & Yanikkaya, 2006; Gyimah-Brempong & Muñoz, 2006; North, 1990). According to the 95% confidence interval, for developing economies to minimize income inequality, the conclusion at least holds for high institutional quality. This contradicts evidence from Perera and Lee (2013) for developing economies but supports the findings of recent studies, such as Aiyar and Ebeke (2019), Hartmann et al., (2017), Jauch and Watzka (2016), and Brunori et al. (2013), who show that weak institutions have a deleterious impact on income distribution in developing economies. The negative institution-inequality relationship also supports the broad theoretical arguments of new institutional economics (Acemoglu & Johnson, 2005), and empirical evidence from Acemoglu and Robinson (2006), Gwama, (2014) and Gundlach and Paldam (2009), that implies strong institutions are necessary to moderate income inequality by improving the efficiency of desired resource allocation and distribution for economic prosperity.

Table 2. 6: Results of ICRG institution threshold

| Estimated threshold | Advanced Countries | Developing Countries |
|---|---|---|
| $\boldsymbol{\gamma}$ | 0.3578931 | 2.165184 |
| 95% Confidence interval | [0.1484064, 0.3578995] | [1.081901, 2.16524] |
| Impact of institutional quality | Estimated Coefficient | Estimated Coefficient |
| $\boldsymbol{\beta_1}$ | 0.0361*** | 0.0179*** |
| | (0.0132) | (0.0030) |
| $\boldsymbol{\beta_2}$ | -0.0233*** | -0.0168*** |
| | (0.0059) | (0.0041) |
| Impact of regime-independent regressors | Estimated Coefficient | Estimated Coefficient |
| Lag of Gini | 0.0033* | 0.0039* |
| | (0.0018) | (0.0021) |
| Real GDP per capita | -0.0076 | 0.0161 |
| | (0.0172) | (0.0147) |
| Fiscal policy | -0.0007 | -0.0003 |
| | (0.0011) | (0.0011) |
| Human capital | 0.0744*** | -0.1504*** |
| | (0.0143) | (0.0170) |
| Trade openness | 0.0373*** | 0.0219** |
| | (0.0113) | (0.0095) |
| $\boldsymbol{\delta_1}$ | 0.0366** | -0.0089 |
| | (0.0182) | (0.0087) |
| Regime 1 | 131 | 756 |
| Regime 2 | 414 | 131 |
| Linearity test | | |
| Wald test (LM) | 41.882[0.000] | 66.540[0.000] |
| Fisher test (F) | 3357.501[0.000] | 8661.306[0.000] |
| Likelihood Ratio test (LM) | 43.679[0.000] | 69.334[0.000] |

Notes: *, ** and *** denote significance at 10%, 5% and 1% levels; Standard errors in parentheses

Consistent with prior studies and theoretical expectations (e.g. Dulani et al., 2013; Bergh and Nilsson 2010), we find a significantly positive relationship between real GDP per capita and income inequality, suggesting that sustainable economic development in developing economies is not inclusive, given the level of institutional quality. Weak institutional mechanisms worsen the impact of economic development, thereby deteriorating income distributions. In contrast, we find evidence of a negative relationship between income per capita and income inequality for the

advanced economies, but the result is only statistically significant in the model with the World Bank institutional quality index. The coefficient of fiscal policy is negatively correlated with income inequality, but it is not statistically significant. Regarding the effect of human capital development, the results are positive for advanced economies, implying an average increase in the returns on human capital investment (Carter, 2007; Berggren, 1999). However, the negative human capital – income inequality nexus for developing economies also suggests that large expansions in literacy in most developing countries have clearly reached the lowest income groups and as more productive workers are rewarded with higher wages (Castelló and Doménech, 2012; Checchi, 2001). These results are significant at the 1% level. In addition, we find a positive relationship between trade openness and income inequality. This supports the political economy argument that the elite gain the most from trade globalization, while the risks are shared by a larger group at the bottom of the income distribution. This result is consistent with the findings of Bergh and Nilsson (2010).

## 2.5 Concluding remarks

Extant literature has highlighted the crucial role of institutions in economic development, but not much has been done empirically, to investigate the existence of an institutional quality threshold effect on income distribution, which is the main contribution of this study. Using data from 52 developing countries from 1996 to 2017, we investigated whether there exists an institutional quality threshold affects income inequality. Another contribution of this study is adopting a regression based on the concept of a threshold effect advanced by Kremer et al. (2013) to take advantage of the rich dynamics in the relationship between institutions and income distributions.

Our findings show that the inequality-reducing effect is disproportionate, given the level of institutional quality. More specifically, when institutional quality is measured by the WBGI proxy, we find quadratic effect for advanced countries but a monotonic and negative effect for developing countries, irrespective of whether developing countries are below or above the threshold. As discussed in the section 1.4.3 and 1.5, the results of the WGI may be attributed to the "subjective" nature of the governance indicators as emphasized in prior studies such as Knack & Keefer (1995) and Bekaert *et al.* (2005). Also, the strong impact of government effectiveness on income inequality may reiterate the fact that all efforts of international institutions particularly the World Bank to addresses institutional lapses in developing countries were solely focused on streamlining transparency and accountability in public institutions and as such may have influence significantly our findings. This evidence was also reported in (Gradstein & Chong, 2004) for developing countries. Also, our findings revealed that, for developing countries government effectiveness had more influence on the institutional environment while rule of law contributes significantly to the institutional environment of advanced countries. However, when the ICRG-based measure of institutions is used as the threshold variable, we find a quadratic association between institutions and income inequality for both the advanced and developing countries. Theoretically, our empirical findings validate the existence of a non-linear relationship between institutions and income inequality which confirms recent arguments of an augmented Kuznets inverted U-shaped curve relationship between institutions and income inequality (Chong & Calderón, 2000;Acemoglu and Robinson, 2006; Bourguignon and Verdier, 2000). This finding also supports the theoretical argument of the new institutional economics (Acemoglu and Johnson, 2005).

The implication of our results suggest that institutional development enhances policy efforts to reduce income inequality. Thus, a better institutional environment allows for the exploitation of the full benefits associated with a country's institutional development. As such progressivity towards equitable redistribution of resources matters, where better institutional quality, such as property rights, is potent in ensuring that long-run economic growth trickles down to the ordinary people. More specifically, when institutional quality is below the optimal level, we find that institutions tend to distort income inequality, by reducing policy efforts. Weak institutions encourage extra-legal activities and thereby offer opulence in the hands of a limited few. For countries with institutions above the threshold, we find that better institutional quality is associated with lower income inequality, suggesting that building on progressively strong formal institutions improves the equality of opportunity and the pace of redistribution. Since the income inequality reducing effect of institutional quality kicks in after a certain threshold level, it is imperative that policymakers aggressively develop their institutions to ensure zero tolerance for corruption, as well as public sector independence and upholding of the rule of law. All these are essential to ensure efficient resource allocation and distribution towards sustainable development. In conclusion, we provided evidence that reiterates the fact that developing economies have the capacity to enjoy benefits that accrue from maintaining a positive institutional environment.

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Appendix 2. 1: Description of variables

| Variable | Description | Source |
|---|---|---|
| Gini Coefficient (Gini) | Gini index of disposable income | SWIID |
| GDP per capita (GDPC) | Gross domestic product per capita, constant prices (PPP; 2011 international dollars) | IMF |
| Fiscal policy | Net lending (+)/borrowing (–) of the general government | IMF |
| Trade openness (OPN) | Exports and imports of goods (% of GDP) | WDI |
| Human capital index (HCI) | Returns to mean years of schooling | PWT 9.1 |
| Institutions ICRG | Principal component scores for bureaucratic quality, control of corruption and rule of law<br><br>The variables are weighted as,<br>1. Bureaucratic quality on a scale of 4,<br>2. Control of corruption on a scale of 6 and<br>3. Rule of law (law and order) on a scale of 6. | ICRG |
| Institutions WBGI | Principal component scores for government effectiveness, control of corruption and rule of law<br><br>1. The governance indicators are constructed from expert opinions and various surveys including (Public sector organizations, Surveys of households and firms, Commercial business information providers and Non-governmental organizations).<br>2. These are then rescaled between 0 and 1.<br>3. The resulting output is further weighted using an Unobserved Components Model (UCM).<br>4. The final composite indicator runs from -2.5 to 2.5, with higher values corresponding to better governance. | WBGI |

**CHAPTER 3**

# Financial Development And Poverty Reduction In Developing Economies

**CHAPTER 3:** FINANCIAL DEVELOPMENT AND POVERTY REDUCTION IN DEVELOPING ECONOMIES: DOES THE MEASURE OF FINANCIAL DEVELOPMENT MATTER?

## 3.1 Introduction

One of the Millennium Development Goals (MDGs) was to minimize global poverty by half—a goal that was met five years ahead of time. According to the World Bank, the number of people in extreme poverty decreased by 114 million between 2012 and 2013. More strikingly, extreme poverty declined from 35 percent of the global population in 1990 to 10 percent in 2015 (UNDP, 2016). Accompanying this success story was the financial system that provided "fertile ground" for achieving the development goals, following the 2002 Monterrey Consensus. Halfway through the 15-year time span of the MDGs, the world was plagued with a catastrophic financial crisis that impacted the progress of some of the development goals. Policymakers had to overcome the structural challenges of the financial crisis to achieve the post-2015 Sustainable Development Goal (SDG) regarding poverty eradication. This included mobilizing domestic financial resources to support transforming the private sector for sustainable development (Cihák, Demirgüç-Kunt, Feyen, & Levine, 2012). Theoretically, there is a consensus that countries with more highly developed financial systems grow faster and reduce poverty (Jalilian & Kirkpatrick, 2002; Honohan, 2004; Jeanneney & Kpodar, 2011). Recent evidence, however, shows that a positive finance–growth nexus does not necessarily mean financial development can explain poverty reduction (Beck et al., 2007; Seven & Coskun, 2016; Kaidi & Mensi, 2017; Rewilak, 2017). A review of the extant literature shows that many studies have empirically explored the finance–poverty nexus (Jalilian and Kirkpatrick, 2002, 2005; Beck et al., 2007; Jeanneney and Kpodar, 2011; Seven

& Coskun, 2016; Rashid and Intartaglia, 2017; Ayyagari et al., 2020). However, these studies generally offer mixed findings, and the results remain inconclusive.

A common premise in such studies is the use of economy-wide financial development measures that fail to capture how different financial institutions contribute to poverty alleviation in developing countries. One such failure is excluding non-formal financial institutions such as microfinance institutions from the measure of financial development. Little is known about the overall finance–poverty relationship via the contributions of microfinance in the financial sector. Empirical studies are silent on the unbalanced sectoral effect of the financial system on poverty reduction. The data show that microfinance institutions provide access to financial services for over 200 million clients who cannot obtain credit from traditional banks, an essential path out of poverty (Donou-Adonsou & Sylwester, 2016). In addition, the poverty indicators used in these studies are one-dimensional and do not reflect the different forms of deprivation experienced by the poor. Meanwhile, evidence from the MDGs shows that poverty should be understood as a multidimensional or multi-faceted human problem (Hulme & Fukuda-Parr, 2009). Banerjee and Duflo (2007) also show that the poor spend their money not only on consumption but also on lifecycle needs, including health, investment in education, and asset ownership, which the poor cannot easily acquire via the formal financial system. Microfinance institutions provide this opportunity because they are mandated to reach the socially excluded who lack access to mainstream sources of finance. Following in the footsteps of the poverty-lending approach, this study focuses on the theme that the extent to which financial development affects poverty in developing countries depends on the simultaneous impact of credit provided by both traditional and non-traditional financial institutions.

Our study differs from earlier works in several ways. First, we contribute to the finance–poverty literature by using three different poverty measures. The first two measures are the poverty headcount and poverty gap. Researchers of poverty have mostly relied on the micro-data to estimate multidimensional poverty. We distinguish our study from prior research by using a newly constructed multidimensional measure that encompasses the various aspects of poverty outlined in Alkire and Santos (2014), Alkire and Foster (2009), and Banerjee and Duflo (2007). The indicators primarily used in prior studies are narrow in definition and may not directly describe all aspects of poverty. Therefore, we estimate a multidimensional poverty index using a recently developed macro-level deprivation database from washdata.org to capture the various dimensions of deprivation, a novelty of this study. Second, most finance–poverty research focuses on economy-wide financial development indicators, failing to capture contributions from the other sources of finance mostly used by the poor, such as microfinance institutions. In this study, we conduct a comparative analysis of the contribution of commercial banks and microfinance institutions to poverty reduction. The findings of the study reveal that the impact of financial development on poverty depends on the measures of poverty and financial development indicators. We find that all the alternative financial development indicators employed in the models are negatively correlated with the multidimensional poverty index; only the microfinance proxies of financial development appear to have a strong impact. A further investigation also revealed that it is access to finance, the only social performance goal, that has negative impact on poverty reduction.

The rest of the paper is organized as follows. Section 2 presents a review of the relevant literature. Section 3 discusses the data and econometric methods used in the study. Section 4 provides a discussion of the empirical findings, and section 5 concludes the paper.

### 3.2 Recent studies on financial development and poverty reduction

Theories that examine the effect of financial development on poverty reduction generally offer favorable predictions (Levine, 2005). One such theory is the trickle-down effect, which argues that a well-functioning financial system would increases poverty reduction by promoting economic growth (Greenwood and Jovanovic, 1990; Beck et al. 2007). The trickle-down theory is widely supported by previous studies such as Fan et al. (2000), Dollar and Aart (2002), and Ravallion and Datt (2002). Analogous to the favorable conditions established in theoretical studies, the empirical literature has also suggested that financial development contributes to poverty alleviation in several ways. First, a well-developed financial system enables efficient allocation of capital, and reduces of borrowing and financing constraints, such as information asymmetry and high fixed cost for small borrowers (Jalilian & Kirkpatrick, 2005). Second, financial development fosters free choice, enabling the underprivileged to access funds for growing businesses, which are linked to more jobs, income growth, and poverty reduction (Jauch & Watzka, 2016; Odhiambo, 2009). Some of the studies that sought to examine the relationship between financial development and poverty reduction include, but are not limited to Jalilian and Kirkpatrick (2002, 2005), Beck et al., (2007), Arestis and Caner (2009), Odhiambo (2009, 2010), Jeanneney and Kpodar (2011) and Zhang and Ben Naceur (2019). Although there is a wide range of studies on the finance-poverty relationship, the empirical evidence is mixed. For example, Ayyagari et al., (2020) found evidence of a strong

negative relationship between financial depth and rural poverty in India. The authors also found that financial deepening induced a more significant reduction in rural poverty than financial outreach. Using national survey data covering 45,000 Indian households for the periods 2016 and 2017, Churchill and Marisetty (2020) also found that financial inclusion had a strong poverty-reduction effect, irrespective of the poverty indicators used in the study. In a bid to "unmask" the relationship between finance and poverty, Zhang and Ben Naceur (2019) identified three different effects of financial development on poverty. First, they found that four out of five dimensions of financial development used in the study, including access, depth, efficiency, and stability, reduced inequality and poverty. Second, financial liberalization tends to exacerbate inequalities and poverty. Third, compared to the stock market, developing the banking sector has had a stronger impact on income distribution. In reviewing the mechanism through which liquidity reduces inequality and poverty, Blau (2018) found that liquidity-induced wage growth strongly moderated the effect of both income inequality and poverty. Using GMM on panel data from 120 developing economies from 1980 to 2013, Inoue (2018) investigated the impact of financial development and remittances on poverty conditions in developing economies. Inoue observed that both financial development and remittance flows in developing economies have poverty-reducing effects. Accordingly, Inoue concluded that remittances can replace financial development in many developing economies as a tool in the poverty alleviation process. Ho and Iyke (2018) investigated the so-called trickle-down hypothesis for China using macro-level data from 1985 to 2014. The authors found support for a three-way relationship between financial development, economic growth, and poverty reduction at the national level. Kaidi and Mensi (2017) found that financial development failed to reach the poorest segment of society in a sample

of 138 countries from 1980 to 2014. Similarly, Rashid and Intartaglia (2017) used data from 1985 to 2008 and a two-step system GMM estimator and found that financial development played a significant role in reducing absolute poverty, but not when poverty was measured in relative terms. The authors also found that the effect of financial development on poverty reduction was significant only when liquid liabilities and private credit were used as measures of financial development. Rewilak (2017) also observed that both financial deepening and increased physical access are beneficial for reducing the headcount poverty ratio. The author further observed that using alternative indicators of financial instability led to an increase in the incidence of poverty. Using microfinance gross loans to GDP and microfinance credit to GDP as measures of financial development, Donou-Adonsou and Sylwester (2016) assessed the impact of financial development on poverty reduction in developing countries between 2002 and 2011. The authors found that financial development via microfinance institutions does not appear to have any significant impact on poverty reduction. Their findings were robust in terms of poverty measures and financial development. Banerjee and Jackson (2016) found that microfinance increased the level of indebtedness among already impoverished people. Boukhatem (2016) investigated the contribution of financial development to poverty reduction in 67 low and middle-income economies from 1986 to 2012. The findings showed that instability in the financial systems of developing economies tends to eliminate positive gains from financial development and thus ends up penalizing the poor. Applying a dynamic panel estimation technique and a recent dataset covering 1987–2011, Seven and Coskun (2016) assessed the financial inequality–poverty nexus in emerging economies. The authors revealed that in their sampled emerging economies, financial development promoted economic growth but not poverty reduction. Using a dynamic panel OLS

estimation technique on data from South Asian economies between 1990 and 2013, Sehrawat and Giri (2016) showed that financial development and economic growth reduced poverty in South Asian countries, but rural–urban income inequality aggravated poverty. Employing the autoregressive distributed lag (ARDL) model, Abosedra et al. (2016) concluded that financial development contributed to poverty reduction in Egypt only when private credit was used as a proxy for financial development. Uddin et al. (2014) looked at the relationship between financial development, economic growth, and poverty reduction in Bangladesh using quarterly data from 1975 to 2011. They found a non-linear relationship between financial development and poverty. Jeanneney and Kpodar (2011) pointed out that while the poor benefited from financial development through the McKinnon "conduit effect," they tend not to gain from greater credit availability. The authors also found that financial instability significantly hindered efforts aimed at reducing poverty in developing economies. Kondo et al. (2008) show that microfinance had no statistically significant impact on household assets or human capital investments, such as health and education. As such, the effect of an increase in microfinance portfolios on the incomes and consumption of the poor does not necessitate a pro-poor approach to poverty alleviation in developing economies if the impact of microfinance does not cover all aspects of poverty.

## 3.3 Data and methodology

### 3.3.1 Measures of poverty and financial development

In practice, there are different approaches to measuring poverty, but according to Ravallion and Lokshin (2003), the methodological approach is very important for policy implications. A common approach adopted in the literature is to count the number of people living on consumption expenditures or income levels below a threshold where food energy intake is just sufficient to sustain life (Ravallion & Chen, 2019; Ravallion & Lokshin, 2003). Given the above classical approach to poverty measurement, Beck et al. (2007) adopted a poverty line of $1.00 per day, chosen in part because of its proximity to the poverty lines used by many poor countries. In contrast, Ravallion et al. (2009) used a poverty line of $2 per day, which corresponded to the median income of the countries sampled in their study. Along with these conceptualizations, the World Bank defined a more conventional international poverty line that was set at $1.90 per day (2011 PPP) in 2015. The poverty line was anticipated to preserve the real purchasing power of the old poverty line of $1.25 a day (2005 PPP) in the world's poorest regions (Reddy & Rahul, 2016). In this study, we focus on three poverty measures: a headcount index, the poverty gap, and a multidimensional poverty index. The first two measures—headcount index and poverty gap—are both based on the international poverty line of $1.90 a day. Due to the limitations of the headcount index[5], we included the poverty gap index. The poverty gap index measures the depth of poverty by considering how far the poor are from a given poverty line. All these indicators were obtained from the World Bank's poverty and equity database (Povcalnet). Previous studies,

[5] The headcount poverty index counts all people below the poverty line without considering the depth of poverty.

including but not limited to Alkire and Foster (2009, 2011), Nolan and Whelan (2010), Alkire and Roche (2012), Alkire and Santos (2014), Chen et al. (2019), and Whelan et al. (2019), have criticized income or consumption-based poverty measures, arguing that they do not cover the overall living conditions of households because of their narrow definitions. According to Alkire and Foster (2009), the multidimensional poverty index is made up of several lists of deprivations experienced by the poor over their lifetimes. These include poor health, lack of education, and inadequate living standards. Deriving a multi-dimensional index comes with difficulty. Particularly, while a priori and in theory selecting the individual as the unit of identification is a preferred option, in practice it entails several difficulties (conceptual applicability of indicators to different subgroups and data availability) that seem to justify using the household as the unit of identification as a second-best option. Also, the issue of an applicable weighting scheme is problematic as most multi-dimensional poverty indices differ by country due to the national priorities. Also, multi-dimensional indicators are computed from micro-level indicators, but these surveys generally do not collect information on all indicators at the individual level and also are not conducted each year. The novelty of our study is that we estimate a multidimensional poverty index using macro-level data that captures these deprivations. Principal component analysis is used to reduce the deprivation variables into a single variable. The principal component is used instead of the additive approach because the additive approach can result in a biased composite indicator, which may not entirely reflect the true information of its individual indicators. Also, the associated weights may not be desirable or difficult to verify. Another limitation of the additive method is its full compensability i.e., poor performance in some indicators can be compensated by sufficiently high values of other indicators. We then normalized the score of the

principal component into an index of range between 0 and 1 using a min-max normalization approach[6]. **Errore. L'origine riferimento non è stata trovata.** lists the theoretical constructs of our multidimensional poverty index and the corresponding variables that were used[7]. We report the results of individual sampling adequacy based on the Kaiser-Meyer-Olkin (KMO) test. The overall test shows a sampling adequacy of 90.33%.

Table 3. 1: Items selected for the multidimensional poverty index

| Dimension | Indicators | KMO | Source |
|---|---|---|---|
| Health | Prevalence of undernourishment (% of pop.) | 0.9193 | WDI |
| | Child under 5 mortality | 0.8688 | UNICEF |
| | Child between 4 - 14 mortality | 0.8543 | |
| Education | Mean years of schooling | 0.9238 | UNDP |
| | Children out of school (% of primary school age) | 0.8766 | WDI |
| Living Standard | Population without access to clean cooking fuel | 0.8946 | WDI |
| | Unimproved sanitation | 0.8860 | Washdata.org |
| | Unimproved drinking water | 0.9564 | Washdata.org |
| | Population without access to electricity | 0.9057 | WDI |
| | Per capita household consumption expenditure | 0.9223 | WDI |

Note: Overall KMO = 0.9033, Bartlett's sphericity =0.000

To measure financial development, we rely on indicators of financial development that relate to economic growth and are commonly used in the literature (Beck et al., 2007). We use two proxies: private credit to GDP and commercial bank assets to GDP. The advantage of these proxies over alternative financial development indicators is their importance to financial intermediation, a channel for private sector financing. As such, we further explore other alternative proxies rarely used in the literature: assets to GDP and gross loan portfolios of microfinance institutions to

[6] The normalization technique is computed as $POV_{it} = \frac{X_{it} - Min(X)}{Max(X) - Min(X)}$

[7] See Appendix 3.2 for the summary of the descriptive statistics of the variables.

GDP[8]. Microfinance institutions differ from mainstream banking in that they receive most of their financing from external loans, grants, or investors (Donou-Adonsou & Sylwester, 2016). Microfinance institutions primarily provide "microcredit" financial services to the poor (Donou-Adonsou & Sylwester, 2016; Khandker, 2005). Data on private credit and commercial bank assets were taken from the Global Financial Development Database (Beck et al., 2000; Cihák et al., 2012). We extract microfinance data from the Microfinance Information Exchange (MIX) database. We control for the effect of income inequality, income, and government spending (see

[8] The data is deflated using the following formula $\frac{\left\{(0.5)*\left[\frac{F_t}{Pe_t}+\frac{F_{t-1}}{Pe_{t-1}}\right]\right\}}{\left[\frac{GDP_t}{Pa_t}\right]}$, where F is credit or assets; *Pe* is end-of-period CPI, and *Pa* is average annual CPI (see Beck *et al.*, 2013; Donou-Adonsou & Sylwester, 2016).

Appendix 3. 1 for variable descriptions).

### 3.3.2. Empirical model and estimation strategy

We use the basic growth–poverty model suggested by Ravallion (1997) and Ravallion and Chen (1997) to conduct our empirical estimation. The empirical model is written as;

$$\log P_{it} = \alpha_i + \beta_1 \log \mu_{it} + \beta_2 \log g_{it} + \beta_3 \log x_{it} + \epsilon_{it}$$
$$(i = 1; \dots; N; t = 1; \dots; T_i) \qquad (3.1)$$

where $P_{it}$ is the measure of poverty in country $i$ at time $t$; $\mu_{it}$ represents the financial development indicator; $\beta_2$ is the elasticity of poverty to income inequality given the Gini coefficient, $g$; $\beta_3$ is the elasticity of poverty to variable $x_{it}$ (government spending); $\alpha_i$ denotes time fixed effects; and $\epsilon$ is the error term. In Eq. (1), the coefficients ($\beta_i$) are elasticities. As Adams and Page (2005) pointed out, the model assumes that income inequality is related to poverty reduction. In this model, Ravallion (1997) also shows that economic growth (proxied by income per capita) is more potent for reducing poverty in low inequality countries. Therefore, the relationship between poverty and income per capita is expected to be negative and significant. The finance–poverty nexus is ambiguous, as there is no clear-cut relationship in the literature. However, we expect a better-developed financial system to reduce poverty through pro-poor economic growth and development (Jalilian & Kirkpatrick, 2002, 2005; Beck et al., 2007). We estimate Eq. (3.1) using pooled OLS, which assumes that the covariates in the model are exogenous. For sensitivity analysis and endogeneity concerns, we estimate both instrumental variables (2SLS) and system GMM regression. We employ instruments that are frequently used in the finance literature: ethnic, language, and religious fractionalization, and the lags of financial development indicators. The theoretical literature has established that institutional quality

(protection of property rights) is considered one of the most important pillars of a capitalist economy. As such, well-defined property rights is an important determinant of economic growth and therefore poverty reduction through efficient allocation of resources and investment (Bekaert et al., 2005). Therefore, we include the rule of law as an additional instrument. An economy with poor respect for the rule of law may increase opportunistic behavior that disproportionately benefits the rich. We also include the lag of an index from the Fraser Institute, which measures the extent of credit allocation between the government and the private sector (credit market regulation). The more government borrowing there is, the lower the amount of credit available to finance private projects. In the IV and System GMM estimations, the credibility of the estimates depends on the appropriateness of the instruments. Therefore, we test the validity of the instruments using the Hansen test of overidentifying restrictions. Failure to reject the null hypothesis supports the overall validity of the instruments. We use balanced panel data covering 49 developing countries[9] from 2000 to 2017. However, the number of observations varies depending on the available data for the poverty measures.

### 3.4 Empirical Results

#### 3.4.1 Descriptive Statistics and Correlation

In this section, we present the results of the summary statistics and the correlation matrix. **Errore. L'origine riferimento non è stata trovata.** presents a summary of the descriptive statistics. The

[9] Countries included in the study are Albania, Bangladesh, Benin, Bolivia, Burkina Faso, Cambodia, Cameroon, Colombia, Republic of Congo, Cote d'Ivoire, Dominican Republic, Egypt, El Salvador, Ghana, Guatemala, Honduras, India, Indonesia, Jordan, Kazakhstan, Kenya, Mali, Kyrgyzstan, North Macedonia, Madagascar, Malawi, Mexico, Moldova, Mozambique, Nepal, Namibia, Nicaragua, Niger, Nigeria, Pakistan, Panama, Paraguay, Peru, Philippines, Rwanda, Sierra Leone, South Africa, Sudan, Tanzania, Thailand, Togo, Uganda, Ukraine, and Viet Nam.

results indicate that private credit as a percentage of GDP averaged 28.56% with a minimum and maximum of 1.32% and 120.80%, respectively. Bank assets as a percentage of GDP averaged 33.33%. The average for microfinance assets as a percentage of GDP is 0.11%, while microfinance credit as a percentage of GDP averaged 0.06%. We record a mean headcount poverty index of 15.21% and a poverty gap of 5.43% from 2000 to 2017. The multidimensional poverty index also shows significant variations with a mean index of 0.40.

Table 3. 2: Summary Statistics of all variables

| Variable | Obs | Mean | SD. | Min | Max |
|---|---|---|---|---|---|
| Multi-dimensional Poverty | 882 | 0.40 | 0.23 | 0.00 | 1.00 |
| Headcount ($1.90 a day) | 390 | 15.21 | 18.92 | 0.00 | 85.96 |
| Poverty gap ($1.90 a day) | 390 | 5.43 | 8.10 | 0.00 | 46.11 |
| Per capita GDP | 882 | 6,328.02 | 5,170.30 | 630.68 | 30,454.76 |
| Gini | 390 | 42.25 | 9.40 | 24.03 | 64.76 |
| Government spending | 882 | 23.54 | 7.60 | 9.49 | 61.71 |
| MFI credit (% of GDP) | 789 | 0.06 | 0.28 | 0.00 | 5.85 |
| MFI asset (% of GDP) | 788 | 0.11 | 0.62 | 0.00 | 13.10 |
| Private credit (% of GDP) | 880 | 28.56 | 21.95 | 1.32 | 120.80 |
| Bank asset (% of GDP) | 881 | 33.33 | 28.96 | 1.60 | 160.13 |
| Credit market regulations | 853 | 8.14 | 2.04 | 0.00 | 10.00 |
| Rule of law | 882 | -0.60 | 0.43 | -1.94 | 0.58 |
| Ethnic Fractionalization | 882 | 0.58 | 0.23 | 0.05 | 0.93 |
| Language Fractionalization | 846 | 0.54 | 0.31 | 0.02 | 0.92 |
| Religious Fractionalization | 882 | 0.44 | 0.22 | 0.07 | 0.86 |

**Errore. L'origine riferimento non è stata trovata.** reports the Pearson correlation matrix. Due to the high correlations between our financial development indicators, we treat them separately in the model to avoid multicollinearity issues. We proceed to estimate Eq. (1), using pooled country-year observations in a balanced panel. To assess the finance-poverty relationship, we estimate several specifications of our model, each one focusing on a specific financial development

indicator across the three different measures of poverty. **Errore. L'origine riferimento non è stata trovata.** and **Errore. L'origine riferimento non è stata trovata.** show the empirical results using pooled OLS with time-fixed effects. While the OLS regression does not control for endogeneity, we still report the results for the sake of comparison.

Table 3. 3: Results of the correlation matrix

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 1. MFIC | 1.0000 | | | | | | |
| 2. MFIA | 0.9829 | 1.0000 | | | | | |
| 3. BASSET | 0.1363 | 0.1087 | 1.0000 | | | | |
| 4. PCREDIT | 0.1071 | 0.0787 | 0.9830 | 1.0000 | | | |
| 5. RGDP | 0.0775 | 0.0434 | 0.5306 | 0.5527 | 1.0000 | | |
| 6. CGOV | 0.1995 | 0.1952 | 0.2676 | 0.2736 | 0.0442 | 1.0000 | |
| 7. GINI | 0.0073 | -0.0070 | 0.0909 | 0.1088 | 0.0286 | -0.3004 | 1.0000 |

Consistent with prior studies, including Ravallion (1997), Adams and Page (2005), Donou-Adonsou and Sylwester (2016), and Zhang and Ben Naceur (2019), we find that income per capita reduces poverty while income inequality increases poverty. The results also show a negative relationship between government expenditure and the poverty measures. These results are significant at conventional levels. In the finance–poverty relationship, we also find a negative relationship between microfinance indicators of financial development (MFIC and MFIA) and all poverty measures; both enter the model with significant coefficients. While the traditional financial development indicators (PCREDIT and BASSET) are negatively correlated with all poverty indicators, we find that the relationship is not statistically significant when we consider the multidimensional poverty index.

Table 3. 4: OLS Estimates of Microfinance Institutions and Poverty

| | Multidimensional Poverty | Headcount Poverty | Poverty Gap |
|---|---|---|---|

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| GINI | 0.102*** | 0.103*** | 2.672*** | 2.657*** | 2.452*** | 2.440*** |
| | (-0.021) | (-0.021) | (-0.173) | (-0.172) | (-0.151) | (-0.150) |
| RGDP | -0.211*** | -0.211*** | -1.252*** | -1.263*** | -1.139*** | -1.147*** |
| | (-0.006) | (-0.006) | (-0.050) | (-0.050) | (-0.044) | (-0.044) |
| CGOV | -0.178*** | -0.179*** | -0.783*** | -0.787*** | -0.272** | -0.278** |
| | (-0.017) | (-0.017) | (-0.135) | (-0.135) | (-0.118) | (-0.118) |
| MFIC | -0.150*** | | -2.286*** | | -1.816*** | |
| | (-0.057) | | (-0.46) | | (-0.402) | |
| MFIA | | -0.111*** | | -1.620*** | | -1.268*** |
| | | (-0.040) | | (-0.324) | | (-0.282) |
| Observation | 354 | 355 | 354 | 355 | 354 | 355 |
| Adjusted R2 | 0.787 | 0.784 | 0.718 | 0.719 | 0.719 | 0.719 |
| F-Statistics | 330.897*** | 326.331*** | 230.199*** | 230.913*** | 231.239*** | 231.605*** |

Note: *p<0.1; **p<0.05; ***p<0.01; Standard Error in parentheses

Table 3. 5: OLS Estimates of Financial Development and Poverty

| | Multidimensional Poverty | | Headcount Poverty | | Poverty Gap | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| GINI | 0.104*** | 0.108*** | 2.735*** | 2.756*** | 2.462*** | 2.488*** |
| | (-0.021) | (-0.021) | (-0.174) | (-0.172) | (-0.150) | (-0.149) |
| RGDP | -0.206*** | -0.204*** | -1.146*** | -1.127*** | -1.078*** | -1.059*** |
| | (-0.007) | (-0.007) | (-0.059) | (-0.057) | (-0.051) | (-0.050) |
| CGOV | -0.185*** | -0.182*** | -0.669*** | -0.647*** | -0.241** | -0.214* |
| | (-0.017) | (-0.017) | (-0.137) | (-0.136) | (-0.119) | (-0.118) |
| PCREDIT | -0.005 | | -0.225*** | | -0.110* | |
| | (-0.008) | | (-0.066) | | (-0.057) | |
| BASSET | | -0.010 | | -0.283*** | | -0.163*** |
| | | (-0.008) | | (-0.066) | | (-0.057) |
| Observations | 389 | 388 | 389 | 388 | 389 | 388 |
| Adjusted R2 | 0.775 | 0.776 | 0.695 | 0.701 | 0.699 | 0.702 |
| F-Statistic | 339.726*** | 340.712*** | 226.344*** | 231.632*** | 230.172*** | 232.918*** |

Note: *p<0.1; **p<0.05; ***p<0.01; Standard Errors in parentheses

To avoid endogeneity problems, we re-estimate Eq. (3.1) using a fixed-effects panel instrumental variables regression. The instruments included are ethnic, language, and religious fractionalization; the rule of law; lag of credit market regulation; and lags of the financial development indicators. To verify the validity of the instruments used in the IV regression, we use Hansen's test of overidentifying restrictions. Under the null hypothesis, the included instruments are uncorrelated with the error term, and the excluded instruments are valid (Beck et al., 2007). A rejection of the null hypothesis validates the instruments. The results of the Hansen p-values suggest that the validity of the instruments is not rejected. This holds for all estimated models. The results of the IV regression are qualitatively similar to the OLS results, but the coefficients are larger in magnitude. **Errore. L'origine riferimento non è stata trovata.** summarizes the findings of the relationship between the microfinance proxies of financial development (MFIC and MFIA) and the poverty measures.

Table 3. 6: 2SLS Estimates of Microfinance Institutions and Poverty

| | Multidimensional Poverty | | Headcount Poverty | | Poverty Gap | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| GINI | -0.041** | -0.042** | 1.752*** | 1.753*** | 0.746** | 0.747** |
| | (0.016) | (0.017) | (0.391) | (0.393) | (0.333) | (0.333) |
| RGDP | -0.174*** | -0.173*** | -1.434*** | -1.440*** | -1.260*** | -1.260*** |
| | (0.006) | (0.006) | (0.141) | (0.141) | (0.120) | (0.120) |
| CGOV | -0.047*** | -0.044*** | -0.696** | -0.746*** | -0.816*** | -0.817*** |
| | (0.011) | (0.012) | (0.272) | (0.278) | (0.235) | (0.236) |
| MFIC | -0.051*** | | -0.243 | | 0.039 | |
| | (0.017) | | (0.427) | | (0.362) | |
| MFIA | | -0.030** | | -0.091 | | 0.031 |
| | | (0.013) | | (0.314) | | (0.266) |
| Observations | 290 | 289 | 290 | 288 | 288 | 288 |
| # of group | 44 | 43 | 44 | 43 | 43 | 43 |
| R-squared | 0.839 | 0.830 | 0.471 | 0.472 | 0.432 | 0.432 |
| Sargan-Hansen | 0.482 | 0.408 | 0.286 | 0.415 | 0.0733 | 0.0817 |

Notes: *** p<0.01, ** p<0.05, * p<0.1; Standard errors in parentheses

Table 3. 7: 2SLS Estimates of Financial Development and Poverty

| | Multidimensional Poverty | | Headcount Poverty | | Poverty Gap | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| GINI | -0.031* | -0.031* | 2.027*** | 2.046*** | 0.824** | 0.828*** |
| | (0.017) | (0.017) | (0.383) | (0.384) | (0.321) | (0.320) |
| RGDP | -0.162*** | -0.164*** | -1.525*** | -1.471*** | -1.409*** | -1.383*** |
| | (0.007) | (0.007) | (0.148) | (0.147) | (0.124) | (0.123) |
| CGOV | -0.051*** | -0.053*** | -1.098*** | -1.023*** | -0.918*** | -0.863*** |
| | (0.012) | (0.012) | (0.266) | (0.263) | (0.230) | (0.226) |
| PCREDIT | -0.005 | | 0.229* | | 0.217** | |
| | (0.005) | | (0.117) | | (0.099) | |
| BASSET | | -0.002 | | 0.147 | | 0.162* |
| | | (0.005) | | (0.109) | | (0.091) |
| Observations | 329 | 328 | 335 | 334 | 329 | 328 |
| # of group | 45 | 45 | 46 | 46 | 45 | 45 |
| r-squared | 0.820 | 0.819 | 0.512 | 0.511 | 0.5614 | 0.5667 |
| Sargan-Hansen | 0.0816 | 0.0542 | 0.900 | 0.465 | 0.080 | 0.091 |

Notes: *** p<0.01, ** p<0.05, * p<0.1; Standard errors in parentheses

The results in **Errore. L'origine riferimento non è stata trovata.** show that microfinance credit (MFIC) reduces multidimensional poverty, which is statistically significant at 1%. The results show that a 10% increase in the gross loan portfolio of microfinance institutions can reduce multidimensional poverty by 5.1%. We also find a negative relationship between microfinance assets (MFIA) and multidimensional poverty, suggesting that a 10% rise in microfinance assets can reduce poverty by 3%. This finding is supported by evidence from Hadj Miled and Ben Rejeb (2018) and Khandker (2005), implying that providing financial access for the poor through microfinance institutions may help substantially alleviate all dimensions of poverty. Improved access to finance may lead to a long-lasting increase in income to cushion investments in income-generating activities and improve the lives of the poor. As far as headcount poverty and the

poverty gap are concerned, we find no statistically significant relationship with MFIC and MFIA. **Errore. L'origine riferimento non è stata trovata.** reports the estimation results of the traditional financial development indicators (PCREDIT and BASSET) against all measures of poverty. We find a negative but statistically insignificant relationship between the multidimensional poverty index and the two proxies of the traditional finance indicators. However, the results show that a 10% increase in private credit (PCREDIT) worsens headcount poverty and the poverty gap by 2.29% and 2.17%, respectively. These results are significant at the 10% and 5% levels. In addition, we find that a 10% rise in bank assets (BASSET) increases the poverty gap by 1.62%. Although we find a positive relationship between headcount poverty and bank assets (BASSET), this result is not statistically significant. For a further robustness check of our findings, we estimate a two-step system GMM, taking into consideration the dynamic nature of our panel data and country-specific effects. **Errore. L'origine riferimento non è stata trovata.** and **Errore. L'origine riferimento non è stata trovata.** report the results.

Table 3. 8: Two-step system GMM estimates of Microfinance institutions and Poverty

| | Multidimensional Poverty | | Headcount Poverty | | Poverty Gap | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Lag of dependent variable | 1.006*** | 1.015*** | 0.814*** | 0.822*** | 0.743*** | 0.765*** |
| | (0.013) | (0.012) | (0.031) | (0.029) | (0.015) | (0.024) |
| GINI | 0.005 | 0.008 | 0.511*** | 0.496*** | 0.521*** | 0.490*** |
| | (0.005) | (0.006) | (0.106) | (0.106) | (0.078) | (0.066) |
| RGDP | 0.003 | 0.006* | -0.227*** | -0.218*** | -0.190*** | -0.166*** |
| | (0.003) | (0.003) | (0.060) | (0.057) | (0.012) | (0.014) |
| CGOV | 0.014*** | 0.015*** | -0.015 | -0.019 | 0.096* | 0.111*** |
| | (0.005) | (0.004) | (0.109) | (0.104) | (0.047) | (0.021) |
| MFIC | -0.013*** | | 0.118 | | -0.114 | |
| | (0.004) | | (0.223) | | (0.206) | |
| MFIA | | -0.006* | | 0.061 | | -0.145** |
| | | (0.003) | | (0.151) | | (0.050) |

| | | | | | | |
|---|---|---|---|---|---|---|
| Constant | -0.101* | -0.137** | 0.473 | 0.445 | -0.298 | -0.473** |
| | (0.050) | (0.051) | (0.780) | (0.744) | (0.266) | (0.173) |
| Observations | 292 | 292 | 189 | 190 | 189 | 190 |
| AR1 | 0.009 | 0.009 | 0.049 | 0.049 | 0.031 | 0.032 |
| AR2 | 0.670 | 0.697 | 0.572 | 0.605 | 0.699 | 0.809 |
| # of instruments | 24 | 24 | 24 | 24 | 24 | 24 |
| Hansen | 0.458 | 0.535 | 0.956 | 0.960 | 0.916 | 0.917 |

Notes: *** p<0.01, ** p<0.05, * p<0.1; Standard errors in parentheses

Table 3. 9: Two-step system GMM estimates of Financial development and Poverty

| | Multidimensional Poverty | | Headcount Poverty | | Poverty Gap | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Lag of dependent | 1.008*** | 1.003*** | 0.745*** | 0.747*** | 0.813*** | 0.795*** |
| variable | (0.014) | (0.011) | (0.031) | (0.030) | (0.017) | (0.031) |
| GINI | 0.014** | 0.013** | 0.736*** | 0.755*** | 0.490*** | 0.352*** |
| | (0.007) | (0.006) | (0.218) | (0.146) | (0.077) | (0.093) |
| RGDP | 0.008* | 0.005 | -0.269 | -0.235* | -0.088 | -0.342 |
| | (0.004) | (0.003) | (0.161) | (0.124) | (0.083) | (0.206) |
| CGOV | 0.011** | 0.010** | 0.053 | 0.024 | 0.138 | 0.064* |
| | (0.005) | (0.004) | (0.200) | (0.197) | (0.093) | (0.033) |
| PCREDIT | -0.004** | | -0.056 | | 0.001 | |
| | (0.002) | | (0.158) | | (0.083) | |
| BASSET | | -0.002** | | -0.084 | | 0.225 |
| | | (0.001) | | (0.117) | | (0.160) |
| Constant | -0.152** | -0.131*** | 0.158 | -0.040 | -1.320 | 0.961 |
| | (0.059) | (0.045) | (1.829) | (1.290) | (0.927) | (1.504) |
| Observations | 335 | 334 | 216 | 215 | 216 | 215 |
| AR1 | 0.008 | 0.007 | 0.061 | 0.057 | 0.028 | 0.043 |
| AR2 | 0.974 | 0.867 | 0.599 | 0.605 | 0.797 | 0.807 |
| Hansen | 0.506 | 0.453 | 0.853 | 0.867 | 0.899 | 0.864 |

Notes: *** p<0.01, ** p<0.05, * p<0.1; Standard errors in parentheses

In Columns 1 and 2 of **Errore. L'origine riferimento non è stata trovata.**, the estimates show a negative relationship between our multidimensional poverty index and microfinance credit (MFIC). We also find negative association between the multidimensional poverty index and microfinance assets (MFIA) These results are statistically significant at the 1% and 5% levels.

These results confirm our estimates from the OLS and 2SLS regressions. We also find evidence of a positive relationship between the headcount poverty index and the microfinance measures of financial development (MFIC and MFIA) but not statistically significant. In column 5, the estimate of microfinance credit (MFIC) is negative but not statistically significant. In column 6, the estimate between microfinance assets (MFIA) and poverty gap is negative and significant at the 5% level, indicating a 10% increase in microfinance assets has a poverty-reducing effect of 1.45%. These results strengthen the importance of microfinance institutions as agents of change in the fight against poverty in developing economies. Thus, providing non-collateral loans at lower interest rates may reinforce the importance of microfinance in reducing poverty. These findings are consistent with evidence from Hadj Miled and Ben Rejeb (2018) and Inoue and Hamori (2013) and also support the poverty lending approach (Robinson, 2001). In **Errore. L'origine riferimento non è stata trovata.**, however, our results provide show negative relationship between the traditional indicators of financial development and the multidimensional poverty index but not the headcount poverty and poverty gap indices. These are significant at 5% level. However, the magnitude of the impact of smaller than the resulting magnitude from that of the microfinance indicators. We find a no dependence between the traditional financial development indicators and the other two poverty measures. Comparatively, the results so far confirm the poverty-reducing effect of microfinance institutions in developing economies. These results are consistent with earlier studies such as Jalilian and Kirkpatrick (2002, 2005), Jeanneney and Kpodar (2011), and Sehrawat and Giri (2016). The insignificant effect of traditional financial development indicators on the multidimensional poverty index and headcount poverty is not especially surprising; as argued by Copestake et al. (2005), the "better off" poor benefit more from financial

institutions compared to the core poor. This may be attributed to issues of borrowing constraints from the client's side (Banerjee et al., 2015; Banerjee & Jackson, 2016) and the targeting approach of banking institutions in developing economies, as argued in Kondo et al. (2008) and Nawaz (2010).

Given this assertion of Copestake et al. (2005), we investigated further the impact of some of the social performance activities of the microfinance institutions on poverty reduction. Three aspects are investigated in this study namely (i) social goals that target women, rural financing, and child education and provide youth opportunities. (ii) development goals that provide access to finance, target gender and women empowerment and poverty reduction. (iii) poverty reduction effects that target low-income earners and very poor clients. the results are reported in

Table 3. 10. Comparatively, we find that although microfinance institutions appear to have negative effect on poverty reduction, their performance is only evident in access to finance. Thus, it is only the relationship between access to finance and all the poverty measures that appear to be negative. All other social performance indicators are positively correlated with the poverty variables. The implication of this findings show that it is only the financial accessibility that contributes to poverty reduction but not the other social performance goals. Although it may appear surprising but one factor that can contribute to this is the motivation for the establishment of the institution. If the motive is for-profit then we do not expect that such a microfinance institution will be concerned with poverty reduction or targeting poor or low-income earners.

## 3.5 Concluding Remarks

This study empirically examined the finance - poverty relationship for 49 developing countries using alternative measures of poverty and financial development. Employing a fixed-effects 2SLS and dynamic panel estimation technique on a panel data covering the period 2000 to 2017, our results suggest that the impact of financial development on poverty depends on the measures of poverty and financial development indicators. Specifically, we find that all the alternative financial development indicators employed in the models are negatively correlated with the multidimensional poverty index; only the microfinance proxies of financial development appear to have a strong impact. After replacing the multidimensional poverty index with the headcount poverty ratio, the impact of financial development appears to be statistically insignificant with traditional banking indicators, but not the microfinance indicators. A further investigation also

revealed that it is access to finance, the only social performance goal, that has negative impact on poverty reduction.

Our findings provide important insights and implications for policy. We conclude that policymakers need to steer financial system development to engender pro-poor poverty reduction via microfinance institutions. Specifically, we argue that governments in developing economies should build an inclusive financial system where there is effective access to a wide range of appropriate financial products and services for the entrepreneurial poor by mainstreaming microfinance in the banking sector. This will help the socially excluded or the poor to also benefit from the opportunities that accrue from improved financial intermediation and financial inclusion. It is important for policymakers to develop effective regulatory systems for financial institutions, as well as enhance the financial infrastructure. Lessons can be learned from the policy framework that led to the success story of the rural banking industry across the developing world. This can help streamline or strengthen the operations of microfinance institutions to further stimulate poverty reduction. Example of this policy is the two-tier supervision of the rural banking industry in Ghana.

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Appendix 3. 1**: Definition of variables**

| Variables | Definition | Source |
|---|---|---|
| Multidimensional Poverty | Normalized index of poverty based on a principal component score of health, education, and living standard. | Authors calculation |
| Headcount ($1.90 a day) | Is the percentage of the population living on less than $1.90 a day at 2015 PPP | WDI |
| Poverty gap ($1.90 a day) | Is the mean shortfall from the poverty line expressed as a percentage of the poverty line | WDI |
| Per capita GDP | GDP per capita, PPP (constant 2017 international $) | WDI |
| Gini | An index of income inequality, an index of 0 denotes egalitarian income distribution and an index of 100 implies perfect inequality | WDI |
| Government spending | General government final consumption expenditure (% of GDP) | WDI |
| MFI credit (% of GDP) | Measured by the gross loan portfolio, defined as a % of GDP | Market information exchange International |
| MFI asset (% of GDP) | Measured by the deposits, defined as a % of GDP | Market information exchange International |
| Private credit (% of GDP) | Private credit by deposit money banks to GDP (%) | Cihák et al. (2012) |
| Bank asset (% of GDP) | Deposit money banks' assets to GDP (%) | Cihák et al. (2012) |
| Credit market regulations | Measures the extent to which credit is allocated between the government and private sector | Fraser Institute |
| Rule of law | Measures the extent to which agents have confidence in and abide by the rules of society. The score ranges between -2.5 and +2.5 | WBGI |
| Ethnic Fractionalization | Reflects a combination of racial and linguistic characteristics of a group. | Alesina et al. (2003)/ The Quality of Governance Institute |
| Language Fractionalization | Reflects the probability that two randomly selected people from a given country will not belong to the same linguistic group. | Alesina et al. (2003)/ The Quality of Governance Institute |
| Religious Fractionalization | Reflects the probability that two randomly selected people from a given country will not belong to the same religious group. | Alesina et al. (2003)/ The Quality of Governance Institute |

**Appendix 3.2: Summary of descriptive statistics of multi-dimensional poverty variables**

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Unimproved sanitation | 882 | 22.40 | 21.88 | 0.00 | 79.90 |
| Unimproved drinking water | 882 | 15.96 | 14.69 | 0.00 | 62.30 |
| Mean years of schooling | 882 | 6.14 | 2.61 | 1.10 | 11.80 |
| Population without access to electricity | 882 | 36.74 | 33.39 | 0.00 | 96.35 |
| Population without access to clean cooking fuel | 882 | 60.89 | 33.27 | 0.94 | 99.85 |
| Prevalence of undernourishment (% of pop.) | 882 | 16.89 | 10.59 | 0.00 | 55.50 |
| Per capita household consumption expenditure | 882 | 1659.54 | 1432.33 | 207.28 | 6695.60 |
| Child between 4 - 14 mortality | 882 | 13.00 | 11.37 | 1.28 | 62.84 |
| Child under 5 mortality | 882 | 62.12 | 46.11 | 8.97 | 233.98 |
| Children out of school (% of primary school age) | 882 | 8.62 | 13.42 | 0.00 | 73.10 |

Table 3. 10: Random effect estimates of Microfinance institutions social performance and Poverty

| | Multidimensional Poverty | | | | Headcount Poverty | | | | Poverty Gap | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **VARIABLES** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| Target Women | 0.007*** | | | 0.007** | 0.091** | | | 0.077* | 0.092** | | | 0.079* |
| | (0.003) | | | (0.003) | (0.043) | | | (0.046) | (0.043) | | | (0.047) |
| Target Rural areas | 0.005** | | | 0.006** | 0.067* | | | 0.089** | 0.068* | | | 0.082** |
| | (0.002) | | | (0.002) | (0.040) | | | (0.041) | (0.040) | | | (0.042) |
| Target Child Education and Youth | 0.008*** | | | 0.007*** | 0.004 | | | 0.013 | 0.009 | | | 0.020 |
| Opportunity | (0.002) | | | (0.002) | (0.028) | | | (0.029) | (0.028) | | | (0.029) |
| Access to finance | | -0.013*** | | -0.016*** | | -0.186*** | | -0.217*** | | -0.149*** | | -0.178*** |
| | | (0.002) | | (0.002) | | (0.028) | | (0.029) | | (0.028) | | (0.029) |
| Gender empowerment | | 0.006*** | | 0.002 | | 0.026 | | -0.004 | | 0.010 | | -0.020 |
| | | (0.002) | | (0.002) | | (0.027) | | (0.030) | | (0.028) | | (0.030) |
| Poverty reduction | | 0.015*** | | 0.008*** | | 0.212*** | | 0.145*** | | 0.208*** | | 0.148*** |
| | | (0.002) | | (0.002) | | (0.031) | | (0.036) | | (0.032) | | (0.036) |
| Poverty target low-income earners | | | 0.004** | 0.001 | | | 0.088*** | 0.048 | | | 0.085*** | 0.033 |
| | | | (0.002) | (0.002) | | | (0.030) | (0.034) | | | (0.030) | (0.034) |
| Poverty target very poor clients | | | 0.008*** | 0.005*** | | | 0.032 | -0.024 | | | 0.024 | -0.028 |
| | | | (0.002) | (0.002) | | | (0.032) | (0.031) | | | (0.032) | (0.032) |
| Constant | 0.332*** | 0.340*** | 0.340*** | 0.334*** | 2.798*** | 2.886*** | 2.854*** | 2.815*** | 1.557*** | 1.632*** | 1.622*** | 1.568*** |
| | (0.007) | (0.007) | (0.007) | (0.007) | (0.058) | (0.056) | (0.055) | (0.058) | (0.055) | (0.052) | (0.051) | (0.055) |
| Observations | 2,247 | 2,247 | 2,247 | 2,247 | 988 | 988 | 988 | 988 | 988 | 988 | 988 | 988 |
| Wald test | 67.76*** | 127.6*** | 30.68*** | 186.6*** | 17.70*** | 67.83*** | 11.01*** | 86.66*** | 18.74*** | 53.51*** | 9.457*** | 68.67*** |
| within R-squared | 0.0385 | 0.0723 | 0.0170 | 0.103 | 0.0342 | 0.0967 | 0.0156 | 0.132 | 0.0371 | 0.0781 | 0.0140 | 0.110 |

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

## Conclusion and Thoughts on Future Research

The discourse on poverty and inequality is an important subject matter in the development economics literature and the "Global South" in particular. The entirety of the dissertation contributes to poverty and income inequality literature by arguing on the impact of economic spillovers, institutional change and financial development.

In this dissertation, we estimated the impact of entrepreneurship and innovation by examining the effect of spillovers on income inequality in developing countries. We applied spatial panel regression models to address potential issues of spatial dependency and spillover effects among neighboring countries. The empirical results indicated that innovation is significant in widening income inequality, especially for high income countries. A positive innovation-inequality dependence is only possible if we measure entrepreneurial activity by new business density. The findings also demonstrate that the effect of entrepreneurial activity on income inequality in middle and low income differs depending on the proxy used. While we find evidence of positive nexus between self-employment and income inequality, the relationship between new business density and income inequality is negative. We found positive feedback effect from self-employment, but negative for the new business density. In terms of high-income countries, we find no dependence between our self-employment and income inequality but positive with new business density. Our findings suggest that entrepreneurial activities (proxied by new business density) are linked to rising income inequality in high income countries. This study also examined whether institutional quality act as mediator in influencing the innovation–income inequality or entrepreneurship-income inequality nexus. The findings demonstrate that institutional quality act as mediator to increase income inequality in high income countries when interacted with innovation but contrary in the middle and low income in the

model with self-employment. But the model with new business density shows otherwise. The interaction effect between institutional quality and entrepreneurial activity is only found to strongly reduce income inequality in middle- and low-income countries but not in high income countries.

Given the prevalence of policy support for institutional change in developing countries, we continued our empirical discussion by investigating whether there exists an institutional quality threshold effect on income inequality. Since the choice of threshold method is an important debate, we adopted a panel threshold model by Kremer et al., (2013) which corrects the limitations of Hansen (2000) and Hansen and Caner (2004) threshold models. We estimated the threshold model for developing countries and compared our findings with the results on advanced countries. Also, our findings suggest that the impact of institutional quality depends on the choice of institutional quality indicators. Specifically, using the World Bank Governance indicators we find monotonic relationship between institutional quality and income inequality in developing countries but non-linear relationship when the International Country Risk Guide measures of institutional quality are used. We estimated the threshold effect of the individual institutional quality indicators. For developing countries, we found that the impact of institutional quality on income inequality is influenced by changes in government effectiveness while the relationship between institutional quality and income inequality in the advanced countries is influenced by changes in rule of law.

We concluded our discussion by examining the impact of financial development on poverty alleviation in developing countries. The debate over the role of non-formal financial institutions such as microfinance institutions in the financial development process is an important issue in the poverty literature. We made our contribution to the relevant finance-poverty literature by investigating the sensitivity of the choice of financial development indicators on different poverty measures. We

constructed a multidimensional poverty measurement that included various aspects of deprivations. By conducting a multi-level panel regression, we made a comparative analysis of the impact of traditional commercial banks and microfinance institutions on poverty alleviation. Our findings demonstrate that the impact of financial development on poverty depends largely on the measures of poverty and financial development indicators. Specifically, we find that all the alternative financial development indicators employed in the models are negatively correlated with the multidimensional poverty index; only the microfinance proxies of financial development appear to have a significant impact. After replacing the multidimensional poverty index with the headcount poverty ratio, the impact of financial development appears to be statistically insignificant with traditional banking indicators, but not the microfinance indicators. We find also that financial development albeit the traditional banks appear to worsen poverty, particularly the poverty gap ratio.

We cannot wave out limitations of this study. In this regard, the focus has been explicitly set on broadening the scope of the study by looking at measurement issues and providing country specific analysis in the future. Particularly, further extensions to the relationship between innovation and income inequality may include exploring other sources of innovation. Our findings used only patent applications, it is vital to explore other innovations such as technological upgrading in exports, a mixture of trademark and industrial design which are highly sought after in the middle and low countries, and innovation in services. Also, exploring how potential sources of research and development funding and their performing sectors influence income distribution is very relevant to advancing the literature given the significant amount of funds that flow through international co-operations on technology transfers in middle and low-income countries. This will enrich our

understanding by providing a more generalized perspective on the motivation for innovation and its real impact on income distribution.

Methodologically, perhaps the most serious limitation is data availability and proxies for measuring entrepreneurial activities. Exploring vast aspect of entrepreneurial propensity on developing countries may allow for modelling of the endogenous linkages between income inequality and entrepreneurial activities over time. Also, finding a more suitable micro-level data to investigate the potential spillover effect of entrepreneurship on income distribution is another direction for future research. A lot of the discussion is about within-country inequality and one potential development for future research is to look at within country spatial poverty and inequalities, as both poverty and inequality exhibit regional patterns. An examination of the link between entrepreneurship and poverty might provide further insight on the entrepreneurship-inequality nexus.