FINANCIAL FRICTIONS, AGGREGATE PRODUCTIVITY, AND CROSS-COUNTRY INCOME DISTRIBUTION.

A THESIS SUBMITTED

TO THE GRADUATE SCHOOL OF SOCIAL SCIENCES ANADOLU UNIVERSITY

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF A

DEGREE OF DOCTOR OF ECONOMICS

BY

SANDAY AMOS

ESKISEHIR 2022

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ESKISEHIR
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ÖZET

Financial Frictions, Aggregate Productivity Differences, and Cross-Country Income Distribution

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iktisat Doktora Anabilim

Anadolu Üniversitesi, Sosyal Bilimler Enstitüsü,

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Bu makale, mali kısıtlamaların kredilerin yanlış tahsisi, toplam çıktı, üretkenlik ve ülkeler arasındaki gelir farklılıkları üzerindeki etkisini analiz etmektedir. Makale, finansal sürtüşmeler nedeniyle kredilerin yanlış tahsisinin ülkeler arasındaki gelir farklılıkları üzerindeki etkisini analiz eden beş bölümden oluşmaktadır. Birinci bölüm, finansal anlaşmazlıkların ana kaynaklarını tanımlar ve aracılık sürecinde bulunan finansal sürtüşmelerin, tasarruf ve yatırım, girdiler ve çıktılar, yetenekli girişimcilik ve kariyer seçimleri, borçlanma maliyeti ve getiriler arasında boşluklar yaratarak sermayenin yanlış tahsisine nasıl yol açtığını gösterir. İkinci bölümde, toplam çıktı ve ülkeler arasındaki gelir dağılımı üzerindeki finansal sürtüşmelerin kapsamlı kanıtları incelenmektedir. Daha sonra, bu sürtüşmelerin kaynak tahsisini ve ekonomik ilerlemeyi etkilediği belirli nedensellik kanalları ve temel mekanizmalar belirlenmektedir. Üçüncü bölüm, finansal engellerin ülkeler arasındaki toplam üretim, üretkenlik ve gelir farklılıkları üzerindeki etkisini tespit etmek ve nicel olarak değerlendirmek için sürtüşmeleri belirlemekte, tamamlanmamış finansal piyasalara sahip standart bir kalkınma modeli sunmaktadır. Bu bölümde sunulan model, ikili finansal planı olan bir ekonomi modelidir: bir kredi planı ve bir tasarruf planı. Yeterli birikime veya servete sahip haneler veya firmalar girişimci olurken, yeterli birikim ve sermayeye sahip olmayanlar, işgücü sağlayarak veya piyasadan çıkarak ücretli olmayı seçerler. Tasarrufu olmayan yetenekli haneler borçlanarak girişimci olmaya karar verebilirler, ancak kredi tutarının teminatın değerine bağlı olması için teminat vermeleri gerekir. Bu nedenle teminat, bir borçlanma kısıtı görevi görür. Çalışma, borçlanma kısıtlarından (teminat), katılım maliyetlerinden ve aracılık maliyetlerinden kaynaklanan sürtüşmelere odaklanmaktadır. Dördüncü bölüm sonuçları ele almaktadır.. Bu makaleden çıkarılan ana sonuç, finansal sürtüşmeler, yanlış

kredi tahsisi, toplam çıktı kayıpları, azalan TFV ve ekonomik az gelişmişlik arasında güçlü bir bağlantı olduğudur. Bu sonuçlar, finansal sürtüşmelerin ülkeler arasındaki gelir farklılıklarının kalıcılığını artırdığını ve sürdürdüğünü gösteren kanıtları doğrulamaktadır. Modelde sunulan ana fikir, finansal sürtüşmelerin bazı kuruluşlarda girdi istihdamını, modern teknolojileri benimsemesini ve yatırım için krediye erişmesini engellediği, bu da TFV'yi azaltıp gelir açıklarını artırdığıdır. Tahminler, az gelişmiş finansal piyasalara sahip fakir ülkerlerde finansal gelişmenin verimliliği gelirleri ve GSYİH'yi önemli ölçüde artırabileceğini gösteren, finansal piyasaları az gelişmiş ülkelerde GSYİH'nın %30'unu aşan büyük gelir ve TFV kayıpları göstermektedir. Bu tahminler, ülkeler arasındaki finansman anlaşmazlıkları ve gelir farklılıklarına ilişkin literatürde gözlemlenen son ampirik tahminlerle büyük ölçüde tutarlıdır. Mali sürtüşmelerin olmaması durumunda, verimlilik artışları nedeniyle TFV ve çıktı kaybı önemli ölçüde yaklaşık %5'e düşecektir.

Keywords: Financial Frictions; Misallocation; Aggregate Productivity; Income Distribution

ABSTRACT

Financial Frictions, Aggregate Productivity Differences, and Cross-Country Income Distribution

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This essay analyses the effect of credit frictions on capital misallocation, aggregate output, productivity, and income divergencies between countries. The essay is composed of five chapters that analyse how credit misallocation from financial frictions impact cross-country income differences. The first chapter identifies the key sources of financial frictions and demonstrates how frictions embedded in the intermediation process generate capital misallocation by driving wedges between savings and credit, investment, inputs and outputs, allocation of entrepreneurial talent, and occupational choices. In chapter two, I review the broad evidence on credit market frictions on GDP and cross-country income distribution. I then locate the specific causal channels and the key underlying mechanisms through which these frictions affect resource allocation and economic development. The third section presents a standard model of development with incomplete financial markets characterised by frictions to capture and quantitatively evaluate the impact of financial impediments on total output, aggregate productivity, and income differences between countries. The model presented in this section is of an economy with a dual financial scheme: a credit and savings regime. The households or firms with sufficient savings or wealth endowments become entrepreneurs, while those without adequate savings and capital choose to become wage earners by supplying labour or exiting the market. Talented households without savings can decide to become entrepreneurs by borrowing but must posit collateral thus, the size of the loan is dependent on the collateral value. Collateral thus, act as a borrowing constraint. The study emphasises frictions originating from – borrowing constraints (collateral), participation costs, and intermediation costs. Chapter four presents the findings. The main conclusion

drawn from this essay is that there is a robust connection between financial frictions, credit misallocation, aggregate output losses, lower TFP, and economic underdevelopment. These results confirm the evidence that financial frictions amplify and perpetuate the persistence of income variations between countries. The main idea presented in the model is that financial frictions inhibit some establishments from hiring inputs to adopting modern technologies and accessing credit for investment which lower TFP and amplify income gaps. The estimates show large income and TFP losses exceeding 30% of GDP within countries with underdeveloped financial markets indicating that a move to the frontier of financial development by poor countries with underdeveloped financial markets could increase productivity, income, and GDP significantly. These estimates broadly mirror recent empirical findings observed in the literature on financing frictions and cross-country income gaps. In the absence of financial frictions, TFP and output loss would reduce significantly to about 5% due to efficiency gains.

Keywords: Financial Frictions; Misallocation; Aggregate Productivity; Income Distribution

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ETİK İLKE VE KURALLARA UYGUNLUK BEYANNAMESİ

Bu tezin bana ait, özgün bir çalışma olduğunu; çalışmamın hazırlık, veri toplama, analiz ve bilgilerin sunumu olmak üzere tüm aşamalarında bilimsel etik ilke ve kurallara uygun davrandığımı; bu çalışma kapsamında elde edilen tüm veri ve bilgiler için kaynak gösterdiğimi ve bu kaynaklara kaynakçada yer verdiğimi; bu çalışmanın Anadolu Üniversitesi tarafından kullanılan "bilimsel intihal tespit programı"yla tarandığını ve hiçbir şekilde "intihal içermediğini" beyan ederim. Herhangi bir zamanda, çalışmamla ilgili yaptığım bu beyana aykırı bir durumun saptanması durumunda, ortaya çıkacak tüm ahlaki ve hukuki sonuçları kabul ettiğimi bildiririm.

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(İmza)

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(Öğrencinin Adı Soyadı)

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STATEMENT OF COMPLIANCE WITH ETHICAL PRINCIPLES AND RULES

I the undersigned hereby truthfully declare that this thesis is an original work prepared by me; that I have behaved in accordance with the scientific ethical principles and rules throughout the stages of preparation, data collection, analysis and presentation of my work; that I have cited the sources of all the data and information that could be obtained within the scope of this study, and included these sources in the references section; and that this study has been scanned for plagiarism with "scientific plagiarism detection program" used by Anadolu University, and that "it does not have any plagiarism" whatsoever. I also declare that, if a case contrary to my declaration is detected in my work at any time, I hereby express my consent to all the ethical and legal consequences that are involved.

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(Name and Surname of the Student)

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TFP	:	Total Factor Productivity
GDP	:	Gross Domestic Productivity
GINI	:	Measure of income inequality
RBC	:	Real Business Cycle
CES	:	Constant Elasticity of substitution
MPL	:	Marginal Product of Labour
MPK	:	Marginal Product of Capital
GFDD	:	Global Financial Development Database
BIS	:	Bank of International Settlement
IMF	:	International Monetary Fund
UNWIDER	:	United Nations World Institute of Development Research
WIID	:	World Income Inequality Data
SWIID	:	Standardised World Income Inequality Data
FAS	:	Financial Access Survey

CHAPTER ONE

1. INTRODUCTION

There are large variations in aggregate output, total factor productivity (TFP) and income per person between countries. Why do these large aggregate gaps in productivity, output per-worker and income persist? One of the prominent and most widely accepted explanations in the literature is that these gaps are primarily due to variations in TFP between countries[1]. And the deeply rooted factors embedded in historical institutions[2]. Although these factors provide plausible explanations in the understanding of the fundamental and proximate causes of the persistent cross-country income divergences[3], they are inadequate in accounting for the persistent TFP, aggregate output, and cross-country income disparities as recently shown by (Syverson, 2011).

However, an important yet understudied factor that has attracted significant interest in recent studies, is the role of financial frictions. There is growing evidence linking financial frictions to differences in output, TFP, and variations in income between countries. These studies indicate that financial market frictions distort the efficient provision of capital which amplify aggregate productivity and income losses (Hsieh & Klenow, 2009; Banerjee & Moll, 2010; Moll, 2014; Buera, Kaboski & Shin 2011; Buera and Shin 2013; Midrigan & Xu, 2014)). This is particularly prevalent in underdeveloped economies with weak financial systems. Thus, this study aims to examine the effect of financial frictions in credit misallocation, aggregate output, productivity and income gaps between countries.

Underdeveloped economies are often characterised by weak and inefficient financial markets. Weak credit markets often lead to wasteful and inefficient allocation of capital, resulting in lower aggregate output per-worker, and incomes between individuals, firms and countries. By distorting the efficient allocation of capital, financial frictions amplify divergence in living standards, productivity, and wealth across countries. However, most existing theories of development often neglect how this

[1]See for instance (Hall & Jones, 1999; Caselli, 2005; Klenow and Rodr´ıguez-Clare, 1997; Solow 1957).
[2] For a review see, (Acemoglu et al., 2001; Acemoglu et al., 2002; Spolaore and Wacziarg, 2012; Nunn, 2008; Rodrik, et al., 2004)
[3] See Romer, (1990); Mankiw, Romer, and Weil- (MRW, 1992); Barro (1991); Lucas, (1988); Solow, (1957)

mechanism of financial frictions affect capital accumulation, wealth, and income distribution. Moreover, the consequences of credit market frictions on capital misallocation, total output and differences in income are not well understood in the literature. In this essay, we explore how financial frictions affect aggregate productivity, output, and cross-country income distribution. We show the key underlying mechanisms and the causal pathways through which frictions perpetuate the persistence of cross-country income divergence.

First, financial frictions impose binding credit constraints on firms and individuals with good investment projects and business ideas from access to capital. The firms facing funding constraints due to the absence of collateral may be forced to exit the market or to produce at lower marginal productivity, due to inefficient capital allocation. Financial frictions may also inhibit productive firms from undertaking productive investments by acting as an entry barrier or by inhibiting firms from hiring quality inputs, adopting improved technologies or from insuring risks which may lead to income and output losses across firms, individuals, or countries. However, in countries with developed and well-functioning financial markets, capital flows freely to its best use, with the most efficient firms operating businesses, and the inefficient firms with low marginal product exit. However, due to the existence of financial frictions in many developing economies, there is a potential for misallocation of capital which often result in TFP losses and variations in income per-capita.

For instance, (Hsieh and Klenow, 2009) using manufacturing data from US, Chinese, and Indian firms, find that misallocation from financial frictions accounts for between 40 and 60% of the TFP differences between Indian and American firms and about 30 to 50% of variations in TFP differences between US and Chinese firms. In contrast, (Buera, Kaboski, & Shin, 2011) by applying a calibrated framework of entrepreneurship with credit market frictions and indicate that variations in financial development account for about 80% of the variations in income per-capita between the US and Mexico and up to 40% of aggregate TFP differences between the US and other economies with lower financial market development. Their study finds that, in the small-scale service segments, financial frictions decrease TFP by about 30% and about 50% in the large-scale manufacturing segments. Overall, they find that credit misallocation from financial frictions account for about 50% of the TFP loss in small-scale segments and exceeds half of the aggregate variations in output among large-scale firms.

In contrast, (Midrigan & Xu, 2014) using Korean manufacturing firm data to measure the impact of credit market frictions on TFP through the distortion and misallocation channel of firm market entry and technology adoption show that credit market frictions account for about 2.5% of TFP losses in firm output, employment, and growth rate between new and old firms. They further observe a significant reduction in output and consumption of up to 40% due to distortions arising from financial frictions particularly failure to adopt improved technology and restriction of firm entry into modern sectors. The estimated reduction in TFP losses due to capital misallocation in modern firm segments were between 5 and 10%. While (Aghion, Fally, and Scarpetta, 2007) in a study of credit constraints as an entry barrier in 16 advanced countries find no suggestion that financial deepening hurts the entry of large firms.

The differences in the observed outcomes across studies could be due to measurement errors, application of different methodological approaches in the quantification and estimation of productivity losses from financial frictions, or due to focus on different mechanisms and channels of transmission of financial frictions. It could also be due to a lack of proper guidance on how to capture and quantify productivity and income losses originating from financial frictions.

The primary object of this essay is to offer a unified model that captures and quantifies the distortionary consequences of credit market frictions on TFP, output, and cross-country income gaps. With this goal in mind, the study identifies the key underlying sources of financial frictions that generate aggregate productivity and output losses, and cross-country income differences.

The essay was inspired by the work of (Buera & Shin 2013) who found evidence of financial frictions in explaining the persistent cross-country income and output divergency through the misallocation channel of financial frictions on aggregate productivity, investment, firm size-distribution, and output per capita growth. Although this essay mirrors (Buera, and Shin 2013), however, the key motivations diverge in two fundamental ways. First, unlike in the Buera and Shin study that use firm-level data, this study uses cross-country panel data to estimate the consequences of credit market frictions on aggregate output and income differences between countries. Moreover, while, Buera and Shin focus on collateral constraint as the key underlying mechanism of misallocation in endogenously determining occupational choices, selection into and exit

from entrepreneurial activity or technological adoption and investment. This essay focuses on multiple channels of misallocation and financial frictions including borrowing (collateral) constraints, interest rate spreads, intermediation costs, participation cost and savings constraints as the main mechanisms generating financial distress, distortions, and aggregate productivity, output, and income losses. This essay argues that financial frictions are a key source of variations in income, output and aggregate productivity across countries. To support this argument, I draw on evidence from multiple sources including literature reviews and cross-country quantitative analysis of data from several emerging and advanced countries.

This essay is related to several strands in the literature. Firstly, it's linked to a more recent strand of literature that examines how credit market frictions affect economic development. This literature was initiated by the seminal work of (Hsieh and Klenow 2009) and recently extended by (Moll, 2014; and Midrigan and Xu, 2014; Buera and Shin, 2013; Buera, Kaboski & Shin, 2011). This strand of literature argues that the low aggregate output, TFP and the large cross-country income differences observed across countries — are a consequence of resource misallocation arising from financial frictions. Following this argument, (Hsieh and Klenow, 2009) examine the effect of credit misallocation on TFP and GDP through the misallocation of occupational choices and entrepreneurial talent. While Moll (2014) identify borrowing constraint as a key source of financial friction and examine the impact of collateral constraint on credit misallocation, output and TFP and whether savings or self-financing can undo capital misallocation. The studies of Moll (2014) and Prina (2015) indicate that savings are an efficient way of reducing financial frictions, especially in communities with underdeveloped financial systems.

The study also mirrors the work of (Midrigan & Xu, 2014) who use manufacturing data from Columbian, South Korean, and Chines plants to examine the effect of credit market frictions on TFP differences through the firm entrance, technology adoption as the misallocation channel. Its also related to the work of (Buera, Kaboski and Shin 2011) who study the distortionary effects of credit frictions on sectoral, aggregate TFP, and between country differences in output per worker due to misallocation of capital and entrepreneurial talent.

And recent literature on international trade that analyses how credit frictions impact the relative advantage of nations. The main contributors to this strand of literature include (Chaney, 2016; Manova, 2008a, b; Muûls, 2008; Matsuyama, 2005; Wynne, 2005; Kletzer and Bardhan,1987). Studies of Manova (2013), Berman & Héricourt (2010), Chor & Manova (2012), Manova (2008a), Minetti & Zhu (2011), and Beck (2002) have systematically demonstrated that financially-underdeveloped economies are inclined to specialise in segments that are not capital intensive. While, Manova, Wei, & Zhang (2015), Manova (2013), Greenaway, Guariglia and Kneller (2007) present outcomes on the effect of credit market frictions on firm export performance and find that foreign firms with local partners outperform their domestic counterparts in exporting due to financial vulnerability.

This study is also closely related to the works of (Bartelsman, Haltiwanger & Scarpetta 2013) that study the impact of financial frictions on cross-country productivity differences through the allocation and selection channels of firm market access and exit. Finally, this study mirrors studies of heterogeneous establishments with credit frictions. For instance, (Cooley & Quadrini, 2001) propose a framework of firm heterogeneity with imperfect credit markets characterised with default risk to examine the effects of frictions on firm investment, expansion and exit. And the work of (Cooley, Marimon, & Quadrini, 2004) study a broad set of firms with financial constraints in contract enforceability and show that frictions magnify the impact of technology shocks on aggregate output. Its also related to studies of (Midrigan & Xu, 2014; Buera & Shin 2013; Buera, Kaboski, & Shin 2011) that apply heterogeneous agent models with frictions to study the effect of credit frictions on economic growth.

This essay also fits into the large literature on financial sector development that examines the impact of finance on economic development for instance (King & Levine, 1993a; Levine, 1997; Levine, 2005; Levine & Zervos 1998; Rajan & Zingales, 1998; Beck & Levine, 2004; Beck et al., 2000; Levine et al., 2000), and literature on finance and entrepreneurship (King & Levine 1993b; Evans and Jovanovic, 1989) and the impact of credit traps on income inequality (Galor & Zeira, 1993; Aghion & Bolton 1997; Banerjee & Newman 1993; Greenwood & Jovanovic, 1990).

The closest studies to the present study are those of (Buera & Shin, 2013; Buera, Kaboski & Shin, 2011; Dabla-Norris, Ji, Townsend, & Unsal, 2015; Greenwood,

Sanchez, & Wang, 2013) who study how financial frictions and financial development, or underdevelopment affect aggregate productivity, inequality, and cross-country income differences. This study extends this literature by proposing a dynamic model to quantitatively evaluate the impact of credit frictions in explaining income variations between countries.

The essay contributes to the literature by demonstrating how credit market frictions affect development by identifying the underlying sources and causal mechanisms through which financial market imperfections affect development and offering a unified model that captures and quantitively evaluates the distortionary effect of credit frictions on development. This essay adds to this literature in three fundamental ways. First, it adds to the literature on financial frictions and aggregate productivity differences by building on the work of (Midrigan & Xu, 2014; Moll, 2014; Hsieh & Klenow 2009; Buera & Shin 2013; Bartelsman, Haltiwanger & Scarpetta, 2008; Banerjee and Duflo, 2005) who study how financial frictions generate distortions that lead to capital misallocation, aggregate productivity losses and income gaps.

Secondly, this essay contributes to the literature that explores how financial market development affect output and income between countries initiated by (King & Levine 1993; Levine 1997, 2005; Levine & Zervos, 1998; Aghion, Howitt, & Mayer-Foulkes, 2005; Beck et al. 2000; Levine, et al. 2000; Jeong and Townsend, 2007) who study the effect of financial development and underdevelopment on cross country income and output gaps.

This study adds to the literature on how credit market frictions affect development by locating the main underlying mechanisms and causal pathways through which frictions affect development. Several mechanisms have been identified in the literature that could lead to distortion, misallocation and aggregate productivity differences. For example, (Banerjee & Newman, 1993) study the role of credit traps on occupational choices and income distribution. They find that financial market frictions affect the distribution of entrepreneurial talent and firm-size distribution through the firm selection, entrance and exit path. While Evans and Jovanovic (1989) identify liquidity constraints as a barrier to entrepreneurship. They find that liquidity constraints exclude would be potential entrepreneurs leading to misallocation of entrepreneurial talent. While Caselli and Gennaioli (2003) identify dynastic management as a source of failure in the efficient

allocation of managerial talent and while Lucas (1978) find that it affects firm-size distributions. In contrast, Restuccia and Rogerson (2008) identify policy for instance regulations, legal entry barriers, and taxation as the source of frictions and distortions which affect aggregate productivity across firms.

This essay distinguishes between three frictions. Frictions, to financial access, intermediation, and efficiency. These frictions have multiple origins in the literature. Frictions to financial access originate from participation costs, collateral constraints, borrowing, and interest rate spread. The frictions to intermediation efficiency originate from - high intermediation and agency costs, adjustment and capital costs, and interest rate spread. To show how these frictions amplify productivity losses, dampen investment, output growth, and credit access, this study focuses on three main mechanisms of misallocation, that lead to aggregate productivity losses and cross-country income variations. These include borrowing constraints, participation, and intermediation costs.

The key finding of this study is that financial frictions account for more than 30% of the aggregate productivity losses and income per worker across countries. Financial frictions also have substantial differential consequences on aggregate output and income per worker, but the impacts vary between countries depending on the economic structure of a country, and the nature of financial structure. These outcomes mirror recent findings of (Hsieh and Klenow, 2009; Restuccia and Rogerson 2008; Midrigan and Xu 2014; Buera, Kaboski, & Shin, 2011; Buera, & Shin, 2013; Joeng and Townsend, 2007), who find large variations in TFP and output per capita between poor countries with underdeveloped financial markets and advanced countries. For example, (Buera, Kaboski, & Shin 2011) find that variations in the depth of financial markets between Mexico and the US can explain about 80% of the disparities in per capita income between the US and Mexico. They find that, the impact of credit market frictions on output is much higher in the large manufacturing segments compared to small firms. While financial frictions lead to less than 30 per cent fall in services, in manufacturing TFP decreases by more than 50 per cent, in 18 OECD countries.

Similarly, Hsieh & Klenow, (2009), using the US as a benchmark find significant TFP differences between China and India relative to the US induced by financial frictions that lead to distortions and capital misallocations. They show that shifting to the US

efficiency levels could lead to overall productivity increases by a factor of 30% to 50% for China and between 40% and 60% for India. Likewise, (Restuccia and Rogerson (2008)) find TFP losses between 30 and 50 per cent due to distortions in input allocation. Overall, these findings support the thesis that financial market failures distort efficient input allocation and induce productivity losses which amplify cross-country income differences.

The empirical relevance of this study is that credit market frictions are a dominant cause of distortions, misallocation, and aggregate productivity losses in developing countries and cross-country income variations. Thus, understanding the nature of financial frictions is vital to the evaluation of financial development policies such as financial inclusion and microcredit that attempt to influence financial development, aggregate productivity, poverty reduction and economic development in developing countries. Several studies have documented financial friction are a key source of misallocation and economic underdevelopment of poor countries thus, this topic is fundamental to grasping the nature of financial frictions and in showing how frictions affect aggregate productivity and cross-country income gaps.

The analysis follows from the benchmark model of misallocation and financial frictions suggested by (Hsieh & Klenow 2009). This model distinguishes between the various sources of financial frictions to disentangle, capture and quantity their effects on aggregate output, TFP and income distribution. I extend this model building on the recent work of (Buera, Kaboski & Shin 2011; Townsend and Ueda 2011) who examine how financial development and underdevelopment affect economic development and inequality. I apply this model to quantify aggregate productivity losses from misallocation using a group of emerging and low-income economies. I use the amount of external credit to GDP as an inference for the level of financial development to evaluate TFP estimates by the standard model in the data. I show that credit market frictions can account for total productivity losses of between 25 and 30 per cent.

1.1 The objectives

The main purpose of this essay is to investigate the effect of financial frictions on capital misallocation, TFP and cross-country income variations. The essay also aims to document the underlying sources of financial frictions, the causal channels, and the key mechanisms through which financial frictions affect aggregate output, TFP, and income

differences between countries. Finally, the essay aims to provide a unified framework that captures and quantifies the distortionary effects of financial frictions on aggregate output, TFP and cross-country income variation.

1.1.1 The Nature of Financial Frictions

A striking regularity in the empirical literature on economic growth is that credit access is a fundamental determinant of economic development. This proposition is backed by robust evidence showing a strong positive link between financial market depth and economic progress at the macro-level (King and Levine, 1993b; Levine 1997, 2005; Levine, Loayaz and Beck, 2000; Levine and Zervos, 1998), and financial development, poverty and inequality reduction at a micro level (Zhang & Naceur, 2019; Demirguc-Kunt & Levine, 2009; Beck, Demirgüç-kunt and Levine 2007; Jalilian & Kirkpatrick, 2002; Honohan 2004; Pitt and Khandker 1998).

The importance of finance in economic growth is historically rooted in the literature dating to Adam Smith in 1776. Nevertheless, Schumpeter (1912) is renowned for initially theorising and recognizing the productivity and growth-enhancing effects of finance in facilitating private enterprise, innovation, and economic development (King, & Levine 1993; Levine, 1997, 2005) for a detailed overview. However, in most developing economies firms operate under acute financing constraints. This is because financial markets in these countries are underdeveloped and characterised by frictions that distort the efficient allocation of capital and prevent firms from accessing credit. The outcomes of these frictions are aggregate inefficiencies which translate into low aggregate productivity and large disparities in per-capita income across countries.

Following these initial studies, several studies particularly (Greenwood and Jovanovic, 1990; Galor and Zeira, 1993; Piketty 1997; Banerjee and Newman 1993; Banerjee & Duflo, 2005, and Aghion and Bolton 1997), have shown that financial frictions affect income distribution, occupational choices, and development. However, recently, a growing literature has emerged showing that credit frictions lead to significant disparities in income distribution between countries due to resource misallocation (Hsieh & Klenow 2009; Moll, 2014; Midrigan & Xu 2014; Buera & Shin 2013). These studies have shown that, capital misallocation due to financial frictions which manifest in several forms including information asymmetry, borrowing constraints, collateral constraints, high intermediation costs, limited insurance against risk related to entrepreneurship, and

frictions related to capital and labor mobility, limited contractual enforcement and weak property rights or distortionary public policies such as tax subsidies reduce productivity, lower aggregate output and amplify inequality. These frictions reduce affect aggregate productivity and output, first by distorting capital allocation among firms and secondly by distorting incentives and among firms which amplifies income gaps across individuals and countries.

This is particularly more prevalent in underdeveloped economies where financial markets are underdeveloped. As a result, firms in these countries operate under acute financing and binding credit constraints which impede firm creation, expansion, and productivity. Small and medium scale enterprises are particularly more affected by this type of financing frictions because they have inadequate access to external funding due to absence of collateral. Thus, low-income countries remain poor because economic development in these countries is driven by many inefficient firms and entrepreneurs who are credit constrained by financial frictions.

Hypothetically, financial development positively affects economic development through economic growth and aggregate productivity via several mechanisms. First, through the savings mechanism of financial intermediaries which mobilise capital from surplus savers and lend to borrowers or deficit savers. Secondly, through the lending mechanism of financial intermediaries that mobilize and direct capital by reallocating from firms with low marginal returns towards the most productive users with high productivity through trade and investment. Thirdly, through the risk management function of financial intermediaries that allow broader risk diversification, through hedging, insurance, and securitisation. Similarly, financial institutions enhance productivity growth by exerting corporate control and monitoring managers which allows the effective separation of management from shareholders. The financial intermediaries also gather and evaluate information about different investment projects and mobilise resources to fund these investment projects by providing liquidity. This process facilitates wealth creation by enabling those deprived of access to productive capital for business and investment, an equalising force in theory.

However, there is also a growing indication that excessive financial market development may be harmful to economic growth and financial stability as it generates fragilities that inhibit growth (See, Law and Singh 2014; Sahay, Čihák, N'Diaye, &

Barajas, 2015; Arcand, Berkes, & Panizza, 2015; Reinhart, & Rogoff, 2009; Reinhart, & Rogoff, 2010a, b; Cecchetti, Mohanty, & Zampolli, 2011). For instance, many recent studies on financial deepening and growth particularly (Arcand, Berkes, and Panizza, 2012; Rousseau and Wachtel 2011; Cecchetti and Kharroubi, 2012; Law and Singh 2014) have shown that rapid credit growth and excessive financial deepening could be harmful to economic growth as it amplifies financial instabilities which dampen or inhibit growth. They show that excessive and faster credit growth can generate financial instability. Moreover, they indicate that beyond certain thresholds the benefits of financial deepening on growth diminish significantly and the costs of financial deepening start to rise, as further financial deepening exacerbate economic and financial instability which is growth-inhibiting because it generates financial fragility. Cecchetti and Kharroubi (2012) have particularly shown that debt is beneficial to growth only up to 100% threshold level of GDP, beyond which further credit growth impedes economic growth. These outcomes are supported by the studies of (Cecchetti, Mohanty, & et al, 2011) who find that when the ratio of private sector credit approaches 90% of GDP, it's harmful to aggregate productivity growth. A related survey by (Easterly, Islam and Stiglitz, 2000) on the impact of financial sector development on output volatility indicate that output volatility starts increasing when the ratio of financial depth or private sector credit to GDP ratio reaches 100%. Beyond this threshold, they show that further credit increases harm output volatility and economic growth.

Rapid credit growth and excessive financial deepening may also exacerbate income inequality and amplify financial fragility which diminishes the impact of financial development on growth. A recent study by (Kumhof, Ranciere, and Winant, 2015) has shown that between 1983 and 2007, the share of the top 5% of income distribution in USA increased by 10% from 24 to 34 per cent accompanied by an increase in the debt-to-income ratio of the bottom 95 per cent of the income distribution by 80% from 60 to 140 percentage points. This demonstrates that financial development disproportionately benefits the rich more than the poor. This observation was first documented by (Greenwood and Jovanovic 1990) who showed that financial development may disproportionately benefit the rich more than the poor because as financial development enhances growth, it generates more returns to capital and thus exacerbates income inequality. However, there are also studies that report the "vanishing effect" of finance

on growth for instance, (Rousseau and Wachtel, 2011). They find that credit has no statistically significant effect on GDP growth for the period 1965-2004.

Financial frictions and financial underdevelopment may also generate similar effects on output and income distribution. Studies of (Galor and Zeira 1993; Aghion and Bolton, 1997; Piketty, 1997; Banerjee and Newman, 1993) have demonstrated that financial frictions may induce or propagate income inequality and poverty traps by distorting occupational choices and allocation of entrepreneurial ability. They show that financial frictions can affect the allocation of entrepreneurial talent by preventing talented individuals pursuing certain occupations or firms from innovating or pursuing certain entrepreneurial activities.

However, most existing studies on the impact of financial system development and economic development often ignore the effects of these mechanisms of financial development or underdevelopment on credit misallocation and wealth distribution in explaining aggregate productivity and income gaps between countries. In this essay, I study the effect of financial frictions in the economic underdevelopment of low-income countries through its distortionary consequences on capital allocation and aggregate productivity losses that lead to income divergence.

To study how financing frictions, affect the capital allocation, aggregate productivity, and cross-country income distribution, I apply an endogenous growth model of financial intermediation characterised by borrowing constraints. In this model, financial frictions originate from multiple sources including imperfect credit markets, while misallocation follows from imperfect output markets. I show how financial frictions generate misallocation which diminishes TFP and amplifies cross country income divergence. This proposed model is based on Hsieh and Klenow, (2009), Restuccia & Rogerson, (2008), Buera and Shin, (2013), Buera and Shin (2013), Midrigan and Xu, (2014). In this model, I disentangle the different forms of financial frictions to capture and quantify their effects on capital allocation, aggregate output, and income distribution using a panel of emerging, low-income, and advanced economies.

1.2 The Sources of Financial Frictions.

This segment provides a short summary of the sources and nature of credit market frictions ubiquitous in many developing countries. I distinguish the micro from the macro sources of financial frictions.

Although the importance of well-functioning capital markets in capital allocation, productivity growth and economic progress has been widely recognised (see, King and Levine, 1993b). However, there is documented evidence that financial markets in developing countries are underdeveloped and inefficient due to frictions. Nevertheless, the underlying sources of financial frictions that lead to financial underdevelopment and capital misallocation in developing countries are still poorly understood (Hsieh and Klenow, 2009; Restuccia and Rogerson 2008). Recently, there is an emerging and rapidly growing literature attempting to identify the nature, sources, and consequences of financial frictions on capital allocation, productivity, and the implications on output and income distribution (Allen, et, al. 2014; Allen, Otchere, & Senbet, 2011; Allen, et al. 2010).

The sources of credit frictions in the literature can be traced to the pioneering work of (Akerlof, 1970; Townsend, 1979; Stiglitz and Weiss, 1981) who emphasise asymmetric information as the main source of financial constraints. This literature argues that its infeasible to attain an informationally efficient market as demonstrated by (Grossman and Stiglitz, 1980) because of information frictions for instance moral hazard, limited commitment, agency costs and costly state verification and monitoring which leads to market failure. Information frictions distort the allocation of capital because of costly state verification and wasteful monitoring costs due to imperfect information which lead to `a la (Stiglitz-Weiss, 1981) credit rationing and 'a la Townsend (1979a) costly state verification problem.

However, if borrowers fully pay off their debt, there is no need for costly verification of the true state of the project or the borrowers' creditworthiness. It's only when the borrower defaults that the lender may need to verify the true state. Similarly, if the lender incurs verification costs, he passes them on to the borrower by charging higher interest rates. This makes external funding more expensive because of high intermediation costs arising from costly state verification and monitoring. It drives a wedge between dependence on external and internal funding because of high borrowing costs which explains why a large fraction of projects are funded with retained earnings instead of borrowing. Importantly, the interest rate increases with the borrowing as the default risk and monitoring costs become high.

This is particularly more common in countries without centralised information access and limited legal enforcement due to weak property rights which leads to frequent credit defaults and credit rationing as shown by (Stiglitz & Weiss 1981). In his pioneering work (George Akerlof, 1970) recognised that increasing the interest rate to exclude fraudulent borrowers would distort capital allocation by diluting the pool of creditors due to adverse selection and moral hazard problem. He argued that charging high interest rates to eliminate bad borrowers would crowd out good borrowers, leaving only bad ones willing to borrow at high interest rate with a likelihood of defaulting. This explains why interest rates and the cost of business in underdeveloped countries doing is very high due to informational and credit market frictions that prevent firms from getting access to external funding due to information wedges.

A few studies have proposed solutions to this problem of information frictions, costly state verification and monitoring. For instance, (Diamond, 1984) propose a model of financial intermediation with delegated monitoring and risk diversification which minimises the costly state monitoring and the unnecessary state verification processes. Similarly, Leland-Pyle, (1977) proposed a model of financial intermediation with information transfer which minimises information asymmetry and moral hazard through sharing of information between borrowers and lenders. Grossman (1981) equally propose a model of private information disclosure with guarantees, that minimises informational frictions and facilitates efficient allocation of resources.

In the micro literature, several scholars have studied the effect of information frictions on financial access, investment, and income distribution. For instance, (Lambert, Leuz and Verrecchia, 2012) study the impact of information asymmetry on borrowing costs. They show that with information asymmetry a firm's borrowing cost is higher, while under perfect competition without information asymmetries the cost of capital is low. Similarly, Karlan and Zinman (2010) using an experimental set-up to study the impact of informational frictions on credit constraint and moral hazard by liberalizing credit screening at high-interest rates estimated at 200%, find no evidence of moral hazard.

Another source of frictions in the literature is the absence of property rights (See, De soto 1989; De soto 2000). Due to a lack of property rights many potential borrowers are excluded from financial access. Besley, (1995) study the effect of property rights on

incentives and investment in two regions of Ghana, one with traditional communal/customary land rights and ownership and the other with private/personal property ownership. He finds higher investment in regions with personal property rights compared to those with traditional/customary land ownership, suggesting that property rights matter for investment and land use due to the security of tenure, the ability to use the land as collateral to obtain credit.

Related works pioneered by (La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1997, 1998) hereafter, (LLSV) and (Johnson, McMillan, & Woodruff, 1999, 2002) examine the impact of property rights and legal origins on financial development and access. They show that economies with robust legal protection for investors have developed financial systems. This literature is founded on the pioneering work of (Demsetz 1967; De Soto, 1989, 2000) who developed the theory of property rights and how it affects development through capital formation, allocation, and accumulation. For instance, De Soto (2000) distinguishes between dead and live capital (productive and non-productive capital) based on differences in the tenure and security of property rights. He finds that places with strong security of tenure and legal protection have developed financial systems.

In the macro literature, financial frictions originate from two main sources: the demand for credit by firms (borrowers) and the supply of credit (financial intermediary). This literature distinguishes between financial frictions originating from the supply or financial intermediary side from frictions originating on the demand side (firms and households). At the firm or household level, frictions originate from the firms' lack of collateral or credit history, or due to firm and individual-specific reasons such as size and age. From the supply side (intermediary, balance sheet) frictions may originate from aggregate shocks such as aggregate economic productivity shocks, technology shocks, business cycles, that affect the bank balance sheet and the supply of credit in the economy.

From the supply side, the primary source of friction is the liquidity constraint which may occur due to temporary business cycles, technology shock, financial crisis or adverse external productivity shocks which affects bank balance sheet and liquidity supply, or profitability and investment leading to tightening of credit supply. In the absence of collateral or durable assets, these frictions interact with credit market imperfections to

amplify credit constraints. For a recent overview on the macroeconomics of financial frictions (see, Brunnermeier, Eisenbach, & Sannikov, 2012).

The most well-known macro studies of financial intermediation with frictions in the literature are those of (Holmström and Tirole 1997; Kiyotaki and Moore, 1997; Gertler & Kiyotaki, 2010; Bernanke, 1983a, b; Bernanke, Gertler and Gilchrist, 1996, 1999; Bernanke, and Gilchrist, 1986). These studies argue that macroeconomic shocks such as business cycles, output shocks, default risks, trade shocks, and country-specific risks could lead to disruptions in credit supply and financial intermediation, particularly in the absence of durable assets.

From the demand side, the benchmark macroeconomic models of financial intermediation with borrowing constraints popularised by (Holmström and Tirole 1997; Kiyotaki and Moore, 1997; Bernanke and Gertler, 1989) the primary source of financial frictions originate from shocks to the borrowers' income also known as productivity or technology shocks. Negative external shocks that affect borrowers' income or wealth, may lead to default in the absence of collateral leading to a reduction in investment, consumption, and output. The main source of frictions to firms and households in the macro literature are negative external shocks to entrepreneurial or business income. In the absence of collateral, these frictions prevent firms from access to external funding or borrowing for investment due to liquidity constraints (see, Evans and Jovanovic, 1989; Fazzari, Hubbard, & Petersen, 1987).

In this strand of literature, several studies have empirically established how liquidity constraints affect investment and entrepreneurship. For instance, studies of (Evans and Jovanovic, 1989; Fazzari, Hubbard, & Petersen, 1987; Aghion et al., 2007; Matsuyama 2007; Clementi and Hopenhayn, 2002; Cooley & Quadrini 2001) have shown that liquidity constraints affect firm investment and growth. They show that negative shocks to entrepreneurial wealth interact with borrowing constraints to prevent entrepreneurs from investing and expanding. This results in lower levels of capital accumulation and lowers entrepreneurial net worth in the following period due to tightened credit constraints. However, improvements in borrowers' net worth or balance sheet conditions could reduce frictions and increase investment.

1.3 Borrowing Constraints and Occupational Choice.

An empirical regularity in the literature on the economic underdevelopment of underdeveloped countries is that inadequate financial access is a key barrier to entrepreneurship, firm creation, and growth. Surveys of potential entrepreneurs identify inadequate financial access as a major obstacle to entrepreneurship and business formation in developing economies (Kerr, & Nanda, 2009; Musso, & Schiavo, 2008; Paulson & Townsend, 2004; King and Levine, 1993; Banerjee and Duflo, 2005). For instance, (Banerjee and Duflo, 2014) have shown that while some firms may wish to borrow more, they face borrowing constraints that inhibit their expansion and productivity. Inadequate financial access has been identified as a formidable constraint to entrepreneurship in developing countries that impose binding credit constraints on entrepreneurship. Firms and entrepreneurs in many underdeveloped economies face severe borrowing constraints that inhibit firm productivity and expansion. Improved access to finance has been shown to stimulate entrepreneurship and improve firm productivity through investment. However, due to weak financial development, there is limited access to banking services such as savings and credit in underdeveloped economies which hinder entrepreneurial activity compared to advanced economies (King and Levine, 1993; Banerjee and Duflo, 2005).

Borrowing constraints affect entrepreneurship and occupational choices in multiple ways. First, firms and entrepreneurs facing liquidity and borrowing constraints, often underperform relative to their unconstrained counterparts (Evans and Jovanovic, 1989). Secondly, borrowing constraints may distort occupational choices and allocation of entrepreneurial talent by preventing entry of firms or propagating exit of firms and entrepreneurs from certain professional occupations or businesses. In the absence of accumulated savings or wealth endowments, most firms or entrepreneurs rely on external finance for survival (Holtz-Eakin, Joulfaian, and Rosen, 1994). However, due to borrowing constraints for instance lack of collateral, many potential firms or entrepreneurs may be excluded from financial access. In a study of endowment effect on entrepreneurship (Holtz-Eakin, Joulfaian, and Rosen, 1994) have shown that prospective entrepreneurs who receive an endowment have a higher potential for creating business. Similarly, they show that existing entrepreneurs who receive an endowment are not only more likely to stay in business but also experience a significant increase in revenue and output. In contrast, (Hurst and Lusardi, 2004) argue that borrowing constraints are

irrelevant to entrepreneurial creation. However, the potential for entrepreneurship is determined by the initial wealth distribution which improves over time.

Although this may be true for some entrepreneurs, however, borrowing constraints are a strong determinant of entrepreneurial choice and may generate entry barriers in the absence one's own savings or wealth endowment. However, (Cagetti & De Nardi, 2006) argue that prohibitive borrowing constraints reduce wealth inequality, average firm size, and the number of entrepreneurs and capital accumulation.

1.3.1 The Nature of Financial Markets in Developing Countries

The nature of financial systems differs significantly across countries. While some countries are dominated by the bank based financial market structures, others are led by the financial market or capital-market based financial structures or both. A country's financial structure is determined by the nature and level of economic development of a country, its legal institutions, and corporate structures. For instance, most low-income countries are dominated by bank-based financial structures. In contrast, most developed market economies are dominated by market-based systems because the structure of the economy is dominated by publicly-owned firms.

Financial market structures perform a fundamental role in the mobilisation of long-term finance which reduces the cost of external finance. Similarly, the corporate structure of firms in advanced countries is dominated by public firms, while in developing and low-income countries the economic structures are dominated by family-owned micro-enterprises dependent on self-financing or bank credit.

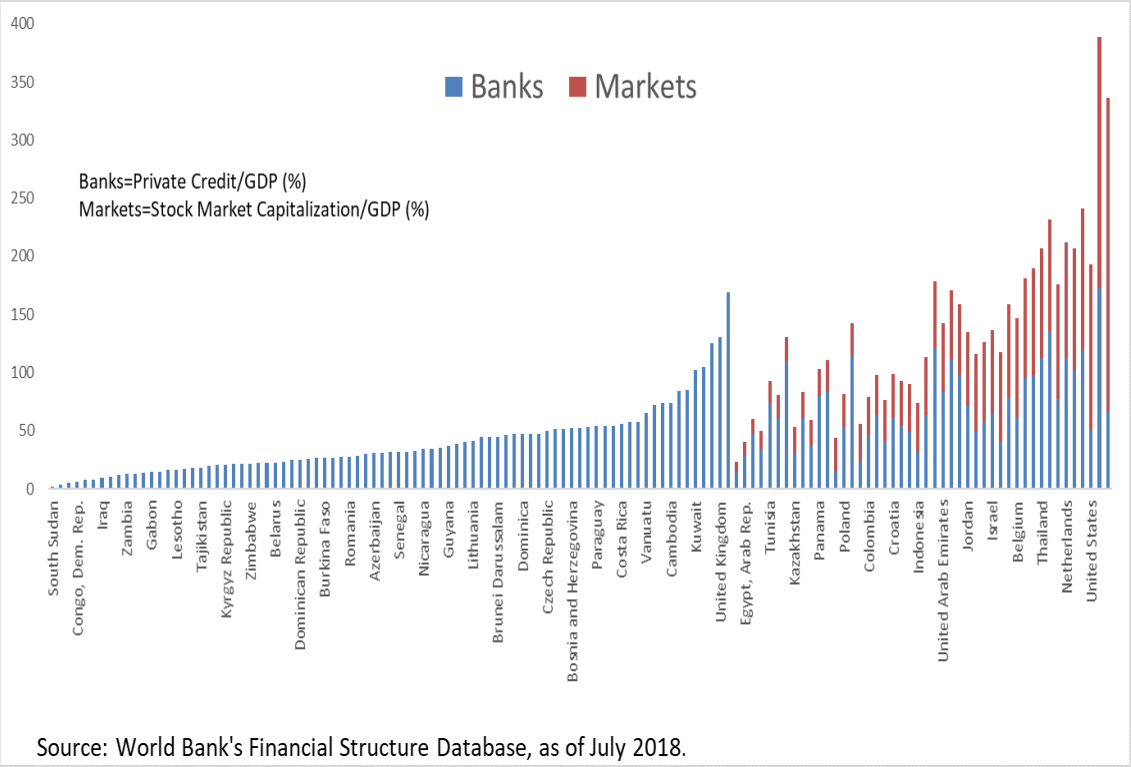

Figure 1:1 ***Financial Structures Across Countries***

For instance, according to the recent international financial development data from the World Bank, the level of financial intermediation approximated by the proportion of credit to GDP in low-income economies is estimated at about 31% compared to 86% in high-income countries. The World Bank Enterprise survey statistics also show that nearly 25% of all firms in emerging economies identify financial access as a key constraint to their business operations. The share of financially constrained firms is considerably larger among firms in sub-Saharan Africa estimated at (39%) compared to East Asia and the Pacific (11.9%). These constraints often create distortions that lead to inefficiences in capital allocation, which translate into lower aggregate firm productivity and per capita income. The evidence of the extent of financial constraints is presented in table 1.1.1 below adopted from (Beck, Demirguc-Kunt, & Maksimovic, 2008)'s study.

1.3.2 Global financial Access and Structure.

Table 1:1 *Firm Financing Patterns around the globe.*

Country	External finance	Bank	Equity	Leasing	Supplier credit	Development bank	Informal
Argentina	43.45	29.99	2.81	0.75	7.48	1.60	0.82
Armenia	11.42	4.53	0.00	1.08	0.88	3.58	0.68
Belarus	20.36	5.73	1.09	0.90	3.13	9.40	0.12
Belize	38.93	20.36	13.57	0.00	3.21	1.79	0.00
Bolivia	38.97	27.02	0.00	0.00	8.26	0.29	0.74
Brazil	51.80	23.06	6.88	4.65	11.37	4.20	0.40
Bulgaria	26.78	6.03	1.38	3.45	6.47	3.82	2.87
Canada	48.55	23.45	8.39	2.39	3.39	5.93	5.00
Chile	57.34	41.34	0.26	2.57	7.71	0.48	1.00
China	29.93	10.17	2.41	1.63	2.41	4.63	5.93
Colombia	55.22	29.18	0.37	1.97	12.45	4.78	0.00
Costa Rica	37.92	21.13	0.19	0.15	7.54	2.08	1.35
Croatia	41.31	19.79	3.02	0.31	8.19	6.23	2.47
Czech Republic	32.50	13.90	0.66	3.90	3.75	6.84	3.46
Dominican Republic	42.58	25.32	0.56	0.08	10.40	0.95	1.77
El Salvador	55.00	32.03	4.59	0.54	9.19	3.92	0.14
Estonia	60.14	20.81	14.71	9.46	6.96	3.07	3.35
France	30.91	6.76	5.76	4.30	7.36	1.42	1.67
Germany	54.29	16.84	23.13	0.74	0.94	8.52	4.13
Guatemala	57.34	28.38	1.09	2.78	18.72	2.63	0.63
Haiti	24.17	10.83	0.24	0.24	2.38	10.24	0.24
Honduras	44.33	29.17	1.00	0.00	9.00	2.67	2.50
Hungary	35.86	13.99	6.96	2.41	5.06	6.05	1.39
Indonesia	21.83	17.17	0.00	1.67	0.67	1.67	0.00
Italy	77.71	49.67	6.88	1.67	5.83	1.17	4.17
Lithuania	39.60	12.42	11.74	4.08	5.24	1.32	4.79
Malaysia	40.62	13.81	4.76	3.48	13.81	4.05	0.71
Mexico	34.33	6.83	7.00	0.33	11.17	5.33	3.50
Moldova	20.07	10.11	0.49	2.01	4.40	2.22	0.83
Nicaragua	56.70	19.32	1.36	0.91	15.23	7.61	3.18
Pakistan	43.13	29.96	5.63	1.50	2.92	1.04	2.08
Panama	64.02	47.15	2.07	1.22	5.00	1.17	0.24
Peru	35.53	20.90	0.50	0.50	9.08	1.68	0.88
Philippines	36.55	17.49	1.96	1.41	10.84	4.49	0.36
Poland	58.60	15.44	27.58	4.50	4.60	4.33	1.72
Romania	25.91	11.53	3.01	2.44	4.09	2.67	2.16
Singapore	45.17	28.06	7.67	1.16	6.14	0.58	0.00
Slovak Republic	30.84	9.26	1.17	10.23	4.00	3.45	2.60
Slovenia	38.55	16.99	3.51	2.88	8.27	4.61	1.04
Spain	39.78	23.00	0.67	8.04	4.22	2.62	1.22
Sweden	43.42	19.70	8.33	1.22	6.16	3.43	1.12
Trinidad &Tobago	71.35	40.00	12.73	0.85	15.18	1.85	0.00
Turkey	43.98	20.41	9.68	4.85	1.42	6.21	1.17
Ukraine	25.80	7.21	2.53	1.01	7.84	4.45	2.71
United Kingdom	36.12	13.14	11.56	2.91	7.47	0.58	0.47
United States	47.12	21.47	3.24	6.09	6.62	6.76	2.94
Uruguay	54.04	39.79	1.38	0.74	8.30	2.77	0.00
Venezuela	28.73	14.80	3.05	0.50	5.88	1.75	0.25

Source: World Bank Enterprise Survey, and Beck, Demirguc-Kunt, & Maksimovic, (2008).

The financial system structure affects firm credit access. There is evidence that credit markets in most poor countries are weak and underdeveloped (Allen, Otchere, & Senbet, 2011; Conning, & Udry, 2007; Fafchamps, 2003). Due to weak financial markets access to external finance by firms is very difficult. Thus, many firms do not have credit access.

Access to credit is a more severe obstacle among small and medium scale businesses (Beck and Demirguc-Kunt, 2006; Beck, 2007; Aterido, Hallward-Driemeier, & Pagés, 2009) in bank-based low-income countries. For instance, based on a recent World Bank Enterprise Survey (WBES) evidence suggest that nearly 40% of all firms in sub-Sahara Africa identify as financially constrained compared to 15% in Europe and Central Asia or 12% in East Asia and Pacific. See, figure 1.2: which shows financing constraints across different regions.

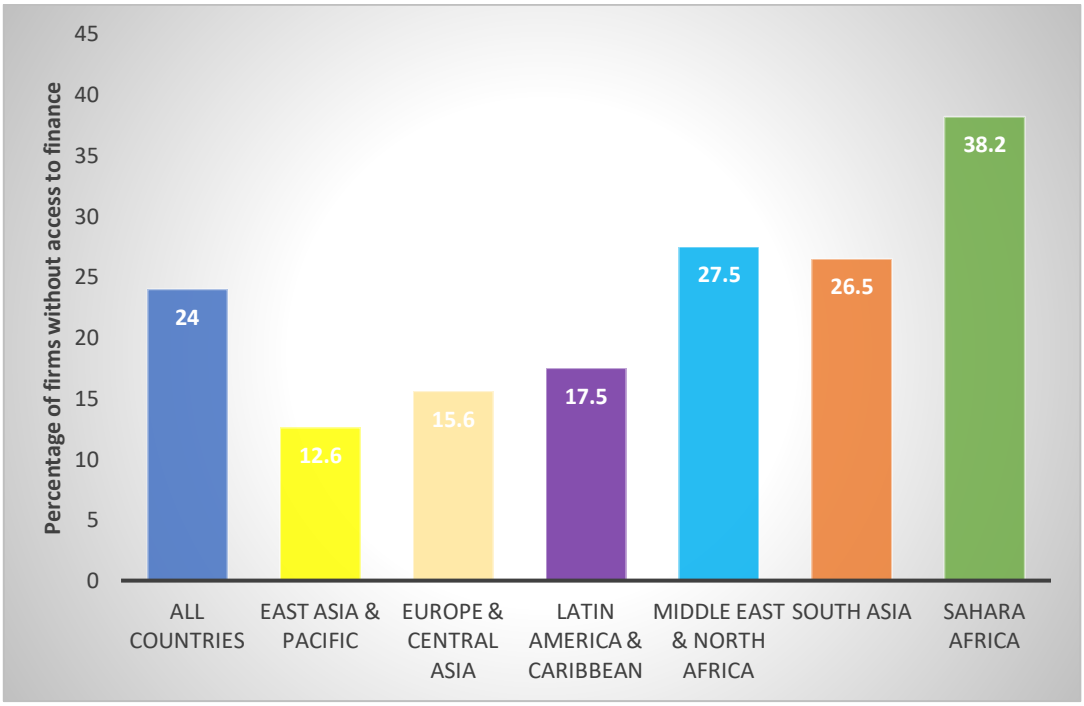

Figure 1.2 The Percentage of firms identifying finance access as a Major obstacle

Source: Owners Calculation based on World Bank Enterprise surveys.

Similarly, due to underdeveloped financial markets in developing countries, a significant number of people remain unbanked and without access to credit. Evidence based on a recent World Bank financial inclusion survey suggests that a bulk of people in developing countries do not borrow from formal financial institutions, do not hold accounts with formal financial institutions, and save much less. In contrast, a significant

proportion of people in middle income and advanced countries have more access to banking services covering loans, savings and credit. Several factors including lack of legal or formal identification, high borrowing costs and low financial broadening due to fewer bank branches have been cited as the leading cause of financial underdevelopment and exclusion in low-income countries. However, recently, digital technologies such as mobile money, using fintech and mobile telephony for transactions have emerged as an important financial inclusion strategy in developing countries. This has enabled developing countries to narrow the gap in financial inclusion with advanced countries. It's now estimated that about 1.2 billion people have access to mobile money and 372 million are active mobile money users daily.

1.3.3 Financial structure and Access

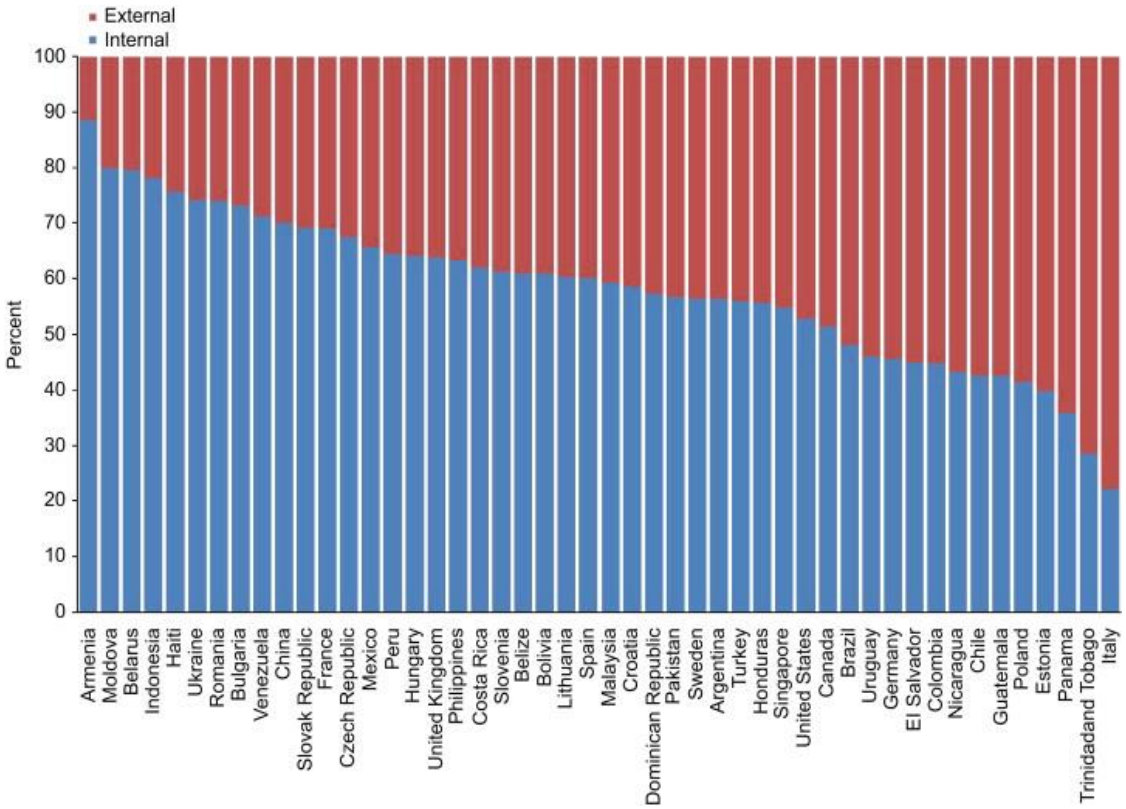

Figure 1.3 *Global Financing Patterns Internal Vs External Finance Access*

Source: Based on Beck, Demirguc-Kunt, & Maksimovic, (2008).

This figure demonstrates that in bank-based financial systems, firms predominantly rely on internal financing because access to external finance is difficult due to borrowing constraints. This has been demonstrated in the previous table which shows that in countries with weak financial systems firms majorly rely on external

borrowing and less on internal financing as opposed to firms in countries with underdeveloped financial market structures.

1.3.4 The Nature of Financial Frictions in Developing Countries

This part provides an overview of the nature of credit market frictions in developing countries. I distinguish between three common forms of financial frictions that generate distortions and misallocation persistent in developing countries: (a) ***frictions to financial access*** - occasioned by participation costs that lead to financial exclusion, for instance, collateral constraints, high transaction costs, high monitoring and enforcement costs or limited liability; (b) ***frictions to financial deepening*** – induced by borrowing, savings, and payments constraints, and (c) ***frictions to financial intermediation efficiency*** arising from – high-interest rate spreads, overhead costs, and non-performing loans. The frictions to intermediation efficiency originate from the intermediary or balance sheet side. I disentangle the underlying mechanisms that drive these frictions to capture and quantify their distributional consequences on aggregate output, TFP, and income distribution. I show how financial frictions affect credit access, entrepreneurial investment, firm performance, and aggregate productivity growth.

1.3.4.1 Frictions to Financial Access

Credit access is fundamental for firm investment and growth. However, access to credit is often cited as a strong barrier to doing business in poor countries. This is because financial markets in developing countries are underdeveloped. A growing literature suggests that credit markets in poor countries are imperfect and weak. As a result, firms in poor countries operate under acute financing constraints due to financial frictions. These constraints vary considerably across regions, firm size, and age. They are particularly more severe among small and medium-size firms in poor economies[4].

For instance, recent studies by (Demirguc-Kunt, Klapper, Singer, Ansar, & Hess, 2018; Demirgüç-Kunt, & Klapper, 2012, 2013; Beck, and Demirgüç-Kunt, 2008) suggest that about 1.7 billion people globally are still unbanked and an estimated 2.3 billion people remain financially excluded or underserved majority of whom live in emerging and low-income countries, see **figure 1.3.1** below.

[4] See, Beck and Demirgüç-Kunt, 2006 for a review on financial constraint and growth among SMEs

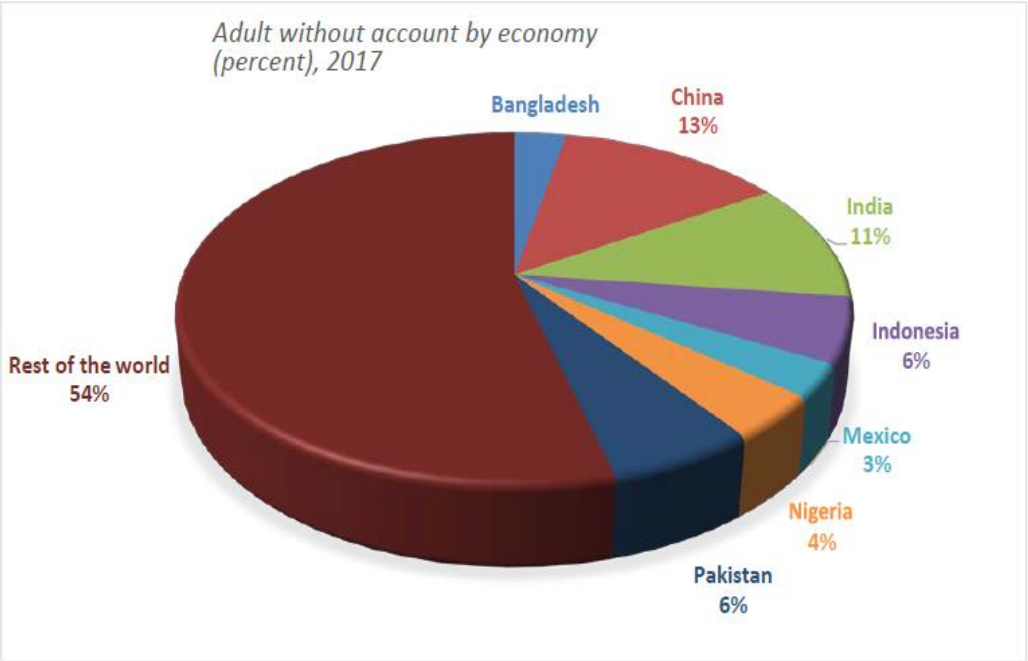

Figure 1.3.1 *Number of Unbanked people across seven selected emerging markets*

Source: Global Findex database, IMF; Barajas, et al., (2020)

As shown in figure 1.2 above, more than half of the unbanked households globally are based in just seven countries which are found in emerging and low-income market economies. Similarly, there is still large unmet financing need facing small growing businesses (SGBs), and Small and Medium Businesses (SMBs) estimated in trillions of dollars in developing and emerging markets frontiers.[5] According to the IFC (2017), there is an annual unmet financing gap of $5.2 trillion among formal micro, small, and medium enterprises (MSME) in poor countries. This financing gap is particularly more acute in East Asia and Pacific, Africa and Latin America regions where a majority of firms lack credit access (**See, Figure 1.2.3.2**) below.

[5] See, the International Finance Corporation (IFC) Report. (2017). On MSME Finance Gap: Assessment of the Shortfalls and Opportunities in Financing Micro, Small, and Medium Enterprises in Emerging Markets.

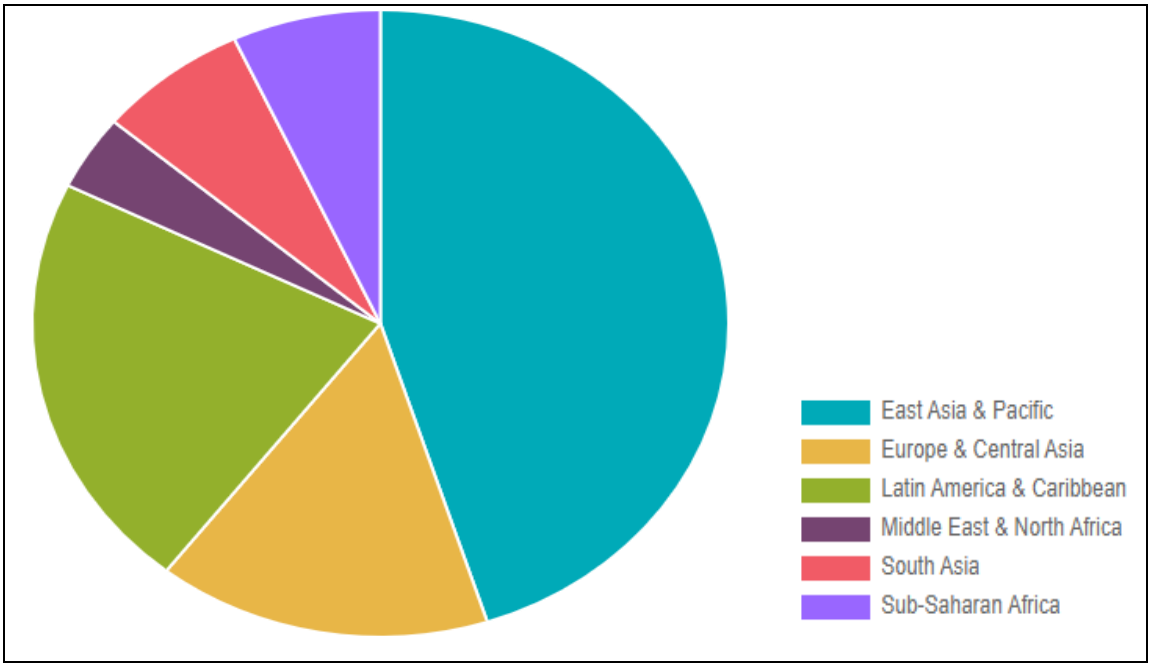

Figure 1.3.2 *MSME Financing Gap by Region in US dollars*

Source: International Finance Corporation (2017). *MSME Finance Gap Data*.

Financial constraints significantly vary based on firm size, with small firms facing more severe constraints compared to medium and large size firms. The severity of financial constraints also varies considerably across regions with small and medium-size firms in emerging and low-income economies more constrained compared to advanced countries. For instance, in Sub-Sahara Africa, almost 50% of small firms identify as financially constrained compared to about 15% in advanced countries and 35% in emerging markets. For a detailed analysis of differences in firm financing constraints based on size across different income groups, refer to **figure 1.2.3.3** below.

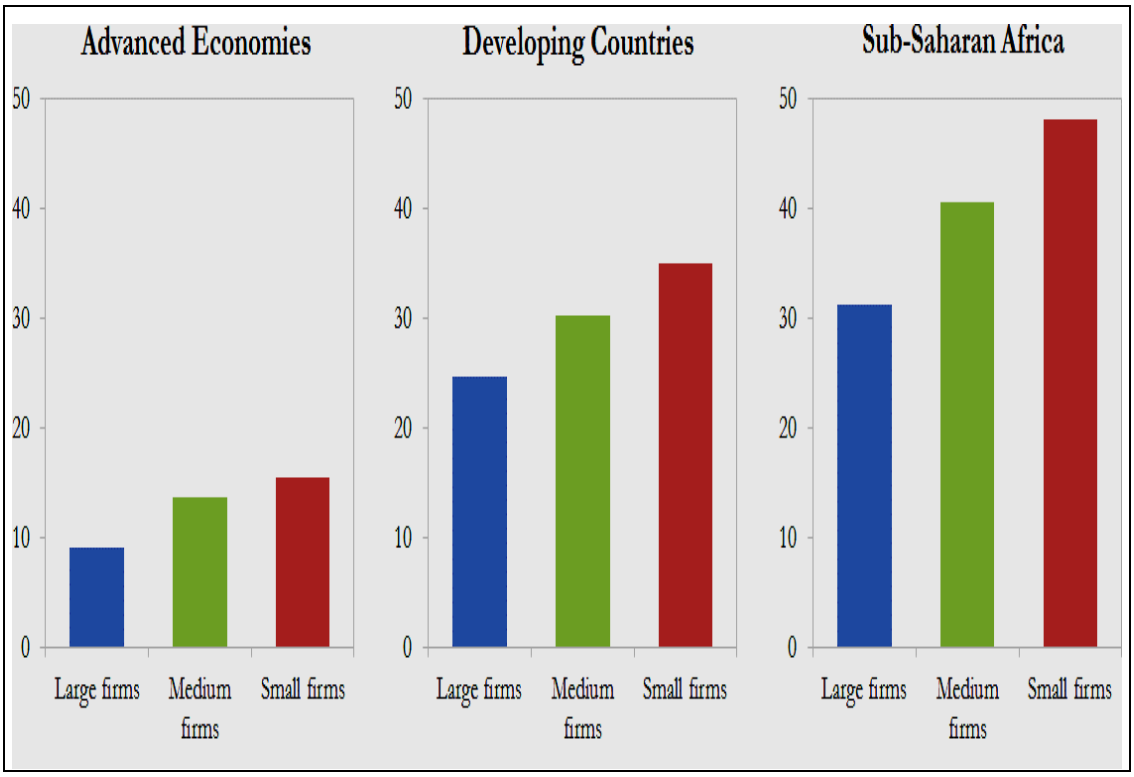

Figure 1.3.4 *Percentage of firms identifying financial access as a major constraint.*

Source: Based on owners computation from Enterprise Survey and (Dabla-Norris, et al., 2015).

Some of the firm financing constraints happen due to rejection of loan applications arising from lack of collateral and credit histories. In sub-Sahara Africa the rate of rejection of loan applications is higher compared to firms in other regions. For instance, about 15.4% of all loan applications by Sub-Sahara African firms are rejected compared to 10.6% across all countries, 7.6% in East Asia and Pacific, 3.3% in Latin America. The high rates of rejection of loan applications by financial institutions in Sub-Sahara Africa could be attributed to high rates of default by firms which lead to a large number of non-performing loans or the absence of collateral by firms which exposes banks to high credit risks. **Firgure 4** provides an overview of the rate of rejection of loan applications by firms across different regions of the world.

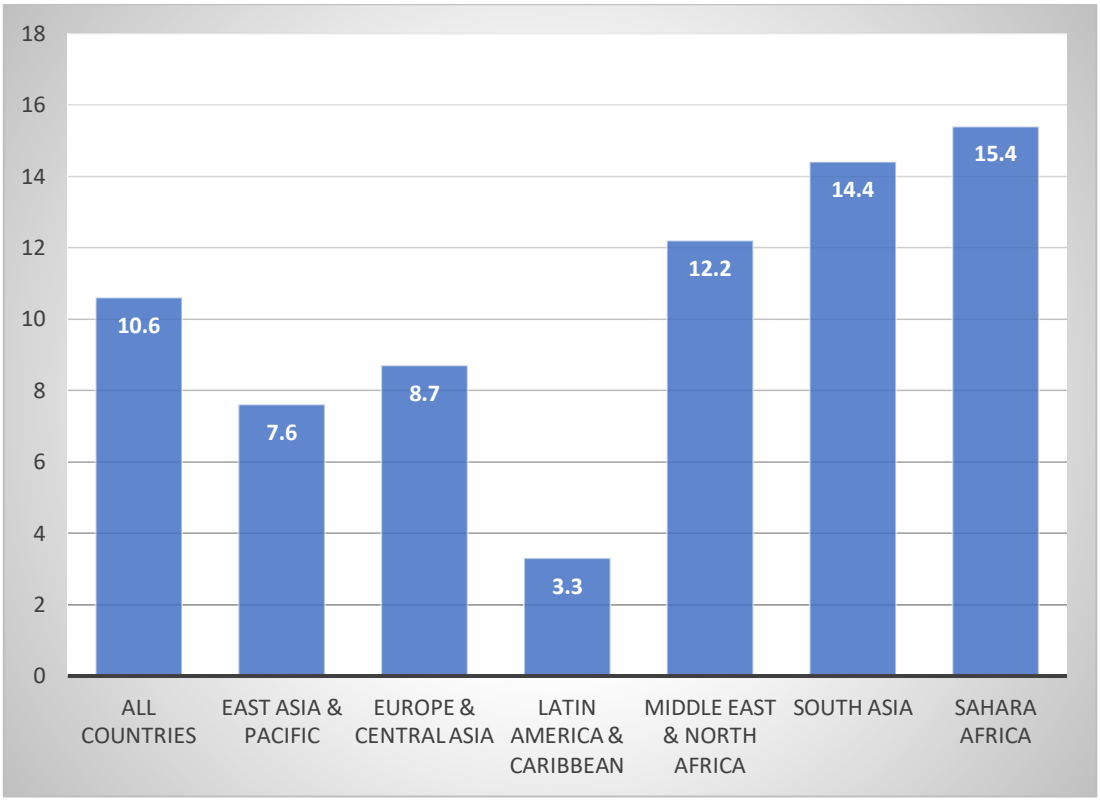

Figure 1.3.5 *Percentage of Firms whose Recent Loan Applications were Rejected.*

Source: Owners computation based on World Bank Enterprise surveys.

1.3.4.2 Financial Deepening Frictions

Although there is growing evidence showing that well-developed financial markets enhance financial access, intermediation, and growth (see, King and Levine, 1993b; Rajan and Zingales, 1998; Levine, 1997, 2005; Levine, Loayza and Beck, 2000; Beck, Levine, and Loayza 2000; Levine and Zervos, 1998). However, the level of financial development based on broad indices of financial development, such as financial depth (FD), financial institution depth (FID), and financial institution access (FIA), among others developed recently by (Svirydzenka, (2016) indicates that financial deepening varies considerably across regions or countries. Particularly, in Africa and other low-income countries, the indices of financial development is based on, financial depth (FD), financial institution depth (FID), and financial institution access (FIA), are too low compared to other regions.

These differences in financial development across countries affect financial intermediation and access by firms. This is partly because of weak financial market

infrastructure and low level of financial deepening in poor countries that affect financial access by households and firms. See, figure 1.2.3.5 (a) below for reference.

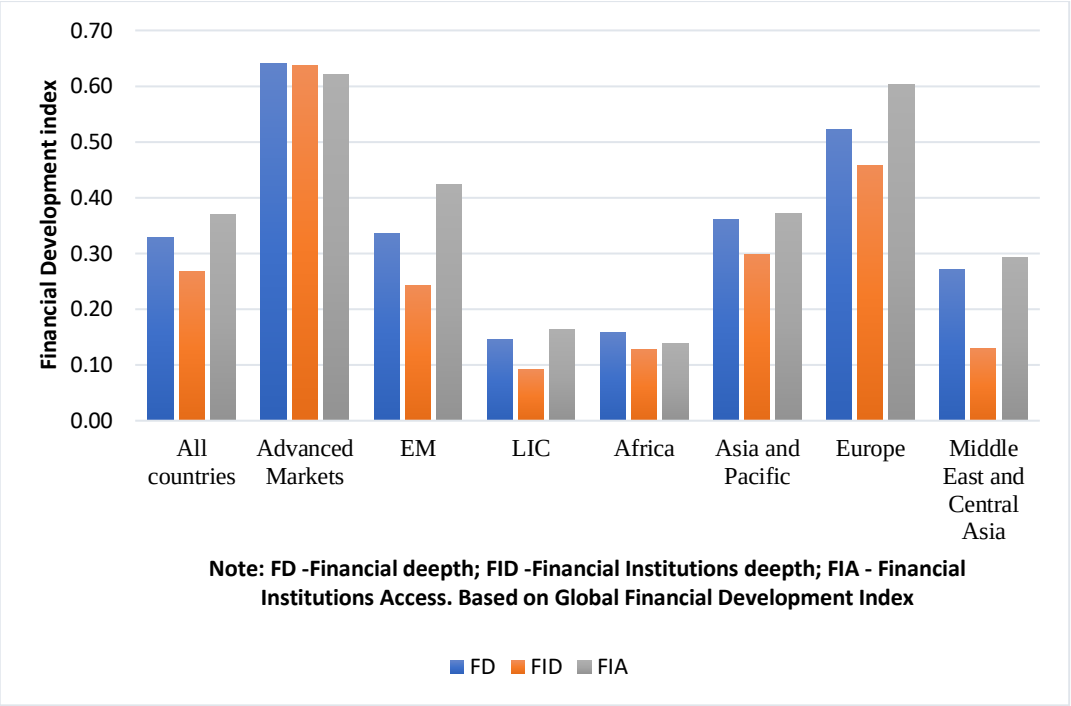

Figure 1.3.6 *Differences in Financial Development Across Regions, 2018.*

Source: Owners' computation based on financial development index Svirydzenka (2016).

Similarly, the level of financial depth indicated by an alternative measure, the ratio of private credit to GDP is extremely low. For instance, while the share of credit/GDP in most middle-income and high-income countries exceeds 100%, in sub-Sahara Africa and other low-income countries, it's below 45%. The world bank classifies a country as financially developed when the ratio of financial development indicated by the ration of credit/GDP exceeds 70%. Which suggests that many economies in sub-Sahara Africa and other low-income countries are financially underdevelopment. For reference, see **figure 1.2.3.6 (b)** below.

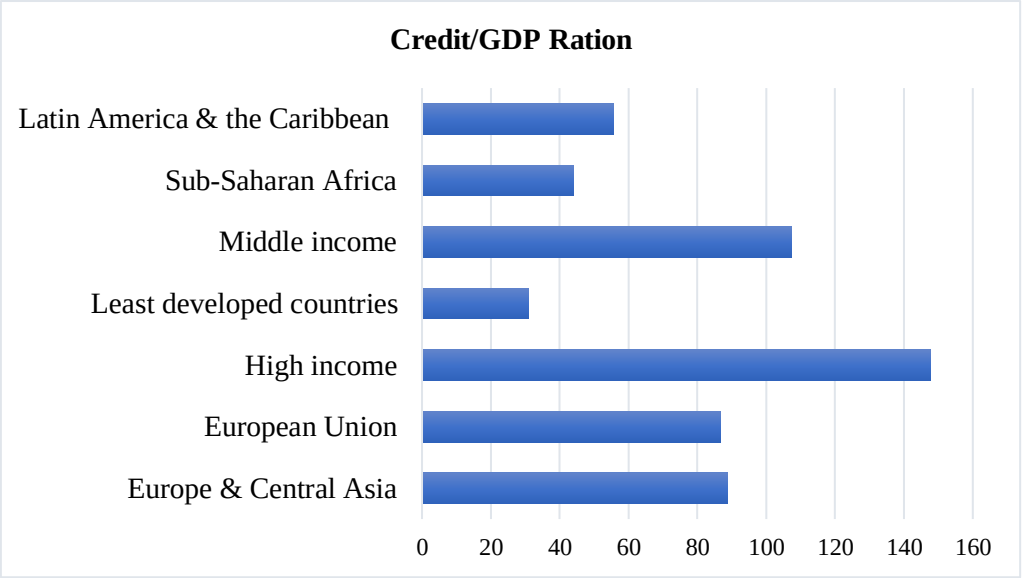

Figure 1.3.7 *Financial Deepening Proxied by Credit to Private Sector GDP Ratio*

Source: Owners' computation based on World Bank Financial Development Data 2018.

In terms of finance and Banking infrastructure, evidence suggests large gaps and variations in the level of development of financial institutions across countries. For instance, the distribution of financial institutions in terms of the number of Bank Branches (per 100,000 adults) vary significantly across countries. While the global average number of bank branches per 100,000 adults is about 38, in Africa including other poor economies is below 5. Also, while the number of automated teller machines (ATMs) (per 100,000 adults) is about 90 in the Euro area, 31 in Latin America, 21 in the Middle East & North Africa, it's below 3 in sub-Sahara Africa and other low-income countries. The low density of bank network infrastructure in developing countries thus discourages savings and financial access.

A key dimension of financial market development is financial access or inclusion. Financial inclusion has implications for economic growth. It enables firms and individuals to access vital capital needed for enterprise creation and expansion. However, due to binding credit constraints, majority of the firms and individuals are inhibited from financial access which impedes firm expansion and GDP growth.

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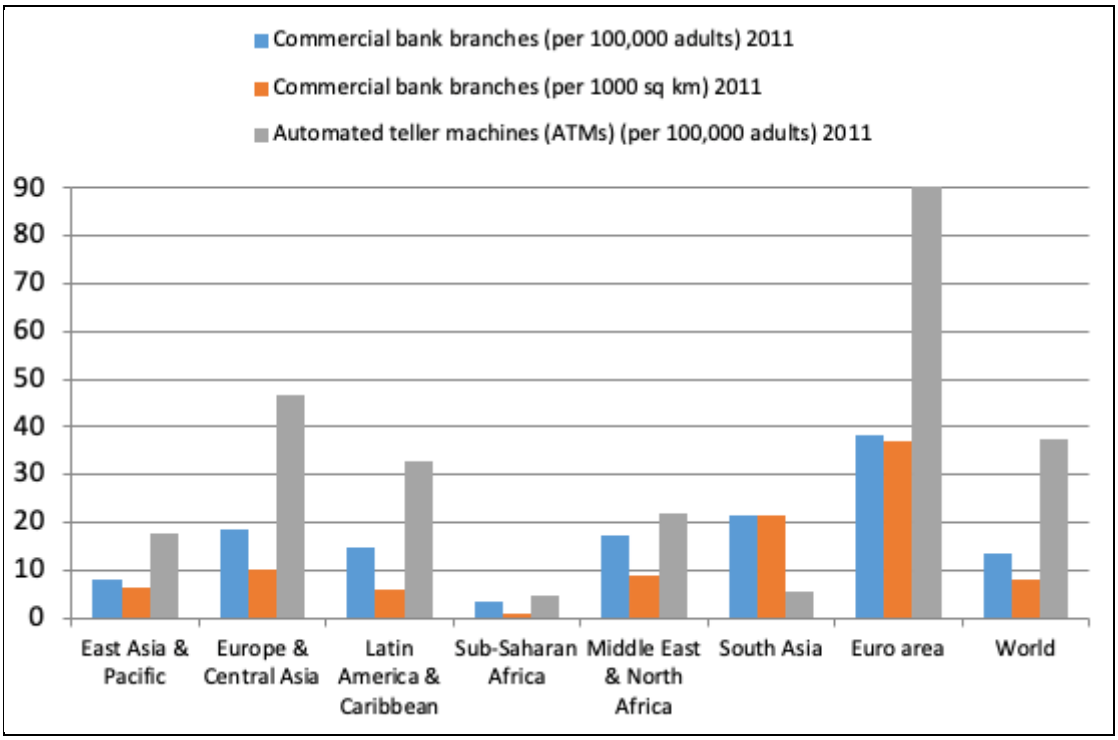


Figure 1.3.8 *Distribution of Banking Infrastructure Across Regions.*

Source: Owners' computation based on financial inclusion Indicators database.

1.3.4.3 Obstacles to Household Financial Inclusion Across Regions.

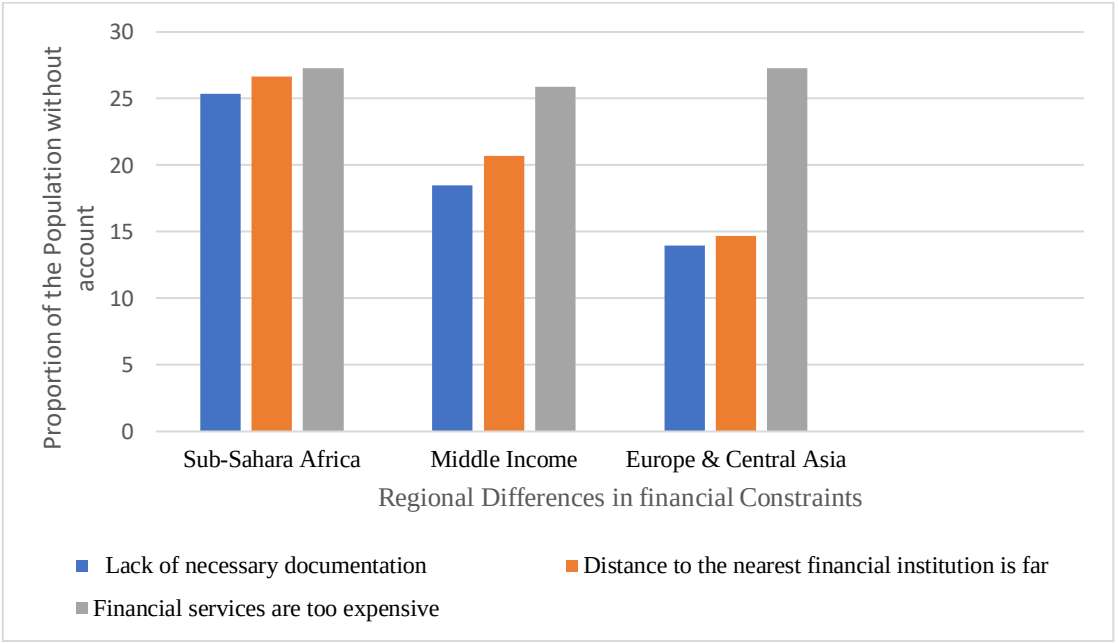


Figure 1.3.9 *Major Obstacles to Financial Inclusion and Acces Across Regions.*

Source: Based on World Bank Financial Inclusion Survey, 2017

1.3.4.4 Association Between Financial Access and Per Capita GDP

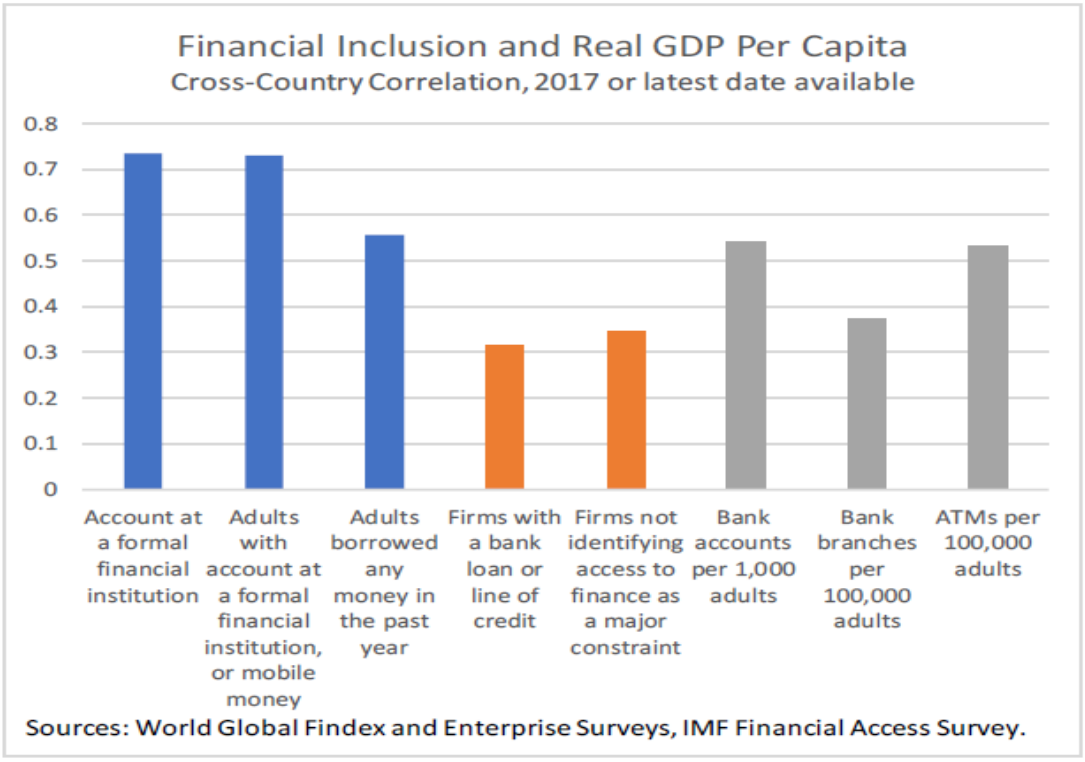


Figure 1.3.10 *The Link Between Financial Access and Per Capita GDP*

1.3.4.5 Regional Differences in Account Ownership and Credit Access

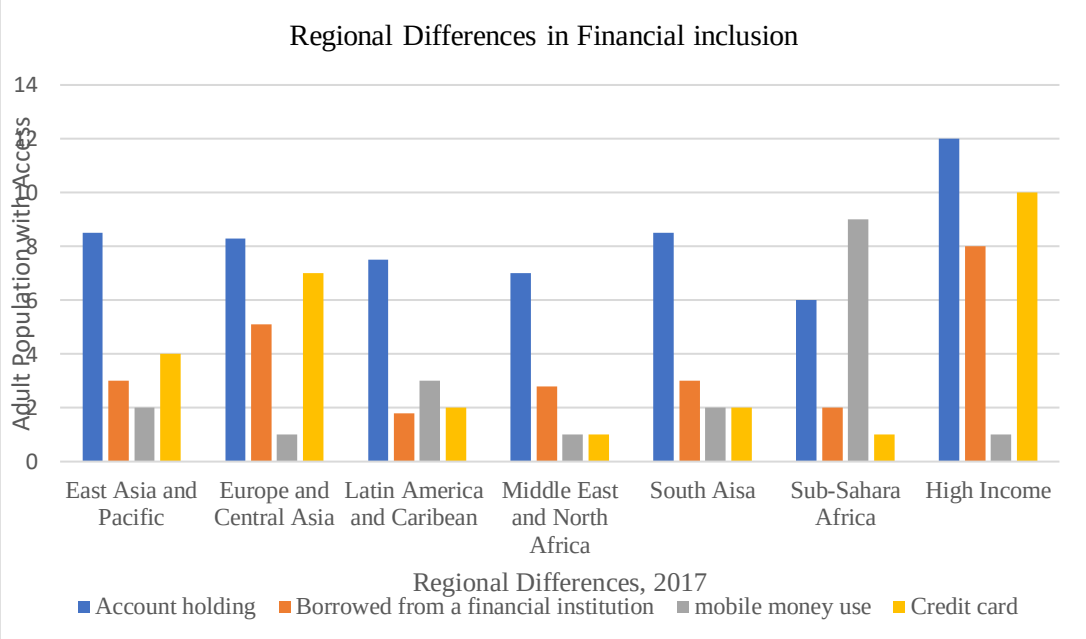


Figure 1.3.11 *Regional Differences in Financial Access*

Source: Own calculation based on World Bank Financial Inclusion Survey data.

1.3.5 Frictions to Financial Intermediation Efficiency.

Efficiency in financial intermediation is vital in enhancing financial access. However, financial intermediation efficiency can be hampered by high intermediation costs such as high monitoring costs, verification costs, screening costs, collateral requirements, high-interest charges, and transaction fees which affect the cost of borrowing. Indeed, the intermediation costs in many developing and low-income countries are extremely high compared to middle- and high-income countries. For example, in Sub-Sahara Africa, the interest rate spread (the wedge between deposit and lending rate) is too high estimated at about 12% compared to 3 and 8% in advanced and middle-income countries. Similarly, the loan collateral requirements in sub-Sahara Africa are too high estimated at about 157% of loan value compared to 50% in advanced countries. These frictions constrain firms and households from accessing financial services.

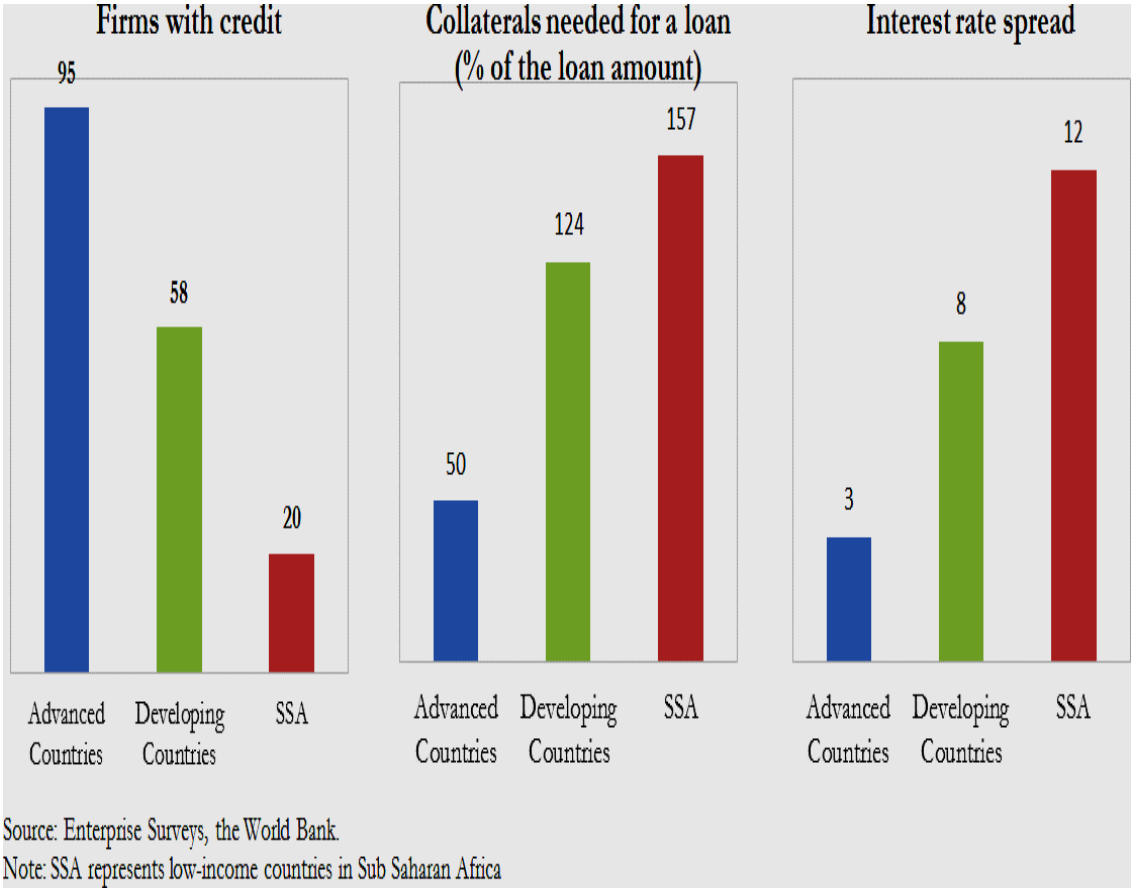


Figure 1.3.12 *Regional differences in financial frictions*

Source: Based on (Dabla-Norris, and others, 2015)

1.4 Microfinance as a Solution to financial frictions

In this section, I demonstrate how Microfinance plays a key role in improving access to credit by easing borrowing constraints. Microfinance has emerged as an important policy intervention against financial exclusion and a remedy to poverty (Khandker, 2005; Pitt and Khandker 1998; Collins, Morduch, Rutherford, & Ruthven, 2009; Morduch, 1999), entrepreneurship and credit access, (Banerjee, Breza, Duflo and Kinnan 2015; Armendariz and Morduch, 2010; Hulme and Mosley, 1996), albeit with some scepticism (Morduch, 2000; Morduch and Roodman, 2011; Bateman 2010).

Microfinance was originally founded on social capital with trust and social networks as forms of collateral (Granovetter, 1973, 1983; Adler, & Kwon, 2002; Uphoff, 2000; Besley, and Coate, 1995). However, following the pioneering work of Townsend, (1979), based on the design of optimal lending contract under limited information, and Williamson, (1986) study of financial intermediation with costly state verification, as well as Diamond, (1984) model of financial intermediation with delegated monitoring and Boyd and Prescott (1986) model of a coalition of borrowers. Microfinance was originally meant to solve this problem of financial intermediation with the above frictions using social capital (social networks) as a form of collateral to mitigate the costly verification problem through peer-monitoring and joint liability lending, which enhance credit access among credit-constrained borrowers without physical collateral.

For instance, in Diamond (1984), Townsend (1979) and Boyd and Prescott's (1986) models of financial intermediation with delegated monitoring, costly state verification, and a coalition of heterogeneous borrowers, the financial intermediary minimizes the risk of loan default and intermediation costs by delegating the task of monitoring, screening, and costly state verification of the loan contracts to the borrowers. In contrast, Microfinance enhances credit access by enhancing the optimal design of loan contracts with limited information envisaged under Townsend, (1979) and solving the problem of information asymmetry identified by (Stiglitz and Weiss, 1981), and the problem of collateral constraint through social capital and joint liability lending, where group members guarantee each based on trust, close social ties, and peer-monitoring.

The joint liability model of Microfinance based on peer monitoring has been widely studied in economic literature (see, Ghatak and Guinnane, 1999; Armendariz, & Gollier, 2000; Banerjee, Besley, and Guinnane, 1994; Besley, and Coate, 1995; Diamond, 1996) for a review. This model of credit access based on group lending has intuitive and superior properties that mitigate credit risk for instance social capital which acts as a form

of insurance. Similarly, peer screening, monitoring, and verification mechanisms embedded in the model enable the financial intermediary to reduce adverse selection and moral hazard problems which reduce credit default (Aghion and Gollier, 2000; Ghatak and Guinnane, 1999). The joint liability model of microfinance also reduces intermediation costs, increases repayment (Giné and Karlan, 2010) and reduces the risks of default due to penalties and insurance embedded in the social contract (Bhole, & Ogden, 2010; Giné, Jakiela, Karlan and Morduch 2010)).

This model of microfinance has been very successful in enabling access to credit and financial inclusion in many developing countries because it eliminates frictions and barriers to credit access such as lack of collateral and property rights. As a substitute for physical collateral, this model uses trust or social capital through group guarantee schemes and joint liability as a form of insurance or collateral by borrowers against the loan default. As Boyd & Prescott (1986) have demonstrated, the coalition of heterogeneous borrowers in the presence of adverse selection can improve credit market outcomes by providing cross-subsidization within the coalitions which are embedded in the microfinance model of group lending.

However, a key challenge with this model of financial inclusion based on social capital is that it's difficult to access large sums of money for entrepreneurship as trust is built over time through graduated lending. Similarly, emerging evidence from recent impact evaluations on microfinance provide mixed outcomes of the impact of microcredit on poverty alleviation with some analyses showing strong evidence (Banerjee, Duflo, Glennerster, & Kinnan, 2015; Banerjee, et al., 2015; Duvendack, et al., 2011; Stewart, et al., 2010; Van Rooyen, 2012; Burgess, & Pande, 2005; Morduch, 1999), while others find no effect or some scepticism (Roodman & Morduch, 2014; Morduch, 2000).

1.5 Consequences of Financial Frictions on Output and Income Distribution

This segment documents the underlying effects of financing frictions on total output and cross-country income distribution. I explore the underlying mechanisms and causal pathways through which financing frictions interact with households and firms, to generate productivity gaps, income differences or poverty reaps. Finally, I locate this study in the broader discipline of economics by positioning it and outline the contribution of the study to economic literature and policy.

1.6 Consequences of Credit Market Frictions on Aggregate Productivity

Credit market frictions have consequences on capital allocation, productivity, and income distribution. In countries with functional and well-developed credit markets, productive firms and entrepreneurs tend to operate enterprises, while the inefficient entrepreneurs and firms contribute their capital to the more efficient firms inform of deposits or savings which are lent to firms. In practice, however, developing countries are characterised by imperfect capital markets which distort the efficient allocation of funds: leading to large dispersions in output across firms. Under this condition, reallocation of capital from less productive firms with lower marginal productivities would lead to productivity increases and consequently an increase in GDP. Inability to redistribute capital from lower to higher productivity firms is regarded as a "misallocation" of capital. This capital misallocation is captured in data as a TFP loss. Therefore, financing frictions contribute to large a proportion of differences in TFP, aggregate output, and gaps in income per-capita between countries[6]. Apart from capital misallocation, there are also other forms of distortions that can lead to resource misallocation and productivity loss other than capital. However, the focus of this essay is on the misallocation of capital which is a pervasive problem in many developing countries[7].

1.7 Effect of Credit Market Frictions on Agricultural Productivity

Credit market frictions have significant implications for farm input allocation and productivity. For instance, a recent study by McArthur, and McCord (2017) provide evidence that suggests that differences in agricultural credit access across Asia, Africa, and the Americas has significant effects on farm yields across these regions. They find that in regions with greater access to agricultural input credit the crop yields are higher compared to those with lower credit access.

[6] For empirical evidence, see Caselli, (2005); Restuccia and Rogerson (2008); Hsieh and Klenow (2009); Hall and Jones (1999); Midrigan, and Xu, (2014); Klenow and Rodr´ıguez-Clare (1997)
[7] See Banerjee and Duflo (2005) for a review.

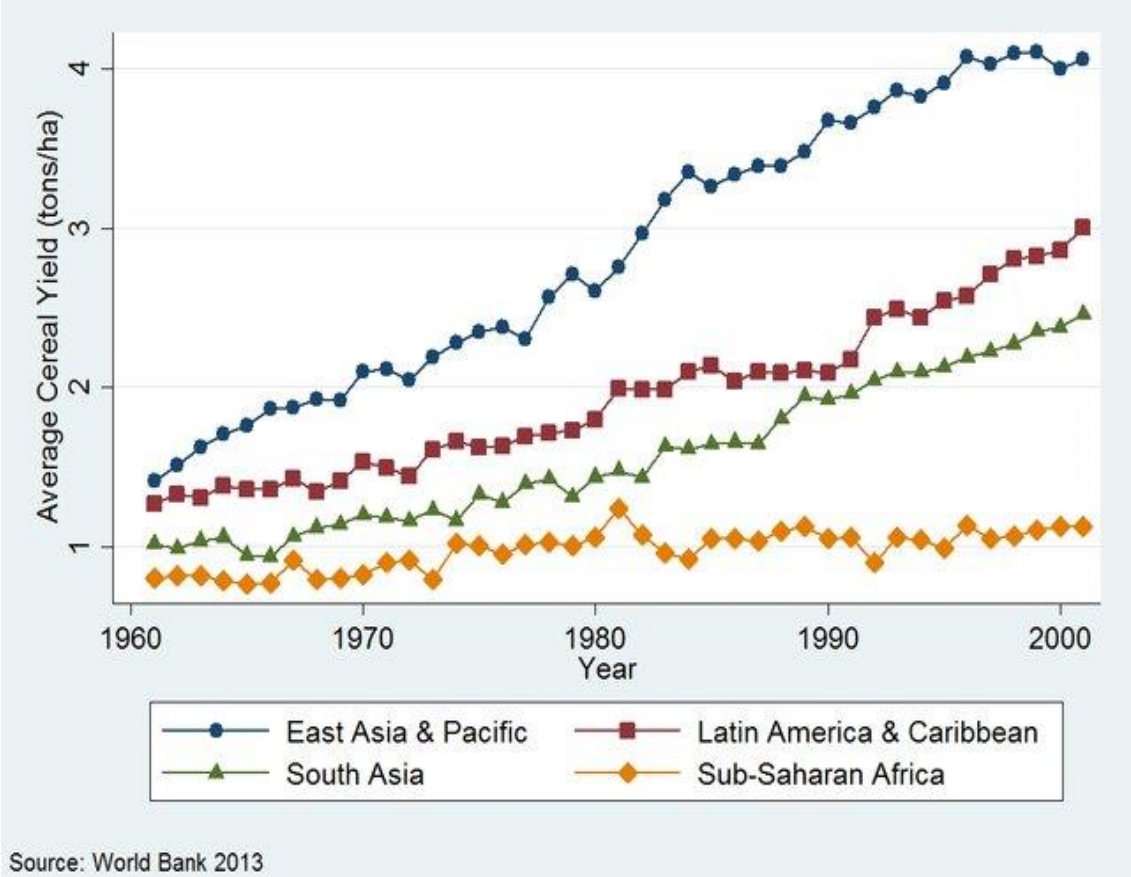
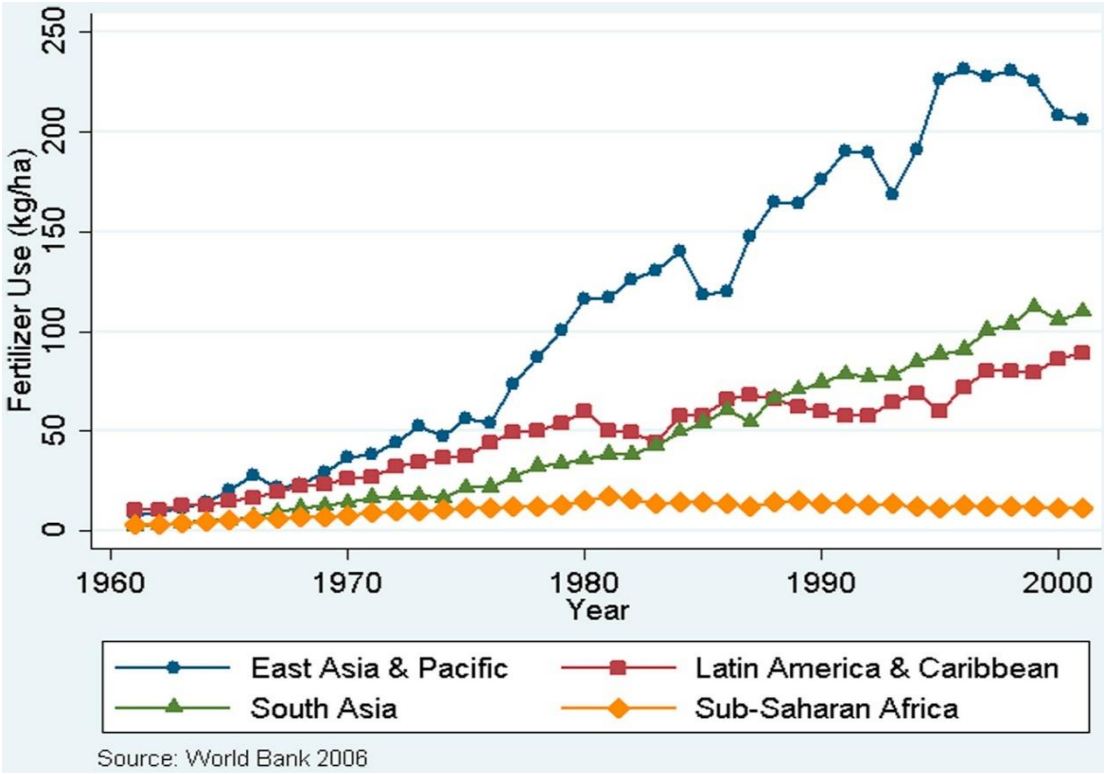


Figure 1.4 *Cereal yields across regions, 1961–2001*

Based on (McArthur, and McCord, 2017)

This demonstrates that countries with limited access to credit have lower productivity compared to countries where farms have greater access to finance. Agricultural credit access also has effects on agricultural input allocation and farm productivity. In countries where farmers have greater access to credit, crop yield is higher due to better access to improved seeds and agricultural inputs (Sheahan, & Barrett, 2017; Dillon, & Barrett, 2017; Fafchamps, 2004).



Based on (McArthur, and McCord, 2017).

Figure 1.4.1 *Effect of Credit Access on Productivity: Cereal yields across regions*

Evidence suggests that credit access enables farms households to acquire better inputs and production techniques which increase productivity. Recently, Matsumoto & Yamano, (2010) in a study on Ethiopia have shown that credit access has positive effects on-farm productivity. They find that farms with credit access have higher cereal yields compared to those without credit access because credit access enables firms to purchase better quality seeds and other farm inputs which increase productivity. Farms with credit access have a cereal yield of 704kg compared to 553 in farms without credit access. This means that credit access enhances the productivity of cereal yield by 151%. In the local wheat production access to credit increases wheat yield by 264% compared to local wheat production without credit access. These differences arise because credit access enables farmers to purchase hybrid seeds and fertilizer, see table 2, below.

A related study by (Karlan, Osei, Osei-Akoto, & Udry, 2014) in Ghana also find similar results after relaxing credit constraints and incomplete insurance which affect investment decisions and activities of small-scale farmers with high marginal returns. Similarly, Udry and Anagol (2006), in a study on returns to capital in the Ghanaian informal segment find large returns ranging between 205 and 350% in the newly

established technology farms of pineapple farming, and outputs ranging between 30 and 50% in traditional food crop farming due to differences in capital access between farms. This suggests that financial frictions constrain farms from the adoption of better technologies which widens productivity and output gaps between constrained and unconstrained farms.

Table 1.2 *Effect of Credit Access on Farm Productivity (Cereal Yields)*

Crop	All	Access to Credit		Difference
		without Credit	with Credit	(3) - (2)
	(1)	(2)	(3)	(4)
Teff	664.9	553.2	704.4	+151.2***
	(445.7)	(396.2)	(455.8)	[40.6]
HYV Maize	1,800.6	1,714.5	1,838.3	+123.8
	(1,382.7)	(1550.4)	(1318.5)	[364.1]
Local Maize	1,233.3	1,309.3	1,130.1	-179.2
	(1,060.9)	(1149.8)	(920.5)	[115.8]
HYV Wheat	1,144.5	1,080.6	1,170.1	+89.5
	(769.1)	(872.3)	(730.1)	[186.6]
Local Wheat	998.1	807.5	1,071.6	+264.0***
	(794.7)	(664.)	(828.9)	[78.8]

Note: *** denotes significance at 1% based on mean variation in the *t*-test statistics. The digits in parentheses show standard deviations, while the statistics in the brackets indicate the white noise. Source: This results were based on Matsumoto & Yamano, (2010).

1.7.1 The impact of financial Development on Wealth Distribution

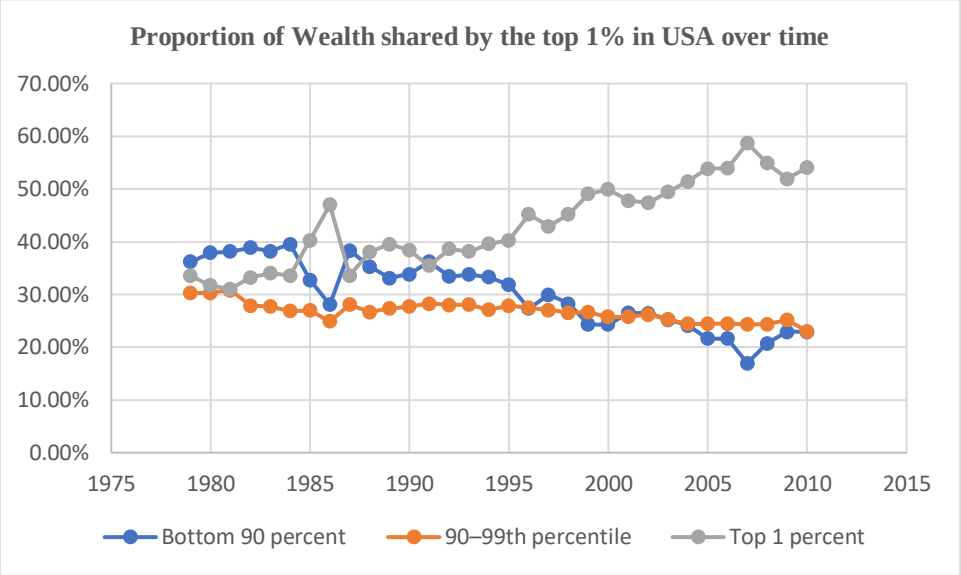


Figure 1.5 *The impact of financial Development on Income and Wealth Distribution*

Source: Adopted from economic policy institute database

1.7.2 The effect of Financial Deepening on output and Income distribution

Although several studies particularly (Honhan, 2004; Claessens & Perotti 2007; Beck, Demirgüç-Kunt, & Levine, 2007) have indicated that more financial deepening enhances growth, reduces poverty and income inequality. However, there's a growing literature indicating that excessive and rapid financial deepening may exacerbate inequality, financial instability and negatively affects economic growth (Cecchetti, & Kharroubi 2015; Sahay, Čihák, N'Diaye, & Barajas, 2015; Arcand, Berkes, and Panizza, 2015; Law and Singh 2014; Rousseau and Wachtel 2011).

Table 1.3 *Effect of Financial Development on Real GDP-per-worker growth*

Real GDP/worker income growth	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Private credit to GDP	0.036***	0.038***	0.035***	0.035***	0.035***	0.048**
	(0.011)	*(0.011)*	*(0.011)*	*(0.011)*	*(0.011)*	*(0.021)*
Credit/GDP *squared*	–0.018***	–0.018***	–0.018***	–0.017***	–0.017***	–0.022***
	(0.005)	*(0.005)*	*(0.005)*	*(0.005)*	*(0.005)*	*(0.008)*
Log of real GDP per worker	–0.742***	–1.020***	–1.110***	–1.110***	–1.160***	–6.220***
	(0.211)	*(0.210)*	*(0.208)*	*(0.207)*	*(0.204)*	*(1.200)*
Working age population growth		–0.478***	–0.480***	–0.471***	–0.501***	–0.685***
		(0.162)	*(0.160)*	*(0.163)*	*(0.152)*	*(0.162)*
Trade openness			0.010***	0.010***	0.009***	0.054***
			(0.003)	*(0.003)*	*(0.003)*	*(0.010)*
Share of Government Expenditure in GDP				0.0106	0.0107	–0.145
				(0.046)	*(0.045)*	*(0.331)*
Average CPI					0.0378	0.047
					(0.036)	*(0.037)*
Turning point for the effect of private credit to GDP on real GDP-per-worker growth	0.98	1.02	0.99	0.99	1.01	1.08
95% confidence interval	(0.97;1.00)	(1.01;1.03)	(0.98;1.01)	(0.98;1.0)	(0.99;1.02)	(1.06;1.11)
Number of observations	270	270	270	270	270	270
R-squared	0.098	0.160	0.190	0.190	0.213	0.424

Source: Based on Cecchetti and Kharroubi (2012). These results are based on a 5-year mean real GDP-per-worker growth from 1980–2009 for every country. ***/**/* indicates significance at the 1/5/10% level. The threshold effect of private credit to GDP on real GDP-per-worker growth is defined as the level at which private credit to GDP is either below or above an increase in private credit to GDP is estimated to raise (reduce) real GDP-per-worker growth.

CHAPTER TWO

2 Related Literature

2.1 Introduction

This section presents a summary of related literature on how financial frictions affect economic development and cross-country income differences. Conventionally, economists have considered finance as an important source of economic development, productivity, and income distribution. Nevertheless, the role of financial frictions and how financial development affects cross-country income and TFP gaps have been relatively understudied in the economic literature until recently. In this essay, I provide an overview of the recent developments and various sources of financial frictions and how these frictions affect TFP, aggregate output, and cross-country income distribution. I distinguish between frictions to financial access – caused by intermediation costs, frictions to financial deepening – generated by borrowing constraints, from frictions to intermediation efficiency caused by – agency costs for instance monitoring costs. I evaluate their impact on TFP, GDP growth, and cross-country income distribution.

2.2 Literature Review

Growing literature analysing the effect of financial frictions on economic growth exists. This literature argues that countries may diverge in income and output depending on the extent of resource misallocation or variations in the level of financial development between countries. The initial contributions to this literature were pioneered by studies of (Greenwood and Jovanovic, 1990; Galor and Zeira, 1993; Banerjee and Newman 1993; Aghion and Bolton, 1997; Piketty, 1997), and most recently by (Baqaee, & Farhi, 2020; Midrigan and Xu, 2014; Moll, 2014; Hsieh and Klenow, 2009; Restuccia & Rogerson, 2008; Buera and Shin, 2013; Banerjee and Duflo, 2005; Matsuyama, Gertler, & Kiyotaki, 2007; Matsuyama 2007).

Similarly, there is a growing literature showing a strong positive link between financial development proxied by the ratio of credit/GDP or capital market capitalisation, and economic development initiated by (King and Levine 1993; Beck, Levine & Loayza, 2000; Levine, Beck, & Loayza, 2000; Beck, Demirgüç-Kunt, and Levine, 2000; Levine and Zervos, 1998; Levine, 1997; Levine, 2005), and a robust link between financial development, economic progress and variations in institutions measured by the quality

of contract execution, property rights protection or creditor enforcement (Rafael La Porta et al., 1997, 1998). This essay contributes to the former strand of literature by developing an endogenous model of economic development with heterogeneous firms characterised with financial frictions and emphasises the role of frictions in the misallocation of resources and aggregate productivity losses.

Several studies on financing frictions and economic development particularly, (Midrigan and Xu, 2014; Buera and Shin, 2013; Buera, Kaboski and Shin, 2011; Hsieh and Klenow, 2009; Restuccia and Rogerson, 2008; Jeong and Townsend, 2007) have established these financial frictions account for large differences in aggregate output, TFP, and incomes between countries. For example, Buera, Kaboski and Shin (2011) using a calibrated model of entrepreneurship with frictions show that variations in the level of financial development between countries can account for almost 80 per cent of differences in TFP between USA and up to 40% of TFP differences between US and low-income countries with underdeveloped financial markets. Using USA as a yardstick to evaluate the extent of misallocation, Hsieh and Klenow (2009) also find misallocation of resources ranging between 30% and 50% of the TFP in China and between 40%-60% in India; analogous to Restuccia & Rogerson, (2008) who find comparable outcomes (30-50%) using US firm level data. Similarly, Midrigan and Xu (2014) using a calibrated model with South Korea firm level data find that financial frictions account for a comparatively small amount of TFP losses of estimated at around 2.5%. Thus, there is a disagreement in literature over how much of the differences in TFP and income per worker are accounted for by financial frictions. Likewise, (Jeong & Townsend, 2007) also find that 70 per cent of TFP growth in Thailand from the 1970s to the 1990s can be attributed to development in the financial sector. Amaral and Quintin (2005), Buera, Kaboski and Shin (2011), Moll (2014), Greenwood, Sanchez and Wang (2009) also provide similar quantitative assessments of the effect of financial frictions on TFP gaps.

Gilchrist et al. (2013), using borrowing costs from US manufacturing firms and interest rate spreads, find modest losses in TFP. Midrigan and Xu (2014), for instance analyse the effect of collateral constraint on total productivity. They find small quantitative effect on surviving firms through misallocation channel and conclude that self-financing can cover losses from collateral constraint. Restuccia & Rogerson (2008) find substantial TFP dispersion in U.S. firms ranging from 30 to 50 percent using calibrated US data. Guner, Ventura & Xu (2008) study the effect of government policies

on firm size and productivity dispersion, they find a large reduction in size of firms by 20 percent and decrease in output by 8.1 to 25.6 percent across firms due policy distortions.

Gopinath, et al, (2017), using manufacturing data from Spanish firms for the period 1999 and 2012 study how capital market frictions affect productivity dispersion across firms in Southern Europe find large differences in productivity due to capital misallocation arising from adjustment costs and decrease in real interest rates linked to the euro convergence criteria.

Despite the disagreements in the literature on the size and magnitude of distortions and differences in TFP an empirical regularity in the literature is that credit frictions account for a large portion of variations in income and output per worker across countries. Thus, improving credit access could significantly improve productivity and reduce TFP gaps and differences in income and output across countries. For instance, in low-income countries (LICs) where financial markets are underdeveloped, improving credit access could enhance entrepreneurship, economic growth, productivity, and poverty reduction (Bruhn and Love 2014; Karlan & Morduch, 2010; Honohan 2004; Black and Strahan, 2002).

To study how financing frictions affect capital allocation, aggregate productivity, and cross-country income distribution, I apply an endogenous growth model of financial intermediation characterised by borrowing constraints. In this model, financial frictions originate from multiple sources including imperfect credit markets, while misallocation follows from imperfect output markets. I show how financial frictions generate misallocation which diminishes TFP and amplifies cross country income divergence. This proposed model is based on Hsieh and Klenow, (2009), Restuccia & Rogerson, (2008), Buera and Shin, (2013), Buera and Shin (2013), Midrigan and Xu, (2014). In this model, I disentangle the different forms of financial frictions to capture and quantify their effects on capital allocation, aggregate output, and income distribution using a panel of emerging, low-income, and advanced economies.

2.3 The impact of financial frictions on Misallocation and Productivity

There is a rapidly growing empirical literature showing that financial frictions have consequences on capital misallocation, aggregate productivity, and cross-country income gaps. This literature was pioneered by (Banerjee and Duflo, 2005; Syverson 2010;

Caselli, 2005; and Restuccia, & Rogerson, 2017) who studied the sources and consequences of misallocation on aggregate productivity differences. This literature has been recently expanded by (Restuccia & Rogerson, 2008; Alfaro, Charlton & Kanczuk, 2008; Hsieh and Klenow, 2009; Midrigan and Xu, 2014; Buera, Kaboski and Shin 2011; Buera, and Shin 2013; Moll, 2014) who study the effect of financial frictions on capital misallocation, firm performance as well as income gaps between countries using firm based data.

For instance, Alfaro, Charlton and Kanczuk (2008), employing firm-level data for 79 advanced and developing countries, investigate the impact of credit frictions on capital misallocation and cross-country income differences across heterogeneous establishments. They find that misallocation accounts for up to 58% of the variations in income per worker across countries. Similarly, (Buera, Kaboski, & Shin, 2011), study the impact of credit frictions on cross country distribution. They find that nearly 80% of variations in productivity per-worker between Mexico and the USA, can be explained by misallocation of capital. For low income countries, they find that credit frictions can explain almost 40% of variations in TFP and output per capita particularly in economies with weak and underdeveloped capital markets. They further that productivity is much higher in large-scale manufacturing firms due to the distortionary effects of financial frictions. For services, they find that financial frictions lead to less than 30 per cent fall in total productivity compared to more than 50 per cent in manufacturing TFP decreases in 18 OECD countries.

Likewise, Hsieh & Klenow, (2009), study the impact of credit market frictions on capital allocation and TFP using US as a benchmark. They find significant TFP differences in output and productivity between Chinese and Indian firms relative to the US due to distortionary effects of financial frictions on capital allocation. They show that if Chinese and Indian firms shift to the US efficiency levels, it could lead to overall productivity increases by a factor of 30% to 50% for China and between 40% and 60% for India. Restuccia and Rogerson, (2008) using standardised data based on the US firms also find sizeable TFP losses ranging between 30 to 50 per cent due to distortionary effects of tax policies on capital, labor, real estate and income.

2.4 The Impact of Financial Friction on Productivity and Income Distribution.

Financial market frictions have strong effects on productivity and income distribution. In the micro literature, evidence suggests that financial frictions affect

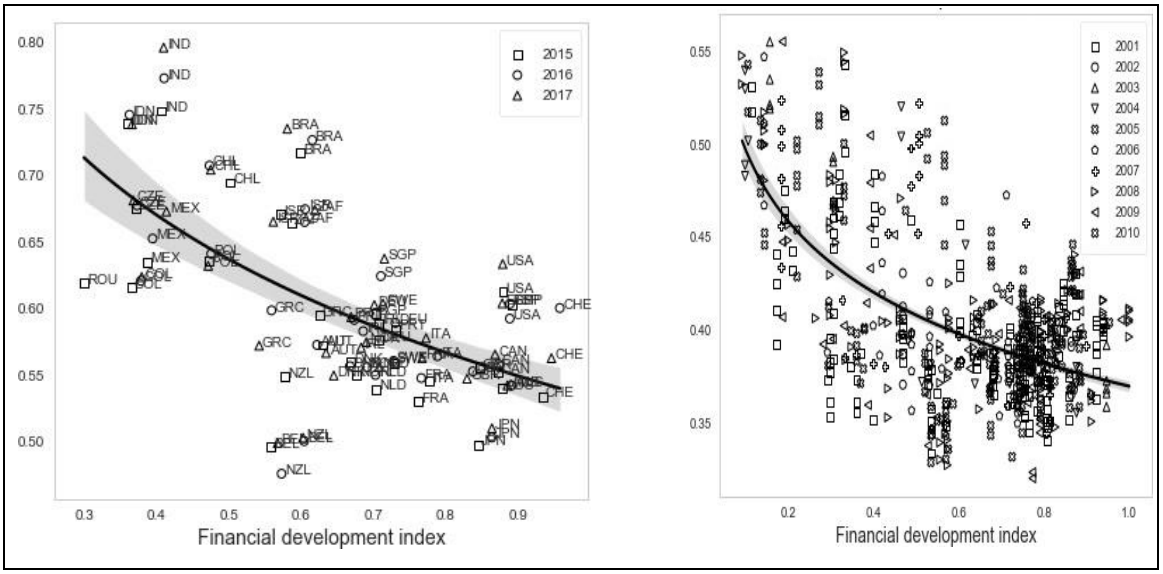
wealth distribution and output growth. This literature dates to Greenwood and Jovanovic (1990), Banerjee and Newman (1993), Galor and Zaira, (1993), Aghion and Bolton, (1997), Piketty, (1997). These studies have shown that negative output shocks following an economic or financial downturn amplify income inequality due to financial frictions. Inequality could also be amplified by borrowing constraints such as the absence of collateral which inhibit households from accessing finance for entrepreneurship and investment in human capital development.

In the macro literature pioneered by Bernanke and Gertler (1989), Kiyotaki and Moore (1997) (here-after KM) and Bernanke, Gertler, and Gilchrist (1999) evidence suggest that credit market frictions can affect wealth and income distribution through productivity shocks, reduction in household consumption, fall in household assets, credit defaults, and bankruptcy. Recently, Piketty (2014) in his book "Capital in the Twenty-First Century" has shown that capital income gains from recent financial developments have gone to the top one per cent of the income distribution than the bottom 90% of the income group. This suggests that excessive financial deepening is not beneficial to the poor and may exacerbate inequality. Thus it can be concluded that financial deepening has differential effects on income distribution but benefits the rich more than the poor.

2.5 The Impact of Financial Development on Income and Wealth Distribution

As noted in the preceding section, excessive financial development may amplify wealth inequality. To demonstrate how excessive financial development affects wealth distribution, I make a visual plot of the financial development index vs the wealth of the top 1%, 5% and 20% of the income distribution based on the USA data. As shown in the figure below, over the past three decades gains from financial development have gone to the top 1% of the income earners, especially in developed countries and very little has gone to the bottom 5%.

Wealth share of top 1% and 5% Vs Income share of top 5% and 20% of income



(a) Wealth concentration (b) Income inequality

Figure 2.1 *Effect of Financial development on Wealth and Income Inequality*

Source: Owners Computation based on GFDID and Shaker-Akhtekhane, (2020).

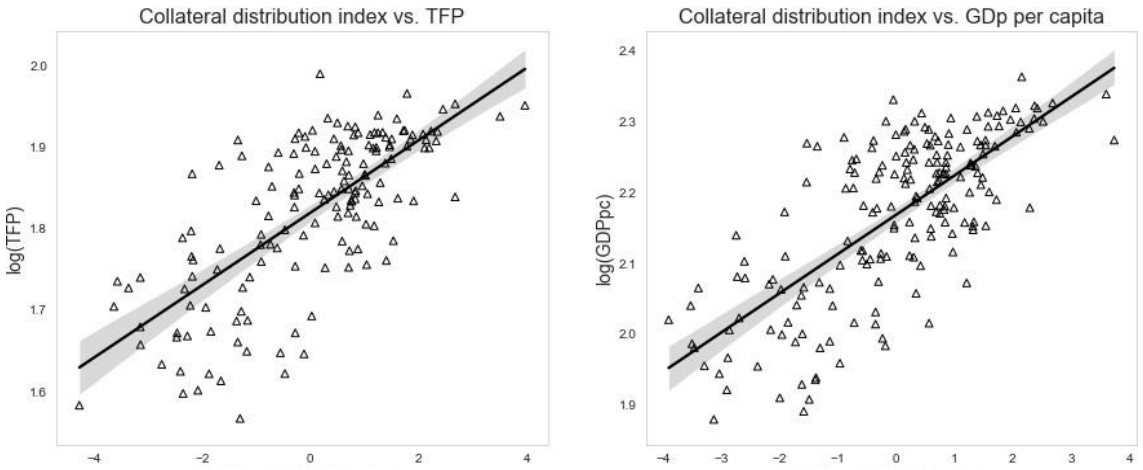
Using cross-country wealth data from the Credit Suisse Research Institute between 2015 and 2017, and the financial development index from the IMF, I explore the association between financial development and wealth concentration. The evidence suggests that the wealth share of the top 1% increases rapidly with financial development index compared to the wealth share of the top 5% which reduces by -0.56. This relationship is consistent with other wealth groups, say top 1% over top 10%, or top 5% over top 10%, all of which exhibit strong negative correlations with financial development.

Because the wealth data from the Credit Suisse Research Institute largely contains developed countries, one might want to know the same relationship, including less-developed economies. For this reason, I utilize income data as a substitute for wealth data across countries for which there are richer data sets available. For income data, I use the World Income Inequality Database (WIID) of UNU-WIDER and the SWIID (Soltz, 2016) from the year 2000 to 2017. The correlation of financial development with the income share of the top 5% over the income share of the top 10% is equally large, about -0.52. This is also consistent

when we use other income groups instead, say top 5% over top 20%. Figure 2.4 shows the association between financial development with both wealth and income concentration at the top.

2.6 Effect of Collateral Constraints on TFP and Output per Worker

As demonstrated in section one, financial development/underdevelopment influences economic development either through productivity growth or credit frictions. Under perfectly competitive conditions in financial markets, output and productivity should equalize across all firms or countries. In practice, however, firm activities and investment decisions in many developing countries are influenced by financial access. Firms facing binding credit constraints will tend to have lower investment, lower output, and productivity due to constraints like lack of collateral which prevent particularly small firms from gaining access to external finance.



Collateral constraint index Vs TFP Collateral constraint index Vs GDP

Figure 2.2 *Effect of Collateral distribution on TFP and GDP per worker*

Source: Owner's estimation based on data from World Bank GFDD and Shaker-Akhtekhane, (2020).

The link between the collateral constraint index, TFP and GDP per Worker is clear. The evidence suggests that as collateral rates increase TFP and GDP reduce due to difficulty in financial access.

CHAPTER THREE

3.0 Theoretical Literature

There is inadequate guidance in theory on the underlying mechanisms and causal links through which financial frictions affect economic development. The conventional approach in the literature has been through regression and cross-country analysis, except for a few micro and macro-level studies that identify financial frictions as a source of distortions, misallocation and cross-country income inequality, poverty, or growth. At the micro-level several studies for instance, (Greenwood and Jovanovic, 1990; Galor and Zaira, 1993; Banerjee and Newman, 1993; Aghion and Bolton, 1997; Piketty, 1997) link financial frictions to income inequality. At the aggregate level, there are several studies particularly Bernanke and Gertler (1989) and Kiyotaki and Moore (1997) that identify financial frictions as a source of output fluctuation. Similarly, there are cross-country studies that identify financial frictions as a source variation in income and output (King and Levine, 1993a,b; Levine, 1997, 2004; Rajan and Zingles, 1998; La Porta, et al., 1998; Levine and Zervos, 1998; Shleifer and Vishny, 1997; Beck and Levine, 2004; Beck et al. 2000; Levine, et al. 2000; Bencivenga and Smith, 1991).

Recently, there is a burgeoning literature linking financial frictions to inefficient resource allocation, distortion, and misallocation. These frictions have been identified as a source of distortions which prevent firms from adopting cutting-edge technologies that leads to aggregate productivity and income differences within firms and across countries. This literature indicates that frictions interfere with the efficient allocation of resources across firms may lead to productivity differences and income gaps.

There are many channels through which these financial frictions affect incentives, occupational choices, TFP, output, income, and wealth distribution within firms and across countries. This literature has been recently renewed by the studies of (Townsend and Ueda, 2006; Midragan and Xu, 2014; Hsieh and Klenow 2009; Rusticcia and Rogerson, 2008; Buera, Kaboski and Shin 2011; Moll, 2014; Buera and Shin 2013; Banerjee and Duflo, 2005; Jeong and Townsend, 2007) that show how frictions affect

capital allocation, firm productivity, and economic development. Banerjee and Duflo, (2005) provide a summary of the various sources of frictions and how they affect resource allocation and economic development.

A number of mechanisms and channels have been identified through which financial frictions distort efficient allocation of capital and TFP and output in the literature (Restuccia & Rogerson 2017; Banerjee & Moll, 2010). One of the dominant channels highlighted in the literature is limited enforcement which affect financial intermediation leading to borrowing constraint Amaral and Quintin (2010), causing differences in productivity is the misallocation of resources among heterogeneous production units or establishments that differs across countries, see for instance (Restuccia and Rogerson 2008 and Hsieh and Klenow, 2009).

3.1 Early Theoretical Literature.

The theoretical literature on financial frictions and development can be classified into two broad categories the micro and macro literature. I use this literature to explain the role of financial frictions in economic development and underdevelopment through its effect on the misallocation of capital and aggregate productivity.

The early macro literature on financial frictions was pioneered by Bernanke and Gertler (1989) and Kiyotaki and Moore (1997) and emphasise agency costs and business cycle fluctuations as the source of financial frictions. For a review of this literature (Brunnermeier, Eisenbach, & Sannikov, 2012; Quadrini, 2011) provide an excellent summary with recent advances. While Banerjee and Duflo, (2005) provide an excellent summary of the micro literature on the sources of financial frictions and misallocation.

The main distinguishing feature between the micro and macro literature in relation to economic development is the source of frictions. In micro-economic literature on economic development, frictions originate from the household and firms either due to inability to save, lack of collateral or due to household and firm specific characteristics. In contrast, frictions in the macroeconomic literature originate from aggregate shocks for example business cycle shocks, aggregate output shocks, country risk and can be exogenous or endogenous in nature. For instance, business cycle shocks that affect the balance sheet of the financial intermediaries could also affect aggerate credit supply to the borrowers. The macroeconomic frictions can also be cyclical, procyclical, countercyclical or acyclical. They can emerge endogenously or exogenously.

In the early models of real business cycle (RBC) initiated by (Kydland and Prescott, 1982) frictions originate from multiple sources including negative aggregate productivity shocks to output that may lead to fluctuations in employment, real wages, income, and assets prices. Frictions could also emerge exogenously from trade shocks, or from international financial markets due to default risk on external debt and bankruptcy as shown by Eaton and Gersovitz (1981), or endogenously from country specific risk due recurrent instability in consumption compared to output. Other sources of financial frictions in the RBC literature initiated by (Holmström and Tirole 1997; Kiyotaki and Moore, 1997; Gertler & Kiyotaki, 2010; Bernanke, 1983a, b; Bernanke, Gertler and Gilchrist, 1996, 1999; Bernanke, and Gilchrist, 1986) are the technology shocks, shocks to income and agency costs as well as balance sheet conditions that affect investment and supply of credit.

In the models of financial accelerator proposed by (Bernanke et al., 1999) frictions emerge from agency costs related to "costly state verification" problems, where outside funding are more expensive compared to internal funds as shown by (Bernanke and Gertler, 1989) which may lead to risk of default due to risk exposure. In these models, if individual owners of the over indebted firms default on their debt, the cost of capital from by firms from international markets will be high due to endogenous probability of default. Accordingly, negative production shocks may occur due to inability to achieve the required rate of return to refinance the debts.

3.2 Theoretical Models of Financial Intermediation with Frictions

The early literature on financial frictions can be traced to studies of (Stiglitz and Weiss, 1981; Leland-Pyle 1977; Townsend, 1979; Akerlof, 1970; Grossman and Stiglitz, 1980) that focused on information asymmetry, agency costs and costly state verification as the primary source of frictions. These early studies argued that due to information wedges between lenders and borrowers or buyers and sellers, its unfeasible to have an efficient market outcome, which may lead to market failure.

However, in the development and macroeconomic literature, frictions originate from many sources. Recent micro-macro founded models of development consider sources including collateral constraints, limited enforcement, borrowing costs or policy distortions as the major source of frictions. These studies argue that frictions originating from these constraints distort incentives of firms and ability of households which lead to

misallocation. The early macroeconomic and development literature was initiated (Greenwood and Jovanovic 1990; Banerjee and Newman, 1993; Galor and Zaira, 1993; Aghion and Bolton, 1997; Piketty, 1997) that demostrate how financial frictions generate poverty traps, amplify wealth and income inequality, distort incetives of household and firms leading to misallocaation of talent and occupational choices.

Building on these early studies, there is a growing strand of literature pioneered by (Banerjee and Duflo, 2005; Restuccia and Rogerson, 2008; Banerjee and Moll, 2009; Hsieh and Klenow, 2009; Buera, Kaboski, and Shin 2011; Midrigan and Xu, 2014) that emphasises financial frictions as the major source economic underdevelopment and cross-country income divergence. These studies argue that financial frictions distort capital allocation which affect firm productivity and income distribution as shown by Restuccia and Rogerson (2008) and Hsieh and Klenow, (2009).

In the model of financial intermediation with information frictions pioneered (Akerlof, 1970; Leland-Pyle 1977; Townsend, 1979; and Stiglitz and Weiss, 1981): they demonstrate that it's unfeasible to achieve an informationally efficient market outcome in a competitive market equilibrium due to imperfect information or information asymmetry. Akerlof, (1970) was among the first to demonstrate this outcome. He showed that informational failures often lead to inefficient market outcomes due to moral hazard and adverse selection problems. Holmstrom (1979), Townsend, (1979) and Stiglitz and Weiss, (1981) extended Akerlof's initial work to financial intermediation. They argue that agents may conceal some private information about the true state of a product or about their true intensions which may distort the true market value and prices of the goods and services due to moral hazard and adverse selection. Holmstrom (1979) proposes a risk sharing as a solution to this moral hazard problem while Townsend, (1979) suggests costly state verification as a solution.

In the extension of this model of imperfect information to credit markets Stiglitz and Weiss, (1981) demonstrated that due to information failure it's impossible to differentiate between borrowers (bad and good) due to the moral hazard and adverse selection problem which may create credit rationing. Credit rationing distorts efficient allocation of capital because it may crowd out good borrowers and leave bad ones.

To solve this problem of information failure and costly state verification Diamond (1984) proposed a model of financial intermediation with delegated monitoring

where financial intermediaries can minimise monitoring costs by delegating the incentives of monitoring borrowers and loan contracts to third parties for instance insurance companies.

In the macro-literature, the models of Kydland and Prescott, (1982), Bernanke and Gertler (1989) and Kiyotaki and Moore (1997) are taken as benchmarks. These benchmark models emphasise the role of production shocks, business cycles and agency costs as the key mechanisms for extension and propagation of credit frictions.

3.3 Recent Theoretical Literature on Intermediation with Frictions.

Recent advances in finance and economic development literature suggest that financial frictions are a major source of distortion, misallocation, and long-term economic divergence across countries. A regular aspect in these frameworks is that financial frictions account for significant aggregate factor productivity and income differences.

This segment presents an endogenous model of economic development with financial frictions to demonstrate how financial frictions distort resource allocation, aggregate productivity, and income difference. I present both the stable and the dynamic adaptations of this model and show how frictions distort resource allocation which affect aggregate output, productivity, and income distribution. The fixed form of this model is based on the standard frameworks of (Hopenhayn, 1992; Holtz-Eakin, Joulfaian and Rosen 1994; Banerjee and Duflo, 2005; Evans and Jovanovic, 1989) that study how financial frictions affect entrepreneurial decisions and total productivity. The dynamic variant of this model is based on (Hsieh and Klenow, 2009) and originates from the micro literature.

3.3.1 Static Micro-Model of Development with financial frictions.

In the simple static framework, the model assumes an assortment of households ranked by their productivity level (z) and wealth (a). The share of household wealth and output is represented by $g(a,z)$. The model also assumes that households are heterogeneous in their preferences with utility u, and marginal productivity $\mu(z)$. The preferences are increasing in consumption of the single good. The distribution of households at each point in time (t) follows a joint distribution represented by $\beta(a;\ \mathrm{z})$. The household preferences are represented as follows:

$$\sum_{t=0}^{\infty} \beta^t \, u(c_t, 1 - H_t) \qquad (1)$$

Where c_t is consumption. The household utility (u) increases with wealth a_t. If the household decides to engage in entrepreneurship by owning a private firm without an initial wealth or savings it must borrow. The household uses borrowed capital K_t to generate $z_t f(k_t)$ units of output. If the household chooses to get employed, each household supplies h_t units of labor at a market wage rate w_t. The total household output Y can be represented as:

$$Y_t = Z_t w_t F(K_t, h_t). \qquad (2)$$

Where h_t is the time worked in hours.

In the absence of household wealth α_t, the household borrows capital k_t at a market rate r_t. The household rental cost of capital is $R_t = r_t + \delta$. The δ represents the depreciation rate of capital. The evolution of household wealth can be represented as follows:

$$\alpha_t + 1 = z_t f(w_t) - (r_t + \delta)k_t) + (1 + r_t)\alpha_t - c_t \qquad (3)$$

Which can be expressed as;

$$\alpha_t = (z_t w_t + r_t \alpha_t - c_t) \qquad (4)$$

Where, α_t represents household wealth, r_t the endogenous interest rate, k_t the rental capital households borrow from the rental market at a rental rate $R_t = r_t + \delta$.

The borrowing constraint for the households facing credit stress can be stated as: $k_t \leq \tau(z, r_t)\alpha_t$, where τ, is the borrowing constraint. The marginal productivity/utility and savings function of the household can be expressed as follows:

$$\varphi_t = (a, z) = max_k\{f(k, z) - (r + \delta)k + (1 + r_t)\alpha_t \quad s.t \quad k_t \tau(z, r_t)\alpha_t\} \qquad (5)$$

Where, φ_t is the marginal productivity of the household. Capital misallocation at time t occurs when the marginal productivity of capital $f_k(k_t(a, z), z)$ is not equalized across all households or firms with capital control levels $k_t(a, z) > 0$.

In the studies of (Restuccia & Rogerson, 2008; Hsieh & Klenow 2009; Joeng & Townsend 2007; Buera, Kaboski & Shin 2011) a distinction is made between frictions that affect marginal productivity of capital k from frictions that affect the

productivity of talent z. Joeng and Townsend (2007) using Thai data from 1976 and 1996 show that 73 per cent of the TFP growth in Thailand is accounted for by occupational changes and financial deepening. While, (Hsieh & Klenow, 2009) assert that the variations in output between American, Chinese, and Indian firms is due to misallocation of entrepreneurial talent which distort occupational choices.

3.3.2 Dynamic model of Development with financial frictions

This part extends the simple static version of the model of entrepreneurship with frictions (borrowing constraint) represented as a joint distribution $g(a, z)$ into a dynamic form by endogenizing the distribution of entrepreneurial wealth and productivity a and z determined through a dynamic progression of z and an optimally elected time path for endowment a based on the work of (Bernanke, Gertler & Gilchrist, 1999). This dynamic model is extended to firms and the macro economy. The main structure of this model is the link between the cost of borrowing and the wealth of potential borrowers.

3.3.3 Extension of the Dynamic Model with Frictions to Firms

In the static version above, we assumed a single agent, the firm or household. In the dynamic version, we will assume that there are multiple agents, borrowers and lenders who supply funds. The higher the net worth of the borrowers, the lower the borrowing constraints and distortions and the higher the financing that can be raised externally. This model assumes a representative firm or household i, operating in a competitive market with monopolistic competition producing varieties of goods using a Cobb-Douglas technology with constant elasticity of substitution (CES), reminiscent to (Dixit & Stiglitz 1977). The goods are aggregated into a single unit of output y. The model further assumes that there is unrestricted entry and departure of firms in the market as in the model of (Hopenhayn,1992) and the reallocation of output between firms as shown by Meltiz, (2003) following the departure and entrance of more firms in the market. Firm $i's$ value-added is represented by an output function $z_t f(k_i, l_i)$ where k_i and l_i are the capital-labor inputs of firm i, while z_i is firm-dependent productivity term, and f is strongly concave. The fixed cost of operating the firm is given by $\mathcal{Y}$ and specified in quantities of output. The economy has an unlimited endowment of K and H units of capital and labor. The firm rents capital K_t and L_t, which it uses to produce output given by;

$$Y_t = F(K_t, L_t) = K^{\alpha} L^{1-\alpha} \quad (6)$$

with a Cobb-Douglas CES technology. During the production process, K_t declines constantly at rate δ and generates a growth shock z_t with volatility $\boldsymbol{\delta}$. Thus, the cumulative capital in the economy evolves as:

$$\frac{dK_t}{K_t} = (\iota_t — \ \delta)\ dt + \sigma dZ_t \quad (7)$$

Given that the input markets are competitive, the firm's return on investment in labour is w_t, which is similar to the marginal productivity of labor (MPL) given by:

$$w_t = \frac{\partial F(K_{si}, L_{si})}{\partial L_{si}} = \frac{\alpha_s}{1-\alpha_s}(1-\alpha)\ (\frac{Y_t}{L_t}) \quad (8)$$

Firms and individuals without sufficient capital may decide to borrow externally or sell their labour. When they choose to borrow, they face borrowing costs rc_t. Such that the firm's rental rate of return on capital is, rc_t, which is equivalent to the marginal productivity of capital (MPK):

$$rc_t = \frac{\partial F(K_t, L_t)}{\partial K_t} = \alpha\ (\frac{Y_t}{K_t}) \quad (9)$$

The instantaneous rate of return on capital is given by;

$$dr^k{}_t = (rc_t — \ \delta)dt + \sigma dZ_t, \quad (10)$$

specified as the rental return of capital $\mathrm{rc_t}$, less the borrowed capital $\mathrm{K_t}$, returned after depreciation and the productivity shock. The profit or capital gains is then defined by $\mathrm{rc_t} — \ \delta$, which corresponds to the rental return of capital less depreciation.

To introduce frictions and distortions in the model we assume that firms in their choice of inputs face (a) technological frictions in the form of adjustment costs, (b) informational frictions, and (c) a generic class idiosyncratic distortions such as borrowing constraints, intermediation costs, participation costs, collateral constraints, interest rate spreads, policy distortions, as in Hsieh and Klenow (2009) and Restuccia and Rogerson (2008), both correlated and uncorrelated with firm characteristics.

Rusticcia and Rogerson (2008) distinguish between distortions or frictions (τ) that affect capital k as τk, from distortions that affect labor and may also affect total output τY. For example, distortions that increase the MPK relative to MPL e.g., access to cheap credit from state-owned banks can distort capital allocation τK, leading to differences in productivity across firms. Or tax incentives where firms that

receive tax incentives inform of tax exemptions may have higher productivity compared to firms that pay taxes.

3.3.4 Extension of the Model to the Macroeconomy

Variations in aggregate output and TFP across firms are a key determinant of cross-country disparities in income and variations in the level of economic development and living standards. In the endogenous growth models, differences in TFP are driven by: (a) Innovation and technological change and differences in the rate of adoption and diffusion of technology (see, Romer,1990 and Aghion, & Howitt,1990), and (b) productivity - differences in the efficiency of resource utilization across production units (Syverson, 2011; Caselli, 2005; Hsieh and Klenow 2009; Rusticcia and Rogerson, 2008; Prescott, 1998; Klenow and Rodríguez-Clare, 1997).

This essay is concerned with the latter: resource allocation/misallocation originating from financial frictions as the key source of TFP and aggregate variations in income and productivity between countries. I concentrate on three potential sources of frictions and channels of misallocation (borrowing constraints e.g collateral, intermediation costs, and participation costs) and show how they distort the incentives of firms and the ability of households to adopt best technological practices or prevent resources from being allocated efficiently across firms.

This extension to macroeconomy follows from (Hsieh and Klenow, 2009) and assumes a representative economy where firms produce output Y in a perfectly competitive product marketplace with M_s varieties of differentiated products which is aggregated into a single unit of output Y_s, for all firms in the industry S, following a Cobb-Douglas production technology with constant elasticity of supply (CES). This can be represented as:

$$Y = \sum_{s=1}^{S} Y_s = 1 \tag{11}$$

The total industry output is given by:

$$Y_s = \left(\sum_{i=1}^{M_s} Y_{si}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{1-\sigma}} \tag{12}$$

The industry price of output Y_s faced by firms in the market is equal to P_s, and the total industry revenue is equal to $P_s Y_s$. The TFP of capital and labour is expressed as:

$$Y_{si} = A_{si} K_{si}^{\alpha s}, L_{si}^{1-\alpha s} \quad (13)$$

Because firms face similar input prices and technology, under competitive market conditions, the marginal productivities of K and L should equalize across all firms in the equilibrium. However, due to frictions or distortions that affect incentives of firms to adopt better technologies and distortions that affect firm factor prices, the MPK and MPL across firms may differ such that firms that face distortions have higher returns.

Rusticcia and Rogerson (2008) distinguish between distortions or frictions that affect capital τk, from distortions that affect labor and may also affect total output τY. For example, distortions that increase the marginal product of capital relative to labor e.g., access to cheap credit from state-owned banks can distort capital allocation τK, leading to differences in productivities across firms. In this study I focus on frictions that distort capital allocation and lead to productivity differences. The industry profit function with distorted capital allocation can be expressed as follows:

$$\pi_{si} = (1 - \tau Y_{si}) P_{si} Y_{si} - w L_{si} - (1 + \tau K_{si}) R K_{si} \quad (14)$$

The marginal revenue products of capital and labour with frictions can be expressed as;

$$MRPL_{si} = (1 - \alpha s) \frac{\sigma - 1}{1} \frac{P_{si} Y_{si}}{L_{si}} w \frac{1 + \tau K_{si}}{1 - \tau Y_{si}} \quad (15)$$

$$MRPK_{si} = \alpha s \frac{\sigma - 1}{1} \frac{P_{si} Y_{si}}{K_{si}} r \frac{1}{1 - \tau Y_{si}} \quad (16)$$

CHARPTER FOUR

4. METHODS AND DATA

Although the economic literature does not offer a standard model for measuring the income, output, and aggregate productivity losses from financial frictions. Various methods that have been proposed to capture and quantify the productivity effects and income losses from financial frictions (Bils, Klenow, and Ruane, 2021; Dixit and Stiglitz, 1977; Meltz, 2003; Hopenhayn, 1992). While some studies argue that output, productivity, and income losses from financial frictions are better measured by the degree of competition and product variety (Dixit and Stiglitz, 1977; Meltz, 2003; Dhingra and Morrow, 2019), others argue that it's better measured by the degree of freedom of entry and exit (Hopenhayn, 1992), still others suggest that it's better captured by frictions to human and physical capital that lead to misallocation of entrepreneurial talent (Hsieh and Klenow, 2009) as the likely cause of inefficiency and productivity differences. Moreover, others are of the view that variations in productivity and income across firms or individuals are better measured by the difference in the "managerial talent" as a potential source of inefficiency across countries (Bloom, Sadun and Van Reenen, 2017; Caselli and Gennaioli, 2003; Lucas, 1978; Hopenhayn and Rogerson, 1993) or entry costs (Barseghyan, & DiCecio, 2011). As can be observed there is no unified method for quantifying or capturing frictions and distortions as a source of inefficiency. What explains this divergence in outcomes?

4.1 The Approaches

There are several measures of misallocation adopted in the literature. A broadly used technique in the measurement of misallocation adopted in various studies is the degree of firm entry and exit based on (Hopenhyn, 1992) dynamic model. According to this model, inefficient firms could be forced to exit the industry leaving only efficient firms to operate. However, this exit may be driven by misallocation, for instance when productive firms receive tax subsidies or access to cheap credit which may lead differences productivity due to distortions in capital allocation across firms (Restuccia & Rogerson, 2017; Restuccia & Rogerson, 2008).

Another measure of distortion and misallocation is the degree of firm selection, market reallocations and restructuring based on (Olley, & Pakes, 1996 and Levinsohn and

Petrin, 2003) and intra-industry resource reallocations based on Melitz (2003) dynamic industry model. The Olley & Pakes, (1996) measure evaluates the effect of regulatory barriers as a distortion on restructuring in the telecommunications sector in the USA. They find that deregulation of the telecommunications sector led to restructuring, entry and exit of firms in the US telecommunication industry. This restructuring led to significant increases in productivity in the telecommunications sector in the US after deregulation due to the entry of new firms resulting in reallocations of market shares.

In Melitz's (2003) dynamic model of international trade with heterogeneous firms based on intra-industry reallocations, frictions originate from participation in trade. His model suggests that trade frictions encourage only the efficient firms to export while driving the inefficient firms to leave the market. Other notable measures of misallocation in the literature are related to technical inefficiency based on (Coelli, Rao, O'Donnell, & Battese, 2005). To study how financing frictions affect aggregate output and income variations between countries, we follow the benchmark model of (Hsieh & Klenow 2009) to quantify productivity and output losses from distortion and misallocation of resources.

4.2 The Empirical Approach

A variety of methods have been proposed to study how financial market development or underdevelopment affects growth, income distribution and productivity. Initial studies employed cross-country regressions using panel data (King and Levine, 1993; King and Levine, 1993; Levine, Loayza, & Beck, 2000; Levine and Zervos 1998; Beck, Levine, and Loayza, 2000). While other studies use time series-based OLS and cross-sectional methods. These studies rely on the credit-to-GDP ratio or M2 (broad money supply) to GDP ratios as the standard proxies to approximate the effects of financial market deepening on development outcomes across countries. However, these measures may be misleading as they abstract from economic reality because they are partial measures and do not consider the significant cross-country heterogeneities and variation in financial development, this could lead to deceptive outcomes. For instance, there are large differences in the ratio of private credit-to-GDP across countries ranging from less than 14% in Uganda to more than 203.57% in the USA.

Likewise, while financial market development is a good measure of economic development, most analyses of this relationship assume that it follows a linear trend. However, recent studies have demonstrated that the link between financial deepening and

growth is non-linear. For instance, (Deidda, & Fattouh, 2002; Easterly, Islam, & Stiglitz, 2000) have systematically demonstrated the presence of a non-linear link between financial market depth and output volatility. Their estimations indicate that output volatility increases when the ratio of the private sector credit approaches 100% of GDP. More recently, several studies particularly (Reinhart, & Rogoff, 2009; Arcand, Berkes and Panizza, 2015; Cecchetti and Kharroubi 2012; Law and Singh 2014) have shown that beyond certain levels of debt/GDP ratio, the linear finance-growth nexus breaks.

While most studies examining the productivity, output, and income consequences of financial frictions for instance (Hsieh and Klenow, 2009; Townsend and Ueda, 2006; Buera and Shin, 2013; Jeong and Townsend, 2007) use either firm-level or cross-sectional data, Midrigan and Xu (2014) apply panel data. Instead, this essay uses a distinct method to analyse the effect of credit market frictions on aggregate output, TFP, and income distribution by considering variables that consider all aspects of the financial structure. For example, the recently developed "index of financial development" (Svirydzenka, 2016) and changes in income distribution across time-based on "the Standardized World Income Inequality Database" SWIID developed by (Soltz, 2016) and UNWIDER-WIID.

The financial development index – is a broad index of financial market development that describes how improved financial systems and markets are in the dimensions of financial depth, financial access, and efficiency (Svirydzenka, 2016). The index is based on the conceptual approach of (Čihák 2012; Beck, Demirgüç-Kunt & Levine, 2000; Beck, Demirgüç-Kunt, & Levine, 1999) and combines data sets from various facets of the financial structure to create a broad index of financial development. The Svirydzenka index uses an updated dataset from the global financial development GFDD database established by (Beck, Demirgüç-Kunt & Levine, 2000; Beck, Demirgüç-Kunt, & Levine, 1999) and recently updated by (Čihák et al., 2012)—with supplementary data from the Bank of International Settlements (BIS) and IMF FAS.

4.3 The Data

To analyse how financial frictions affect aggregate output, income distribution and productivity, I rely on data from multiple sources. The data on the income changes are sourced from the UNWIDER-WIID database and the SWIID database (Soltz, 2016). This data is used to evaluate how financial development affects income changes. I use the Gini coefficient and changes in the proportion of the income of the bottom and highest

income quintiles. Change in Gini is computed as the yearly growth rate for every nation's Gini coefficient, for the period between 1980-2017. Changes in the bottom income ratio equal to the yearly growth rate of the proportion of the bottom income quintile, calculated over the period 1980-2017. The proportion of the bottom income quintile is computed as the income of each country's bottom quintile divided by total GDP. Changes in the bottom income share are then taken as the variance between the logarithmic share of the bottom income quintile for the poorest segment and the logarithm of the share of the bottom income quintile for the initial observation divided by the log difference of the total number of years of the two populations.

The data on real GDP is sourced, from the Penn World Table (PWT), (Feenstra, Inklaar, and Timmer, 2015) the World Bank development indicators. The data describes real GDP across countries over time and measures the productive capacity and standard of living across countries. The data constitute prices of final goods (e.g., government spending, consumption, investment) gathered across countries by the International Comparisons Project (ICP).

The financial development data is sourced, from the "Global Financial Development Database" (GFDD). The GFDD is a broad dataset that contain data on financial system characteristics for 214 countries since 1960 (Beck, Demirgüç-Kunt, and Ross Levine, 1999; Beck, Demirgüç-Kunt, and Levine, 2000; Beck, Demirgüç-Kunt, and Levine, 2009; Čihák, Demirgüç-Kunt, Feyen, and Levine, 2012). The database is based on a "4x2 financial structure" and captures (i) access, (ii) financial depth, and (iii) stability, (iv) efficiency of the financial systems. The data contains 109 indicators, capturing various characteristics of financial intermediaries and markets between countries over time.

The data on credit market frictions (collateral, intermediation cost, participation cost, and interest rate spreads) and firm performance is taken from the World Bank's Enterprise Surveys. This data describes the characteristics of the financial system and firm financial access, for instance, the proportion of firms with access to credit, ratio of collateral-to-loan, and the interest rate spread, gross savings to GDP, and the firm employment distributions.

4.3.1 Variables

Most studies examining the economic impact of financial market development or underdevelopment on development, aggregate output and income distribution, apply standard quantitative indicators like the private credit to GDP ratio, M2 (broad money), stock market capitalization, which are highly imperfect indicators of financial market development, and do not adequately capture the intricate and multidimensional features of the financial structure especially in ameliorating informational and financial frictions, transactions costs and in enabling the mobilization and efficient allocation of capital (Svirydzenka, 2016).

Measuring financial development has been further compounded by missing data. For instance, while data on some variables such as credit to GDP ratio is available since the 1960s, financial access data only started to be collected in 2004. Consequently, missing data could imply either missing market, inefficiency, or inaccessibility of financial services. An alternative way has been to splice the data into two indices before and after the data becomes available or use proxy indicators which may be misleading.

To overcome these limitations, we rely on a new comprehensive index of financial development based on (Svirydzenka, 2016; Sahay, et al., 2015; Čihák, et al., (2012) that takes into account all measures of financial development including: access, use and efficiency. The index captures (i) the financial depth, (ii) financial access, (iii) financial intermediation efficiency and (iv) financial stability. Other control variables include Real GDP growth rate, credit/GDP ratio, and trade openness, as well as the number of years of schooling, trade, population, remittances, institutional quality, etc.

The Gini indicator is applied to evaluate effect of changes in the income share of the lowest bottom quintile and the income share of the upper-income quintile. The use of changes in the income changes of the poorest quintile enables us to examine how financial market development affects the lowest income quintile across each country. Using income changes in the poorest quintile offers supplementary information to study the effect of financial development on income distribution because the Gini coefficient is an estimate of the whole income distribution, while changes in the lowest income quintile estimate changes in the lowest quintile.

The Poverty Headcount is the percentage change in growth rate the population living below USD 1.9 per day. These data are derived from household surveys from a sample of 78 developing and emerging economies for the period 1980 to 2018. The data are obtained from (Chen and Ravallion, 2001) and World Bank PovcalNet (http://econ.worldbank.org/povcalnet).

4.4 Results

In this part, I present the outcomes of the impact of credit market frictions on output growth and income differences between countries. First, I present results on the effects of financial development on output growth and income distribution and the threshold effects of financial development on growth and output volatility. Next, I provide the conclusions and discussion of the findings.

The econometric estimates of the threshold effects of financial development denoted by the ratio of private credit to GDP on output-per capita growth indicate that beyond the 90% threshold level of the ratio of credit-GDP, per worker productivity significantly falls and turns to negative thereafter. This finding is validated by several studies including (Reinhart & Rogoff, 2009; Arcand, Berkes & Panizza, 2015; Law & Singh, 2014; Cecchetti & Kharroubi, 2012; Deidda & Fattouh 2002) who find that beyond the 90% thresholds further financial deepening negatively impacts output growth and productivity. For instance, (Reinhart & Rogoff, 2009) using data from 60 advanced countries find this turning point at 90% of debt/GDP ratio. While (Arcand, Berkes & Panizza, 2015) find this turning point at 100 % of the credit/GDP. The findings of this analysis are presented in table 2.1 below.

4.4.1 The impact of financial Development on Output Per-worker Growth

Table 2.1 *Private credit to GDP and Output-per-worker growth*

Productivity growth	(1)	(2)	(3)	(4)	(5)	(6)
Credit/GDP (5year average)	0.0369***	0.0373***	0.0336***	0.0334***	0.0325***	0.0477**
	(0.0117)	*(0.0116)*	*(0.0118)*	*(0.0118)*	*(0.0121)*	*(0.0208)*
Private credit to GDP *squared*	–0.0196***	–0.0193***	–0.0185***	–0.0184***	–0.0178***	–0.0229***
	(0.00520)	*(0.00522)*	*(0.00521)*	*(0.00519)*	*(0.00543)*	*(0.00836)*
Log output per worker	–0.732***	–0.979***	–1.046***	–1.049***	–1.086***	–6.279***
	(0.195)	*(0.197)*	*(0.195)*	*(0.195)*	*(0.191)*	*(1.174)*
Working population growth (5yr)		–0.461***	–0.463***	–0.455***	–0.483***	–0.675***
		(0.164)	*(0.163)*	*(0.166)*	*(0.155)*	*(0.164)*
Trade openness			0.0105***	0.0105***	0.00979***	0.0545***
			(0.00295)	*(0.00297)*	*(0.00296)*	*(0.0108)*
Government Expenditure to GDP				0.00962	0.00977	–0.114
				(0.0453)	*(0.0445)*	*(0.329)*
Five-year average CPI inflation					0.0364	0.0456
					(0.0368)	*(0.0368)*
Threshold effect of private credit to GDP on real GDP-per-worker growth	0.94	0.96	0.91	0.91	0.92	1.04
95% confidence interval	(0.93;0.95)	(0.95;0.98)	(0.90;0.92)	(0.90;0.92)	(0.90;0.93)	(1.02;1.07)
Observations	269	269	269	269	269	269
R-squared	0.103	0.161	0.194	0.194	0.215	0.426

This model uses five-year mean of real GDP-per-worker growth for the period 1980–2018 based on (Cecchetti and Kharroubi, p.5 2012) as the dependent variable for each country, which produces six observations per country. ***/**/* indicates significance at the 1,5, and10% level. The threshold level of the effect of private credit/GDP on real GDP-per-worker growth indicates the level of private credit/GDP below (above) which an increase in private credit to GDP is estimated to increase (reduce) real GDP-per-worker growth.

When the proportion of credit-to-GDP reaches 94% output falls by 0.732, as the share exceeds 100% the output growth falls by -6.28% as shown in table 2.1. Thus, it can be concluded that the financial sector is useful to economic growth up to a particular level above or below which it has negative impacts on the economy.

4.4.2 The impact of financial development on output-per-worker productivity

Table 2.2 *Real Output per-worker growth and financial sector share in employment*

Real per-worker output	(1)	(2)	(3)	(4)	(5)	(6)
Financial intermediations share in total employment	3.345***	3.335***	3.354***	3.347***	3.341***	5.574**
	(0.690)	*(0.677)*	*(0.675)*	*(0.706)*	*(0.705)*	*(2.602)*
Financial intermediations share in total employment *squared*	–43.35***	–43.31***	–43.48***	–43.37***	–43.30***	–103.6***
	(9.025)	*(9.004)*	*(8.980)*	*(9.516)*	*(9.493)*	*(35.82)*
Log real GDP per worker	–3.346***	–3.334***	–3.409***	–3.417***	–3.407***	–6.087***
	(0.665)	*(0.672)*	*(0.708)*	*(0.708)*	*(0.707)*	*(1.537)*
Population growth		0.0243	0.00762	0.00799	0.0129	–0.111
		(0.189)	*(0.174)*	*(0.174)*	*(0.181)*	*(0.237)*
Trade openness			0.00195	0.00194	0.00193	0.0171
			(0.00431)	*(0.00442)*	*(0.00439)*	*(0.0173)*
Five-year average government consumption share in GDP				0.00260	0.00249	–0.360
				(0.0581)	*(0.0586)*	*(0.269)*
Five-year average CPI					–0.00256	0.0181
Inflation					*(0.0236)*	*(0.0250)*
Threshold effect of share of financial intermediation in total employment on real GDP- per-worker growth	3.86	3.85	3.86	3.86	3.86	2.69
95% confidence interval	1.20;6.51	1.28;6.42	1.29;6.42	1.22;6.50	1.22;6.50	–6.34;11.7
Observations	95	95	95	95	95	95
R-squared	0.331	0.331	0.333	0.333	0.333	0.536

Source: Adapted from Cecchetti and Kharroubi (2012). ***/**/* indicates 1, 5, and 10% significance level. The dependent variable is the 5-year mean real output-per-worker growth for 1980–2009 for every country. The threshold effect of the financial sector's share in total employment on real GDP-per-worker growth is indicated by the level of the financial sector's share in total employment below (above) which an increase in the financial sector's share in total employment is estimated to raise (reduce) real GDP-per-worker growth.

Financial sector development has consequences on employment and real output per worker. As the ratio of the financial sector in overall employment expands, the effect on real GDP- per-worker growth reduces. This suggests that the financial sector crowds out resources from other productive sectors of the economy which affects real output per worker growth as shown in table 2.2 above.

4.4.3 The effect of financial Sector development and GDP-per-worker growth.

Table 2.3 *The effect of financial sector development on GDP-per-worker growth*

5-year real GDP-per-worker growth	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
5-year average financial intermediation employment growth	**–0.471*** ***(0.083)***	**–0.327*** ***(0.074)***	**–0.325*** ***(0.073)***	**–0.328*** ***(0.073)***	**–0.331*** ***(0.074)***
5-year working population growth	**–0.356*** ***(0.204)***	**–0.275** ***(0.186)***	**–0.286** ***(0.183)***	**–0.270** ***(0.188)***	**–0.259** ***(0.191)***
Five-year average openness to trade	**0.007** ***(0.0148)***	**0.022** ***(0.0138)***	**0.023** ***(0.0143)***	**0.022** ***(0.0142)***	**0.022** ***(0.0138)***
5-year average government consumption share in GDP	**–0.762*** ***(0.212)***	**–0.636*** ***(0.219)***	**–0.626*** ***(0.220)***	**–0.637*** ***(0.220)***	**–0.635*** ***(0.219)***
Five-year average CPI inflation	**0.021** ***(0.018)***	**0.011** ***(0.018)***	**0.011** ***(0.018)***	**0.011** ***(0.018)***	**0.011** ***(0.018)***
Log GDP per worker	**–0.083*** ***(0.014)***	**–0.073*** ***(0.012)***	**–0.072*** ***(0.012)***	**–0.074*** ***(0.012)***	**–0.076*** ***(0.012)***
Financial intermediation share in total employment	**–1.732*** ***(0.529)***				
Private credit to GDP		**–0.001** ***(0.005)***			
Private credit/GDP			**–0.002** ***(0.006)***		
Financial system assets/GDP					**0.002** ***(0.005)***
No. of observations	104	110	110	110	110
R-squared	0.616	0.583	0.584	0.583	0.583

Source: Cecchetti and Kharroubi (2012). ***/**/* indicates a 1, 5, and 10% significance level. The dependent variable is the 5-year average real GDP-per-worker growth for 1980–2009 for each nation. The financial intermediation share in total employment is the share of the financial intermediation sector in total employment above. Private credit/GDP is the ratio of private credit/GDP offered by the banks during the period. Financial system assets to GDP are measured as the ratio of financial system assets to GDP for the base year of the period over which the averages are calculated.

In general, the finding that emerges is that big and fast-growing financial sectors can be very costly for the rest of the economy. They crowd in vital resources in a way that is harmful to growth at the aggregate level.

4.4.4 The threshold impact of financial market development on Output Growth

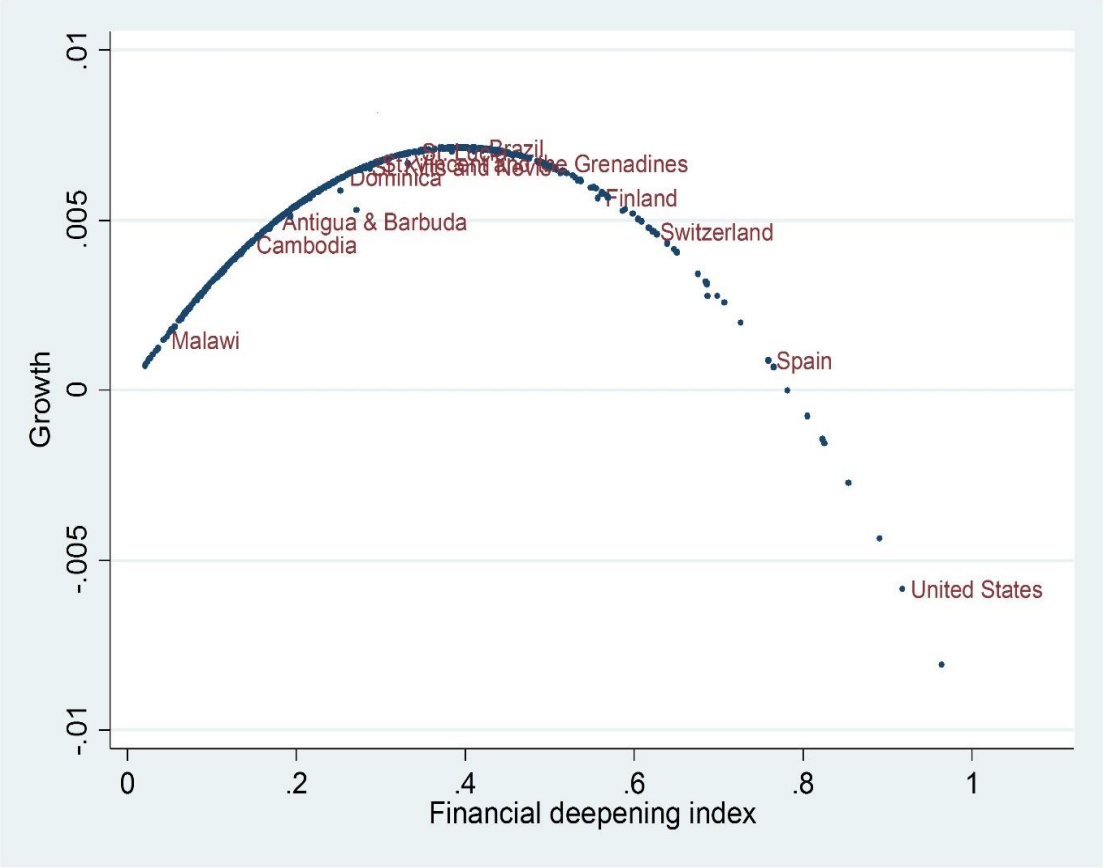


Figure 3.1 *Threshold effects of financial development on Output Growth*

Figure 3.1 above is related to table 2.1 and shows how financial development affects economic progress. This figure indicates that at low stages of financial depth, financial development has beneficial impacts on growth. However, beyond specific thresholds of financial depth, indicated by the share of credit/GDP, finance negatively starts to affect growth above certain turning points as shown in Figure 3.1 and table 2.1 above (see, Cecchetti and Kharroubi, 2012; Sahay, et al, 2015a). A few recent surveys for instance (Sahay, et al, 2015a) have demonstrated that beyond certain thresholds of credit/GDP, the finance growth relations become unstable. As shown in figure 3.1 above, when the financial deepening index exceeds 0.8 financial development starts generating a negative growth rate what (Shaxson, 2018 and Christensen, Shaxson, & Wigan, 2016) refer to as the curse of finance.

4.4.5 Threshold effects of Financial Development on Economic Growth

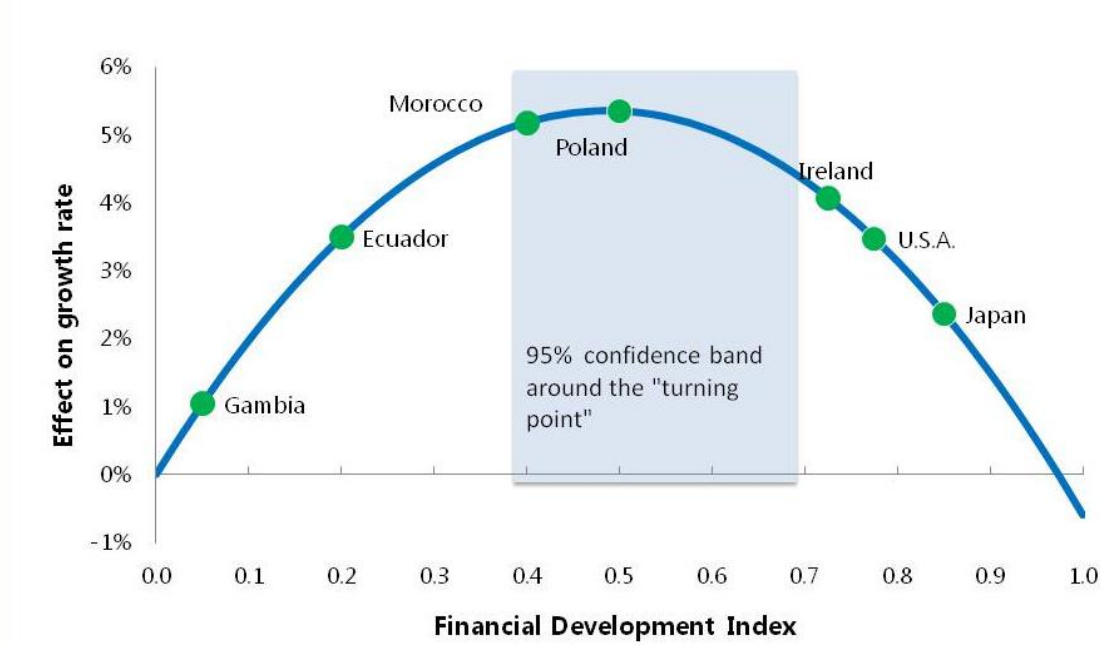


Figure 3.2 *The threshold impact of Financial Development on Growth Rate*

Source: Authors calculation based on Financial market development Index, and (Sahay, et al, 2015a). Note: The estimates are based on data from more than 170 countries since 1980

In figure 3.2, I showed how financial deepening negatively affects growth. I indicated that financial development proxied by the financial development index affects the growth rate beyond certain thresholds. Based on figure 3.2, evidence suggests that when the financial development index which represents the proportion of credit/GDP exceed 50% of GDP, it generates negative growth rates. This suggests that there is an optimal threshold of financial development above which the rate of economic growth starts to decline as shown in the 3.2 above. For instance, in economies with high rates of financial depth like Japan, the USA, and Ireland, finance generates negative growth rates. It could be because financial development crowds out resources of other productive segments of the economy. However, in poor countries with underdeveloped financial markets, finance development positively affects growth. This suggests that the link between financial development and economic growth is non-linear in nature as shown by (Deidda, & Fattouh, 2002) and most recently, (Sahay, Čihák, and N'Diaye, 2015) and (Reinhart & Rogoff, 2009; Law, & Singh 2014; Arcand, Berkes & Panizza, 2015; Cecchetti, & Kharroubi, 2012).

4.4.6 The impact of financial Deepening on Output Instability

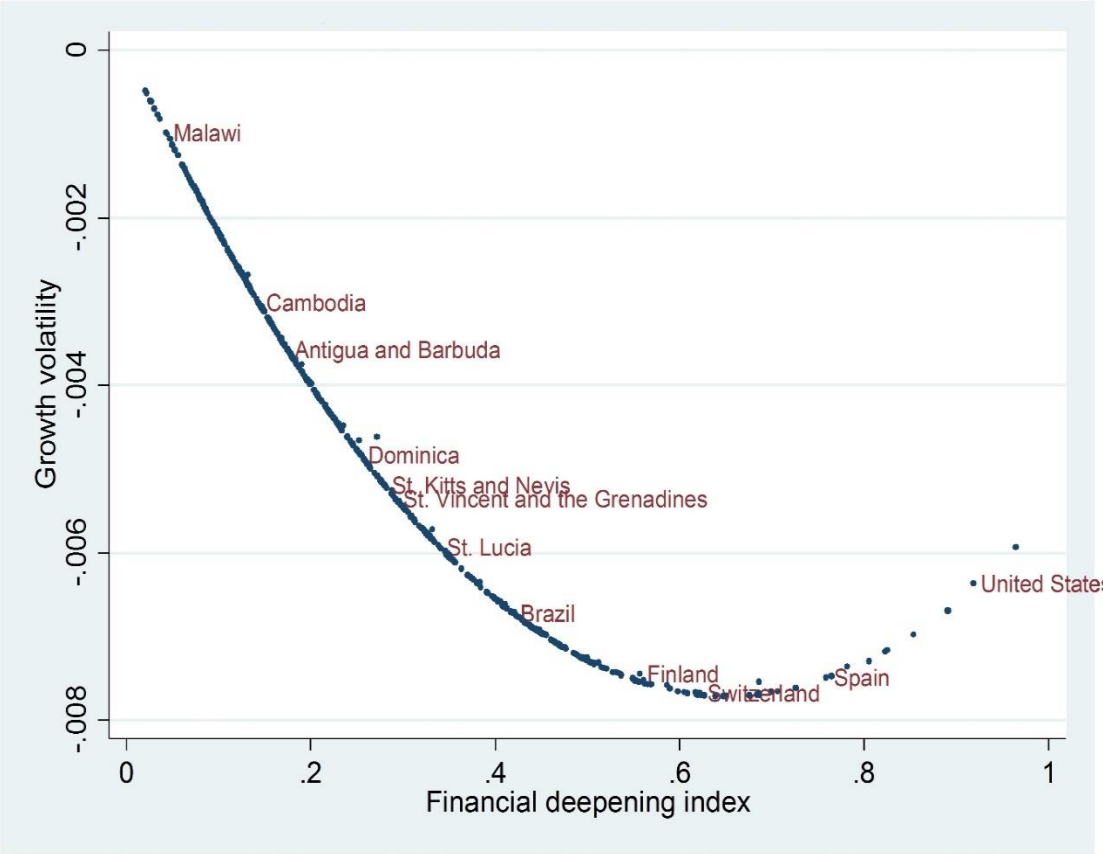


Figure 3.3 *The impact of financial Deepening on Output Volatility*

Source: Own computation from the financial deepening index database based on the IMF and (Sahay and others, 2015a). The curvature indicates the expected impact of financial deepening on output instability, holding constant factors. The output volatility is measured by the variance of GDP growth rates using a 5 year moving average.

As shown in figure 3.3, the finance growth relations become unstable at higher levels of financial depth. Several studies including (Sahay and others (2015a; Easterly, Islam, & Stiglitz, 2000) have shown that beyond 100% level of financial depth represented by the credit to private sector as a percentage of GDP, the finance growth relations become volatile.

4.5 Sources of Frictions

Table 2.4 *Summary of statistics*

	LIC (Low-Income Countries)			Emerging Market Countries		
	Uganda	Kenya	Mozambique	Malaysia	Philippines	Egypt
Ratio of savings as a % of GDP	8	15.4	7.1	39	25.7	24.5
The Collateral to loan ratio	173	120.8	92	64.6	238.4	85.5
% of firms with access to credit	17.2	25.4	14.2	60.4	33.2	17.4
Proportion of non-perform. loans (%)	2.3	10.6	3.1	8.5	4.5	19.3
The interest rate spreads	10.9	8.5	8.2	3.3	4.3	6.1
The Share of top 5% emp.	53.8	54.1	41.3	29.5	52.7	58.4
The share of top 10% emp.	64.2	66.9	55.8	46.3	65.7	72.7
The share of top 20% emp.	74.6	81	71.9	63.5	79	85.9
The share of top 40% emp.	86.4	93.2	87.2	84.1	90.8	95

4.6 The effects of frictions on TFP, output, and Income.

To standardise the effect of various credit frictions on TFP, output and income inequality, I use the following parameters: ratio of credit access, ratio of collateral to loan and interest rate spread to determine how reducing the participation cost (ψ), relaxing the borrowing constraint λ, and relaxing the intermediation cost χ affect credit access and financial inclusion.

4.7 Summary Statistics of the effect of financial frictions

Table 2.5 *A Calibrated Model of Frictions for Selected Economies*

The target moments	Uganda			Kenya			Mozambique		
	Data	Model	Parameter	Data	Model	Parameter	Data	Model	Parameter
Collateral to loan ratio	173	173	$\lambda = 1.58$	120.8	120.8	$\lambda = 1.83$	92	92	$\lambda = 2.09$
Firms with credit (%)	17.2	17.9	$\psi = 0.07$	25.4	22.93	$\psi = 0.08$	14.2	14.3	$\psi = 0.21$
% of non-perform. loan	2.3	3.7	$p = 0.15$	10.6	10.9	$p = 0.18$	3.1	3.7	$p = 0.14$
Interest rate spread	10.9	9.5	$\chi = 0.80$	8.5	9.2	$\chi = 0.20$	8.2	7.4	$\chi = 0.7$
Overhead costs/assets	6.9	6.6	$\eta = 0.37$	6.6	6.5	$\eta = 0.37$	7.4	7.3	$\eta = 0.54$
The target moments	**Data**	**Malaysia Model**	**Parameter**	**Data**	**The Philippines Model**	**Parameter**	**Data**	**Egypt Model**	**Parameter**
Collateral (% of loan)	64.6	64.6	$\lambda = 2.56$	238.4	238.4	$\lambda = 1.42$	85.5	85.5	$\lambda = 2.17$
Firms with credit (%)	60.4	62.2	$\psi = 0.08$	33.2	31.6	$\psi = 0.07$	17.4	14.6	$\psi = 0.08$
Non-perform. loan (%)	8.5	7.6	$p = 0.15$	4.5	3.4	$p = 0.11$	19.3	16.6	$p = 0.25$
Interest rate spread	3.3	5.0	$\chi = 0.05$	4.3	8.3	$\chi = 0.10$	6.1	8.8	$\chi = 0.01$
Overhead costs/assets	1.5	1.5	$\eta = 0.37$	3.2	3.1	$\eta = 0.29$	1.5	1.4	$\eta = 0.44$

Source: Owners computation based on data from Dabla-Norris, et al (2015), and the IMF

4.7.1 Effect of Financial Frictions on GDP, TFP, and Inequality

Table 2.6 *The impact of financial exclusion on GDP, TFP and income Inequality*

	Participation cost ψ			Borrowing constraint λ			Intermediation cost χ		
	GDP(%)	TFP(%)	Gini	GDP(%)	TFP(%)	Gini	GDP(%)	TFP(%)	Gini
Uganda	5.77	5.67	-0.0210	17.94	10.41	-0.0034	0.74	0.42	0.0018
Kenya	5.16	6.50	-0.0314	12.28	9.30	-0.0203	1.93	0.74	0.0082
Mozambique	12.72	10.16	-0.0267	10.30	4.83	0.0217	0.88	0.32	0.0033
Malaysia	8.44	10.94	-0.0696	4.52	2.85	0.0059	1.26	0.00	0.0013
The Philippines	2.56	3.40	-0.0165	20.21	16.45	-0.0336	1.48	0.58	0.0033
Egypt	7.04	11.31	-0.0590	7.78	6.61	0.0026	0.69	0.02	0.0033

Note: Effect of movement to the global frontier of financial sector development in one of the three parameters on GDP, TFP and GINI. Source: Owners computation based on Dabla-Norris, Townsend, Unsal and Ji ,(2015)

4.8 The effect of Financial Deepening on GDP, TFP and Income Inequality.

Table 2.7 *Effect of Financial Deepening on GDP Per worker, TFP and Inequality*

	The participation cost ψ			The borrowing constraint λ			The intermediation cost χ		
	GDP(%)	TFP(%)	Gini	GDP(%)	TFP(%)	Gini	GDP(%)	TFP(%)	Gini
Uganda	5.79	5.76	−0.0210	18.05	11.01	−0.0029	0.69	0.33	0.0014
Kenya	5.76	7.99	−0.0324	13.02	9.39	−0.0155	1.17	0.36	0.0065
Mozambique	12.73	11.53	−0.0292	10.40	4.97	0.0206	0.62	0.25	0.0023
Malaysia	8.74	10.69	−0.0713	4.51	2.97	0.0060	0.86	0.23	0.0007
Philippines	2.69	3.52	−0.0170	21.17	16.38	−0.0337	0.92	0.38	0.0023
Egypt	6.81	11.80	−0.0630	7.90	6.66	0.0031	0.42	0.19	0.0021

Note: Effect of increase in credit to GDP ratio by 1% on output, TFP, and inequality, when intermediation costs (x) are decreased to zero.

4.8.1 The effect of Reduction in Distortions

4.8.2 The Effect of reduction in frictions on TFP, Output Per worker (Belgium).

Table 2.8 *Effect of Movement to the Frontier (adoption of best financial practices)*

Change in real world output per worker	65%
Decrease in gap btn actual and potential world output	35.6%
Growth in world TFP	17.4%
Reduction in output gap across countries	27.2% (111.4% - 84.2%)
Reduction in distortions	20.8% (23.4% - 2.6%)
Reduction in average dispersion of (cap-wghtd) distortion	13.5% (14.6% - 1.1%)

Source: Based on Greenwood, Sanchez, and Wang, (2010).

4.9 The effect of Financial deepening on GDP, TFP, and Inequality

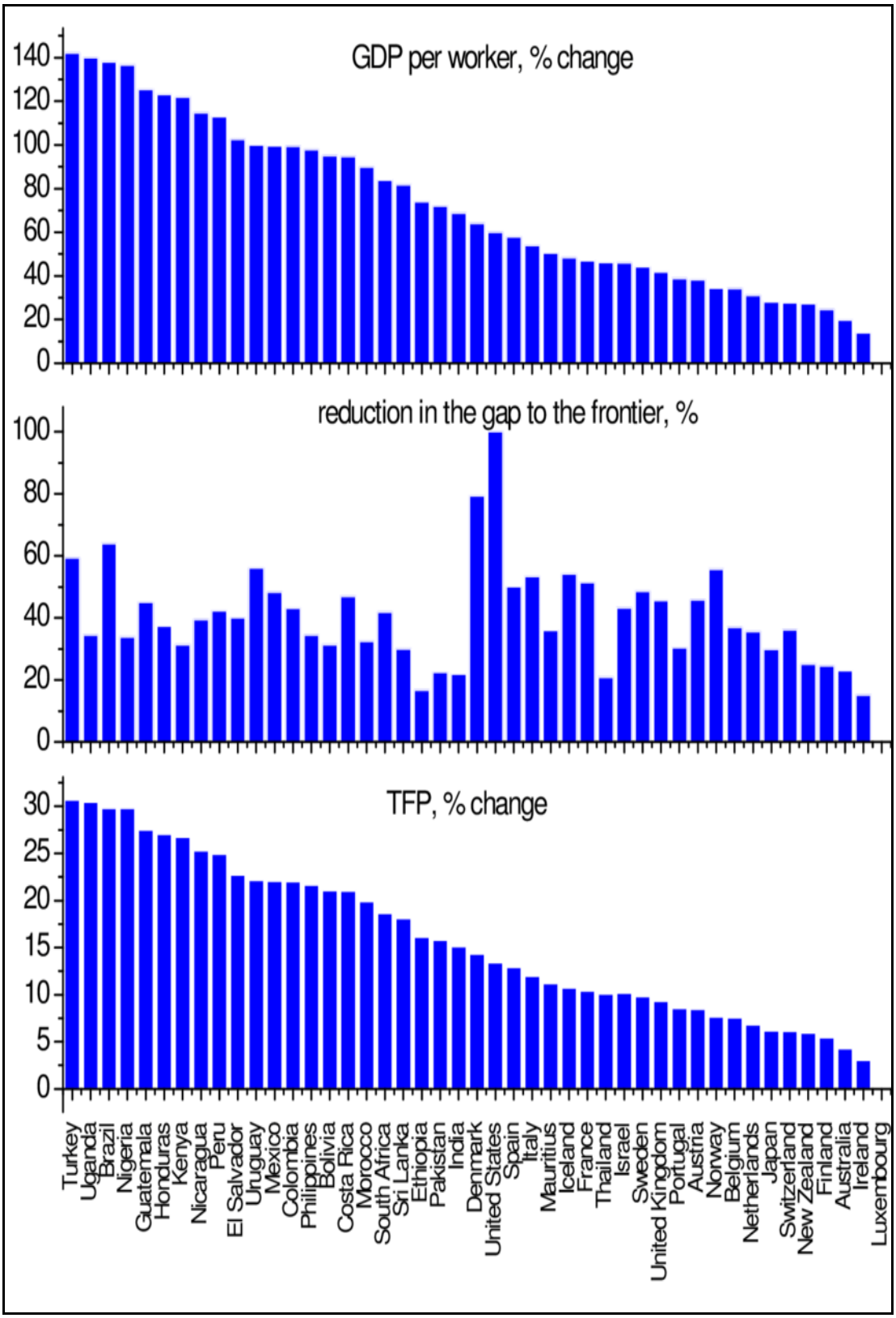


Figure 3.4 *Effect of Movement to the frontier on GDP Per Worker and TFP Change*

Source: See (Greenwood, Sanchez, & Wang, 2013)

Effect of adoption of best financial practices and move to frontier of financial sector on TFP and GDP.

CHARPTER 5

5.1 Discussion and Conclusion

This essay has analysed the consequences of credit market frictions on aggregate output, productivity, and the persistence of cross-country income differences. The econometric analysis indicates that financial frictions have important implications for aggregate output, productivity, and cross-country income distribution. Financial frictions generate large aggregate productivity and output losses that amplify the persistence of income divergence a cross-countries.

The key mechanisms of propagation that amplify these outcomes are borrowing constraints such as the absence of collateral, limited enforcement and commitment that bind firms and potential entrepreneurs from access to financial services for enterprise creation; intermediation costs such as high-interest rate charges and asymmetric information that lead to high monitoring costs that exclude potential firms and entrepreneurs from borrowing and participation costs such as high fixed transaction costs, account fees and charges, documentation requirements and limited savings opportunities. These mechanisms are powerful channels of amplification that constrain firms from credit accessibility due to financial frictions thus, reducing aggregate output, productivity, and increasing income inequality and productivity differences among individuals and firms across countries.

Particularly, I have demonstrated how borrowing constraints, participation, and intermediation costs generate powerful amplification mechanisms that distort credit and talent allocation diminishing aggregate output, productivity growth, and widening income inequality. These amplification mechanisms depend on key features such as the absence of collateral, limited commitment and contractual enforcement, and high monitoring costs and interest rates charges that lead to financial exclusion of potential entrepreneurs and individuals from the market.

The essay has also offered a micro-founded model of development that links financial market incompleteness to aggregate output, productivity, and cross-country income distribution. The model proposed in this essay offers a coherent framework that describes how financial frictions constrain credit accessibility across heterogeneous agents distinguished by wealth endowments and talent. The model is characterised by an economy with a dual scheme a savings and credit regime. The savers' transfer wealth by

depositing their money into a financial institution without borrowing. While saving is costless, agents must incur a cost to borrow. The borrowing costs include annual account fees, fixed transactions costs, and documentation costs which are key determinants of financial access and a barrier to credit access faced by firms and individuals in many developing and emerging market countries.

In this model, households decide whether to become entrepreneurs or wage earners by supplying labour depending on the amount of savings, wealth endowment, or access to credit. Only talented individuals and firms with sufficient savings or wealth-endowments can become industrialists. The untalented individuals or gifted but wealth-strapped individuals are incapable of establishing a profitable enterprise due to credit constraints and instead resort to labour supply turning into wage earners. Therefore, career choices define whether a person can save or bear risks, with long-term consequences on aggregate productivity, economic development, and income allocation.

Participation in the credit regime allows the individuals or firms to access credit but are constrained by asymmetric information, collateral constraints, and limited commitment which emerge from the incomplete contract enforceability. Entrepreneurs must deposit collateral to borrow. The value of collateral determines the size and the amount of credit accessible. The asymmetry of information between banks and borrowers generates financial friction which leads to high-interest rate charges on borrowers to cover the monitoring costs of highly risky individuals and firms to avoid defaults. These intermediation costs are another source of inefficiency and financial exclusion, which distort the efficient distribution of capital and business talent within the economy and decreases TFP and output.

The model offered in this essay has significant policy implications regarding economic development and in explaining the persistence of inequality across countries. It suggests that the prevalence of financial frictions in developing countries are a source of distortion and credit misallocation which prevent the best use of economic resources that keep developing country economies below the attainable productivity frontier.

When financial frictions are considered three key outcomes emerge. First, the frictions distort efficient allocation of capital and talent which prevent the entrance of more efficient firms and individuals thus, reducing total productivity and output of individual producers through multiple channels. First, finance frictions inhibit the

adoption of better technology which reduce the productivity of individuals and firms. Second, financial frictions create misallocation between existing producers by causing inefficient capital allocation.

These findings have important implications for policymakers concerned about accelerating economic growth and reducing rising inequality. One policy avenue to accelerate growth and reduce inequality involves financial reforms to design effective debt contracts that eliminate excessive losses due to financial frictions (e.g., collateral constraints, intermediation costs and high credit participation and monitoring costs). Deepening local financial markets by providing long-term finance and adequate guarantees against risks, which has the potential to increase domestic capital mobilisation cheaply and credit allocation efficiently. Deep local financial markets should help strengthen and accelerate financial access and investment. Deep and efficient local capital markets are fundamental to faster output growth and economic development. Deep local financial markets facilitate access to long-term finance, safeguarding economies from capital-flow instability and thus, reducing overreliance on foreign debt. Moreover, deep, and efficient local financial markets can enable developing country governments and the private sector to mobilise financial resources needed for investment in infrastructure, to create jobs, which spur economic growth.

5.2 Conclusion

This essay sought to motivate the discussion on how credit frictions affect aggregate output, productivity, and income gaps between countries. The essay identifies the key sources of credit frictions and shows how these frictions affect economic development and cross-country income gaps. I argue that credit market frictions are a strong source of economic underdevelopment and a driver of persistent cross-country income variations. I locate the key sources of financial frictions and document the causal channels and underlying mechanisms through which these frictions distort the efficient capital allocation which amplifies aggregate productivity losses and perpetuates persistent cross-country income and output gaps. Three main sources of frictions are identified Intermediation cost, participation cost and borrowing constraint.

Evidence based on quantitative analysis of variations in total output, productivity, and income distribution between countries due to financial frictions strongly suggest that financial market frictions are a major cause of economic underdevelopment and a key source of cross-country income variation. This contradicts the majority of the previous studies that have predominantly focussed on the role of proximate, fundamental, and deeply rooted historical factors, as the key source of cross-country income and wealth divergence with limited attention on the impact of financial frictions.

Financial frictions distort the efficient allocation of resources which generate substantial aggregate productivity, income, and output losses. Financial frictions impose strong borrowing constraints which inhibit productive firms and entrepreneurs from raising capital to undertake investment. Financial frictions drive wedges between savings and investment, cash and debt, inputs and outputs which affect firm performance. These frictions impose substantial economic costs on the economy in form of output and productivity losses, low investment and earnings which translate into lower per capita GDP and underdevelopment.

While the results indicate that financial frictions lead to credit misallocation and aggregate productivity and output losses, however, the aggregate economic cost of financial frictions vary considerably between countries subject to the degree of financial development. Given these outcomes, it can be concluded that without significant improvements in the financial sector to eliminate barriers to credit access the gaps between advanced and low-income countries could continue to widen. Thus, policymakers should consider improving the financial sector to overcome financial frictions. This essay proposes three key policy reforms to improve the financial sector development in developing countries. The proposals include deepening local financial and capital markets, engineering financial sector reforms to remove frictions through fintech and digital financial services, and design of efficient contracts to reduce waste from financial frictions such as transaction costs, participation costs, information costs and enforcement costs that intensify financial misallocation. These proposals will transform and improve financial markets to facilitate financial access, financial market efficiency, and economic development. Future research on financial frictions and development will certainly benefit from careful attention to the power of financial

frictions in credit and talent misallocation and their consequences on aggregate output, productivity, and cross-country income distribution.

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APPENDIX:

Table 11 *Firm Financial Constraints Across Regions*

	% of firms with a bank loan/line of credit	Value of collateral needed for a loan (% of the loan amount)	Percent of firms not needing a loan	Percent of firms whose recent loan application was rejected	Percent of firms using banks to finance investments	Proportion of investment financed by banks (%)	Percent of firms using banks to finance working capital	Proportion of working capital financed by banks (%)	Percent of firms identifying access to finance as a major constraint
All Countries	31.3	200.8	48.4	10.6	25.1	13.7	28.1	10.7	24
East Asia & Pacific	28.7	235.5	49.5	7.6	21.9	11.1	26	10.7	12.6
Europe & Central Asia	38.6	170.7	58.8	8.7	26.8	14.3	30.9	10.3	15.6
Latin America & Caribbean	51.3	201.7	44.3	3.3	41.2	26.9	41	16.5	17.5
Middle East & North Africa	25.4	200.5	52.1	12.2	25.7	13.5	27.2	12.2	27.5
South Asia	27	236	44.7	14.4	21.8	14.4	25	12.4	26.5
Sub-Saharan Africa	19.9	213.7	38	15.4	18.8	8.9	21.8	8	38.2

Source: World Bank Enterprise surveys