Tomas Bata University in Zlín
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Doctoral Thesis

Forfeited Benefits or Mitigated Losses? The Economic Impact of Not Having a Stock Market: A Synthetic Control Approach

Propadlé výhody nebo zmírněné ztráty? Ekonomický dopad neexistence akciového trhu: Syntetický kontrolní přístup

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“In the long run, it is probable that the values of his contribution to contemporary thought will lie much less in what he found out than in the method he used and his way of applying it.”

– *“Dr. Kinsey.”* New York Times, 27 Aug. 1956

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ABSTRACT

Despite the flourishment of financial markets globally as a financial reform strategy over the last century, roughly one-sixth of countries worldwide are still without any formal stock exchange. Numerous studies have identified positive associations between well-functioning stock markets and economic growth. However, some researchers remain justly skeptical about their contribution, particularly in developing countries. In addition to this contention, so far, no substantive effort has been made to measure the impact of stock market unavailability on an economy.

This dissertation aims to address this knowledge gap by examining the economic impact of stock markets' absence in countries lacking such exchanges. Using the synthetic control method (SCM), it estimates hypothetical economic performances of selected non-exchange countries had they established stock exchanges in 1994. The method constructs credible counterfactual scenarios, known as synthetic controls, as a weighted combination of comparable countries with existing stock exchanges. These synthetic controls effectively mimic the non-exchange countries' pre-treatment economic trajectories and show their potential evolution had stock markets have been present. The analysis employs economic output, investment, and employment as key outcome variables, and covariates such as inflation, financial institution development, level of democracy, and population growth alongside pre-treatment outcome data, are used as predictors. While six countries without a stock exchange are the focus of the study, seven other countries that established their first stock exchanges around 1994 comprise the donor pool for constructing synthetic controls.

The analysis findings reveal that the impact of stock markets' absence in the non-exchange countries is heterogeneous across macroeconomic indicators and economies. While most countries forfeited substantial output gains without markets, they neither benefited nor incurred a cost in terms of aggregate investment. Exceptionally, Ethiopia appears to have benefited from not having a stock market, both in terms of output and investment gains. The employment impact, on the other hand, was found to be significantly positive for non-exchange countries like the Democratic Republic of Congo and Guinea. The significance of these results is tested using placebo tests. Robustness checks using alternative weight assignments largely confirmed the directions of the impacts estimated by the baseline analysis.

The dissertation contributes to the broader literature on the impact of stock markets by introducing an uncharted approach of SCM, to the topic. It also makes the case for using SCM for estimating the impact of an absence of interventions. Furthermore, the study also has practical implications for policymakers, as it presents evidence that can inform their decision-making process regarding stock exchange establishment in their respective economies.

ABSTRAKT

Navzdory celosvětovému rozkvětu finančních trhů jako strategie finanční reformy v minulém století je zhruba šestina zemí na světě stále bez oficiální burzy cenných papírů. Četné studie zjistily pozitivní souvislosti mezi dobře fungujícími akciovými trhy a hospodářským růstem. Někteří výzkumníci však zůstávají k jejich přínosu, zejména v rozvojových zemích, oprávněně skeptičtí. Kromě tohoto tvrzení dosud nebyla vyvinuta žádná podstatná snaha o měření dopadu nedostupnosti akciového trhu na ekonomiku.

Cílem této disertační práce je odstranit tuto mezeru ve znalostech zkoumáním ekonomického dopadu neexistence akciových trhů v zemích, kde tyto burzy neexistují. Pomocí syntetické kontrolní metody (SCM) odhaduje hypotetickou ekonomickou výkonnost vybraných zemí, které burzy nezavedly, pokud by v roce 1994 burzy zavedly. Metoda konstruuje věrohodné kontrafaktuální scénáře, tzv. syntetické kontroly, jako váženou kombinaci srovnatelných zemí s existujícími burzami cenných papírů. Tyto syntetické kontroly účinně napodobují ekonomické trajektorie ne-burzovních zemí před jejich zavedením a ukazují jejich potenciální vývoj, pokud by burzy existovaly. Analýza využívá jako klíčové výsledné proměnné ekonomický výstup, investice a zaměstnanost a jako prediktory jsou vedle údajů o výsledcích před ošetřením použity kovariáty, jako je inflace, rozvoj finančních institucí, úroveň demokracie a růst populace. Zatímco studie se zaměřuje na šest zemí bez burz cenných papírů, sedm dalších zemí, které založily své první burzy cenných papírů kolem roku 1994, tvoří dárcovský soubor pro konstrukci syntetických kontrol.

Výsledky analýzy ukazují, že dopad neexistence akciových trhů v zemích bez burzy cenných papírů je různorodý napříč makroekonomickými ukazateli a ekonomikami. Zatímco většina zemí přišla bez trhů o značné zisky z produkce, z hlediska celkových investic jim to nepřineslo ani prospěch, ani náklady. Výjimečně se zdá, že Etiopie měla z neexistence akciového trhu prospěch, a to jak z hlediska růstu produkce, tak investic. Na druhé straně dopad na zaměstnanost se ukázal jako výrazně pozitivní v zemích bez burzy, jako je Demokratická republika Kongo a Guinea. Významnost těchto výsledků je testována pomocí placebo testů. Kontroly robustnosti s použitím alternativních přiřazení vah do značné míry potvrdily směr dopadů odhadovaných základní analýzou.

Disertační práce přispívá k širší literatuře o vlivu akciových trhů tím, že zavádí dosud neznámý přístup SCM k tomuto tématu. Rovněž zdůvodňuje použití SCM pro odhad dopadu absence intervencí. Kromě toho má studie také praktické důsledky pro tvůrce politik, neboť předkládá důkazy, které mohou být podkladem pro jejich rozhodovací proces týkající se zřízení burz v příslušných ekonomikách.

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LIST OF ACRONYMS

ATT	Average treatment effect on treated
ARMC	Capital Market Regulatory Authority
BCC	Central Bank of the Congo
BCM	Central Bank of Madagascar
BRB	Bank of the Republic of Burundi
CBL	Central Bank of Liberia
CMPIT	Capital Markets Project Implementation Team
DD	Difference-in-Difference
EAC	East African Community
ECMA	Ethiopian Capital Market Authority
ESX	Ethiopian Securities Exchange
IMF	International Monetary Fund
GCF	Gross capital formation
GDP	Gross domestic product
GMM	Generalized method of moments
OECD	Organisation for Economic Co-operation and Development
OLG	Overlapping generations models
OTC	Over-the-counter
PFI	Pre-treatment fit index
PWT	Penn World Table
NBE	National Bank of Ethiopia

MEF	Ministry of Economy and Finance
MENA	Middle East and North Africa
MSPE	Mean squared prediction error
R&D	Research and development
RMSPE	Root mean squared prediction error
SCM	Synthetic control method
SCUL	Synthetic control using lasso
SEC	Securities Exchange Commission
TFP	Total factor productivity
USSR	Union of Soviet Socialist Republics
VAR	Vector autoregressive
V-dem	Varieties of Democracy
WACMIC	West Africa Capital Market Integration Council
WAMZ	West African Monetary Zone’s
WAMI	West African Monetary Institute
WDI	World Bank development indicator
WFE	World federation of exchanges

1. INTRODUCTION

1.1 Background

Over the past few decades, the relationship between finance and the many aspects of economic growth has gained considerable attention among researchers and policymakers. Notably, significant efforts have been made to understand and explain the impact of financial development on key macroeconomic variables including labor markets, international trade, income, savings, investment, consumption, and its sectoral effects at different degrees. Taken as a whole, the fundamental insight that has emerged from the findings of this body of literature is that, while the magnitude of the effects varies across countries depending on various factors, financial development broadly plays an essential role in supporting economic growth. A thorough review of these theoretical and empirical studies on the subject has been provided by Levine (2005), Ang (2008), and more recently by Carré and L'œillet (2018) in the post-global financial crisis period.

The focus of many earlier studies on the finance-growth nexus had been on analyzing the contribution of the banking sector. This emphasis is expected given that the financial systems historically were predominately bank-based, and data on banking sector development, such as growth in banks' assets and credits, has been more readily available than stock market data. However, as non-bank financing expanded globally in the 1980s and 1990s (Weber et al., 2009), academic research eventually widened in scope to include examining the impact of stock markets on economic growth. This research has been facilitated by the increasing availability of cross-country datasets on stock markets' development through sources like the International Monetary Fund's (IMF's) International Financial Statistics, the World Bank's Emerging Stock Markets Factbook, and other compiled datasets.

In contrast to the dominant viewpoint on the positive links between banks and economic growth, the literature examining the influence of stock markets has yielded more mixed conclusions. While numerous studies suggest efficient, well-functioning stock markets can positively influence economic growth, as found by Beck and Levine (2004), Cooray (2010), Bui and Doan (2021), and others, some researchers remain skeptical about the magnitude and significance of this relationship (e.g. Bhide, 1993, Singh, 1997, Singh, 2008). This theoretical skepticism has gained some evidence in empirical studies like Nyasha and Odhiambo (2015) Pan and Mishra (2018) and Bae et al. (2021).

Stock markets can be defined as platforms where economic agents engage in buying and selling transactions and the issuance of stocks or shares, which are the ownership claims of publicly traded companies. These transactions may occur either through stock exchanges, centralized physical or electronic platforms

governed by a defined set of trading and information dissemination rules and regulations, or over-the-counter (OTC), decentralized dealers' networks where brokers and dealers transact directly with no physical location. For a company's shares to be traded on a stock exchange, the company must undergo a listing process that involves meeting specific prerequisites and adhering to prescribed guidelines. In contrast, OTC markets allow the trading of shares of unlisted companies. Furthermore, OTC markets are facilitated by market makers, who are dealers responsible for setting security prices through bids and offers. Unlike the quote-driven price-setting process of OTC markets, exchanges operate similarly to competitive markets for goods and services, where securities prices are established based on market demand and supply dynamics driven by buyers and sellers. Because of the aforementioned features and the absence of a regulatory body in OTC trading, the market tends to be less transparent than an exchange where participants possess complete information about the financial instruments being traded.

Financial development in both developed and developing countries in the last century has been characterized by a remarkable surge in the expansion of stock markets. The financial liberalization efforts undertaken in many emerging economies across Asia, Latin America, sub-Saharan Africa, and Eastern Europe in the last few decades have been featured by a strong drive towards setting up stock exchanges. Currently, numerous active stock exchanges worldwide facilitate the trading of securities. Notably, the World Federation of Exchanges (WFE) monitors around 90 major exchanges across developed and emerging markets in its reports. Despite this remarkable global proliferation, some developing countries still lack formal exchanges. Drawing on the analysis of the available sources, as of 2022, around one-sixth of the internationally recognized sovereign states do not have a stock exchange (see Fig. 1.1). Of these countries without an exchange, around half have a population exceeding one million people, and over a third are located in sub-Saharan Africa. Ethiopia, with a population of over 105 million, and the Democratic Republic of Congo with a population of almost 85 million, stand as the biggest countries in the world without a stock exchange. While growth can be attributed to various factors, considering the prevalent findings of a majority of studies indicating a positive association between efficient stock markets and economic growth, it is hardly surprising that the economic performance of these countries significantly trails in terms of key macroeconomic indicators like GDP and investment, compared to countries with well-established stock exchanges.

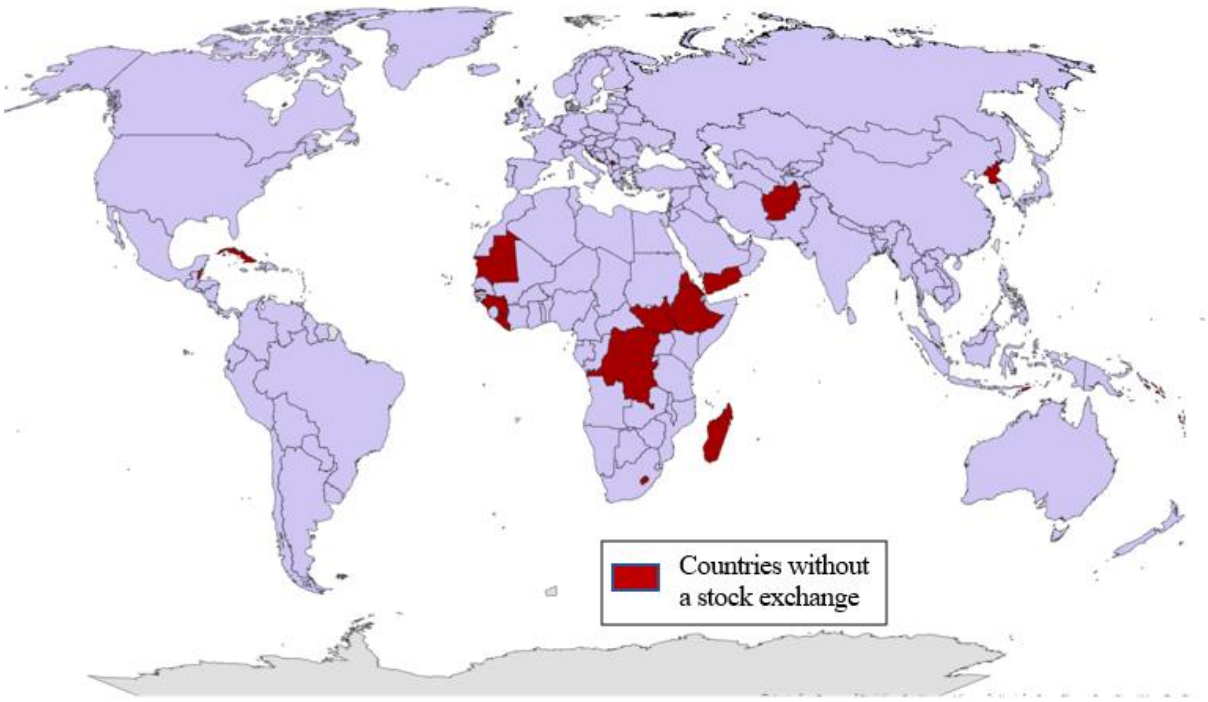

Fig. 1.1: Stock exchange distribution across the world

Source: Author's representation, based on data compiled from research of public sources (2023).

1.2 Motivation

In the past, international financial institutions such as the IMF and the World Bank have advanced the development of financial markets in developing countries as part of their financial reform agendas within the framework of structural adjustment programs (see, for example, World Bank, 1989, World Bank, 1994). Before the 1980s debt crisis, development aid and commercial bank loans were the primary sources of external capital flows supporting growth in emerging economies. However, after these flows failed to sustainably finance development and precipitated crises, financial institutions started to see liberalized capital markets as a more favorable alternative (Singh, 1997). The underlying assumption was that developing countries could attract non-debt-creating foreign capital by setting up and liberalizing stock markets instead of relying on external aid or debt financing. The influx of foreign portfolio investment through purchasing equity securities in the local currency was regarded as a healthier and more sustainable approach with decreased vulnerability to crisis (WIDER, 1990). Thus, the IMF, World Bank, and other international agencies launched and funded various financial sector programs to provide advisory services, and financial and technical assistance for financial sector reforms, including forming new stock exchanges. The Financial Sector Adjustment Loans (FSALs) and Financial Sector Reform and Strengthening Initiative (FIRST) are some of the key programs. Due to this international support

and coercion, the number of countries with stock exchanges rapidly grew from 59 in 1980 to 113 by 2000 (Weber et al., 2009). An IFC retrospective report states that it helped create or revitalize exchanges in over 20 emerging economies during this period as part of its capital markets development work (International Finance Corporation, 2016).

However, the subsequent two decades highlighted that stock markets are susceptible to fluctuations and expensive and contagious financial crises. Contrary to the initial assumption of supporting economic development in developing countries, the decision to open stock markets brought about heightened volatility and short-term inflows. This, in turn, constrained the scope for effective macroeconomic policy responses to the oscillating nature of capital flows (United Nations, 2010). Consequently, the 'one-size-fits-all' approach to promoting stock market development in emerging economies by international financial institutions diminished in the 2000s (Maxfield, 2009). Particularly, the Asian financial crisis of the late 1990s and the global financial crisis of 2008 were big lesson-learning moments of capital market risks, resulting in the institutions' partial abandonment of a mere stock exchange promotion.

The rapid pace of new stock exchange formation and development across emerging economies present in the 1980s – 1990s has slowed down in recent years. To be sure, international institutions have not entirely abandoned their commitment to supporting capital market development. Rather their emphasis shifted to reinforcing regulatory and supervisory frameworks and elevating corporate governance standards. Nevertheless, their level of support for forming new stock exchanges has declined since the early 2000s relative to the prior extensive assistance during the structural adjustment era. For instance, the Independent Evaluation Group (2006) evaluated the World Bank's financial sector reform support from 1993 to 2003 and noted a drop in loans for capital markets between 2000 and 2003. The report highlighted that only ten capital market reform projects received loans in that period, contrasting with the 29 programs funded between 1996 and 1999. Moreover, it would be simplistic to believe that the shift in emphasis after the global financial crisis was limited to financial institutions alone. Developing countries themselves probably felt compelled to reassess their priorities, including their pursuit of establishing new stock exchanges.

The crises underscore the importance of establishing strong supportive institutions before introducing a stock exchange into an economy. The formation of a well-functioning stock market hinges upon the existence of certain economic, legal, institutional, social, and political conditions. These pre-requirements include macroeconomic stability, capable and independent regulatory and supervisory entities, well-defined accounting standards and financial disclosure requirements, investor protection mechanisms, and well-developed market infrastructure at a minimum (Singh, 1997, La Porta et al., 2002, Adjasi and

Yartey, 2007). However, implementing these prerequisites demands a substantial commitment and the devotion of significant scarce public resources. With countries now less able to rely on multilateral financial support for new exchanges compared to the 1990s, the need for comprehension of the potential benefits and costs of a stock market is more pertinent than ever. A rigorous assessment of whether a new exchange can deliver value aligned with present economic conditions and priorities is essential, especially when domestic sovereign funds would be needed to finance the endeavor rather than depending on external assistance.

Given the aforementioned complex historical experience and evolving perspectives on stock market impacts, there is a need for empirical analysis quantifying the potential economic losses of lacking an exchange result. Within this context, the current dissertation examines how much the absence of a stock market costs economies in terms of key macroeconomic indicators such as economic output, investment, and employment losses. Utilizing advanced statistical techniques to construct counterfactual comparisons, the research intends to provide nuanced evidence regarding the significance of exchanges. By doing so, it aims to contribute to academic discourse and provide valuable insights for policymakers in developing countries who are deliberating on the establishment of new stock exchanges within the current developmental landscape and priorities.

1.3 Organization of the Dissertation

The thesis is organized as follows: the second chapter reviews the work of literature on the subject interest of the dissertation. It is divided into three parts. The first part of the chapter discusses some theoretical backgrounds on the role stock markets play in the process of economic growth. It begins by giving a brief overview of explanations surrounding how stock markets emerge in an economy, followed by discussing the theoretical advancement made in incorporating stock markets into macroeconomic modeling. Then it proceeds to discuss the main functions of stock markets in nations' economies. This part of the chapter concludes by presenting the skepticism forwarded by some scholars regarding the significance of stock markets. The second part of Chapter 2 reviews the empirical literature on the subject. It summarizes cross-country studies examining the impact of stock market development on income, investment, and employment. As the empirical literature on the subject is vast, in the interests of briefness, the review only covers the most pertinent research conducted over the last two decades. The last part of the chapter gives a brief overview of the countries without stock exchanges selected for the analysis. The discussion focuses on their overall economy, current financial system, and their effort, or lack thereof, in establishing domestic stock exchanges in their respective economies.

The third chapter outlines the design of the research. It starts by discussing the research problem and establishing why it is important to pursue solving this problem. Here, the knowledge gap in terms of both the lack of research on countries without stock exchanges and the limitations of previously used methods are discussed. Following, the research objective section of the chapter outlines what the thesis aims to achieve. The chapter also explains the chosen analysis method, the Synthetic Control Method (SCM) in detail. It presents the method's general setup, data requirements, validity tests, and inference procedure. It further discusses the treated and control countries, and the sample period selection process. The rest of the chapter describes the data, outcome, and predictor variables utilized for the analysis.

The fourth chapter reports the estimations results of the economic consequences of not having a stock market for each selected country that lacks an exchange. The impacts are estimated in terms the output, investment, and employment opportunities. Based on the significance of the results, which are tested using placebo experiments, the forfeited benefits, or mitigated losses across the indicators in each country are discussed. The chapter also provides outcomes of robustness checks conducted and compares them with the baseline findings.

Chapter five is the final chapter that wraps up the dissertation. It summarizes the research and draws some policy recommendations based on the findings. The contribution and limitations of the study, as well as some suggestions for future research, are also provided in the chapter.

2. LITERATURE REVIEW

The notion that financial development as an important component of economic growth goes back as early as the beginning of the 20th century. In his book titled "The Theory of Economic Development," first published in German in 1911 and translated into English in 1934, Schumpeter highlighted how the provision of credit by financial intermediaries is an essential element in nations' development and growth process (Schumpeter and Opie, 1934). Since then, several early economists have analyzed and modeled the finance-growth linkage, largely stressing the pivotal role financial sector development plays in productive economic advancement (Gurley and Shaw, 1955, King and Levine, 1993, Fry, 1994, Kirkpatrick, 2005, Durusu-Ciftci et al., 2017). Notably, the pioneering contributions of Schumpeter and others primarily focused on the banking sector and financial institutions, especially commercial banks, rather than financial markets. Analysis of the impact of financial markets like stock markets gained more prominence a bit later. Nonetheless, early theoretical and empirical works of Goldsmith (1969), Shaw (1973), McKinnon (1973), and many others contribute to our understanding of how financial markets broadly, and capital markets specifically, affect the economy.

This chapter surveys prior theoretical and empirical research on the relationship between stock markets and economic growth. The theoretical background provides a general overview of literature explaining the factors that lead to the emergence of stock markets, their incorporation into economic models, their proposed roles, as well as critical perspectives skeptical of their relevance. The empirical review focuses on studies analyzing the impact of stock markets on key macroeconomic indicators: output, investment, and employment.

2.1 Theoretical background

2.1.1 What leads to stock exchange emergence?

Before discussing their role in economic development in the following subsection and estimating the economic cost of their absence in the coming chapter, it is instructive to explore conditions and prerequisites that give rise to stock markets in an economy. With over 123 exchanges existing around the world (SSE, 2023), stock markets have become common features of the financial landscape in many countries. However, around 17 percent of nations still lack a formal exchange. A natural question that arises with these figures is - what factors lead to the formation of stock markets in some economies but not others?

One factor that can lead to a stock exchange emergence in a country is economic development and capital accumulation. It is well-recognized in the literature that well-functioning stock markets play an important role in the economic development process. Notwithstanding this, there is also a growing literature on the impact of growth on stock markets. Over the years, many

empirical studies have reported that stock market development is positively correlated with economic growth (Ho and Njindan Iyke, 2017). In line with this, a simple comparison of countries with and without stock exchanges reveals striking differences in the level of economic development. While almost all advanced economies possess exchanges, over sixty percent of countries without an exchange are lower or lower-middle-income.

In search of an explanation for this phenomenon, Boyd and Smith (1996) and Blackburn et al. (2005) independently formulate models that show a two-way causal linkage between financial market development and economic growth. According to their theories, the emergence of stock markets is attributed to the costs associated with information asymmetry and moral hazard. In Boyd and Smith's framework, they consider borrowers (firms) with access to two types of technology: a lower-return, known-to-lender technology, and a higher-return, unknown-to-lender technology. The costs of monitoring these technologies by lenders lead to the former being financed through debt markets and the latter through equity markets. The authors show that, as an economy develops and a certain level of capital accumulation is reached, the relative price of capital decreases, prompting monitoring costs to rise. To minimize these costs, firms shift to using the observable-return, equity-financed technology. Eventually, this will lead to the emergence of a stock market.

While Blackburn et al.'s (2005) conclusion is along the same line, their analysis is based on a principal-agent framework. They assume lenders (principals) cannot directly control a firm's (agent's) effort towards a project, but they can influence the type of project undertaken by sustaining certain costs. This leaves them with two options: leave the project choice to the firm, which leads the project to be financed by a mix of equity and debt, or incur a cost and choose the project, which leads the project to be financed by only debt. This cost, represented by forgone wages as lenders invest time in researching and choosing projects, depends on the level of development and capital accumulation. As an economy accumulates capital and wage rates rise, it becomes less tenable for lenders to invest time in project selection. Consequently, stock markets will start to appear as more favorable financing options.

The development of the financial intermediary sector is another factor that contributes to the formation of exchanges. Typically, stock markets emerge in countries with well-developed financial intermediaries (Demirgüç-Kunt and Levine, 1996). Intermediation by commercial banks and other financial institutions plays an important role in supporting capital formation and economic growth. They pool resources from many individual savers and provide large loans to businesses for investment. This allows firms to acquire new technologies and upgrade from a basic production system to a more complex and sophisticated one. However, acquiring information on a new and complex production system is challenging. Lenders willing to provide funding for such sophisticated

productions may need to closely and continuously monitor the progress and assess the management strategies for optimal resource allocation (Capasso, 2008b). Banks and other similar financial intermediaries, that rely on historical data to evaluate projects for loan financing, therefore become hesitant to finance such projects that bear uncertainties.

In contrast, stock markets incentivize dispersed investors to actively gather information on growth opportunities, which becomes reflected in stock prices (Holmström and Tirole, 1993). This aggregated information allows equity markets to finance expanding firms and projects with higher uncertainty. Hence, limitations in debt financing create opportunities for stock exchanges to emerge and fill the void in supplying capital, especially for complex and innovative production techniques.

Globalization can also be a catalyst for the formation and growth of a stock market in a country. As economies become more interconnected, they get the opportunity for knowledge sharing and cooperation. At the state level, governments start to recognize the role stock markets can play in attracting investment and promoting economic growth from other countries' experience and take initiatives to establish or develop their stock exchanges. Alternatively, they get peer pressured into forming an exchange as a symbol of financial advancement and credibility. Over the years, many developing countries established their domestic exchanges in an attempt to emulate the increasing use of stock markets that characterized developed economies. At the public level, globalization helps to expand financial literacy among the local population. As Adjasi and Yartey (2007) emphasize, increasing public knowledge about the functions of stock markets is crucial for their development. Globalization significantly contributes to raising the financial awareness of both firms and potential investors. It exposes them to diverse financial services and products like securities, derivates, etc. that exist in financially advanced economies. Once the public becomes aware of these products and their potential benefits, the demand for them will surge which can drive the establishment of stock markets to meet these demands.

Globalization enables greater capital mobility across borders, allowing foreign capital to flow into the domestic economies. Domestic firms also get access to global markets and cross-border operations. As a result, capital availability in the economy increases, signaling growth opportunities. This put increasing pressure on the country to set up a stock exchange. Moreover, globalization empowers international institutions to advocate for financial market reforms in individual countries or even get involved directly in global integration. These institutions often offer advice and technical assistance for creating stock exchanges. The expansion and spread of organized stock exchanges across emerging economies in the 1980s and 1990s is a good example of this.

Overall different economic, financial, and political factors drive the establishment of stock markets. While they often arise endogenously as a natural outgrowth from capital accumulation, economic growth, and financial intermediation external factors like global integration and ad hoc governmental programs of financial reforms also have important implications for the formation of exchanges.

2.1.2 Stock markets in macroeconomic modeling

Various economic growth frameworks have been employed to analyze the relationship between economic growth and financial markets theoretically. Three main frameworks have been prevalent in modeling stock markets' macroeconomic implications: neoclassical growth theory, overlapping generations (OLG) models, and endogenous growth theory. The subsequent paragraphs review some of the notable contributions within each of these frameworks.

An early example of the incorporation of equity markets under a neoclassical framework is Tobin (1969). The article's main argument is that the equilibrium conditions of the real sector (encompassing production and consumption and factors of production) and financial sector (encompassing asset markets) of the economy are interconnected and mutually influenced. In Tobin's model, equities represent one type of financial asset that economic agents allocate their wealth across, along with other assets like money and bonds. Hence like any other asset, the demand for equities depends upon the relative return they offer versus alternative assets and the total wealth of agents. The interaction of supply and demand for all assets available in the market determines each asset's relative rate of return. Therefore, a change in the price or return of equities can influence agents' optimal portfolio allocation, as well as their overall wealth, investment, and consumption, which are elements of the real sector of the economy.

Cremers (1997) provides another attempt at integrating stock markets into neoclassical growth models. By considering a series of neoclassical models with a varied number of production sectors, the author explores the conditions under which capital markets play an essential role in achieving a competitive equilibrium path in an integrated world economy. The models demonstrate that when the number of production sectors equals the factors of production, the role of capital markets in achieving a competitive world growth path is minor. However, when the economy has fewer sectors than the factors employed, achieving universally competitive growth requires the presence of capital markets to compensate for the lack of sufficient consumption goods markets.

A fundamental assumption of the neoclassical growth theory is a representative agent framework. All individuals in the economy are represented by a homogenous agent with rational expectations. Therefore, the usual formulation of the model neglects the implication of any heterogeneity. To overcome this

limitation, some models incorporating stock markets have combined neoclassical framework with OLG structure. OLG models take the heterogeneity of agents' position over the life cycle into account, making it possible to capture the intergenerational dynamics of the stock market, the economy, and their interplay. One such contribution is Bencivenga et al. (1996), which examines the relationship between capital market efficiency, productive efficiency, and investment composition. Their model illustrates how the reduction of transaction costs enabled by efficient equity markets leads to an increment in steady-state capital stock and output, provided the costs represent real resource losses (such as time costs) rather than just transfers between agents (such as taxes).

Huybens and Smith (1999) also used the OLG framework with neoclassic production to develop a monetary growth model that shows the relationship between inflation, the financial market, and the real activity of the economy. Their models outline the conditions in which the economy can reach two steady states of equilibrium depending on, among other factors, how efficient and active the financial markets are. When bank lending and equity markets are developed and active, the economy can achieve a high activity steady state, where the capital stock and real economic activity are relatively higher. However, when they are less developed, the economy settles into a low-activity one, characterized by relatively lower levels of capital stock and economic activity. According to Huybens and Smith's model, active and developed equity markets enable the economy to achieve a high-capital-stock steady state by allocating funding towards productive capital investment.

Some economists develop theoretical models to compare the performance of stock markets with the banking sector in terms of intertemporal consumption allocation (Fulghieri and Rovelli, 1998), liquidity transformation (Bhattacharya et al., 1998), risk smoothing (Allen and Gale, 1997), etc. For instance, Fecht et al. (2008) explore the comparative role of banks and financial markets in risk sharing and promoting growth. They construct a dynamic model with OLG where banks participate in the financial market for free, but households have to pay a cost to do so. Their model demonstrates that, while markets limit the degree of intertemporal risk-sharing banks can offer at equilibrium, they promote a higher investment in productive technology. Therefore, they assert that financial markets are more effective in enhancing growth.

Ghossoub and Reed (2013) develop a monetary growth model with the OLG setting to examine how introducing a stock market in an economy influences the impact of monetary policy on economic development. The authors primarily focus on the open market operations of monetary policy. They show that expansionary monetary policies tend to discourage investment and hamper growth in economies characterized by less-developed stock markets. In contrast, when stock markets are well-developed, monetary expansions serve to promote capital accumulation and stimulate economic growth.

A key implication of neoclassical growth models is that long-run economic growth eventually approaches stagnation unless it is stimulated by exogenous technological progress (McCallum, 1996). Endogenous growth models emerged to overcome this issue, offering a solution where steady growth can be achieved without exogenous technological changes. This, in turn, provides a desirable feature for the incorporation of the stock market as it allows the direct integration of the markets into the growth process rather than treating them as external factors. Arguably, a pioneering work in this area is that of Greenwood and Jovanovic (1990), who present a model in which both financial markets and economic growth are determined endogenously. According to their model, the relationship between these two variables is bi-directional. Economic growth spurs agents' participation in financial markets by increasing the level of savings in the economy. Financial market development, in turn, lowers the cost of acquiring information about projects which enhances the efficient allocation of resources to productive investment and, eventually, promotes growth.

A seminal work by Levine (1991) also presents an endogenous growth model demonstrating how stock markets get formed endogenously in the economy and their link to growth. According to his model, while liquidity and productivity risk give rise to the formation of stock markets, markets promote investment and economic growth through two key mechanisms. First, since stock markets allow agents to trade their stock easily, it eliminates the risk of premature capital withdrawal and disruption of firms' productive investments. Second, stock markets enable individuals to diversify their risk across many firms, which increases the share of resources allocated to firm investments.

Greenwood and Smith (1997) is another work that investigates the macroeconomic role of financial markets using an endogenous growth framework. The authors propose two models illustrating the different mechanisms through which financial markets can foster economic growth. Their first model demonstrates how markets can redirect capital to its most productive use. The second model focuses on the role of markets in supporting specialization. Their analysis depicts market formation as an endogenous process that arises due to growth, and the existence of the market in turn enhances growth.

Capasso (2008a) develops a model that explores the link between information friction, stock markets, and economic growth within an endogenous growth framework. Similar to the works of Boyd and Smith (1996) and Blackburn et al. (2005), he shows that equity markets emerge and develop as a result of changes in the degree of asymmetric information, which itself depends on economic development. The model assumes capital is produced by different types of firms - high and low-productivity ones. Low-productivity firms have incentives to mimic high-productivity firms to get better financing terms. Capasso argues that these incentives to mimic, which depend on the initial level of capital accumulation, lead to two possible equilibria: a low development equilibrium with

a relatively low level of economic activity, and a high development equilibrium with a relatively high level of economic activity. If the initial level of capital is high, the degree of asymmetric information and the proportion of firms that have incentives to mimic will be lower. This causes the preferred mode of financing to switch to equity. Thus, the model illustrates how information frictions influence both stock market emergence and the market's impact on growth.

In summary, using different growth frameworks, multiple theoretical contributions have been made to formally characterize the link between stock markets and economic growth. Neoclassical growth models, while not typically incorporating stock markets due to their perfect information, no transaction costs, and complete market assumptions, have seen modifications to accommodate market factors. Seminal theoretical models such as Tobin (1969) contributed significantly to explaining the link between equity markets and real economic variables. OLG models, pioneered by Diamond (1965), have also been influential in studying the role of stock markets in the economy while accounting for heterogeneity across generations. The most substantial advancement, however, comes from endogenous growth models, which enable a more robust framework for theoretically modeling the economic effects of stock markets (Tsuru, 2000). Unlike, the neoclassical models, endogenous models raise the possibility of stock markets influencing endogenous growth factors like investment and capital accumulation. Notable contributions in this regard include the work of Levine (1991) and Greenwood and Smith (1997), among others, have provided important insights into the stimulating role markets can play in economic development.

2.1.3 Functions of Stock Market

Theoretical models have identified multiple channels through which well-functioning stock markets can stimulate economic growth. These channels can be categorized into five broad functions of stock markets within the economy: saving mobilization, liquidity provision, risk-sharing, information acquisition about firms, and corporate governance (Levine and Zervos, 1996). The subsequent paragraphs discuss each of these functions in detail.

i. Saving mobilization and allocation of resources

As an economy grows, private and government sectors must raise long-term capital to fund their respective projects. Firms would need to build new factories, expand the existing ones, or buy new machinery. The government would also need funds for the provision of infrastructure. Well-functioning stock markets provide an optimal mechanism for addressing these financing needs efficiently.

Stock markets allow for a broad mobilization of savings by providing a platform for a large and diverse set of investors to participate. Financial instruments that are traded in the market are typically in small denominations. This encourages a larger fraction of the population to take part. An ordinary

household can easily diversify its portfolio and increase its asset liquidity by investing in different firms with promising prospects. Furthermore, markets offer individuals a range of alternative saving instruments that likely align with their liquidity, return, and risk preferences. This stimulates higher household saving rates and increases the aggregate volume of investable savings in the economy.

In addition to mobilizing savings, stock markets allocate the pooled capital to its most efficient uses. In the course of pooling funds from many diverse investors, stock markets make capital accessible to the production sector, expanding the set of feasible investment projects. Oftentimes, individual savers are incapable or unwilling to finance long-term investment projects that tie up their assets for extended periods. With stock markets, however, many diverse individuals can fund such projects while having the option of exiting their investment easily by trading their shares on secondary markets without disrupting the project operations. Besides, prices in efficient stock markets incorporate information about investment prospects. Hence, they guide investors' decisions, which results in funding only promising projects with strong potential returns. This function of stock markets in optimizing the allocation of mobilized savings into their highest-value uses is well illustrated by Greenwood and Jovanovic (1990) and Greenwood and Smith (1997).

ii. Liquidity provision

Stock markets can foster economic growth through the provision of liquidity. Liquidity refers to "the cost and the speed with which agents can convert financial instruments into purchasing power at agreed prices" (Levine, 2005, p.876). Economies typically have many potential production projects with different gestation periods. Some projects require a shorter period to produce capital, while others may take a relatively longer time. Particularly, the gestation period for major investment projects is lengthy and requires a long-term allocation of funds. However, most investors are less interested in long-term investments that can block their savings for long periods. Stock markets alleviate this strain by allowing investors to hold easily tradable shares rather than tying up capital directly. This encourages investors to fund long-term promising investment projects they would otherwise avoid.

At the same time, this stock market feature allows capital to remain invested in the investment project for the long run. The trading of shares in the secondary market has little to zero effect on the actual investment being undertaken. This prevents premature withdrawal of capital from projects as investors trade ownership claims to meet their short-term liquidity needs (Greenwood and Smith, 1997). Consequently, by improving capital allocation and retention, the liquidity provided by stock markets spurs long-term investments that are essential for economic growth.

To understand how liquidity is crucial in the economy, one can refer to the role it played during the Industrial Revolution. As Hicks (1969) noted, without the financial markets that made liquid assets available in England, Holland, and France by the first half of the 18th century, there would have been no industrial revolution, considering such projects usually require large commitments of capital for long periods.

iii. Better risk management

Stock markets play a crucial role in enhancing risk diversification within the economy. They offer a wide array of financial instruments and investment opportunities, allowing investors to hold a diversified portfolio. Investors can spread their risk across different investment options rather than investing their whole savings in just a few assets. Stock markets also bring together a large and diverse set of investors. This enables multiple investors to collectively share and mitigate the idiosyncratic risks associated with a specific investment project. As Levine (1991), states, one such risk is a productivity risk that stems from shocks a project may experience during its production regime. Stock markets, especially internationally integrated ones, reduce the average productivity risk that investors are exposed to.

In addition, stock markets insure investors against liquidity risks. Liquidity risk arises from uncertainties involved in converting an asset into a readily exchangeable form (Levine, 1991). As discussed above, in liquid stock markets, investors can convert their assets into exchangeable medium, or cash, easily and quickly whenever the need arises. Market participants do not need to invest their time and energy in searching for a buyer for their shares, nor do they need to negotiate the transaction terms. The continuous trading mechanisms provided by stock markets enable them to transfer their claims to another participant, following the predefined market rules.

These functions of stock markets contribute to economic growth in many ways. Firstly, it shifts society's savings from safe, low-yield projects to riskier, higher-yield projects (Obstfeld, 1994). Comparatively, high-return, long-gestation investment projects tend to be riskier than low-return ones, in terms of both idiosyncratic and liquidity risk. Hence, in the absence of stock markets, risk-averse investors are less inclined to put their savings on such projects. Conversely, by mitigating these risks, stock markets encourage investors to invest in relatively risky but high-return projects. Secondly, they induce technological innovation and productive specialization, which fosters economic growth. Saint-Paul (1992) illustrates how financial markets' facilitation of risk diversification encourages economic agents to choose specialized and riskier technologies over safer but less productive technologies. Moreover, stock markets enhance saving and consumption by decreasing investors' exposure to income fluctuations. This, in turn, generates additional investment opportunities and provides funds for

financing new and existing projects, contributing to the overall economic expansion and growth.

iv. Information production about investment opportunities

Theoretical literature highlights that the presence of information asymmetry between lenders (investors) and borrowers (firms) is one of the factors that lead to the emergence of stock markets within an economy (Greenwood and Jovanovic, 1990, Blackburn et al., 2005, Capasso, 2008a). Acquiring and processing information on investment projects are usually costly for individual savers. However, stock markets effectively reduce costs associated with these activities through economies of scale. As markets pool large and diverse participants together, the fixed cost of researching and analyzing projects can be spread across many investors. This lowers the average cost per individual investor, making investment research and analysis more affordable and enabling better-informed investment decisions. Therefore, stock markets allocate capital to its most productive use by making information more affordable and accessible to investors.

Stock markets also boost growth by promoting the production of information about investment opportunities in the economy. Prices in stock markets aggregate diverse pieces of information about the underlying investment from many different market participants and incorporate them (Dow et al., 2017). This incentivizes participants to actively produce information. On the one hand, as investors have their savings at risk of loss, it is in their best interest to gather timely and accurate data regarding potential investment opportunities. Hence, they engage in thorough research and monitor projects to maximize their expected return. Additionally, investors who acquire superior and early information can make greater profits than those who have not. On the other hand, managers also have incentives to produce information about the projects they want to be funded through stock markets. Stock market listing requirements typically mandate firms to disclose information about their investment projects to the public. Therefore, managers produce such information to meet regulatory requirements. Furthermore, they can strategically maximize the value of their projects by revealing additional information that may not be readily available in the market (Goldstein and Yang, 2017).

Greater information availability in the stock market enables more effective evaluations of alternative investment projects. It makes it easier for investors to identify promising investments with high returns to allocate their savings. It also makes the most productive and innovative projects obtain financing. Hence, the information production role of stock markets induces a more efficient allocation of resources, which ultimately spurs capital accumulation and economic growth.

v. Promotion of corporate governance

Stock markets enable shareholders to exert corporate control, stimulating better governance and management. When investors finance a project, they obtain certain rights that allow them to influence how their investment is used and monitor its execution. These rights may include voting on major decisions undertaken by the firm, pursuing representation on the board of directors, engaging with management, and more. Having these rights incentivizes investors to provide funds for investment projects, which otherwise would be underfinanced.

Takeovers are another mechanism through which stock markets impact corporate governance. In market environments, the transfer of shares usually serves as a tool for disciplining managers. Suppose a firm is poorly managed and, as a result, its value is declining. In that case, investors may respond by selling their claim to another buyer, potentially exposing the firm to hostile takeovers. This discourages managers from pursuing self-serving actions that can lower the firm value and increase the probability of takeovers. Efficient stock markets also enable capital providers to tie managers' compensation with share prices, providing a non-subjective scale to measure their performance. Hence, they will be incentivized to create a governance structure that maximizes firm value. Managers' interests become aligned with shareholders' interests, which mitigates the agency problem and fosters better corporate governance.

Furthermore, the legal and regulatory frameworks governing stock markets significantly influence firms' governance practices. Markets typically have a set of rules and regulations on governance issues designed to protect investors from potential expropriation (La Porta et al., 2000). These rules and regulations often mandate specific governance standards that firms must adhere to. Stock markets also promote voluntary corporate governance codes and best practices. Although these codes are not legally binding, to maximize their value in the market, firms tend to comply with them. In addition, disclosure requirements and enhanced information production enable continuous scrutiny of corporate performance. This compels managers to demonstrate sound governance practices.

Therefore, stock markets improve corporate governance by facilitating investor oversight, takeover threats, incentive alignments, and governance regulations. Furthermore, improved corporate governance promotes more efficient capital utilization and economic growth.

2.1.4 Skepticism towards stock markets benefits

As the discussion in the prior sections attempted to establish, there is a substantial body of theoretical literature that stresses the significance of stock markets in the process of economic growth. Their various functions in the economy have been modeled and theoretically examined by numerous studies. Nevertheless, it would be erroneous to assume that there is a consensus among economists or the broader policymaking community about the effectiveness and

desirability of stock markets. Some are not entirely convinced of the above-discussed benefits and contend that they may be overstated or have significant downsides.

Bhide (1993) argues that the benefit of stock markets in terms of liquidity provision comes at the expense of losing strong corporate governance and internal monitoring in firms. Since investors can easily sell their shares at any time, stock market liquidity may discourage them from having a long-term commitment to firms whose shares they own. Therefore, they might be reluctant to exert strong corporate control. These further impact firms' growth, and then economic growth, negatively. This tradeoff between liquidity and corporate governance is also formalized in the model developed by Back et al. (2013). Their model shows how greater liquidity can undermine corporate governance by disincentivizing influential blockholders' (large shareholders') activism. Specifically, when these blockholders have substantial initial ownership claims, and liquidity traders are net buyers, they will simply exit their positions rather than incur active engagement costs when they are dissatisfied with management. The authors argue that this effect dominates in equilibrium, indicating that higher liquidity weakens corporate governance.

The benefits of stock market liquidity have also been questioned by Fang et al. (2014), who suggest that heightened liquidity might hinder firm innovation and encourage short-termism. Their argument highlighted two main reasons why increased stock liquidity may affect innovation negatively. First, greater liquidity exacerbates hostile takeover threats. This leads managers to prioritize short-term profit-driven strategies to maintain share prices rather than investing in innovations that increase long-term earnings. Second, high liquidity eases the ownership trading process, enabling institutional investors, who typically chase short-term profit, to exit their positions easily. As failure to appease such investors could lead to their exit, managers may feel pressure to focus on increasing current profits and cut investments in innovation.

The short-termism consequence of stock markets has received considerable attention from theoretical literature. Bolton et al. (2006) present a model that explores the drawbacks of linking managers' compensation to share prices. In particular, they show that such compensation contracts can induce managers to engage in short-term strategies that increase share price and neglect long-term value-increasing strategies. This fuels speculative trading and stock overvaluations. Similarly, Benmelech et al. (2010) examine how stock-based compensation can lead to suboptimal investment. According to their analysis, when managers' pay is tied to stock performance, it motivates managers to withhold information if investment opportunities weaken, resulting in capital allocation to investments that are not value-maximizing in the long run.

With regard to the risk-sharing and information-production functions of stock markets, Peress (2010) highlights the inherent tradeoff between these two roles. His theoretical model illustrates how a larger investor base enhances risk diversification but discourages information acquisition. Specifically, a widely held share implies a well-distributed risk. However, it also means that the average number of shares held by each shareholder is relatively small, and hence the potential gain from private information is minimal. This reduces the investors' incentive to produce costly private information.

Conversely, Van Nieuwerburgh and Veldkamp (2010) explore the reverse linkage and show how acquiring more information about an asset can hinder optimal diversification. They suggest that investors, who face information acquisition costs, are more likely to choose to concentrate their effort and resources on gathering information on fewer assets rather than many in order to take advantage of the potential gains from specialization. Furthermore, as these investors become more knowledgeable about these few assets, they tend to take larger positions in them, leading to the holding of under-diversified portfolios.

Moreover, the resource allocation role of stock markets has also faced skepticism. In particular, the misallocation of capital has been highlighted by some economists as one downside of stock markets. Notably, Joseph Stiglitz, known for his critical views of financial markets, discussed how stock markets' allocations of resources might not be as "efficient" as many have claimed them to be. In his 1972 article, Stiglitz argues that since firms aim to maximize their stock market value and shareholders' wealth, their investment choices are driven by this objective. Shareholders typically value lower-risk projects more, so to maintain their market value, price-taker firms may choose safer projects, even if these projects have lower social returns. This results in underinvestment in risky yet socially beneficial projects. Stiglitz (1982) also emphasized the non-optimality of stock markets' allocation, particularly when there are multiple goods or outputs. Although any share ownership trading affects price distributions across all goods in the economy, stock markets disregard this economy-wide impact. Hence, shareholders and competitive firms allocate capital to investments that enhance their value, even if it distorts the economy's price distribution inefficiently.

Grossman and Stiglitz (1980), further, demonstrated that perfect informational efficiency in financial markets cannot be satisfied in an actual competitive market. Prices do not perfectly incorporate all available information because if they did, investors would not have incentives to incur costs to acquire information.

However, most critiques of stock markets stem from their vulnerability to instability. According to Minsky's (1992) second theorem of the 'financial instability hypothesis,' "over periods of prolonged prosperity, the economy transits from financial relations that make for a stable system to financial relations that make for an unstable system" (p. 8). He argues that at times of economic

expansion, agents in capitalist economies (which the economy is characterized as in his theory) become progressively more optimistic and start to engage in risky investments using external finances. This eventually reaches a point where the monetary resources of these agents can only cover interest payments on their debt obligations, failing to repay the principals, which forces them to take on more loans. This continues until their proceeds cannot even cover interest payments. Subsequently, more debt, followed by defaults on loans leads to bankruptcies, providing conditions for a financial crisis. These activities ultimately lead the economy, at the macro level, into economic recession.

Moreover, another work by Stiglitz (2000) presents a case against capital market liberalization, suggesting it often fails to improve and can even have adverse effects on economic growth for several reasons. He contends that since the capital flows that stem from capital market liberalization are highly volatile, they aggravate economic fluctuations and instability. This instability, coupled with the short-term nature of the capital flows, discourages long-term investments. He also argues that instead of accumulating and generating new productive resources to fuel growth, opening capital accounts can even lead to capital flight. In addition, it exposes countries to external economic shocks from other countries. Given these risks, both Minsky and Stiglitz argue that strategic government intervention is vital for maintaining economic stability and preventing crises.

Notwithstanding the reservations regarding the actual benefits of stock markets' functions discussed in the previous section, the ability of any market to fulfill these roles largely depends on the realization of certain prerequisites. These prerequisites include factors like the prompt availability and accessibility of information and the existence of a strong regulatory framework. However, particularly in developing countries, these compulsory conditions often fail to materialize. Furthermore, small size and low liquidity are common features of stock markets in such countries. Nevertheless, it is very unlikely for small and inactive markets to produce timely and useful information, allocate resources efficiently, diversify risks, and generally make a meaningful contribution to economic growth. In light of these, Sharma and Roca (2012) argue that stock markets in developing economies may be less beneficial than previously thought and might not be worth the redirection of scarce resources away from potentially more advantageous sectors. Similarly, Singh (1997) deems stock markets in these economies not only as futile but also as harmful. He underscores that some of their inherent features, such as volatility, their interactions with the currency market, and their potential to weaken existing banking systems, likely impede economic growth rather than promote it.

2.2 Empirical evidence

A substantial body of empirical research has explored the link between stock markets and various macroeconomic indicators, making significant inroads in enhancing the understanding of the relationship. These empirical investigations range from cross-country analyses to country-specific studies. The literature review presented here concentrates on studies examining the impact of stock market development on the three macroeconomic variables that will be empirically analyzed in the later chapters: namely, output, investment, and labor market. Furthermore, as driving general conclusions from country-specific investigations, particularly those that are relevant to the sample countries under consideration in this dissertation, is problematic, the review focuses on cross-country econometric studies[1].

2.2.1 Stock markets and output

On an empirical level, most studies analyzing the effect of stock market development on economic growth tend to use output or GDP-related metrics as the key outcome variable of economic growth. On the stock market development side, market capitalization, value traded, and turnover ratio are the most common variables used to measure size, liquidity, and trading activity, respectively. While these studies employ a wide range of econometric techniques to examine the effect, the results that emerge from them seem to be largely positive.

Based on the panel data on 40 countries from 1976–1998, Beck and Levine (2004) use the generalized method of moments (GMM) models to estimate the impact of stock markets and banks on economic growth. Their findings reveal that stock markets' liquidity has a strong positive correlation with real GDP per capita growth rate. Cooray (2010) is another study documenting the significance of stock markets on output per capita. Her analysis is based on panel data on 35 developing countries covering 1992-2003. She finds that all of the proxies used to measure stock market development, i.e., market capitalization, liquidity, and the turnover ratio, positively and significantly affect long-run growth. Using a panel vector autoregressive (VAR) model, Pradhan et al. (2013) investigated the relationship in 16 Asian countries from 1988-2012. The empirical results show that stock market development, measured by size, liquidity, and turnover, has a significant positive effect on GDP and GDP per capita, both in the short and long run. Focusing only on emerging markets, Naik and Padhi (2015) also reached a similar conclusion. They use annual data from 1995 to 2012 from 27 emerging countries and measure stock market development through market capitalization, value of share traded, and turnover ratio. The results indicate the presence of a positive relationship between all the market development indicators and economic growth,

[1] *The empirical literature on the subject is vast, and it is impossible to do justice by covering only a fraction of it. Hence, in the interest of brevity, this sub-section will discuss only the most relevant studies and those conducted during the last two decades.*

measured by the growth rate of GDP. Likewise, Durusu-Ciftci et al. (2017) examine the relationship using 40 countries from 1989-2011 and find that market liquidity has a positive long-run effect on GDP per capita.

A significant fraction of the literature argues that the finance-growth nexus is more complex than a simple linear model and raises concerns about potential adverse effects associated with excessive financial development or 'too much finance'. Empirically, an inverted U-shaped relationship, particularly between the banking sector and growth, has been reported by a fair number of studies, suggesting the presence of an optimal level of the sector development beyond which its effect becomes negative (e.g., Law and Singh, 2014, Arcand et al., 2015). Similarly, a few studies find evidence of a non-monotonic relationship between stock markets and economic growth. For instance, Shen and Lee (2006) detect an inverse U-shaped relationship between stock market development and growth, which appears even more pronounced than the banking-growth relationship. Their study, which is based on panel data from 48 developed and developing countries between 1976 and 2001, indicates the positive impact of stock market size, activity, and liquidity on per capita GDP increases up to a certain threshold, after which the effect decreases. This finding is reinforced by Cave et al. (2020). Pooling a dataset of 104 countries observed from 1990-2014, the study provides another evidence of the non-linearity of the relationship. Interestingly, Shen et al. (2011), after analyzing data from 46 countries spanning from 1976 to 2005, found an asymmetric U-shaped relationship. According to their findings, stock market development is negatively but weakly related to per capita GDP growth till a certain threshold is reached, after which the relationship turns positive.

Conversely, insignificant or even adverse effects of stock markets have been detected by some studies, especially studies that focused on developing countries. Minier (2003) employs a regression tree framework to split 42 countries into low and high-capitalization countries and assess if the relationship between stock market development and economic growth differs between the two groups. He reports that while the effect of market liquidity on per capita GDP is strong and positive for countries with large stock markets, this effect turns significantly negative for low-capitalization sub-samples. Adjasi and Biekpe's (2006) research is among the early studies examining the role of stock markets on economic growth in African countries. The study examines the markets' effect on real GDP per capita growth of 14 African countries between 1980 and 2002. The results from the empirical analysis indicate that, while Upper-middle income African countries can benefit from stock market development, the effect on Low and Low-middle income countries is insignificant. Similar findings have been reported by Naceur and Ghazouani (2007), who examine the relationship in 11 countries in the MENA region over the period 1979-2003. Their GMM estimations results reveal that the effect of stock market development on real per capita GDP is not

significant for the most part. The lack of significant impact has been documented by Caporale et al. (2015), who tested the relationship using 10 transition countries from 1994 to 2007. To take the difference in the level of financial development into account, the authors split their samples into three groups. Their results indicate that the stock markets' effect is significant and positive, albeit small, in Central and Eastern Europe, whereas it is insignificant in Baltic countries and Southeastern European countries. The detrimental impact of stock markets on the economic growth of sub-Saharan Africa, on the other hand, is reported by Thaddeus et al. (2022). The study used data from 12 countries from 1990 to 2020, and asses the effect of real market size and liquidity on GDP per capita. The findings show that although market capitalization has a positive effect in the long run, its impact in the short run is not significant. Furthermore, market liquidity affects economic growth negatively.

2.2.2 Stock markets and investment

Studies that examine the impact of stock markets on investment tend to take two approaches: macro-level economywide analysis or micro-level industry or firm-level examinations. The economywide studies analyze the relationship between stock market development and investment across different countries using country-level data on various aspects of stock markets and investment rates or capital formation. Micro-level studies on the other hand employ industry or firm-level data across a broad cross-section of countries to assess how access to equity financing through stock markets affects investment spending within industries or firms.

Wurgler's (2000) influential study employs industry-level data across 28 industries in 65 countries from 1963 to 1995 to examine how financial markets affect capital allocation across industries. He measures allocation efficiency by the extent to which countries increase investment in growing industries and decrease it in declining ones. and stock market development by market capitalization. His findings show that stock markets, as measured by market capitalization, are associated with a higher elasticity of manufacturing investment to growth opportunities. Specifically, stock markets improve capital allocation efficiency by increasing investment in industries where growth opportunities are higher and by decreasing in industries where it is low.

However, Beck and Levine (2002) do not find evidence that having either a market-based or bank-based financial structure per se affects countries' investment elasticity to growth opportunities. Using a panel of 36 manufacturing industries across 42 countries, they examine whether financial structure influences the efficiency of investment flows across industries. While overall financial development positively affects investment sensitivity to industries' growth, the results indicate the type of financial structure a country has does not significantly impact its investment flow efficiency across industries.

Carlin and Mayer (2003) provide additional industry-level evidence on the limited relevance of a country's financial structure in determining variation in investment across industries. The authors analyze the association between financial structure, industry characteristics, and investment activities using a sample of 27 manufacturing industries across 14 OECD countries. Specifically, they classify the industries based on their reliance on market financing, bank financing, and inputs from other stakeholders. The authors then examine whether differences in financial structure (market-based versus bank-based systems) affect industries' investment in fixed capital and R&D. Their results indicate that industries more dependent on equity finance and skilled labor invest more in R&D in market-based financial systems. However, they do not find evidence that a country's financial structure impacts industries' investment in fixed capital. These findings have been supported by Ndikumana's (2005) country-level investigation, which studies whether the level of domestic investment in a country varies with the structure of the financial system it has. His analysis, which is based on data on 99 developed in developing countries over the period 1965-1997, finds no support that stock-based financial systems promote investment more than bank-based.

As is the case for output growth, the effect of stock markets on investment in developing countries is more mixed than in developed countries. Durham (2002) draws a sample of 10 higher-income and 16 lower-income countries over the period 1981-1998 to empirically trace the link between stock markets and private investment. The results provide evidence that suggests the impact substantially varies across countries depending on their initial income level, credit risk rating, and development of their legal system. They show that while increments in stock market valuation, measured by contemporaneous and lagged equity price changes, affect private investment growth positively in high-income countries, the effect appears to be insignificant in lower-income countries. Sarkar (2007) also reports mixed results regarding the contribution of stock markets in developing economies. His panel data analysis, which is based on data from 31 less-developed countries, provides evidence that stock market development (as measured by market capitalization) does not have a statistically significant effect on the growth rate of domestic capital formation. A time-series examination of 16 individual countries likewise reveals that except for 5 countries, a market turnover ratio is not important in explaining changes in capital formation in most of the sample countries. Based on these findings, Sarkar concludes that promoting stock market development may not be as important for capital accumulation as often claimed. This sentiment also seems to be shared by Ayadi and Williams (2023), who explored the effect of stock market development on capital formation of 4 major African economies recently. The results from their random-effects model estimation indicate that while market size has a weak positive effect, neither the size of activity nor liquidity is an important determinant of gross fixed capital formation.

Interestingly, it is not only in developing countries that the role of stock markets in promoting capital formation is questioned. For instance, Arestis et al. (2016) argue that financial market development crowds out physical investment in a financialized economy. Their study analyzes the relationship between financial markets and physical investment in 14 OECD countries observed from 1970 to 2010. Stock market development is captured with the deviation of market indices from their "conventional" levels. They find that the development of stock markets exerts a strong negative effect on the rate of capital accumulation in the business sector.

Bae et al. (2021) studied how stock market concentration affects the elasticity of industry-level investment to growth opportunities in 32 countries. They measure market concentration as the share of total market capitalization accounted for by the top 5 or top 10 largest firms. As in Wurgler (2000) and Beck and Levine (2002), investment elasticity proxies efficiency in capital allocation. The empirical results show that higher stock market concentration adversely affects the investment responsiveness to growth. Furthermore, total market size and liquidity are also found to be unimportant in determining the sensitivity of investment to growth opportunities. for the elasticity. Overall, the study provides evidence that market concentration is associated with capital allocation inefficiency.

Regarding firm-level studies, using firm data from 15 EU countries, Mortal and Reisel (2013) examine the efficient stock markets' capital allocation. Specifically, they match public firms with private firms in the same industry and estimate the standard investment equation, measuring efficiency by the sensitivity of firm investment to growth opportunities (proxied by sales growth). Their findings indicate that investment is significantly more responsive to growth opportunities for public firms compared to private firms, suggesting greater efficiency in capital allocation by stock markets. Furthermore, this responsiveness is more pronounced in countries with more developed stock markets. These findings, however, have been disputed by Asker et al. (2015) who utilize the same estimation approach but with a panel dataset of only U.S. firms. In contrast to Mortal and Reisel, Asker et al. find that public firms invest less overall and are less responsive to changes in investment opportunities compared to observably similar private firms. According to their results, access to equity financing adversely affects firms' investment incentives, lending support to the view that stock markets promote short-termism.

The other stock market-related issue that has gotten attention in the literature is liberalization. For instance, Henry (2000) assesses how stock market liberalizations affect private investment growth in 11 developing countries. The results reveal that market liberalization is consistently followed by an increase in the growth rate of real private investment. There is also a strong positive correlation between investment growth and changes in stock market activity, as

measured by turnover and value traded. These country-level findings have been extended to an industry level by Gupta and Yuan (2009) and to a firm level by Mitton (2006). Gupta and Yuan investigate the impact of liberalization on industry growth across 27 industries in 31 emerging economies. Consistent with Henry's result, they find that liberalization induces higher investment, as measured by growth in fixed capital formation. Likewise, Mitton (2006) examines firm investment responses to liberalization, using a sample of 1,141 firms from 28 countries. By utilizing firm-specific dates when shares become accessible to foreign investors as a firm-level openness indicator, Mitton discovered a significant association between stock openness and higher investment rates. Other recent studies such as Moshirian et al. (2021) and Li et al. (2022) also document a positive investment effect of stock market liberalizations.

However, some studies argue stock market liberalization has limited impacts on investment. Naceur et al. (2008), for example, report no significant effect of foreign participation in stock markets on private investment growth in 11 MENA countries. Likewise, a recent study by McLean et al. (2022) reached a similar conclusion after analyzing the link at a firm level, using data from 33 emerging markets. Their results indicate no substantial change in firm investment spending is attributed to shares becoming investable for foreign investors.

2.2.3 Stock markets and labor markets

The empirical literature examining the effects of stock market development on labor market outcomes is relatively limited. The few existing studies have primarily focused on two main issues: whether stock market development fosters job creation, hence increasing employment; and how stock market development impacts wages. Very few ones also examined its labor mobility effect (e.g., Pagano and Pica, 2012). These studies range from macro analyses to firm-level assessments.

Chen and Zhang (2011) look into how time-varying risk premiums in the stock market, measured by dividend yield, are related to future labor market outcomes. The main outcomes they consider are employment growth, hiring rate, and job creation, and they proxy aggregate dividend yield as a proxy for the stock market dynamics. The authors document that while positive market returns forecast high net hiring rates for the whole period, they predict low employment growth in the short run and high employment growth in the long run. Furthermore, positive market excess returns forecast low net job creation rates in manufacturing in the short run and the opposite in the long run.

Pagano and Pica (2012) analyze the effect of financial development on employment and wage growth, and job reallocation using cross-country industry-level data from 63 countries covering the years between 1970 – 2003. They measure stock market development using market capitalization. They find that stock market development induces employment growth in sectors more dependent

on external finance but has no significant effect on wage growth. Their separate estimations for OECD and non-OECD members reveal that the positive impact of stock market development on employment growth is only observable in non-OECD countries. Furthermore, stock market development is associated with significant reductions in the dispersion of employment growth across industries, indicating it exerts a stabilizing effect on inter-industry job reallocation.

Relatively, most of the investigations into the correlation between stock markets and labor markets are conducted in OECD countries. Gatti et al. (2012) studied the finance-labor market relationship using data on 18 OECD countries over the period 1980 – 2204. In contrast to Pagano and Pica's (2012) findings, the results from their system GMM estimations show that increased stock market capitalization promotes employment in OECD countries. However, the authors note that the positive effect only occurs when the labor market regulations and unionization are weak. Darcillon (2016) endorses the finding that labor regulations influence the impact of stock markets on the labor market. He assesses the link between financial development, measured by stock market capitalization and the employment share of the financial sector, on labor market volatility in 15 OECD countries. The authors estimate the effect for high-skilled and low-skilled labor separately using fixed-effect threshold estimation techniques. He finds strong evidence that higher market capitalization results in employment and wage volatility only in countries with relatively weaker labor market regulation. In fact, it is associated with a reduction in wage volatility in countries with better welfare generosity. The results also indicate that there is no significant difference in the impact across skill levels. Kohler et al. (2019) provide additional evidence on the relationship between financialization and labor market outcomes in OECD countries, focusing on the impact on wage share. They consider capital market competition, proxied by market turnover ratio, aspect of stock market development. Their results indicate that stock market development plays only a minor role in explaining wage share. Further investigation revealed that the long-run effect may even be negative.

Ernst (2019) conducts dynamic panel data estimation using data on 32 OECD members from 1995 – 2018 to assess the effects of various aspects of financial markets on unemployment flows. His findings reveal that stock market development is associated with higher unemployment inflows and outflows. In addition, deregulations of the markets appear to increase unemployment turbulence. Overall, the study demonstrates that while the development of stock markets heightens employment volatility, putting market regulations in place can help stabilize this volatility. Using panel data on 38 countries between 1990 and 2020, Afonso and Blanco Arana (2021) underscore the employment benefit of stock market development across OECD members. Their random-effect estimation results show that increased capitalization and turnover ratio significantly reduce the unemployment rate.

Chodorow-Reich et al. (2021) use regional heterogeneity in stock market wealth across U.S. counties to estimate the causal effect of stock prices on local labor market outcomes. Their findings show that an increment in stock market wealth, induced by a rise in aggregate stock prices in a county, increases local employment and payroll. These effects are concentrated in locally consumed 'non-tradable' goods-producing industries, like retail trade and accommodation and food services. In contrast, they are absent in 'tradable' good producers. sectors in non-tradable industries and total, but not in tradable industries. Chodorow-Reich et al. argue that this shows that the rise in local labor demand is driven by the consumption wealth effect rather than the change in the cost of equity financing.

A related line of research studies how stock market liberalization and integration influence the labor market. Charpe (2011), for instance, investigates the impact of financial market globalization on labor's share of income in 16 high-income and 65 middle and low-income countries from 1980-2005. He uses the sum of foreign assets and liabilities in a country as a percentage of GDP along with capital account openness as indicators of financial globalization. His results show that wage share is negatively impacted by financial globalization in high-income countries. Estimation results across medium-and low-income economies reveal that except for Asian countries, the effects are absent. The contribution of stock market liberalization on wage growth is highlighted by Chari et al. (2012), who employ a difference-in-differences regression model to study the relationship. They analyze data from 25 developing countries that underwent market liberalization between 1980 and 1997 by comparing them with a comparable set of countries that did not pursue such liberalization. The authors find that countries within the liberalized group experienced a significantly higher real wage growth during the post-liberalization period relative to the countries in the non-liberalized control group. They also detect that liberalization induced higher labor productivity growth in countries that opened their stock market.

2.3 Initiatives for introducing stock market in non-exchange countries

Driven by pressure from international institutions like the IMF and World Bank and the need to attract foreign capital for domestic investment and economic growth, establishing stock markets has been a prominent financial reform agenda in numerous developing countries. Consequently, many nations have launched stock exchanges over the last four decades. However, a handful of countries still are without stock markets (see Table A1) due to various economic, political, and infrastructural challenges. This sub-section examines a selection of non-exchange economies, explores their current financial system, and takes stock of institutional initiatives to introduce stock markets within their respective financial landscape.

i. Burundi

Burundi is a low-income country with a population of approximately 12.9 million. With a GDP per capita of only US$262.2 and a negative GDP growth per capita as of 2022[2], it falls to the lower end of the low-income category. The country's financial landscape is dominated by the banking sector, comprising fourteen commercial banks, most of which are either fully or partially privately owned. The non-banking sector primarily consists of a development bank and around 60 Microfinance institutions (IMF, 2022).

Despite continuous efforts to improve the efficiency of the financial system in the post-independence era, such as the financial liberalization experiment of the late 1980s and the adoption of a legal framework to promote and regulate microfinance in 2006, the financial sector remains underdeveloped. Financial instability persists as an ongoing challenge, limiting investment and economic growth. According to the IFC's 2022 report, four banking institutions have faced liquidation in the last 25 years, with an average realization of liabilities at a mere 46.5 percent. Furthermore, ten microfinance institutions have gone bankrupt, and the central bank, Bank of the Republic of Burundi (BRB), has revoked the licenses of five others since 2006 (International Finance Corporation, 2022a).

Burundi currently does not have an operational stock exchange and its capital market is limited to interbank money and treasury securities markets. However, recent years have witnessed concentrated efforts towards developing a stock market, with several key initiatives undertaken. While BRB introduced a secondary market for treasury securities in 2017, the process of establishing a stock market officially commenced in 2019, with the promulgation of the laws governing capital markets. The following year, the law governing the regulatory authority of the capital market was published, paving the way for establishing the Capital Market Regulatory Authority (ARMC) in 2020. The ARMC, tasked with protecting investors and ensuring the proper functioning of the stock market, had its board of directors and general director appointed through Decree No. 100/198 in August 2021 and Decree No. 100/210 in October 2023, respectively. As a significant step forward, in January 2024, BRB and eight other banks launched the Burundi Stock Exchange as a commercial entity registered under the Code of Private Companies and with public participation to manage the operation of the stock market and to facilitate the purchase and sale of securities. Moreover, ARMC officially commenced its activities in February 2024 and has set June 2024 as the target date for the stock market to become operational.

Beyond the domestic financial landscape, establishing a stock market in Burundi holds significance in the context of regional integration objectives. One of the requirements on the regional integration agenda in the East African Community

[2] *World Bank open data*

(EAC)[3] is the establishment of a regional capital market. Article 85 of the treaty for establishing the community, signed in 1999 upon its inception, states that partner states undertake to implement a capital market development program. Hence, as a member state of the EAC since 2007, Burundi's pursuit of a stock market is not only a domestic imperative but also a crucial step towards fulfilling its regional obligations.

ii. Democratic Republic of Congo

The Democratic Republic of Congo (DRC, hereafter) is the largest country in Sub-Saharan Africa, with an area of 2.345 million square kilometers and a home to a population of approximately 99.01 million.[4] Despite being endowed with exceptional natural resources, these resources, coupled with political instability, economic challenges, and social issues have been a source of long-standing conflicts and unrest, impeding economic growth. The World Bank ranks DRC among the five poorest nations globally. In 2022, the country's GDP per capita stood at US$ 528.8 with an annual growth rate of 5.5 percent.3

While the Central Bank of the Congo and the Congolese Government have initiated several reforms to modernize the country's financial system, the sector remains shallow and underdeveloped. Recent reforms include adopting and enacting a microfinance institutions law in 2011, a new foreign exchange regulation in 2014, and a financial leasing law in 2015. Additionally, the insurance sector underwent liberalization in 2018, establishing a new regulatory framework and the Insurance Regulatory and Control Authority. Although banks largely dominate the financial system, the sector is highly concentrated and provides minimal financing to the economy, as evidenced by the low bank credit-to-GDP ratio of about 6.5 percent in 2021 (African Development Fund, 2022). According to the BCC's 2022 annual report, while there are 15 commercial and one savings bank, the non-banking institutions comprise two specialized financial institutions, 23 microfinance institutions, 76 cooperatives, 94 money transfer companies, four electronic money operators, and 61 foreign exchange bureaus.

DRC lacks a stock market, and its capital market is primarily comprised of the government bond market, with participation limited to domestic banks. Thus far, no concrete actions have been undertaken to establish a stock market in the country. Given the near collapse of the country's financial system due to the long period of political and economic instability, the focus over the past decade has been on rebuilding basic financial infrastructure. Moreover, the absence of a strong institutional investor base poses a significant challenge to the potential development of a stock market. However, IFC views the 2015 insurance sector liberalization as a step forward that could lay the foundations for the future

[3] *EAC is a regional economic community comprising eight partner states: Burundi, DRC, Kenya, Rwanda, Somalia, South Sudan, Tanzania, and Uganda.*

[4] *World Bank open data*

development of a capital market (International Finance Corporation, 2022b). In addition, the DRC's recent accession to the EAC in 2022 may soon exert pressure and initiate tangible measures for developing capital markets beyond the existing government bond market and regulatory environment.

iii. Ethiopia

With a population of over 120 million,[5] Ethiopia ranks as the second most populous country in Africa and 12th globally. Despite experiencing strong economic growth over the past two decades, which positioned it among the world's fastest-growing economies, Ethiopia remains one of the poorest nations, with a GDP per capita of US$ 857.3 in 2022.[5] Moreover, global shocks such as the COVID crisis and domestic challenges, including conflicts and drought, have led to a decline in the high growth rates in recent years.

While the Ethiopian financial system is largely dominated by a state-owned commercial bank and development bank (with nearly half of the market share), as of 2024, there are 30 privately owned banks, 36 microfinance institutions, 18 insurance companies, one re-insurance company, ten payment instrument issuer and/or a payment systems operator, and six capital goods finance/lease companies operating in the country (National Bank of Ethiopia, 2024). Nevertheless, the IFC's Country Private Sector Diagnostic report highlights that Ethiopia's financial sector provides limited support to the private sector (International Finance Corporation, 2019).

Since transitioning to a market economy in the early 1990s, Ethiopia's financial sector landscape has undergone multiple gradual reforms, with the recent major reform accompanying the Homegrown Economic Reform Program of 2020. This reform underscores establishing a stock exchange and secondary bond market as one of the measures to enhance the sector's capability to support the economy's transition from public to private-sector-led growth (Federal Democratic Republic of Ethiopia, 2020). To be exact, the concept of a stock market in Ethiopia is not entirely new, as the country had a short-lived experience with the institution between the 1960s and 1970s. Before the nationalization of private property following the establishment of a socialist government in 1974, a rudimentary stock market administered by the National Bank of Ethiopia existed in the country (Legesse, 2012). However, a functional stock market has not operated since its dismantlement after the regime change.

While the Ethiopian government and the National Bank of Ethiopia (NBE) have taken several gradual steps towards re-establishing a stock market over the past two decades, a major development in this process was the ratification of Capital Market Proclamation No. 1248/2021 in July 2021. The proclamation, aimed at developing "the national economy through mobilizing capital, promoting

[5] *World Bank open data*

financial innovation, and sharing investment risks," established the Ethiopian Capital Market Authority (ECMA) under Article 3, an autonomous government regulatory body accountable to the Prime Minster (Federal Democratic Republic of Ethiopia, 2021) (Federal Democratic Republic of Ethiopia, 2021). As stated in the proclamation, the authority's primary objective is to protect investors, ensure fair and efficient securities trading, reduce systemic risks, and promote capital market development for long-term investment.

Following the enactment of the proclamation, the NBE formed the Capital Markets Project Implementation Team (CMPIT) to operationalize it. The team's first task was selecting the ECMA directors and board members. Subsequently, the prime minister appointed the Board of Directors, chaired by the governor of the NBE and the Director General of ECMA in December 2022. Additionally, CMPIT prepared several critical legal frameworks necessary for establishing the Ethiopian Securities Exchange (ESX) and operationalizing capital markets. In May 2022, NBE assigned Ethiopia Investment Holdings and Financial Services Deepening FSD Africa the task of setting up the ESX as a share company through a government-private partnership, per the 2021 Capital Markets Proclamation. In October 2023, they formally founded ESX, and ahead of its operational launch, a fundraising initiative was undertaken in November 2023 by offering 75 percent of its equity to local and foreign private investors, with the remaining 25 percent held by the government through Ethiopia Investment Holdings and four state-owned enterprises. In March 2024, ESX successfully concluded its share sales, securing capital that exceeded its original target by more than two-fold (Ethiopian Securities Exchange, 2024, April 4). Currently, ESX and ECMA are finalizing preparations for the stock market launch, which is set to be inaugurated in late 2024 or early 2025.

iv. Guinea

Located in western Africa, Guinea, home to 14 million[6] people, is another country abundant in natural resources but economically impoverished. Although the regional outbreak of the Ebola pandemic severely impacted several sectors of the economy between 2013 and 2014, driven by a strong mining sector performance, Guinea's economy has experienced rapid growth since 2010. Nonetheless, its GDP per capita, which stood at US$ 994.9 as of 2022[6], positions it among low-income countries.

Considering the Guinean financial sector, while the number of commercial banks has been growing, increasing from 12 in 2012 to 17 in 2022, the sector remains highly concentrated, with three banks accounting for nearly half of the market share. The non-banking sector, which holds only less than six percent of the total sector assets, comprises 12 deposit-taking and four non-deposit-taking

[6] *World Bank open data*

microfinance institutions, 13 insurance companies, and four credit unions and financial cooperatives as of 2022.[7] Despite this range of financial institutions, financial access in Guinea is very weak. According to IFC, due to the high borrowing costs (high lending interest rate, high collateral requirement) and banks favoring short-term lending, less than 10 percent of Guinean firms use financial institutions to finance their investments (International Finance Corporation, 2020). The low credit to the private sector figure also evidences the sector's shallowness, which was 9.2 percent of GDP in 2021.

Despite the need for alternative financial infrastructure, given the underdevelopment of the existing financial institutions, there does not appear to be any active initiatives by the Guinean government or the central bank to establish a stock market in the country at present. However, Guinea is part of the broader regional efforts led by the West African Monetary Institute (WAMI) to create a unified and interconnected capital market ecosystem within the West African region.

Formed in 2001 by the West African Monetary Zone's (WAMZ) member states - The Gambia, Ghana, Guinea, Liberia, Nigeria, and Sierra Leone - WAMI aims to facilitate the creation of a monetary union within these countries. One of the key projects assigned to WAMI by WAMZ is the integration of capital markets across the sub-region. To achieve this, the institution established the West Africa Capital Market Integration Council (WACMIC) in 2013 to manage and implement the integration processes. WACMIC adopted a three-phased approach for capital market integration: Phase 1) facilitating remote access to local markets by foreign dealing members/brokers (from participating states) through local counterparts; Phase 2) enabling direct cross-border access to markets across the participating countries; and Phase 3) achieving a fully integrated West African securities market.

In 2021, supported by funding from the African Development Bank, WACMIC launched Phase 2 of the integration project. In addition to harmonizing and validating capital market rules for seamless integration of existing markets, this phase aims to support the development of capital markets in WAMZ member states that do not have formal exchanges. As such, a key component of Phase 2 is conducting a need assessment study on the state of stock exchanges in the four countries without active stock exchanges, Guinea being one of them (West African Monetary Institute, 2021, May 31). According to WAMI, this assessment study was set to be conducted within nine months (West African Monetary Institute, 2021, November). However, as of the time of writing this dissertation, there are no publicly available updates on its status from either WAMI or WACMI.

[7] *IMF Financial Access Survey database*

v. Liberia

Liberia is a low-income country with a population of 5.3 million[8] that is situated on the West African coast. Two devastating civil wars spanning more than a decade in total and driven by economic deprivation and inequities had severely impacted the Liberian economy for the last decades of the 20th century. Despite grappling with the economic fallout from these conflicts, the post-civil war economy had been recovering at a relatively accelerated pace before being hampered once again by the Ebola crisis in 2014-2015 and, more recently, the COVID-19 pandemic. After these setbacks, the Liberian economy has started to expand again, with real GDP growth reaching 4.8 percent in 2022, corresponding to 2.6 percent in per capita terms.[8]

Liberia's financial sector is small, undiversified, and lacks depth. It is, as is typical of low-income developing countries, bank-dominated. According to the Central Bank of Liberia (CBL), which is responsible for licensing, regulating, and overseeing the financial sector, as of the end of 2023, there were nine commercial banks, accounting for 95.1 percent of the total assets in the financial sector. The small non-banking sector comprises 21 credit-only and two deposit-taking microfinance institutions, one development finance institution, 211 foreign exchange bureaus, 53 money remittance entities, 12 rural community finance institutions, and a growing number of village savings and loan associations (Central Bank of Liberia, 2024). Additionally, 15 insurance companies and five brokerage firms operate in the country.

Over the years, Liberia has implemented important reforms to strengthen its financial infrastructure and improve access. For instance, in 2016, with the support of the World Bank, CBL launched, the Financial Sector Development Implementation Plan, aimed at reforming the financial sector with a focus on promoting access to finance, improving the legal and regulatory environment, and enhancing the national payment system. This was followed by the launch of a four-year (2020-2024) national financial inclusion strategy, to further advance access to formal financial services through digital channels. Despite these efforts, total credit expanded by the financial sector to the economy stood at a mere 12.3 percent of GDP in 2023, indicating limited access to credit and lending activity (Central Bank of Liberia, 2024). Furthermore, the banking sector has struggled with low profitability and high non-performing loans. At the same time, non-bank financial institutions have limited access to capital, which hinders their ability to fill the gap in providing formal financial services.

Currently, the main activity in Liberia's capital market is the issuance of treasury bills, which can only be purchased by banks, and CBL bills, which non-bank participants can purchase, including domestic and foreign investors. Although the

[8] *World Bank open data*

aforementioned financial reforms did not include specific plans for capital market development, the Liberian government has made some efforts to lay some groundwork. In 2016, the country took a significant step towards establishing a stock market by adopting the Securities Market Act and the Central Securities Depository Act to create a comprehensive legal and regulatory framework. The Securities Market Act established the Securities Exchange Commission (SEC) under CBL, which will be responsible for governing the activities of the securities exchange markets. Nevertheless, despite these legislative efforts, the subsequent implementation of these acts appears to have stalled or been incomplete, and SEC members have yet to be appointed.

Moreover, while the initiative for setting up a market seems to have been abandoned by the Liberian government in more recent years, as part of its financial integration efforts, WAMI, at the behest of WAMZ member countries, of which Liberia is a part, supports the development of capital markets. Accordingly, Liberia is one of the countries without a stock market where the aforementioned need assessment study on the state of stock exchanges, under WACMIC's Phase 2 financial integration project, is planned to be conducted.

vi. Madagascar

Madagascar, an island nation surrounded by the Indian Ocean, is a low-income country with a population of 29.6 million.[9] Despite its modest size, Madagascar's economy is among the smallest in the world, with a GDP of approximately US$13.44 billion and a GDP per capita of US$ 453.9. Prior to the COVID-19 pandemic and following the 2009 political crisis, the Malagasy economy was experiencing modest growth, with GDP expanding by 4.8 percent[9] in 2019, the highest rate since 2008. However, the COVID-induced recession, followed by tropical storms and cyclones, led the economy to shrank significantly, highlighting the fragility of Madagascar's economy and its vulnerability to internal and external shocks.

The Malagasy financial system is relatively underdeveloped and shallow. With 12 commercial banks, the banking industry is the largest subsector, accounting for over 93 percent of outstanding deposits and over 94 percent of outstanding loans in 2022. The subsector itself is highly concentrated, with the four largest foreign-owned banks holding about 80 percent of the total assets (International Finance Corporation, 2021). The non-banking sector comprises 13 deposit-taking and two non-deposit-taking microfinance institutions, five insurance companies, and one other deposit-collecting institution.

Over the years, Madagascar has made important progress in improving financial access and inclusion. Between 2012 and 2022, credit offered by commercial banks (which is mostly limited to large companies) as a percentage of GDP grew from

[9] *World Bank open data*

7.6 to 17.3 percent. The lending by microfinance institutions, although contributing a relatively small share in financing the economy, also witnessed a 66 percent growth during the same period, serving as an important source of financing for micro, small, and medium enterprises. Furthermore, digital finance, through mobile money services, has increased at a remarkable rate in recent years. Despite this progress, Madagascar's limited access to financial services and low level of financial inclusion persist, as indicated by its ranking of 132nd out of 190 countries in the World Bank's Doing Business 2020 report in terms of getting credit.

To improve the country's financial sector, the Malagasy Government has implemented various strategies, including adopting and implementing the National Strategy for Financial Inclusion (2018–2022). This strategy focused on increasing financial education and consumer protection, promoting the use of financial services, and strengthening the infrastructure for financial services. Moreover, over the last few years, the Central Bank of Madagascar (BCM) has embarked on a reform program aimed at fostering capital market development, which has been limited to bank placement (interbank trading and open market) and the treasury bill market up to date. In 2022, BCM, in partnership with IFC, initiated a project to develop Madagascar's stock market. The project commenced by forming steering and technical committees comprising managers and specialists from BCM and the Ministry of Economy and Finance (MEF) (Central Bank of Madagascar, 2022). The project was planned to unfold in two phases. The first phase, officially launched in November 2022, involved the development of a national roadmap for the creation of the stock market. To develop this roadmap, BCM and MEF, in collaboration with IFC organized a series of roundtables since the launch, with the last one taking place in June 2023, when the committee presented the roadmap. However, the timeline for the second phase, the implementation phase, has yet to be determined.

Summary

This chapter has attempted to give an account of the existing literature on stock markets and their relationship with economic growth. Theoretical and empirical evidence for the stock market development-economic growth nexus was reviewed, providing a foundation for the subsequent analysis. Given all that has been discussed in the chapter, it is clear that, despite the finance-growth literature historically focusing on the banking sector, there is an expanding interest in the impact of stock market development.

Stock markets emerge in nations driven by diverse economic, financial, and political factors. Economists have used various growth frameworks including neo-classical, OLG, and endogenous growth models, to model their roles in the economy. The main stock markets' roles that have been proposed by these theoretical works are saving mobilization, liquidity provision, risk-sharing,

information acquisition about firms, and corporate governance. However, some economists contend these perceived benefits of stock markets might be overstated or come with significant downsides, particularly in the context of developing economies.

Considering empirical literature, numerous studies have explored the relationship between stock market development and different aspects of economic growth. These investigations span across both developed and developing economies, employing a wide array of econometric techniques. The majority of studies examining the impact on output have taken a macro-level approach, using variables like GDP or GDP per capita, and measuring stock market development in terms of size, liquidity, and trading activity increments. Although many of these studies find positive associations, there are exceptions that have reported negligible, non-monotonic, and even negative relationships. There is not a consensus about the effect of stock market development on investment either. The research on the subject ranges from macroeconomic analysis that assesses the impact on economywide capital formation or investment rate to micro-level investigations that examine how equity financing accessibility affects investment spending within industries or firms. additional studies have explored the implications of market liberalizations, yielding conflicting evidence. Similarly, the limited empirical work focusing on the relationship between stock markets and labor market outcomes like employment and wage growth has yet to establish definitive conclusions. Therefore, our understanding of the effect of stock market development on economic growth remains tentative, given the variations in methodologies, samples, and measures of market development used across studies.

3. RESEARCH DESIGN

3.1 Research Problem

From the discussion in the previous chapter, it is evident that there is ample literature on the relationship between stock markets and economic growth. However, although this research has significantly contributed to our understanding of these dynamics, the discussion has shown that gaps in the literature warrant further exploration.

One of the issues with prior studies is that they often present contradictory results. Although theory illuminates various channels through which stock markets can promote growth, the findings from empirical works have been mixed. Notably, studies on developing economies have yet to conclusively determine whether the impact of stock market development on economic growth is positive, negative, or negligible. Researchers have suggested that the inconsistency in findings may be due to these countries having diverse institutional and structural contexts that moderate the growth effect of stock markets (Ang, 2008). Thus, this calls for more focused examinations that can account for country-specific factors.

Another issue pertains to the research methods that have been employed to examine the stock market-growth relationship. There are two primary approaches to the empirical analysis on the subject: cross-country panel data examinations or single-country time-series studies. However, both approaches are often subject to criticism. The cross-country studies' main limitation is endogeneity issues arising from omitted variables bias and self-selection. While researchers attempt to control for many observable macroeconomic and institutional factors that may influence economic growth while estimating the impact of stock markets, in reality, it is difficult to account for everything. Particularly, accounting for unobserved country-specific factors that drive both stock market development and economic growth is challenging, if not impossible. This can lead to omitted variable bias. Furthermore, as discussed in the previous chapter, the emergence or development of stock markets in economies is anything but random. Governments of countries with better macroeconomic outcomes may deliberately and selectively pursue policies that promote them. Other economic agents like firms and investors may also choose to participate in markets driven by some unobserved factors. This causes a self-selection bias. Time-series analysis of individual countries is also prone to omitted variable problems. In addition, the lack of a clearly defined counterfactual and concern of unreliable extrapolation beyond the scope of the data restrict the generalizability of findings from such studies to other countries.

Existing research has mainly been confined to studying the impact of stock market development on the economic growth process of countries that already have established markets. However, an equally important question is whether the economic growth of the countries without stock markets would have been better

off or worse off had they created one. Moreover, relying solely on research conducted in countries with stock exchanges may yield incomplete insights about the economic advantages or disadvantages of stock markets. Broadening the analysis to incorporate counterfactual evaluations for countries without stock exchanges can offer valuable supplementary perspectives on the effect of stock markets.

In light of these, this dissertation sets out to study the economic implications of stock markets by looking at countries that do not own one yet. It aims to estimate the potential unseized economic benefit these countries could have achieved through stock markets. To my knowledge, this is the first study attempting to quantify the counterfactual economic gain that non-exchange countries would have enjoyed had they had an exchange. In addition, to address the abovementioned methodological issues, this dissertation adopts a comparative case study approach by employing the synthetic control method. The method combines the strength of both cross-country panel data techniques as well as country-specific time series analysis while addressing some of their limitations. The details of this methodological approach are elaborated in the next chapter.

3.2 Research Objectives

The general objective of this thesis is to estimate the unrealized economic benefits of stock markets for countries that currently lack an exchange. To be more specific, it aims to accomplish the following objectives:

i. To assess and compare the economic growth of countries without a stock exchange with a set of selected countries that have stock exchanges in terms of key macroeconomic indicators including output, investment, and employment.
ii. To quantify the unrealized economic gains due to the lack of stock markets across key macroeconomic indicators, i.e., output, investment, and employment for countries without a stock exchange.
iii. To evaluate whether establishing a stock exchange in countries without one would have improved or worsened economic outcomes.

3.3 Methodology

3.3.1 Synthetic Control Methods

Measuring the causal effect of an intervention is an issue of common interest across a diverse range of fields. On a conceptual level, the ideal approach to address this would be through the differences in outcomes of a unit under treatment and in the absence of treatment. In reality, however, the outcome that can be observed is either one of the two: either the unit of interest is treated or not treated. One must find or construct a counterfactual that can validly mimic the unit of interest, to sort this impediment out.

Researchers have been using various statistical techniques ranging from experimental to non-experimental approaches. The most credible method is experimental evaluation, also called randomized controlled trials (RCT), where the intervention is conducted following explicit assignment rules that the evaluator knows and understands. However, most program or intervention assignments are non-random. Fortunately, there are several non-experimental evaluation methods when RCTs are not possible. The most frequently used ones are Difference-in-Difference (DD) and fixed-effect models. While DD estimates the intervention effect by calculating the difference in the before-after change in outcomes between treated and comparison groups, fixed effects models combine DD with multivariate models which allow controlling for time-invariant differences in unobserved covariates that affect the outcome of interest. Nevertheless, these methods are not free of shortcomings. Although the fixed-effect method is an improvement over simple DD with regard to controlling for time-invariant unobservable, it is rather unrealistic to assume that all the unobserved characteristics between the treatment and the control groups are fixed over time.

In this dissertation, to estimate the economic performance that the countries without a stock exchange would have enjoyed if they had one, a transparent data-driven econometric technique called the Synthetic Control Method (SCM) is applied. The method was first introduced by Abadie and Gardeazabal (2003) and extended by Abadie et al. (2010) and Abadie et al. (2015). SCM provides a systematic way of constructing a synthetic control unit or counterfactual that imitates the characteristics of the treated unit in the pre-treatment period. The construction of this synthetic control unit relies on computing a weighted average of the units drawn from the donor pool - a set of potential comparison units that were not subject to the treatment, in which the weight represents the contribution of each comparison unit to the counterfactual of interest. Subsequently, the causal impact of the intervention can be quantified by comparing the difference in the outcome variable between the unit of interest and its synthetic control. The intuition behind this is that a combination of non-treated units provides a better counterfactual than just one non-treated unit alone, making the method more credible than the traditional comparative case study methods. Furthermore, unlike the fixed effects method, the SCM allows for the effect of both the observed and unobserved characteristics to vary over time (Abadie et al., 2010). Since its introduction, the method has gained popularity in empirical studies in different fields e.g. Billmeier and Nannicini (2013) on trade liberalization, Cavallo et al. (2013) on natural disasters, Courtemanche and Zapata (2014) on health policy Biagi et al. (2017) on tourism taxation, Born et al. (2019) on Brexit and many more.

When we apply the aforementioned SCM procedures to this dissertation's primary objective, it boils down to selecting a weighted average of covariates and

the pre-stock-exchange period economic performance of the countries in the control group to create a synthetic counterfactual outcome. This will then be compared against the actual outcome of the countries without stock exchanges, and the difference will be interpreted as the treatment effect.

More formally, let us consider a panel of $J + 1$ countries over the period $t = 1, 2, \cdots, T_0, T_0 + 1, \cdots, T$. Suppose that only the first country remains unchanged while all the other J countries established their stock market at year T_0, given that $1 \leq T_0 < T$, representing the donor pool. Let Y_{jt} denote the outcome of interest for country j at time t. The observed outcome variable can be written as:

$$Y_{1t} = \begin{cases} Y_{1t}^{NM} = Y_{1t}^{M} - \tau_{1t} D_{1t} & \text{without stock markets} \\ Y_{1t}^{NM}, & \text{with stock markets} \end{cases} \tag{3.1}$$

where $D_{1t} = \begin{cases} 1 & \text{if } t > T_0 \\ 0 & \text{otherwise} \end{cases}$, and τ_{1t} is the economic impact that country 1 experienced at a time $t > T_0$ due to its lack of a stock market, i.e., the treatment effect. Conceptually, it can be defined as:

$$\tau_{1t} = Y_{1t}^{NM} - Y_{1t}^{M} \tag{3.2}$$

The statistic of interest is the vector of these dynamic treatment effects $(\tau_{1,T_0+1}, \tau_{1,T_0+2}, \cdots, \tau_{1,T})$. However, estimating these parameters is not as straightforward, as it seems in Equation (3.2). Y_{1t}^{NM} is the observed factual outcome of country 1 under no stock market while Y_{1t}^{M} is its potential outcome under the presence of a stock market. However, Y_{1t}^{M} is not observable since, in reality, country 1 is without a stock market for the whole study period. This is where SCM comes in.

The basic argument of the method is that a combination of units creates a better counterfactual than a single control unit. This involves choosing a set of weights for the control units, accomplished by the SCM algorithm itself. The selection of these weights aims to align the weighted average of control group variables with their counterparts in the treated unit as closely as feasible. Abadie et al. (2010) propose identifying the above treatment effects under the following factor model for potential outcomes:

$$Y_{jt}^{M} = \delta_t + \theta_t Z_j + \lambda_t \mu_j + \varepsilon_{jt} \tag{3.3}$$

In this formulation δ_t is an unknown common factor with constant impact across all countries, Z_j is a vector of relevant observed covariates (which can be time-variant or time-invariant but should not be affected by the absence or the presence of stock exchange in the countries of interest), and θ_t is the related vector of parameters. λ_t denotes unobserved common factors with μ_j representing a vector of country-specific unobservable. And finally, ε_{jt} denotes transitory shocks with zero mean. The crucial aspect here is that, unlike other fixed effects models of

impact evaluation methods, SCM allows the effects λ_t of the unobserved predictors μ_i to vary over time.

Let us define $W = w_2, w_3, \cdots, w_{J+1}$ as $J \times 1$ vector of weights, where $w_j \geq 0$ and $\sum w_j = 1$ for $j = 2, \ldots, J+1$. Each possible choice of W corresponds to a potential synthetic control for the treated countries. The outcome variable for each potential synthetic control unit is given by:

$$\sum_{j=2}^{J+1} w_j Y_{jt} = \delta_t + \theta_t \sum_{j=2}^{J+1} Z_j + \lambda_t \sum_{j=2}^{J+1} \mu_j + \sum_{j=2}^{J+1} w_j \varepsilon_{jt} \tag{3.4}$$

Furthermore, let the $(T_0 \times 1)$ vector $K = (k_1, \cdots, k_{T_0})$ define a generic linear combination of the pre-intervention outcomes as:

$$\bar{Y}_j^k = \sum_{s=1}^{T_0} k_s Y_{js} \tag{3.5}$$

Abadie et al (2010) show that if there exists an optimal W^* such that the weighted value of the pre-intervention outcomes and observed covariates for the control pool equals those of the treated unit or formally:

$$\sum_{j=2}^{J} w_j^* \bar{Y}_j^k = \bar{Y}_1^k \text{ and} \tag{3.6}$$

$$\sum_{j=2}^{J} w_j^* Z_j = Z_1 \tag{3.7}$$

then the unbiased estimator of the treatment effect, τ_{1t}, is given by:

$$\hat{\tau}_{1t} = Y_{1t}^{NM} - \sum_{j=2}^{J+1} w_j Y_{jt} \text{ for } t \in \{T_0 + 1, \cdots, T\} \tag{3.8}$$

The condition of a perfect match on pre-treatment outcomes, as in Equation (3.6), and the assumption of a perfect match on time-invariant observed covariates, as in Equation (3.7), can only hold if and only if $\left(\bar{Y}_j^k, Z_j\right)$ belongs to the "convex hull"[10] of $\left[\left(\bar{Y}_1^k, Z_1\right), \cdots, \left(\bar{Y}_J^k, Z_J\right)\right]$, which is highly unlikely in practice. Hence, the synthetic control W^* is selected so that the above conditions in Equation (3.6) and (3.7) hold approximately. Particularly, it should be chosen

[10] *In a mathematical sense, the convex hull of a set is the set of all convex combinations of the points in the set. Bringing this to SCM, the method assumes that the outcomes and observed covariates of the synthetic control at any pre-intervention period lie within the range of outcomes experienced by the donor countries in the pre-intervention period.*

in a way that minimizes the discrepancy between the pre-intervention outcome of the treated and the potential synthetic control.

To put it formally, suppose X_1 denotes a $K \times 1$ vector containing the pre-intervention covariates and outcomes of country 1, and let X_D is a $K \times J$ matrix containing pre-intervention covariates and outcomes of the countries in the control group. An optimization procedure selects W^* that minimizes the distance between $X_1$and $X_D W$, subject to constraints on the weights. This optimization problem can be expressed as follows:

$$\min_{W} \|X_1 - X_D\|_V \tag{3.9}$$

$$\min_{w} \sqrt{(X_1 - X_D W^*)' V (X_1 - X_D W^*)}$$

$$\text{Subject to:} \quad \sum_{j=2}^{J+1} w_j = 1 \text{ and} \tag{3.10}$$

$$w_j \geq 0 \; for \; j = 2, 3, \cdots, \mathrm{J} + 1$$

The above specification introduces another set of weights V of which $W(V)$ is a function. V is a matrix of non-negative diagonal elements representing the relative importance of the pre-stock market characteristics, i.e., X, in predicting the outcome, Y_{1t}^{M}. The non-negativity and convexity constraints on the weights are to avoid extrapolation and, hence, to ensure the counterfactual outcome values lie within the support of the available data.

Abadie and Gardeazabal (2003) assert that the resulting analysis is valid for any predictor weight. Hence, there are various ways to choose V subject to the constraints. One can select the weights in V based on a subjective assessment of the relative importance of each predictor. An alternative approach is to employ a data-driven procedure and select optimal weights that minimize the outcome's mean squared prediction error (MSPE) in the pre-intervention years, as recommended by Abadie and Gardeazabal (2003) and Abadie et al. (2010). The weights may also be assigned through cross-validation. The aim here, also, is to minimize the outcome's MSPE, but not over the whole pre-intervention period. The procedure starts with dividing the pre-intervention period into training and validation periods. Then, the predictors measured in the training period are used to select the weights in V such that the resulting synthetic control minimizes the root MSPE over the validation period (Abadie et al., 2015). However, ensuring the availability of a substantial length of the pre-intervention period is crucial for the effectiveness of this approach. Additionally, Klößner et al. (2018) show that, in practice, there often exist many different solutions that minimize the out-of-sample error which makes the predictor weights not uniquely defined and the counterfactual ambiguous.

In this thesis, the approach of selecting optimal predictor weights that minimize MSPE during the pre-exchange period, which is also the default method in the *Synth* package is adopted for determining V. This entails selecting V^* to minimize:

$$\underset{v \in V}{\operatorname{argmin}} \left(\sum_{t=1}^{T_0} \left(Y_{1t}^{NM} - \sum_{j=2}^{J+1} w_j(V)\, Y_{jt} \right) \right) \tag{3.11}$$

The resulting V^* is then used to estimate the optimal donor countries' weight, $W^* = W(V^*)$, according to Equation (3.10)

Finally, once these weights are obtained, the treatment effect, i.e., the impact of a stock market absence can easily be calculated as:

$$\hat{\tau}_{1t} = Y_{1t}^{NM} - \hat{Y}_{1t}^{M} = Y_{1t}^{NM} - \sum_{j=2}^{J+1} w_j^* Y_{jt} \qquad \text{for all } t \in \{T_0 + 1, \cdots, T\} \tag{3.12}$$

3.3.2 Assessment of synthetic control's pre-treatment fit

Abadie et al. (2010) emphasize that the synthetic control estimator constructed by the SCM procedure should only be used when it can closely match the treated unit in the pre-treatment period. While it is possible to assess the goodness of the fit with visual inspection of the outcome paths, relying solely on that is not adequate. Therefore, the dissertation uses a quantitative fit metric to validate the pre-treatment fit rigorously. Specifically, the pre-treatment fit index (PFI) proposed by Adhikari and Alm (2016) is applied. The index builds on the root mean square prediction error (RMSPE) measure which is suggested by Abadie et al. (2010) and scales it by a 'perfect fit', taken as benchmark RMSPE, to drive a normalized measure. This enables comparison of pre-treatment between different outcome variables and across different countries. It is calculated as:

$$\text{Fit index} = \frac{\text{RMSPE}}{\text{Benchmark RMSPE}} \tag{3.13}$$

where RMSPE and benchmark RMSPE are given by:

$$\text{RMSPE} = \sqrt{\frac{1}{T_0} \sum_{t=1}^{T_0} \left(Y_{1t}(0) - \sum_{j=2}^{J+1} w_j\, Y_{jt} \right)^2} \tag{3.14}$$

$$\text{Benchmark RMSPE} = \sqrt{\frac{1}{T_0}\sum_{t=1}^{T_0}\left(Y_{1t}(0)\right)^2} \tag{3.15}$$

The lower the value of the index is the better the pre-treatment fit is. Large values, on the other hand, indicate poor (Adhikari and Alm, 2016).

3.3.3 Inference procedure and robustness tests

One of the limitations of SCM is that applying the standard (large sample) inferential techniques to assess the significance of its results is not possible. This is because identification of the treatment effect arises from interventions that affect a small group of units that are not selected based on probabilistic sampling procedures. Besides, the number of units in the comparison group is usually small, as in the current study. To solve this problem and evaluate the significance of the treatment effects, Abadie and Gardeazabal (2003) suggested a placebo analysis.

The placebo analysis is a falsification taste that involves iteratively applying the SCM to the units in the control group and estimating the 'placebo effects.' Then these pseudo-effects are compared to the true treatment effect to determine if the latter is extreme. The underlying idea behind the test is that if the observed difference between the treated unit and its synthetic control is just a mere prediction error, such difference should be observed for any unit regardless of it not being exposed to the intervention.

In the case of the current thesis, each potential control country in the donor pool is subjected to the SCM estimation as if it had not already established its stock exchange at the time it did, while the other countries in the pool and the treated country serve as placebo control countries. The estimated placebo effects are then compared to the actual effects for the countries without an exchange. If the placebos exhibit large treatment effects relative to the estimated effect on the non-exchange countries, this will imply that there is no statistically significant evidence of lost effect from lacking stock markets in the countries without an exchange.

Moreover, to ascertain the robustness of the estimates the study obtains after implementing the SCM procedures discussed above, the dissertation re-run the analysis using an alternative approach for the construction of the counterfactuals. Specifically, it applies a recent variant of the SCM called synthetic control with lasso regularization (SCUL) developed by Hollingsworth and Wing (2020) as a robustness test. The main distinction between SCM and SCUL lies in the optimization problem outlined in Equation 3.9. In the SCUL, the weights are the solution of the following minimization problem:

$$\widehat{W}^{*} = arg\min_{W}\left(\sum_{t=1}^{T_0}\left(Y_{1t}^{NM} - \sum_{j=2}^{\mathrm{J}+1} w_j Y_{jt}\right)^2 + \lambda \sum_{j=2}^{J+1}\left|w_j\right|\right) \qquad (3.16)$$

The first difference is the relaxation of the constraints that require the weights to be nonnegative and sum up to one. If there is a control unit with trends that mirror the treated unit, SCUL places a negative weight on it while SCM likely places zero weight on it. The constraints are imposed in the standard SCM to prevent extrapolation so that all the inferences are conducted within the range of observed data. SCUL, on the other hand, reduces extrapolation by introducing a lasso regularization in the optimization problem. This brings us to the second difference; the last component in Equation 3.16, i.e., $\lambda \sum_{j=2}^{J_c+1}\left|w_j\right|$. It represents a lasso penalty that increases with w_j to enforce sparsity in the wights. λ is the penalty parameter that imposes a shrinkage effect on the control units' weights that are too different from the treated unit. Hence, by driving these weights to zero, it tries to ensure that the optimal weights are sparse, and overfitting does not occur.

3.3.4 Selection of treated and donor countries

In a typical impact evaluation study, 'treatment' refers to exposure to an intervention, with treated units being those exposed and control units being unexposed. In this dissertation, however, the intervention of interest is the formation of a stock exchange in a country. Unlike the usual impact evaluations, what is being evaluated here is the impact of the absence of the intervention. Therefore, 'treatment' is defined as the absence of a stock exchange in a country. Treated countries in this case are countries that lack an exchange and control countries are those that established one during the treatment year.

To identify countries that have stock exchanges and those that do not, multiple sources were consulted. The initial list of countries without stock exchange was based on the lists compiled by Shalifay (2014) and Schiereck et al. (2018). After further examination, countries that created exchanges in recent years were removed from the list. According to Albuquerque de Sousa et al. (2016), as of 2016, there were 49 countries without a stock exchange. Although some of them have established exchanges since then, a significant number of countries still do not have one. Of these, some became sovereign states not long ago or still have limited recognition, making data on the outcome variables unavailable until a later date (e.g., Eritrea, Kosovo, South Sudan, Somaliland, etc.). There are also other countries in the list where data availability on macroeconomic indicators is limited due to political reasons (e.g., Cuba and the Democratic People's Republic of Korea) or instability (e.g., Afghanistan). Thus, given the chosen method of analysis, SCM requires having enough data span for the outcome variables both before and after the establishment of a stock exchange in the control countries,

these countries had to be excluded. Additionally, relative to small and aging demography, large growing populations are more likely to demand a greater range

Table 3.1 List of selected countries without stock exchanges

Country	Region	Income group
Burundi	Sub-Saharan Africa	Low income
DRC	Sub-Saharan Africa	Low income
Ethiopia	Sub-Saharan Africa	Low income
Guinea	Sub-Saharan Africa	Lower middle income
Liberia	Sub-Saharan Africa	Low income
Madagascar	Sub-Saharan Africa	Low income

Source: Author's compilation.

of more complex financial services including stock exchanges. Therefore, the analysis focuses on non-exchange countries with a population size of over 5 million according to World Population Prospects 2019[11]. This resulted in the exclusion of smaller countries like Comoros, Oceanian countries, Liechtenstein, etc. After these exclusions, six treated countries remained for the study (see Table 3.1). These countries are referred to as 'non-exchange countries' or 'treated countries', interchangeably, throughout the text.

To ensure the selection of a comparable control group that can provide a credible counterfactual scenario (i.e., how the outcome variables would have evolved in the treated countries had they had stock exchanges), a series of criteria, as per Abadie et al. (2015) recommendation, are followed in restricting potential donor countries. First, the countries must have established their stock exchanges in the year chosen as a treatment year or at most one year prior or later. Second, countries with any missing data points for all the outcome variables during the analysis period are dropped from the donor pool. Furthermore, countries that experienced large idiosyncratic shocks impacting the outcomes of interest within the analyzed years are also eliminated.

Taking these restrictions into account, 1994 is selected as the treatment year. The reason is that a relatively large number of countries established stock exchanges during this year or within a one-year window, allowing for a robust pool of potential donor countries. The information on exchange opening years came from Weber et al. (2009). According to their study, fourteen countries[12]

[11] *United Nations, Department of Economic and Social Affairs, Population Division (2019). World Population Prospects 2019, Online Edition. Rev. 1*

[12] *Armenia, Latvia, Bhutan, Cyprus, Botswana, Uzbekistan, Nepal, Kyrgyz Republic, Malawi, Moldova, Zambia, Macedonia, Romania, and Estonia.*

Table 3.2 Countries in the donor pool

Country	Stock exchange	Opening year
Bhutan	Royal Securities Exchange of Bhutan	1993
Botswana	Botswana Stock Exchange	1994
Cyprus	Cyprus Stock Exchange	1993
Malawi	Malawi Stock Exchange	1995
Nepal	Nepal Stock Exchange	1994
Romania	Bucharest Stock Exchange	1995
Zambia	Lusaka Stock Exchange	1995

Source: Author's compilation based on data from Weber et al. (2009).

opened exchanges between 1993 and 1995. More than half of these countries were part of the former Soviet Union (USSR). They were not incorporated into the Penn World Table dataset, the primary data source, until 1990 or early 1990s once they became independent states. The only exception is Romania, which has a longer time series despite Soviet membership. Seven countries remained to form the donor pool after removing those with insufficient data length (see Table 3.2). The thesis refers to these countries as either 'control countries' or 'donor countries.'

3.3.5 Data

As Abadie (2021) discussed, SCM has some key data requirements that should be considered during its application. Firstly, data on the outcome and predictor variables before and after the intervention must be available for both treated and control units. Particularly the outcome variable data must be balanced and non-missing for all units throughout the entire study period. Data on the predictors must be available at least one pre-intervention time point. Secondly, the method requires having sufficient pre-intervention data. While there is no formal guideline in SCM literature specifying the optimal length, the credibility of a counterfactual unit created by SCM depends on its ability to track the outcome trend of the treated unit for a longer pre-intervention period. In fact, Abadie et al. (2010) show that the bias of the estimator decreases and converges to zero as the number of pre-treatment periods increases. Lastly, SCM demands the availability of post-treatment outcome data for a sufficiently long period to capture the treatment effect of the intervention.

To estimate the forgone benefit of stock markets in the selected countries without exchanges while adhering to these data requirements, a cross-country panel dataset encompassing annual data on 14 countries with and without stock

exchanges was created. The dataset covers a study period between 1970 and 2019. With the selected treatment year set at 1994, this yields 24 years before the introduction of stock exchanges in the control countries and 25 years following their establishment. This extended time horizon enables a thorough assessment of whether the synthetic control countries' outcome trajectories follow those of the countries without stock exchanges and to capture stock market impacts that go beyond the short-term. The dataset is constructed by combining multiple data sources. The primary data source is Penn World Table (PWT) version 10.01. PWT is deliberately selected as it has a longer time data coverage, offering annual data without gaps for the outcome of interest of the study. This data is supplemented by the World Development Indicators (WDI), the IMF's Financial Development Index database, and Varieties of Democracy (V-Dem) data.

3.3.6 Outcome variables and predictors

This dissertation aims to estimate the economic cost of the absence of stock markets in non-exchange countries. As discussed in the literature review chapter, previous theoretical and empirical studies have highlighted the multifaceted impact stock markets have on nations' economic development process. Thus, assessing this multidimensional impact comprehensively and accurately requires analyzing multiple macroeconomic indicators that can capture various aspects of economic growth.

The dissertation uses three key macroeconomic indicators to evaluate the economic performance of the selected countries without stock exchanges and estimate their hypothetical trajectories had they established an exchange.

i. *Output*: A country's capacity to produce a high volume of goods and services for its population is one of the main indicators of economic growth. This ability is often assessed through GDP, a comprehensive measure of the total quantity of production in an economy. There are three approaches by which GDP can be calculated: the production or output approach, the expenditure approach, or the income approach. The current study utilizes real GDP that is estimated using the output approach, GDP^{o}, as the first outcome variable. GDP^{o} gauges the total value added created in the process of generating all goods and services to measure an economy's production capacity.
ii. *Investment*: Another important indicator is the level of investment in an economy. Investment refers to the production and acquisition of produced assets with the intention of using them in the production process of other goods and services. It is a crucial element of countries' sustainable development. This dissertation measures investment in terms of gross capital formation (GCF) constructed from PWT's capital stock data through the perpetual inventory method. GCF represents the value of new capital infused into the economy and is calculated as capital stock changes plus depreciation.

iii. *Employment*: The ability of an economy to create enough jobs for its population is another metric of economic performance. OECD (2023) defines employment rate as the measure of the degree to which an economy utilizes its labor resources. PWT provides data on the number of individuals engaged in economic activities in each country. Based on this and working age population (those aged between 15 to 64 years) data from WDI, the current study calculates the employment rate as the ratio of employment to the labor force.

Selecting covariates to estimate the weights is a vital step in applying the SCM (Botosaru and Ferman, 2019, Gilchrist et al., 2022). However, SCM literature provides conflicting recommendations on what should be included as part of the predictors. On one hand, some researchers, including Abadie et al. (2015), use the average of the pre-treatment observations of the outcome variable along with additional observed covariates that are hypothesized to have predictive power for the outcome of interest. On the other hand, others like Billmeier and Nannicini (2013) solely use the entire pre-treatment values of the outcome variable as predictors. Ferman et al. (2020) also recommend using all the lagged outcome values as predictors alone instead of including other covariates, unless the researcher strongly believes that they are critical. However, Kaul et al. (2015) theoretically and empirically demonstrate that using all lagged outcome values may render all other covariates irrelevant and, hence should be avoided. Instead, they advocate for using either a limited number or an average of all lagged outcome values along with relevant covariates.

In virtue of Kaul et al. (2015) argument, this dissertation includes additional covariates as predictors when estimating the synthetic countries. Instead of using the average of all the pre-treatment outcomes, the study only includes a restricted number of lagged outcomes. The advantage of using few lags rather than the mean of all lags is that the former better captures fluctuations in the value of the pre-treatment outcomes.

The selection of covariates is based on endogenous growth theory, which emphasizes the role of internal factors including technological progress, human capital accumulation, and institutional development as an important determinant of economic growth (Aghion and Howitt, 1998). However, data on variables that capture technological progress (such as Total Factor Productivity (TFP) or R&D) and human capital accumulation (such as human capital index or education attainment) are not available for some control countries in the donor pool. Hence, considering the data requirements of SCM, these factors cannot be used as predictors. Instead, the study includes essential indicators of institutional development: inflation, financial institutions, and political systems. Inflation is measured by the GDP deflator, while financial institution development is captured by the IMF's relative ranking of countries' financial institutions' depth, access,

and efficiency. A composite index from V-dem capturing the level of electoral, liberal, participatory, deliberative, and egalitarian democracy, is used as an indicator for countries' political systems. Furthermore, population growth is also included as a covariate since it can influence technological progress, human capital accumulation, and institutional development.

In addition to their relevance in predicting the outcomes of interest, the selection is also guided by how well the covariates help the synthetic control to imitate the pre-intervention outcome paths of the non-exchange countries. Although other variables, like trade openness and exchange rates, were considered, they produced poorly fitted synthetic controls, and are therefore not included in the final set of covariates used as predictors. However, the results of the exercises involving these additional variables are included in the appendices for completeness and transparency.

The list of all the variables used in the dissertation and their data source is provided in Table 3.3.

Table 3.3 Variables used in the study and their data source

Variable	Definition/calculation	Source
Outcome variables		
Output	Output-side real GDP at chained PPPs	PWT 10.01
Investment	Gross capital formation: $$GCF_{it} = cn_{it} - cn_{it-1}(1 - delta_{t-1})$$ where cn_{it} is capital stock at current PPPs and $delta_{it}$ is its average depreciation rate at year t in country i.	PWT 10.01
Employment rate	$Emprt_{it} = \frac{emp_{it}}{lf_{it}} * 100$, where emp_{it} is the number of persons engaged and lf_{it} is the population size aged between 15-64 in country i at year t.	PWT 10.01 and WDI
Covariates		
Inflation	$inf = \frac{(gdpdef_{it} - gdpdefi_{t-1})}{gdpdef_{it-1}} * 100$, where $gdpdef_{it}$ is a GDP deflator calculated as the ratio of expenditure-side GDP at current PPPs ($cgdpe_{it}$) to chained PPPs ($rgdpe_{it}$).	PWT 10.01

Population growth	$popg_{it} = \frac{pop_{it} - pop_{it-1}}{pop_{it-1}}$, where pop_{it} is the population size of country i at year t.	PWT 10.01
Financial institutions	Financial Institution Development Index	Financial Development Index, IMF
Democracy	Composite index constructed by combining 5-high level V-Dem democracy indices: electoral democracy index, liberal democracy index, participatory democracy index, deliberative democracy index, and egalitarian democracy index.	V-Dem

Source: Author's compilation.

4. EMPIRICAL RESULTS

This chapter presents and discusses the results of the empirical analysis on the forgone benefit of stock markets for countries without a stock exchange. The chapter starts by providing a simple descriptive comparison of economic performance trends between the treated countries (those without a stock exchange) and control countries (those with stock exchanges). Following that, the results of the SCM experiments are presented. For the sake of clarity, the SCM results are presented in three parts separately. In the first section, the counterfactual economic output levels that would have been realized in the treated countries had they had stock exchanges are estimated. The potential gains in terms of investment are estimated and discussed in the second section. The third section gives the results for employment. To draw causal inferences and check the robustness of the results, each subsection includes in-space placebo tests for each country on the respective outcomes of interest. Finally, as a further robustness check, the stock markets' forgone benefits are estimated using the supplementary SCUL approach.

Table 4.1 presents the average values of the macroeconomic indicators for treatment and control countries before and after 1994, the treatment year when controls established stock exchanges. Between 1970 and 1993, the average GDP was 25.16 percent lower in non-exchange countries relative to control countries prior to their stock market establishment. After introducing stock exchanges in the control economies in 1994, this GDP gap grew by 48.25 percent. This divergence is even more pronounced in the case of capital formation. The difference between the non-exchange countries' average GCF and the pre-exchange control countries' average GCF during 1970 – 1993 was about 61.75 percent. However, after 1994, it widened to 65.98 percent. Interestingly, non-exchange countries had higher average employment pre-1994 compared to control countries before their stock markets. This employment gap only narrowed slightly from 1995 – 2019 after the control countries had implemented exchanges.

While these figures provide some insights into the economic performance differences between countries with and without stock exchanges before and after the establishment of exchanges in the former, drawing conclusions about the economic cost of lacking stock markets based on them alone would be misleading. First, such a simple comparison does not have a well-defined counterfactual for what would have happened if the non-exchange countries had introduced exchanges in their economies. It assumes the control countries' performance accurately represents the counterfactual scenario. However, this is less likely to be true as the countries with and without stock exchanges probably differ most in observable and unobservable characteristics. Furthermore, it is difficult to determine whether the performance differences are derived from the introduction of exchanges in the control countries or by the economic, political, or other factors

that drove the introduction in the first place. Therefore, these shortcomings suggest that the unweighted average of the countries in the donor pool may not provide a suitable comparison group for the treated countries.

Table 4.1 Pre-and post-treatment gap between treated and control countries

Period	Countries	Outcome Variables		
		GDP (In mil.)	GCF (In mil.)	Employment rate (%)
Pre-treatment (1970 – 1993)	Treated	20,729.89	2,484.37	77.01
	Control	27,697.2	6,495.04	64.23
	Difference* (%)	-25.16%	-61.75%	19.90%
Post-treatment (1995 – 2019)	Treated	35,264.09	8,215.59	73.91
	Control	68,145.92	24,151.57	62.47
	Difference* (%)	-48.25%	-65.98%	18.31%

Note*: The difference is calculated by subtracting the average of the treated countries (those without stock exchanges) from that of the control countries (those with stock exchanges). A negative percentage indicates that the treated countries' mean value was below the control group's.*

Source: Author's calculation based on data from PWT 10.01.

To provide a more reliable assessment this study estimates the economic impact of stock market absence using SCM, which addresses the above limitations. The results from the analysis are presented in the subsequent subsections.

4.1 Economic output

Before discussing SCM estimates of the treatment effects in terms of the forgone economic output due to the absence of stock markets, examining the donor elements used to construct the treated countries' synthetic controls is prudent. As previously stated, the synthetic countries get constructed as the weighted combination of control countries with stock exchanges in the donor pool. The optimal weights are calculated in a way that the distance between the synthetic controls and the treated countries' GDP trajectories is minimized over the pre-treatment period. Simply put, they are the solutions to the optimization problem presented in Equation (3.9).

Table 4.2 lays out the weights assigned to each country in the donor pool in creating the synthetic controls of the treated countries. Aside from Botswana, SCM places non-zero weights on the other control countries in the composition of more than one synthetic counterfactual. Romania and Zambia account for substantial non-zero weights in most treated countries (five out of six). Malawi

also contributed to the construction of four countries. The most minor contributor is Cyprus. This could be partially because its income level over the pre-treatment period is different from that of the non-exchange countries. Around 67 percent of the synthetic controls use more than half of the donor countries with non-zero weights for their construction. Only two synthetic controls, namely synthetic DRC and synthetic Liberia rely on less than half of the potential control countries in the donor pool. Overall, the variation in utilization and weighting of the donor countries shows how SCM selectively draws on relevant available data to create suitable comparisons for each treated country.

Table 4.2 Donor weights - GDP synthetic controls

Control countries	**Treated countries**					
	Burundi	**DRC**	**Ethiopia**	**Guinea**	**Liberia**	**Madagascar**
Bhutan	0.703	0	0	0	0.748	0.068
Botswana	0	0	0	0	0	0
Cyprus	0.044	0	0.101	0	0	0
Malawi	0.246	0.61	0	0.394	0	0.516
Nepal	0	0	0.404	0.405	0	0.065
Romania	0.007	0.297	0.112	0.05	0	0.035
Zambia	0	0.092	0.382	0.151	0.252	0.316
PFI	0.06	0.28	0.10	0.11	0.35	0.11

Source: Generated by the author using the *synth* command in Stata 17.

The estimated country weights are then used to compute the synthetic controls GDP paths. Fig. 4.1 plots the evolution of GDP in the six treated countries and their synthetic controls over the entire study period. The solid lines represent the observed trends in the countries without exchanges, while the dashed lines show their synthetic counterparts. The vertical dotted lines mark the year stock exchanges were established in the control countries.

Ideally, in SCM, the real observed and synthetically constructed paths should closely follow each other until the treatment year, so that post-treatment divergence can represent the intervention effects. A visual inspection of the graphs in Fig. 4.1 shows that the GDP trajectories largely meet this goal. The treated countries and their corresponding synthetic controls follow similar GDP trends during the pre-treatment period. The exceptions are synthetic Liberia and synthetic DRC which show considerable deviations from the real trends during the pre-treatment years. However, notably, the graph illustrates a better alignment between the synthetic and real DRC approaching the treatment year.

To quantitively evaluate the quality of the matches further, the pre-exchange goodness of fit is assessed using PFI. These are computed according to the equation outlined in Equation (3.12). According to the threshold proposed by Adhikari et al. (2018), while a value closer than zero represents a great fit, an index lower than 1 shows a satisfactory fit. The results, which are provided in the last row of Table 4.2 show that all the pre-treatment fit indices are below 1, indicating that the synthetic controls satisfactorily imitate the evolution of GDP in countries without stock exchanges. presents the pre-treatment fit index to assess whether the synthetic controls constructed through SCM provide good counterfactuals or not.

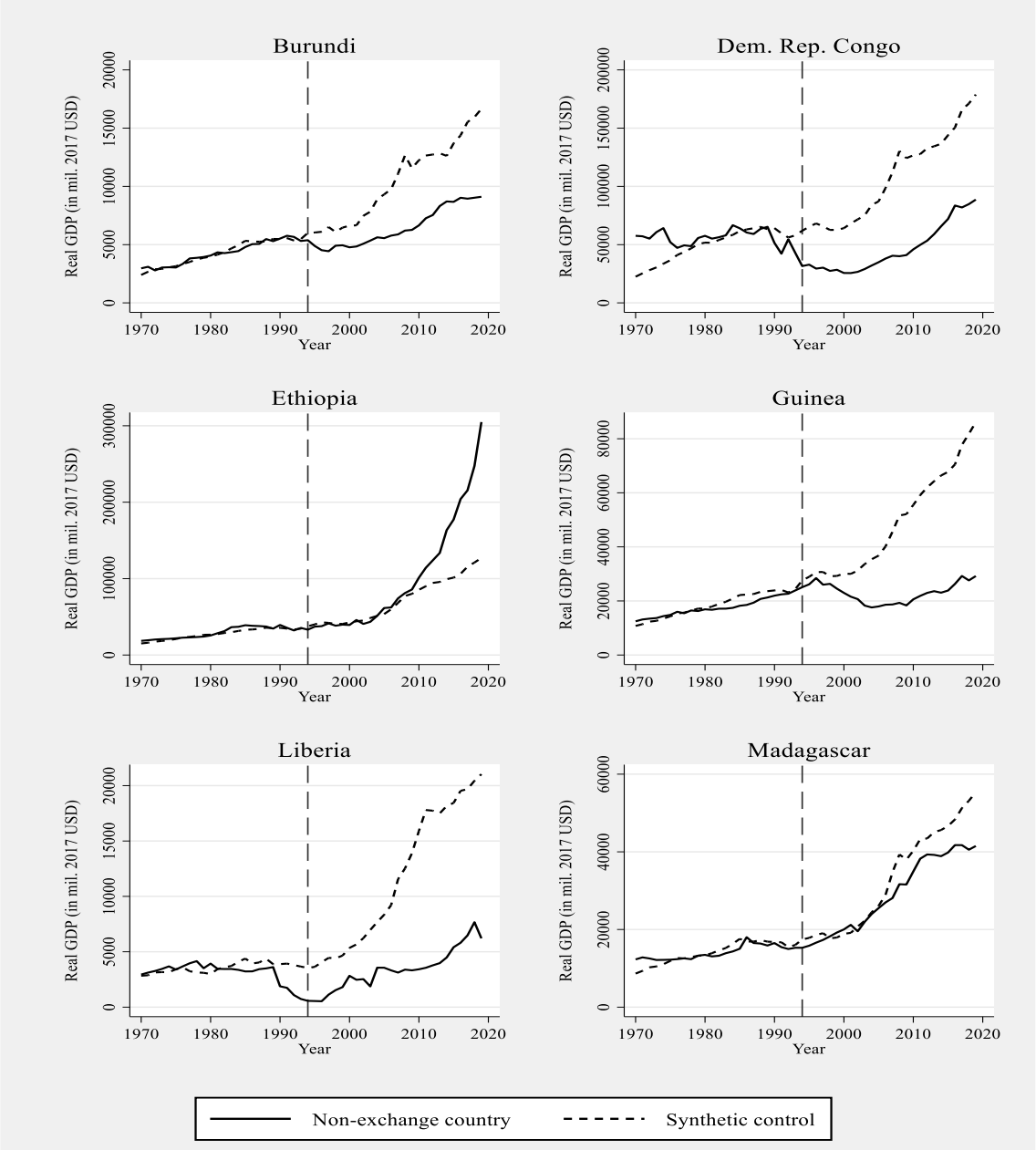

Fig. 4.1: GDP trends: Non-exchange countries vs. synthetic controls

Source: Generated by the author using the *synth* command in Stata 17.

Moreover, the figure shows the synthetic controls with stock exchanges outperform the non-exchange countries in five out of six cases in the post-treatment years, indicating that lacking a stock exchange carries certain inaction costs in terms of economic output. However, the opposite is observed in Ethiopia. While the two lines appear almost to overlap until the middle of the post-treatment period, the real Ethiopia path experiences a dramatic surge in GDP after 2010 relative to the synthetic control.

To show the forgone benefit in terms of economic output more clearly, Table 4.3 reports the average GDP over the post-treatment period for the countries without stock exchange and their synthetic counterparts. It also calculates the ATTs as percentage differences between the treated countries and their corresponding synthetic controls. The results indicate that almost all the treated countries have had average GDPs that are lower than their synthetic equivalents in the post-treatment period. Between 1995 and 2019, on average GDP between 12 and 70 percent was lost due to the absence of stock exchanges in their economies. Liberia stands out as a country that has lost a large GDP augmentation with a 70.71 percent difference. On the contrary, the table shows that Ethiopia has benefited from the absence of an exchange within its economy. It has experienced 41.5 higher GDP than it would have been had the country established a stock exchange in 1994.

Table 4.3 Effect of stock markets' absence on economic output

Countries without exchanges	Actual GDP	Synthetic Control GDP	ATT
Burundi	6,492.54	10,495.13	-38.14%
DRC	46,679.63	108,348.7	-56.92%
Ethiopia	102,648.3	72,544.63	41.50%
Guinea	22,956.52	49,068.67	-53.22%
Liberia	3,454.59	11,796.22	-70.71%
Madagascar	29,352.94	33,448.96	-12.25%

Source: Generated by the author using the *synth* command in Stata 17.

Placebo tests

In order to ensure the reliability of the result presented above, following Abadie et al. (2010), a series of placebo tests are performed. This is carried out by estimating pseudo-treatment effects on the control countries and comparing them with the real treatment effects on the treated countries. To avoid comparing the real treatment effects with pseudo effects estimated based on poorly matched placebos, the placebo countries whose PFI are five times greater than that of the treated country under consideration are dropped from the analyses.

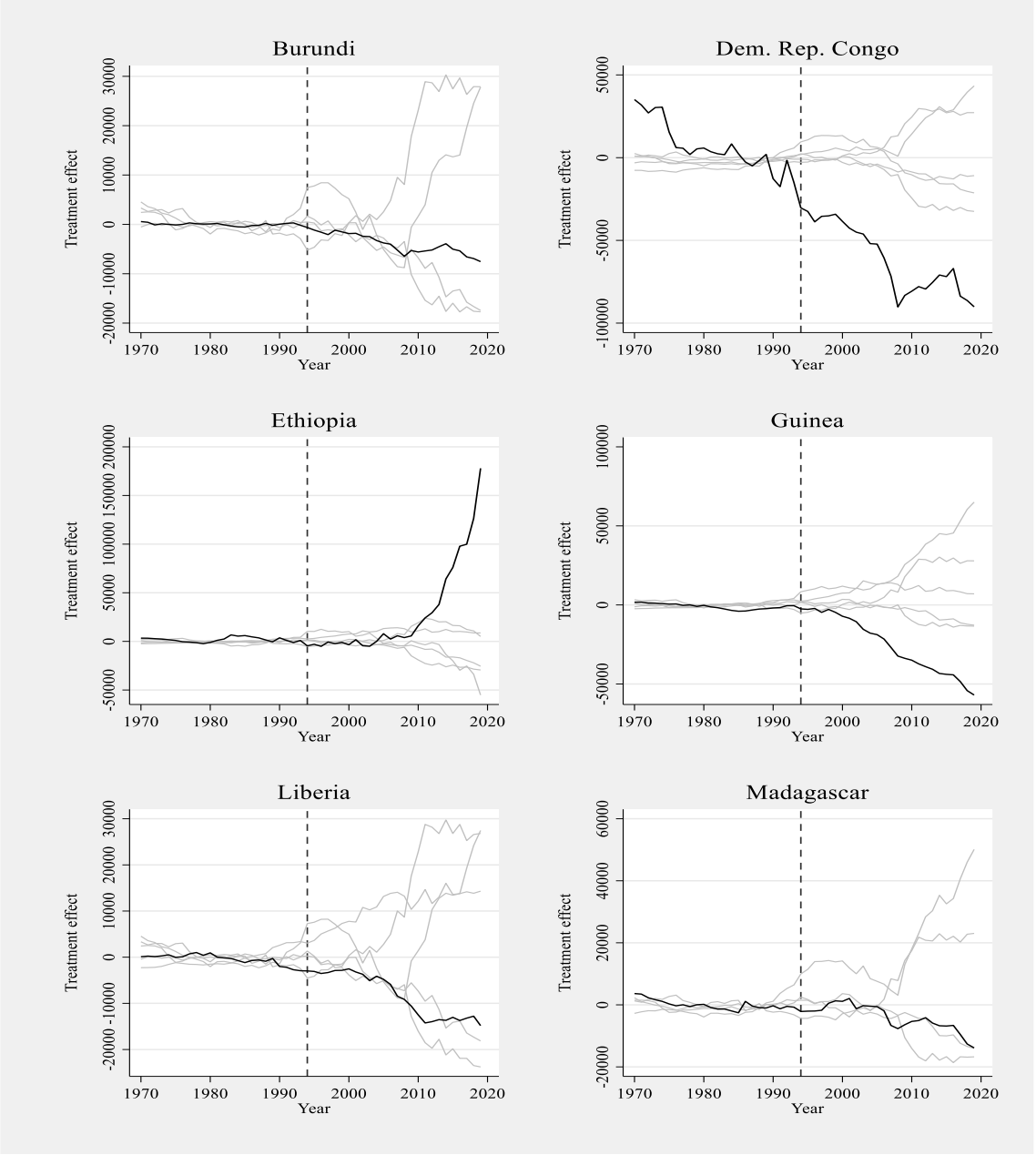

Fig. 4.2: Placebo distribution – GDP as the outcome variable

Source: Generated by the author using the *synth* command in Stata 17.

Fig. 4.2 displays the results from the placebo experiments[13]. The solid black line shows the gap in GDP between the non-exchange countries and their synthetic controls. The light gray lines represent the gaps for the control countries. The statistical significance of the SCM results discussed above can be tested by examining whether the black lines showing the estimated effects for the treated countries lie below all the gray placebo effect lines (if the estimated effect is negative) or above all the gray lines (if the estimated effect is positive).

[13] *Despite Romani being within the pre-treatment fit index cutoff in two cases, Dem. Rep. Congo and Liberia, it has an extremely positive placebo effect, and therefore, it is excluded from the graphs to avoid skewing the scale and obscuring the comparison with other control countries.*

Largely, the results of the placebo tests corroborate the main findings. In particular, the post-treatment period treatment effect paths of DRC and Guinea are prominently below that of the control countries, validating their significant negative impacts from lacking a stock exchange. Ethiopia's seemingly positive benefit from missing an exchange also holds against the placebo comparisons. Among the four control countries retained within the PFI cutoff, Madagascar has the second lowest treatment effect. Similarly, Liberia ranks the second lowest out of five potential control countries included. However, Burundi's estimated treatment effect lies well within the placebo distribution, ranking only third lowest compared to the four controls remaining in the experiment. This casts doubt on the robustness of the negative impact of the absence of a stock market in Burundi, as presented in Fig. 4.1 and Table 4.3. Nonetheless, it is worth mentioning that with few control countries in the experiments, even without the PFI cutoff, it is difficult to draw strong conclusions about the statistical significance of the estimated impacts of lacking stock markets in general. Therefore, these results must be treated with caution.

4.2 Investment

Next, the dissertation examines the impact of the stock markets' absence on the investment level of the non-exchange countries. This is done by repeating the analyses in the previous section using the annual gross capital formation (GCF) as an outcome variable. While the predictors used for the SCM applications are the same as the analyses for the economic output, due to missing data on the outcome variable for one of the control countries, the study period starts in 1971. Therefore, the analyses have 23 pre-treatment and 26 post-treatment years for each case study.

Table 4.4 displays the optimal weights of the individual control countries in the construction of the treated countries' synthetic comparisons. The SCM places non-zero weights on most of the control countries, depending on the treated country. Only Nepal's observations are not used in any of the synthetic controls. Bhutan and Malawi, for instance, contribute substantially to the construction of five out of six synthetics, with their weights ranging from 0.2 – 0.78 and 0.18 – 0.76 respectively. Romania and Cyprus, on the other hand, have non-zero weights only for one synthetic control each, likely indicating their difference in investment trend from the treated countries. Most of the synthetic controls are made up of about 29 percent of the donor pool, i.e., synthetic Burundi, synthetic DRC, and synthetic Liberia. Synthetic Guinea and synthetic Madagascar use around 43 percent of the pool. Whereas synthetic Ethiopia is generated as a weighted combination of about 71 percent of the donor countries considered. The wide range of control countries contributing to the synthetic controls provides reassurance that the estimated effects do not stem from utilizing a small subset of the donor pool variations.

Table 4.4 Donor weights - GCF synthetic controls

Control countries	Treated countries					
	Burundi	**DRC**	**Ethiopia**	**Guinea**	**Liberia**	**Madagascar**
Bhutan	0.784	0	0.203	0.406	0.777	0.434
Botswana	0	0	0.391	0	0	0.36
Cyprus	0	0	0.163	0	0	0
Malawi	0.216	0.762	0.185	0.564	0.223	0
Nepal	0	0	0	0	0	0
Romania	0	0.238	0	0	0	0
Zambia	0	0	0.058	0.031	0	0.206
PFI	0.46	0.37	0.18	0.29	0.86	0.27

Source: Generated by the author using the *synth* command in Stata 17.

Fig. 4.3 plots the evolution of GCF in the countries without stock exchange compared to their synthetic counterparts. As before, the actual GCF trend in the treated countries between 1971 to 2019 is shown with solid lines. The dashed lines composed of a weighted set of donor countries are their synthetic controls and reflect the scenario of having stock exchanges. In most cases, the treated countries' pre-treatment capital formation patterns are well-replicated by their respective synthetic controls. Except for Liberia, the synthetic controls' GCF levels over the pre-treatment period were generally close to those of the treated countries. This suggests that the synthetic trajectories in the post-treatment period provide a reasonable approximation to the trajectories that would have occurred if the non-exchange countries had exchanges in 1994.

Moreover, the PFIs provided in the last row of Table 4.3, largely confirm the visual assessment from Fig. 4.3. All six cases meet pre-treatment fit criteria, although the fit is weaker for some countries' synthetic controls than others. Ethiopia's synthetic control at 0.18 achieves the best pre-treatment fit relative to the other five countries. However, Liberia's synthetic control, with 0.86, has a substantially higher PFI than the other countries' corresponding indices, which casts doubt on the significance of its estimated treatment effect.

Regarding the post-treatment period, Fig. 4.3 shows that the results diverge from country to country and depend on the post-treatment year considered. In the case of Burundi, it is clear that the country's actual capital formation falls below the synthetic trajectory in every post-treatment year. This indicates that missing a stock market has negatively affected Burundi's investment. As with GDP, Ethiopia's GCF trajectory unequivocally outperforms its synthetic counterpart

right after the treatment year. However, the ATT direction for the rest of the treated countries cannot be generalized from examining the graphs. Taking the case of DRC for example, while the solid line showing the actual GCF level stays below the synthetically constructed trajectory from 1994 to 2012, the former exceeds the latter between 2013 and 2016. Similar oscillation can be seen in the Guinea, Liberia, and Madagascar graphs.

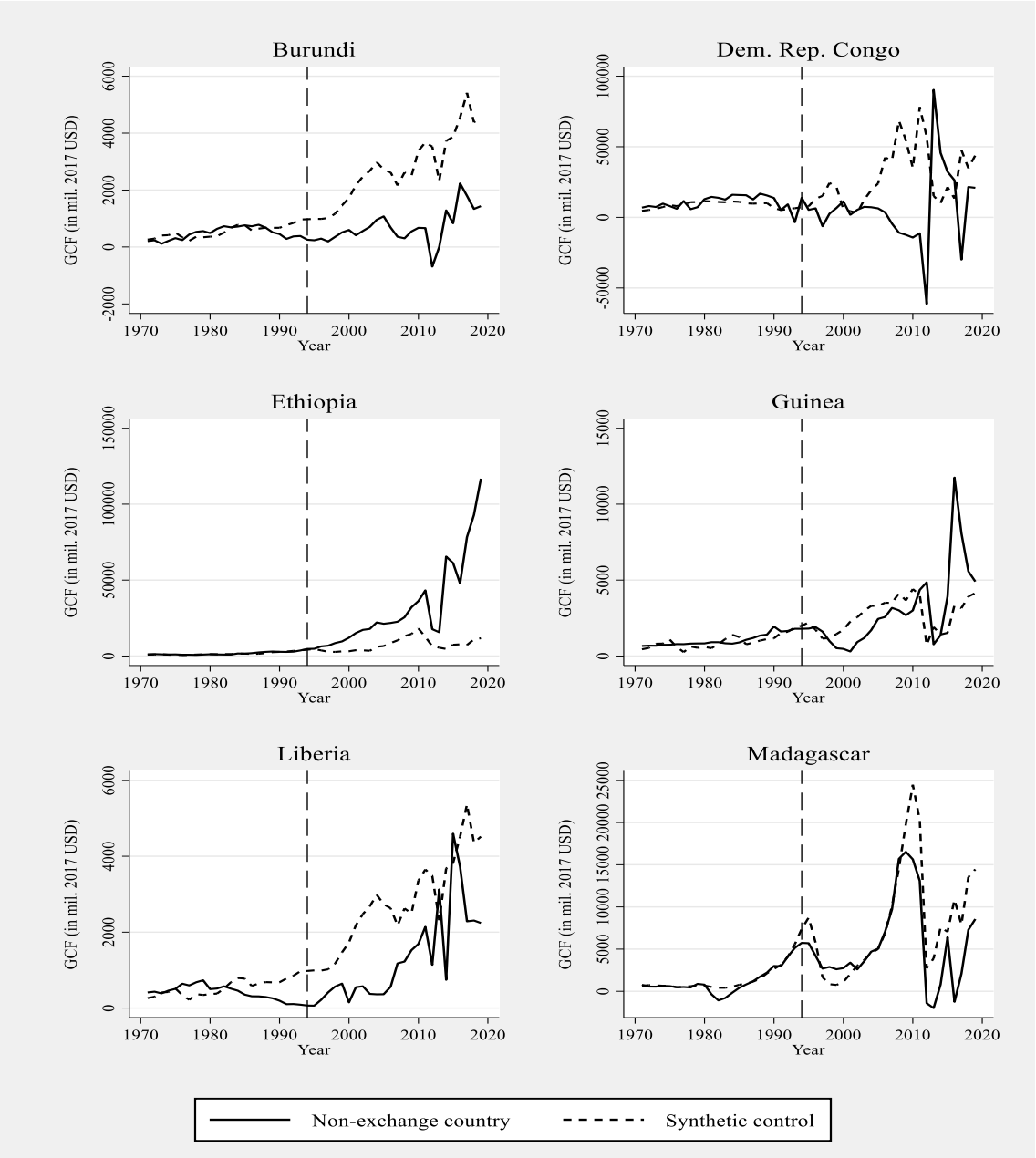

Fig. 4.3: GCF trends: Non-exchange countries vs. synthetic controls

Source: Generated by the author using the *synth* command in Stata 17.

For better clarity, the ATTs in terms of the forgone investment benefits due to stock markets' absences are estimated. Table 4.5 presents the average GCF (in millions of 2017 USD) over the post-treatment period for the treated countries, the synthetic controls, and the ATTs. To compare the treatment effects across

countries, the ATTs are converted into percentage terms. According to the table, between 1994 and 2019, the lack of stock markets in Burundi and DRC resulted in 75 and 79 percent GCF increments in these countries, respectively. Similarly, the actual GCF averaged 53 percent less in Liberia and 31 percent lower in Madagascar than what it would have been in the counterfactual scenario. On the other hand, the analysis found positive ATTs for Ethiopia and Guinea, indicating higher investment with exchanges absence. Particularly, the estimate for Ethiopia suggests that, on average, its post-1994 actual capital formation exceeded its synthetic counterfactual by over three times, corroborating the visual evidence in Fig. 4.3.

Table 4.5 Effect of stock markets' absence on investment

Countries without exchanges	Actual GCF	Synthetic Control GCF	ATT
Burundi	695.19	2,786.60	-75.05%
DRC	6,024.47	28,569.29	-78.91%
Ethiopia	32,772.22	7,313.76	348.09%
Guinea	2,954.88	2,688.76	9.90%
Liberia	1,311.19	2,777.44	-52.79%
Madagascar	5,535.58	8,057.01	-31.29%

Source: Generated by the author using the *synth* command in Stata 17.

Placebo tests

In order to assess the significance of the results presented above further, placebo tests are conducted, in which pseudo-treatment effects are repeatedly estimated for each country in the donor pool as if it is the country that does not have an exchange while the remaining countries (including the real treatment country) serve as its control countries. The results from the experiments for each treated country are depicted in Fig. 4.4[14]. Similar to the experiments conducted using economic output as an outcome variable, placebos with PFIs exceeding five times the treated countries being considered are excluded from the graphing. The treatment effects presented above appear not to be robust in four out of six countries. In particular, as the paths that show the effects lie toward the middle of the placebo distribution, the negative investment impacts of stock markets absence in Burundi, Liberia, and Madagascar or the positive impact in Guinea are not significantly different from zero. In contrast, in the case of Ethiopia, out of the

[14]*Despite Romani being within the pre-treatment fit index cutoff in two cases, Dem. Rep. Congo, and Liberia, it has an extremely positive placebo effect, and therefore, it is excluded from the graphs to avoid skewing the scale and obscuring the comparison with other control countries.*

six placebo estimations that achieve PFI values within the cutoff, five of them are constantly below the true treatment effect, and it is only between 2008 and 2013 that the sixth placebo effect surpassed Ethiopia's. Thus, this indicates a statistically significant difference between Ethiopia's synthetic and actual GCF. The placebo test for DRC also confirms a significant negative effect, as its estimated impact of missing a stock exchange falls below that of all the control countries with a reasonable PFI for over three-fifths of the post-treatment period.

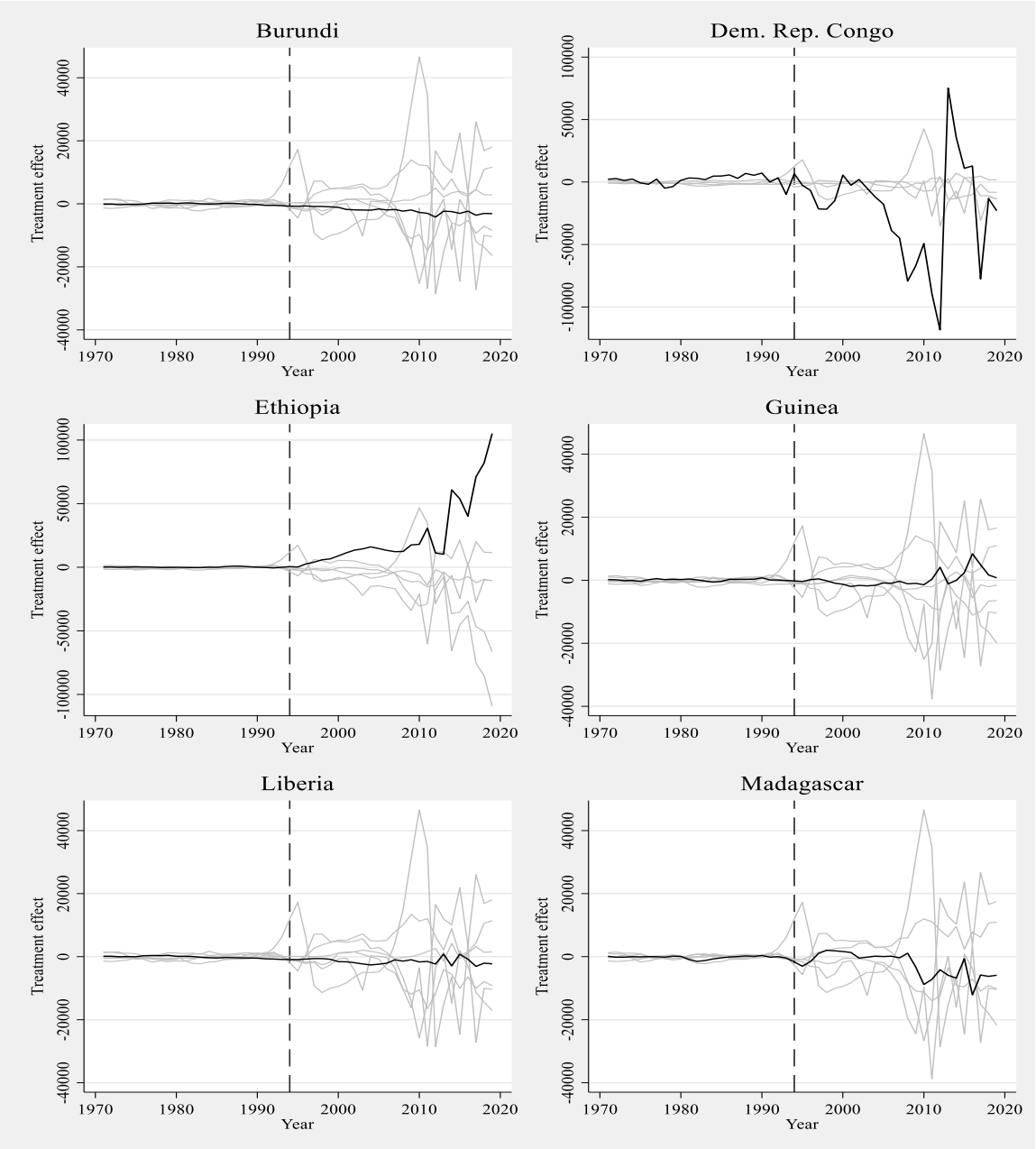

Fig. 4.4: Placebo distribution – GCF as outcome variable

Source: Generated by the author using the *synth* command in Stata 17.

4.3 Employment

Finally, the dissertation analyzes whether the absence of stock markets negatively impacted the employment rate of the countries without stock exchanges. It is often argued that stock markets boost job creation by facilitating investment and economic growth. To examine this empirically, the employment rates realized in the non-exchange countries are compared to the counterfactual scenario where these countries had stock exchanges. Data on employment rate for most countries in the study sample starts from 1980. Hence, while the post-treatment period still spans 1995 – 2019, the pre-treatment period used in the analysis is shortened to 1980-1993 due to this data limitation.

Table 4.6 lists the contribution of the individual donor countries in the construction of synthetic controls corresponding to each country without a stock exchange. Unlike the previous two estimations using GDP and GCF as outcome variables, where every treated country's synthetic counterfactual is composed of at least two control countries, the SCM algorithm assigns weight to just one donor country, Malawi, for generating the synthetic controls of Burundi, Ethiopia, and Madagascar. Unless Malawi's employment trajectory between 1980 to 1994 is similar to each of these countries, its extreme representation in their synthetic control is concerning. On the other hand, synthetic controls for DRC and Liberia are formed as weighted combinations of multiple countries: Bhutan, Cyprus, and Zambia. In contrast, Bhutan accounts for nearly 70 percent of synthetic DRC, Cyprus, and Zambia comprise almost 90 percent of synthetic Libera. Guinea's counterfactual is the only synthetic control that uses more than half (four out of seven) of the donor countries.

Table 4.6 Donor weights - Employment rate synthetic controls

Control countries	**Treated countries**					
	Burundi	**DRC**	**Ethiopia**	**Guinea**	**Liberia**	**Madagascar**
Bhutan	0	0.69	0	0.119	0.112	0
Botswana	0	0	0	0	0	0
Cyprus	0	0.126	0	0	0.442	0
Malawi	1	0	1	0.372	0	1
Nepal	0	0	0	0.09	0	0
Romania	0	0	0	0	0	0
Zambia	0	0.183	0	0.42	0.446	0
PFI	0.14	0.01	0.10	0.01	0.06	0.08

Source: Generated by the author using the *synth* command in Stata 17.

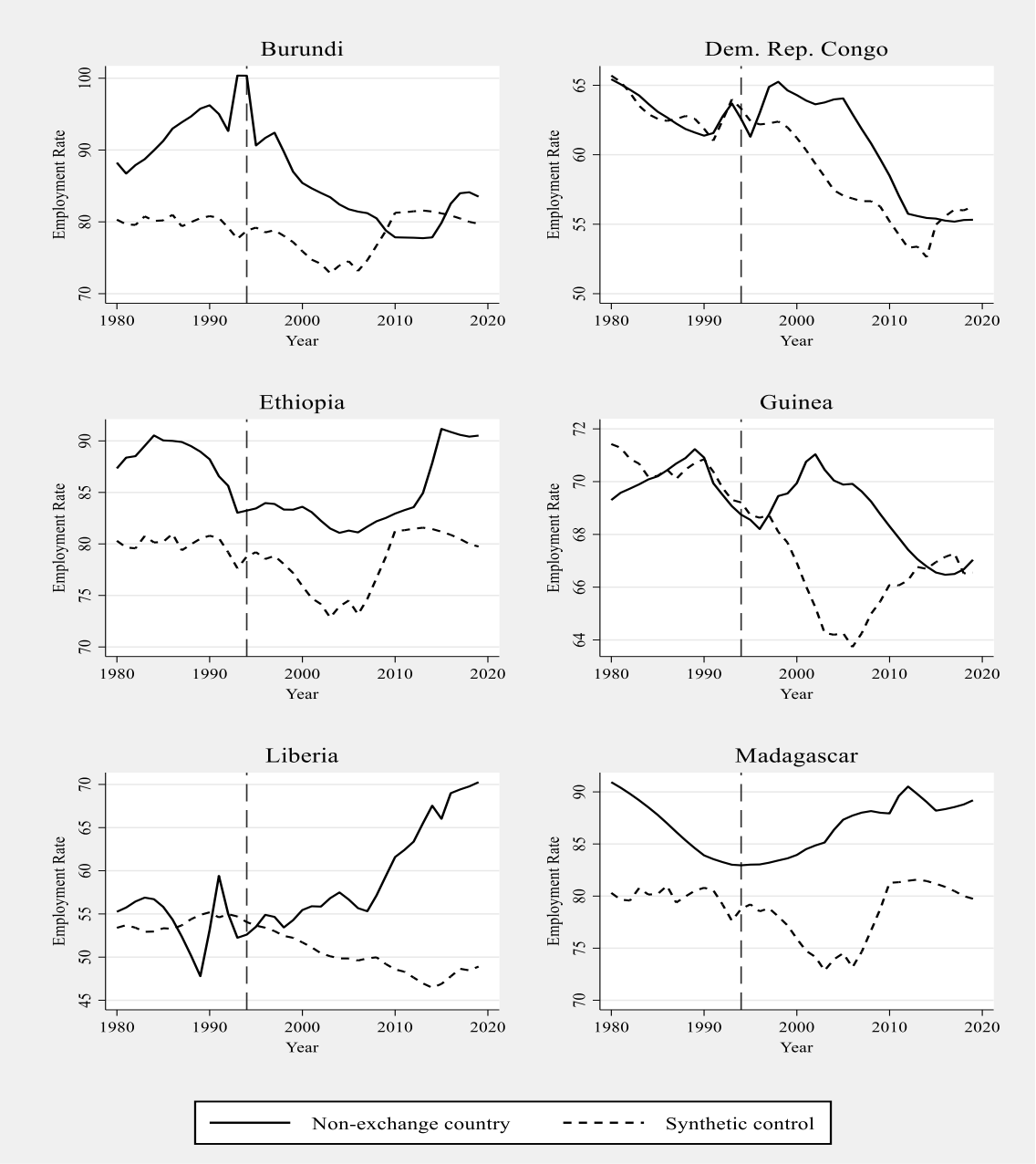

Fig. 4.5: Employment trends: Non-exchange countries vs. synthetic controls

Source: Generated by the author using the *synth* command in Stata 17.

The evolutions of the non-exchange countries and their synthetic counterparts' employment rates over the pre- and post-treatment periods are illustrated in Fig. 4.5. Unfortunately, in most cases, the synthetic controls fail to replicate the pre-treatment employment rate trends of the corresponding non-exchange countries. In particular, the synthetic controls of Burundi, Ethiopia, and Madagascar do not deviate significantly from the actual trends throughout the entire pre-treatment period. This indicates that the weighted average of the available control countries does not adequately approximate the employment patterns of these treated countries. Although the synthetic control for Liberia crosses paths with the actual trend at a few data points, it still portrays a poor pre-treatment match overall.

DRC's and Guinea's synthetic counterfactuals are the only ones that provided a satisfactory pre-treatment fit.

In contrast, the PFI values reported in the last row of Table 4.6 are below one, indicating a good fit for the synthetic controls across all six countries. This contradicts the visual inspection assessment, which suggests a poor pre-intervention fit for four out of the six treated countries. One potential reason for this discrepancy could be the relatively shorter pre-intervention period considered (14 years). Recall that while using GDP and investment as outcome variables, the number of pre-treatment periods used to construct the synthetic controls was 24 and 23 years, respectively. Additionally, SCM assigned a weight to only one donor country for creating the synthetic controls of three out of the six non-exchange countries, further limiting the ability to capture unique employment patterns.

Given this clear discrepancy between the PFI values and the visual inspection, the assessment based on the latter, which indicates poor quality of the synthetic controls except for DRC and Guinea, is prioritized. The examination of these graphs in the post-treatment period suggests that these countries have not missed out on employment benefits due to the absence of stock markets. Rather, their employment rates in post-treatment years appear to be higher than the counterfactual scenario where they established exchanges in their respective economy in 1994.

Table 4.7 presents DRC's and Guinea's employment rate and their synthetic controls in the post-treatment period. It also calculates the ATTs of lacking a stock market in these countries. As the SCM cannot construct a reasonable synthetic control for the other four countries, as shown above, the results that can be drawn from them would be less reliable. Therefore, the dissertation disregards them in the remainder of this analysis. The average effects on DRC and Guinea due to the absence of stock markets are calculated at positive 4.7 and 3.46 percent.

Table 4.7 Effect of stock markets' absence on employment rate

Countries without exchanges	Actual	Synthetic Control	ATT
DRC	60.27	57.57	4.70%
Guinea	68.60	66.30	3.46%

Source: Generated by the author using the *synth* command in Stata 17.

Placebo tests

Regarding the significance of these results, Fig. 4.6 relays the placebo tests assessing the validity of the estimated employment impacts for DRC and Guinea. As before, the graphing only displays placebo runs that have PFIs less than five

times those of the treated countries. For DRC, the line showing the treatment its treatment effect remains above all of the placebo lines for most of the post-1994 period, supporting a robust result. Similarly, Guinea's effect line exceeds four of the five placebo lines, with the one above having a worse pre-treatment fit. Overall, the figure demonstrates that the positive employment effects from lacking stock markets are larger than placebo impacts for both countries, providing confidence that the results are not due to chance.

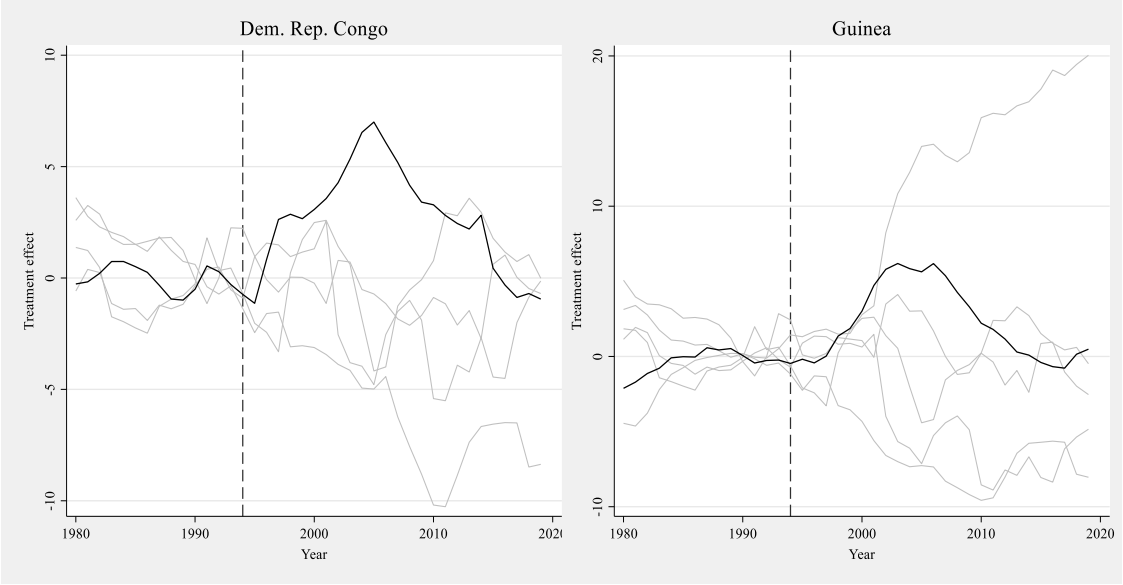

Fig. 4.6: Placebo distribution - Employment as outcome variable

Source: Generated by the author using the *synth* command in Stata 17.

4.4 Further robustness checks

The SCM is designed to provide unbiased treatment effect estimates by constructing a credible counterfactual. Recall that this counterfactual is created as a weighted combination of control units drawn from a pool of potential donors. Hence, its robustness depends heavily on the donor weighting approach. While the objective for selecting the weights is always minimizing the discrepancy between the outcome of the treated unit and the synthetically constructed control over the pre-treatment years, recent advancements in the method have proposed alternative ways of determining them. The approach employed for the dissertation's baseline analyses is one proposed by Abadie et al. (2010), which only selects positive weights between zero and one to avoid extrapolation beyond the available data range. In order to examine the treatment effects of lacking stock markets estimated above hold under an alternative weight assignment strategy, the dissertation implements the SCUL[15] method as a robustness check. As

[15] *Unlike SCM which only requires balanced outcome data, SCUL requires balanced panel data for both outcome variables and all predictors. Since the study's dataset has gaps for some of the covariates used in the baseline analysis, the SCUL specifications employed use only pre-treatment outcome observations as predictors.*

discussed in Chapter 3, this approach allows for negative weights, incorporating control countries with outcome trends that are negatively related to that of the treated for generating synthetic controls.

To simplify the text and improve readability, the tables that show the compositions of the synthetic controls are relegated to the appendix (Table C1). The placebo test results are also reported in Fig. C1, C2, and C3. Here, in the main text, the estimated ATTs using SCUL are provided and compared with the main results discussed in the preceding sections. Fig. 4.7, 4.8, and 4.9 plot the actual and synthetic GDP, GCF, and employment rate trajectories. Table 4.8 then calculates the respective ATTs under SCUL.

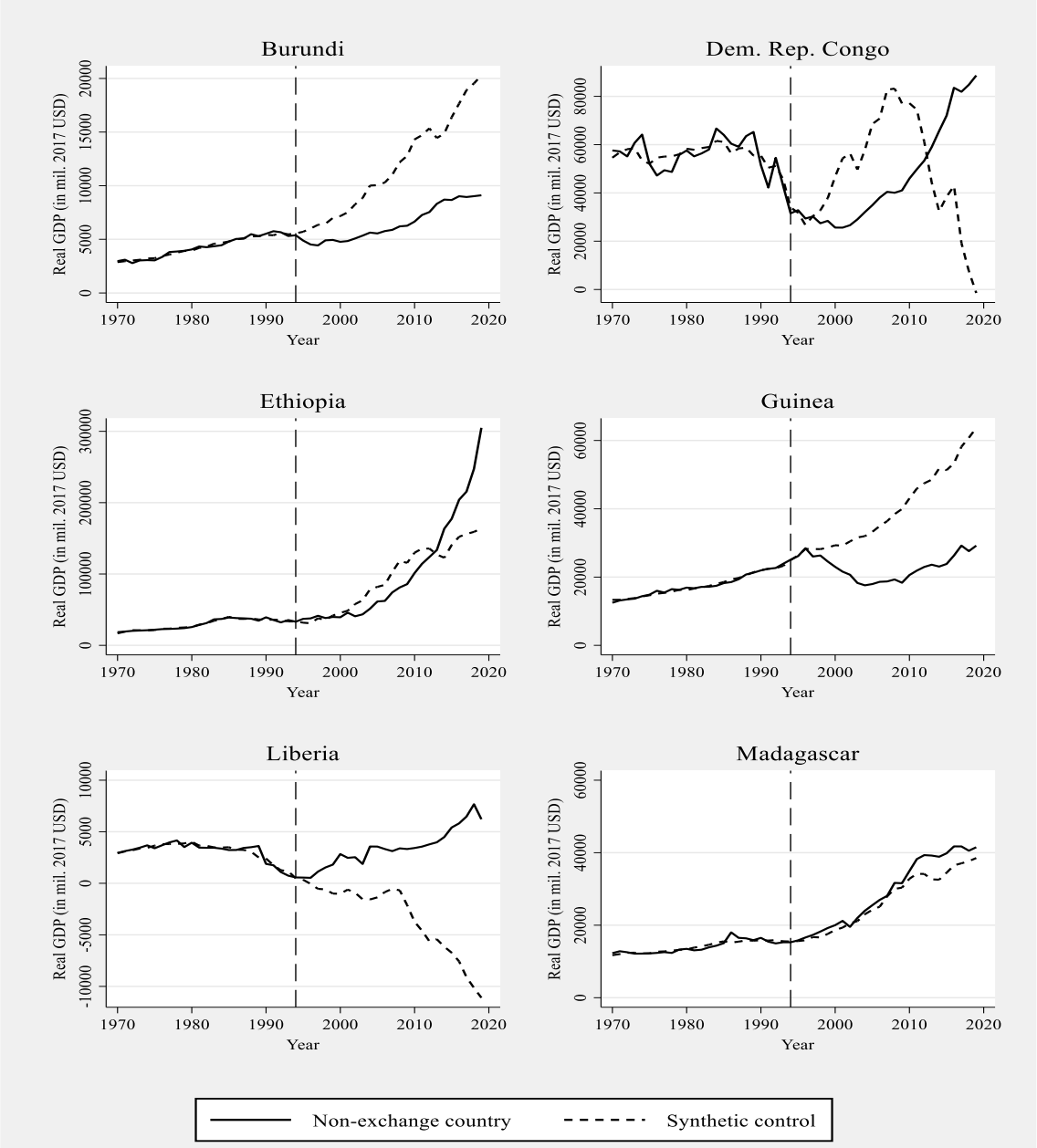

Fig. 4.7: GDP trends: Non-exchange countries vs. synthetic controls, SCUL

Source: Generated by the author using the *scul* command in Stata 17.

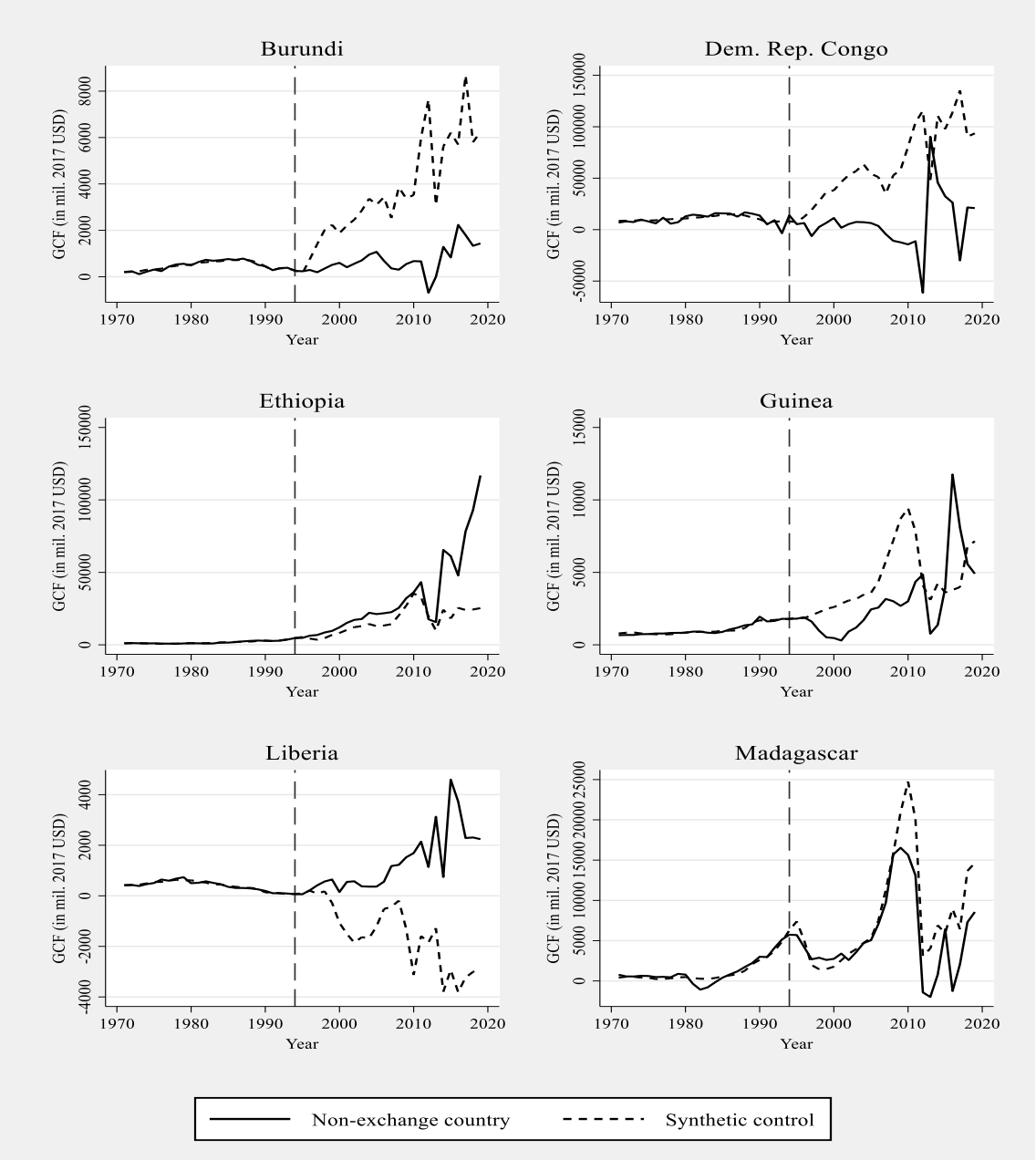

Fig. 4.8: GCF trends: Non-exchange countries vs. synthetic controls, SCUL

Source: Generated by the author using the *scul* command in Stata 17.

At first glance, SCUL seems to produce synthetic controls that replicate the pre-intervention paths of GDP, GCF, and the employment rate for most countries without stock exchanges better than those produced by the standard SCM. However, careful inspection of the graphs reveals extrapolation issues in some of the synthetic controls. For example, the real GDP for Liberia's synthetic control shown in Fig. 4.7, falls below zero after 1994, which is theoretically impossible. This synthetic control is a weighted average of four donor countries, with the two largest contributors (Bhutan and Nepal) having negative weights (see Table C1). However, none of these countries had sub-zero GDP in the post-treatment period, and the heavy negative weights resulted in extrapolation beyond the support of

the available data. A similar issue can also be observed in Liberia's synthetic control's GCF trend (Fig. 4.8). Note that both extreme negative band positive weights can cause the post-treatment outcomes of the synthetic controls to extrapolate beyond the observed data range. This demonstrates that the chosen weighting approach for generating synthetic control in the baseline analysis provides more reliable counterfactuals than SCUL's unconstrained method.

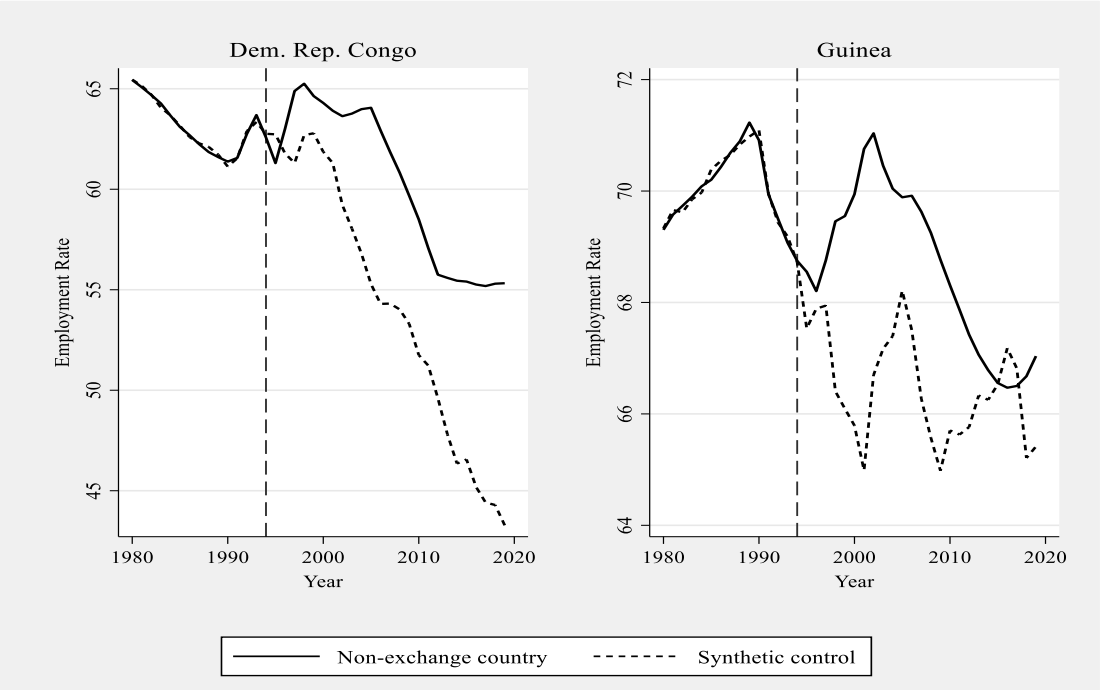

Fig. 4.9: Employment trends: Non-exchange countries vs. synthetic controls, SCUL

Source: Generated by the author using the *scul* command in Stata 17.

Having discussed concerns about extrapolation in the constructions of the synthetic controls, we now compare the treatment effects with those reported in the preceding sections. As Fig. 4.8 shows Burundi's and Guinea's synthetic control trends of real GDP follow the same evolution as the baseline results reported in Fig. 4.1, indicating the negative effect of the absence of stock markets on these countries' economic output. The SCUL ATTs displayed in the second column of Table 4.8, albeit different in magnitude, also reaffirm the baseline analysis findings of adverse effects. For Ethiopia, although its synthetic control slightly outpaces between 1999 – 2012, the actual real GDP realized in the country in the later years surpassed the counterfactual substantially, outweighing the negative effects, as the figure and the positive ATT indicate. However, the positive treatment effect estimated using SCUL is considerably smaller than the baseline estimate. In the case of DRC, the post-treatment synthetic real GDP was above the actual values until it took a sharp downturn in 2013. However, the direction of the average effect, as Table 4.8 reports, remains negative, corroborating the main finding. In contrast, the SCUL treatment effect estimations for Liberia and Madagascar fail to confirm the baseline findings. Unlike Fig. 4.1

and Table 4.3, which demonstrate the presence of forgone output gain due to the absence of stock markets in these countries, the new results show gains.

Coming to the SCUL results for investment, the new synthetic controls plotted in Fig. 4.8, together with the actual GCF trajectory, largely confirm the dissertation's baseline findings. The synthetic controls of Burundi, DRC, and Guinea surpass the actual GCF trajectories observed in these countries for most of the post-treatment years, indicating the negative investment impacts of lacking stock markets. Despite the estimated ATT through SCUL being almost twice as large as the initial estimate, the contrasting positive effect on Ethiopia's GCF reported by the baseline analyses also remains unaltered. The exception is the case of Liberia, where the SCUL results indicate a benefit from having no stock market.

Table 4.8: Effect of stock markets' absence, SCUL

Countries without exchanges	GDP	GCF	Employment rate
Burundi	-45.19%	-81.53%	—
DRC	-3.02%	-90.60%	11.60%
Ethiopia	6.98%	683.83%	—
Guinea	-42.58%	-32.39%	3.23%
Liberia	203.79%	184.99%	—
Madagascar	8.96%	-31.84%	—

Source: Generated by the author using the *synth* command in Stata 17.

Furthermore, similar to the pattern portrayed in Fig. 4.6, the employment rate trajectories of real DRC and Guinea are above their synthetic counterfactuals in the post-treatment periods, affirming the positive labor market impact found in the baseline analyses. While the newly estimated treatment effect magnitude for DRC is over twice as large as the standard SCM estimates, and the effect sizes for Guinea are nearly identical across both weighting approaches, they both are positive.

4.5 Discussion

The analyses in the preceding sections suggest that the economic impact of a lack of stock markets diverges across countries and macroeconomic indicators. This section discusses these findings.

The results show that most non-exchange countries have forgone considerable economic output gain by not establishing stock markets. The real GDPs of Burundi, DRC, Guinea, Liberia, and Madagascar are less than what they would

have been had they created exchanges. This aligns with the extensive literature demonstrating the economic growth benefits of stock markets. Through efficient capital allocation, liquidity provision, risk diversification, and corporate governance improvements, well-functioning stock markets would have boosted the production of goods and services in these countries (Levine, 2005). Conversely, Ethiopia appears to be better off for not having a stock exchange. The absence of a stock market seems to have increased the country's economic output. While unexpected, this result reinforces arguments made by some researchers against unconditionally promoting stock markets in developing countries.

Table 4.9: Effect of stock markets' absence, SCM

Countries without exchanges	GDP	GCF	Employment rate
Burundi	-	NE	
DRC	-	-	+
Ethiopia	+	+	
Guinea	-	NE	+
Liberia	-	NE	
Madagascar	-	NE	

Note*: NE stands for 'no effect' indicating the estimated effect is statistically insignificant*

Source: Generated by the author using the *scul* command in Stata 17.

Examining investment impacts reveals that Ethiopia again stands out as the only country in the sample that has benefited from lacking an exchange. The country displays better investment performance relative to the counterfactual scenario of having an exchange. DRC's investment performance was worse relative to the counterfactual scenario of having an exchange. In the remaining four countries examined, not having a stock exchange shows a negligible impact on investment. According to the SCM estimates, their capital formation trajectories do not significantly diverge from the counterfactual synthetic controls. It has been argued that the short-termism and speculative nature of capital movements in stock markets do not improve long-term physical investments (Singh, 2008). Similar findings by Sarkar (2007), Ayadi and Williams (2023), and others suggest stock markets' impact on investment rates is limited, particularly in developing countries.

The findings for aggregate employment tell an interesting story. Both DRC and Guinea display higher employment rates without stock exchanges than they would have if stock exchanges had been present. Even though SCM was unable to find suitable synthetic controls from the available donor pool for most of the non-exchange countries considered, the impact on the two countries for which the method can construct fairly fitting counterfactuals is favorable.

Overall, while these findings are enlightening by their own accord, they raise a number of questions as well. Why do stock market absences have heterogeneous impacts on output, investment, and employment? Why are most non-exchange countries found to be forfeiting in terms of GDP gains yet remaining unaffected in terms of investment, or even benefiting in terms of employment as a result of lacking stock markets? Moreover, what peculiar feature does Ethiopia possess that makes the unavailability of an exchange advantageous?

The conventional wisdom regarding the interaction between stock markets, capital formation, and labor markets suggests that by mobilizing savings and efficiently allocating capital, stock markets boost investment, thereby facilitating job creation. However, this well-theorized interaction occasionally may fail to materialize for a variety of reasons.

First, short-termism may offset any potential positive effects stock markets have on investment. Capital formation involves long-term investments in the creation of means of production. The time horizon of such processes typically extends far beyond that of the activities observed in stock market environments. In recent decades, stock exchanges have seen a surge in short-term investors who focus on immediate rewards over long-term gains. For instance, a Reuters analysis based on New York Stock Exchange data finds that as of 2020, the average holding period of U.S. shares is just 5.5 months (2020). This is usually not enough time for long-term investments to start making a profit. Therefore, firms may reduce spending on long-term projects to boost the current stock price and appease investors.

Another contributing factor to the lack of significant investment loss due to a stock market's absence could be inefficiency in stock markets. Grossman and Stiglitz (1980) show that because the production of information requires incentives to compensate for its cost, stock markets, cannot be perfectly efficient by their very nature. Thus, stock prices do not fully incorporate all available information relating to an asset. Furthermore, the resulting mispricing causes inefficiency in the core function of stock markets: capital allocation. Overvalued yet inefficient investments get financed, whereas undervalued but efficient investments remain underfunded, which distorts investment decisions. This ultimately dampens aggregate capital formation.

Volatility provides another potential explanation for the stock market's limited impact on investment. The recently developed inelastic market hypothesis states that as institutional investors, who account for a large portion of trading activity in stock markets, have mandates to maintain a certain number of shares, they show little response to price movements (Gabaix and Koijen, 2021). This leads to the aggregate stock demand being inelastic, where demand shocks and capital flows have outsized price effects. Hence, any fluctuation in flows, for any reason, can lead to amplified price changes, leading to a volatile market. High market

volatility, however, can have adverse implications on real economic activities, like capital formation. If stock prices are too volatile, investors may be less eager to hold equities, and their compensation requirement for bearing systematic risk may increase, both of which, in turn, constrain investment. Moreover, higher uncertainty makes firms delay irreversible investment decisions to maximize their project's value (Hu, 1995). Therefore, these effects may counter the hypothesized benefits of capital formation.

Given the lack of evidence that stock markets would have stimulated investment in DRC and Guinea, the positive effects of the absence of exchanges on employment rates do not come as a surprise. In addition to the absence of significant investment impact that can translate to job creation, the stock markets' sectoral reallocation function provides a potential rationale for the favorable employment findings. According to the sectoral shifts hypothesis of unemployment originally postulated by Lilien (1982), unemployment, is partly the result of resources being reallocated from one sector to another in the economy. Given that not all sectors grow at the same pace, the labor demand in the relatively fast-growing industries will be higher and in the declining industries lower, necessitating labor reallocation. However, workers cannot simply reallocate across sectors since each industry requires certain industry-specific skills. Applying this theory to the subject at hand, efficient stock markets, through share prices, direct capital to growing sectors, while starving declining ones. Naturally, this disproportion in capital allocation will be followed by a change in demand for inputs like labor across the sectors. This inevitably exacerbates the structural unemployment rate, although capital is being allocated to its most efficient use.

Suppose the effect of not having a stock market is negligible on investment and positive on employment. Then, what is the driving factor of the estimated significant negative effect on the output of the non-exchange countries? Acknowledging that this is a conundrum that requires further examination, there could be some plausible explanations, one of which is the improvement of TFP. As finance-growth literature highlights, a well-functioning stock market can boost TFP through efficient resource allocation, risk-sharing, and corporate governance improvements (Bennett et al., 2020, Moshirian et al., 2021). Without stock exchanges, financial constraints may hinder firms from investing in productivity-enhancing activities like research and development, innovations, and technology adoption. Besides, given that innovations are risky and entail a high degree of uncertainty, investors and firms may hesitate to undertake such projects without the means to diversify the risk. Moreover, compared to publicly traded firms, family, or state-owned firms prevalent without stock markets tend to have weaker governance mechanisms. In the latter, transparency and accountability are limited. There is no external shareholder oversight or takeover threats. This allows incompetent and opportunistic managers to undertake productivity-diminishing

projects. These firm-level productivity deficiencies impede the enhancement of TFP at an aggregate level, thereby decreasing the overall economic output. Therefore, although the absence of stock markets did not appear to result in labor and capital losses in non-exchange countries, the estimated negative effect on output could be driven by the loss of TFP improvement.

Finally, one possible explanation for Ethiopia's unique benefits from lacking a stock exchange could be its high dependency on the banking sector. According to the IMF's Financial Development Index data, Ethiopia's financial institution development had been significantly higher than the other non-exchange countries. For instance, as illustrated in Figure 4.10, Ethiopia's average financial institution development index, an aggregate measure of depth, access, and efficiency of banks, microfinance institutions, insurance companies, etc., exhibited a distinctly higher trajectory compared to the other five non-exchange countries during the post-treatment period. Whether credit and equity markets substitute or complement each other is a highly contested issue in the finance literature. Ample empirical evidence suggests that banks' contribution to economic growth, particularly in developing countries, is far greater than stock markets' (Arestis et al., 2001, Seetanah et al., 2012, Kim and Lin, 2013, Rioja and Valev, 2014). Therefore, establishing an exchange in Ethiopia's already bank-dominated system may be futile and even undermine growth by shifting funds away from the pivotal banking sector.

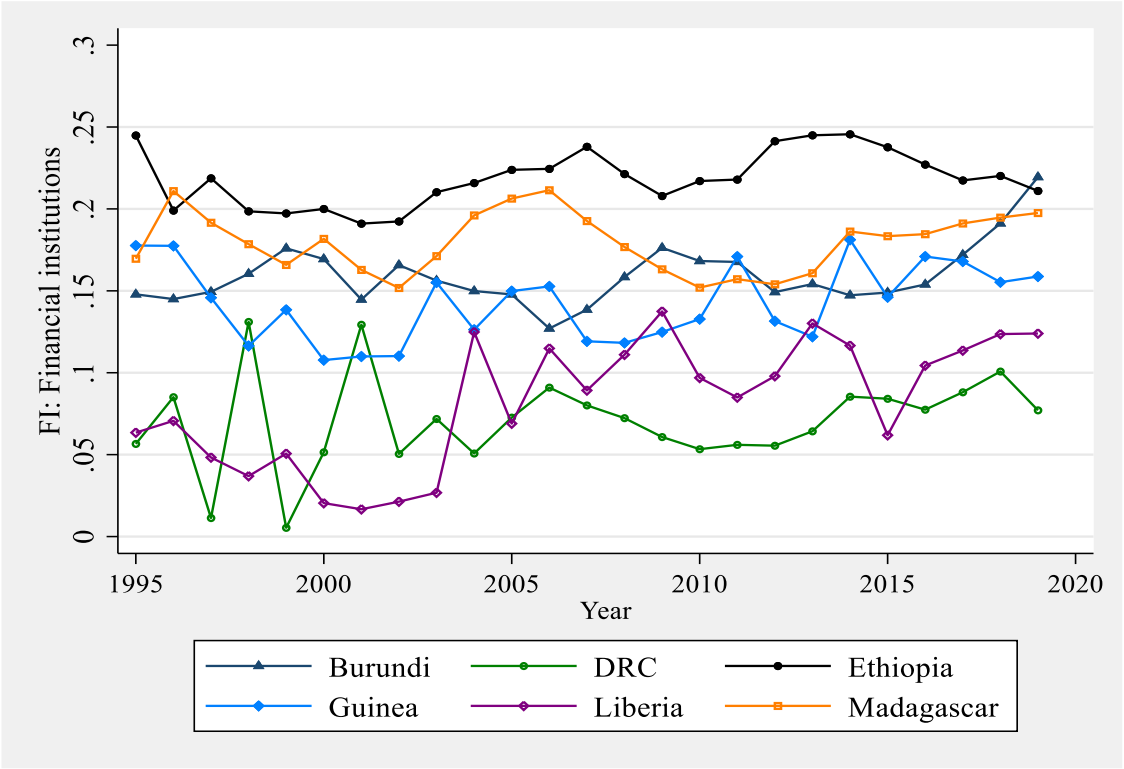

Fig. 4.10: Financial institution development in non-exchange countries, 1995 – 2020

Source: Data from the IMF's Financial Development Index database (accessed on September 15, 2023).

5. CONCLUSION AND IMPLICATIONS

5.1 Summary

Despite substantial financial market development around the world in recent years, around one-sixth of internationally recognized sovereign states still lack a stock market. While some scholars are skeptical about their importance and effectiveness, particularly in developing countries, and policymakers are reluctant to set up exchanges in these countries, the prevailing consensus supports stock markets as crucial for economic growth. In accord with this, many empirical studies have examined the relationship between growth and various stock market metrics through cross-country studies or individual case study analyses. However, to the best of the authors' knowledge, there has not been any endeavor to estimate how much a country gains or loses from lacking a stock market.

It is in this spirit that the current dissertation aims to address that gap by investigating the macroeconomic consequences of not having stock markets in non-exchange countries. The main purpose was to estimate the forfeited benefits or mitigated losses in terms of key indicators like economic output, investment, and employment. A data-driven econometric technique called the synthetic control method (SCM) is employed to estimate the counterfactual macroeconomic conditions that would have materialized in selected countries had they established stock exchanges. SCM creates a synthetic comparator by taking pre-treatment outcome values and observed covariates of the control countries with exchanges. The analyses examined the impacts on six countries without stock markets: Burundi, DRC, Ethiopia, Guinea, Liberia, and Madagascar. Comparable countries that formed their first stock exchange around 1994 were selected for the donor pool. Furthermore, placebo tests assessed the statistical significance of the estimated treatment effects.

The results reveal that most non-exchange countries forfeited substantial output gains due to a lack of stock market. For countries such as DRC, Guinea, and Liberia the difference between the synthetic controls and the actual results is striking, with GDP over 50 percentage points lower in reality than in the counterfactuals. Similar sizable output losses emerged for Burundi and Madagascar. In sharp contrast, Ethiopia experienced a robust, as the placebo test demonstrated, large positive GDP gain as a result of a stock market absence. On the other hand, there does not seem to be strong evidence to back up the claim that the lack of stock markets unfavorably affected the overall investment for most of the countries considered. While the SCM indicates a negative effect on four out of the six non-exchange countries, the impacts on Burundi, Liberia, and Madagascar GCF fall short of robustness according to the result from the placebo tests. The exception is the DRC case where the estimated adverse effect remained significant for three-fifths of the post-exchange years. Ethiopia again exhibits a counterintuitive over three-fold higher capital formation without a stock This

positive effect is backed by the placebo test results as well. Insufficient pre-treatment synthetic control fits impeded the analyses on employment impact for most countries. However, the two successes, DRC and Guinea show higher employment rates relative to their counterfactuals in the years following the establishment of exchanges in the control countries.

5.2 Implications and Contributions

Taken together, the results summarized above point to the following tentative policy implications. First, given the substantial forgone output gains estimated for most non-exchange countries, national policymakers in these countries may want to prioritize the establishment of stock markets in order to take advantage of its economic benefits. Second, the apparent negligible investment impact on four out of six countries without a stock exchange implies it is crucial to accompany the formation of exchanges with effective financial regulations that address short-termism and encourage the allocation of capital to productive uses. Third, the employment gains in some countries highlight that stock markets can lead to reallocation frictions that exacerbate structural unemployment. It is therefore important to ensure the development of the stock market is supplemented by policies that facilitate labor mobility and programs that promote training to improve workers' skills. Fourth, the estimated beneficial effect of a stock market absence in Ethiopia sheds some doubt on the importance of creating an exchange in the country. Especially in the face of the government's ongoing efforts to launch the ESX by 2024, the findings of the current study warrant the need for careful evaluation of the potential cost and merits associated with stock markets. If its establishment is certain, it would be wise for policymakers to design and implement sound regulations, supervision, and enforcement activities so as to reduce the negative aspects of the prospective market. Taken as a whole, however, the heterogeneous impacts underline how inappropriate a one-size-fits-all policy prescription of stock market promotion in developing countries is. Such policy directions need to be guided by individual country characteristics and needs.

The current dissertation makes several distinct contributions to the literature. First, most studies on the stock markets-growth nexus are conducted based on what is observed in the countries that already have the market. However, this study departs from previous works by investigating the issue from the perspective of countries without stock exchanges. The multi-indicator approach that encompasses output, investment, and employment also enables a comprehensive assessment of the stock markets' growth impact. Second, this study is the first to apply the SCM to the evaluation of economic consequences of stock market inaccessibility. Hence, by employing a transparent data-driven approach for constructing synthetic counterfactuals, it improves over traditional case studies and cross-country regression approaches. It can also be used as a methodological reference for subsequent research on the usage of SCM for analyzing stock market impact evaluations. Finally, beyond evaluating stock markets absence outcomes,

the dissertation makes the case for using SCM for estimating, not only the impact of interventions but also their absence, which has not been a typical use of the method but could be of great importance. In this regard, it can serve as a demonstration of SCM implementation for evaluating the consequences of inaction for estimating missed opportunities or mitigated losses.

5.3 Limitations and Future Research

While the dissertation advances the evaluation of the impact of stock markets on many fronts, it is not without its limitations. First and foremost, it should be noted that this dissertation is not meant to be a comprehensive evaluation of the relationship between specific attributes of stock markets and economic growth. Instead, it solely focuses on the impact of the mere presence of the establishment itself. While it is outside the scope of the current dissertation, the impacts of stock markets may diverge based on their level of development and functionality. Second, it does not claim to estimate all the ways the presence of stock markets may impact nations' economies. It does, however, shed some light on the implication of its absence on non-exchange countries' output, investment, and employment, and suggests that this path, too, deserves greater attention in the finance-growth literature. Nevertheless, there could be other avenues that the lack of a stock market may impact these countries. Another limitation of the study is that due to data limitations, the SCM analysis relies on only seven control countries for constructing the synthetic counterfactuals. Notwithstanding the approach can provide substantial improvement relative to the alternative traditional methods and there are no definitive guidelines on the ideal number of units in a donor pool, having more potential donor units increases the likelihood of producing a synthetic control with a good pre-intervention fit. Finally, it is important to bear in mind that although the robustness checks conducted affirm the direction of the estimated impacts on the non-exchange countries, they indicate these impacts' precise magnitudes are uncertain. This demands exercising some caution in interpreting the findings.

Nevertheless, while having these shortcomings, this dissertation hopefully provides a valuable new perspective for research on the relationship between stock markets and economic growth. It is also hoped that this modest starting point can be indicative of several fruitful avenues for further research. The most obvious would be a future replication of the study to concretely establish the exact quantity of losses or benefits in the non-exchange countries. In this regard, using other larger control countries and performing various sensitivity analyses would be beneficial for drawing more solid conclusions. The other plausible conjecture is exploring the impacts while taking into account the nature or characteristics of an exchange that would exist in the counterfactual scenario. While SCM is valuable for creating a synthetic control country with an exchange and estimating the impacts of lacking stock markets, it does not give detailed insights into the size, liquidity, or other features of the stock exchange a country would have in the

counterfactual scenario given data on a set of determinant variables. Therefore, although this endeavor might involve a different method of analysis, the contribution would be more informative. It would also be worthwhile to examine the forfeited benefits or the mitigated losses across other indicators of economic well-being like income inequality, consumption, etc.

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APPENDICES

Appendix A: Stock exchanges presence

A.1 Stock exchange establishment between 1961 -2009

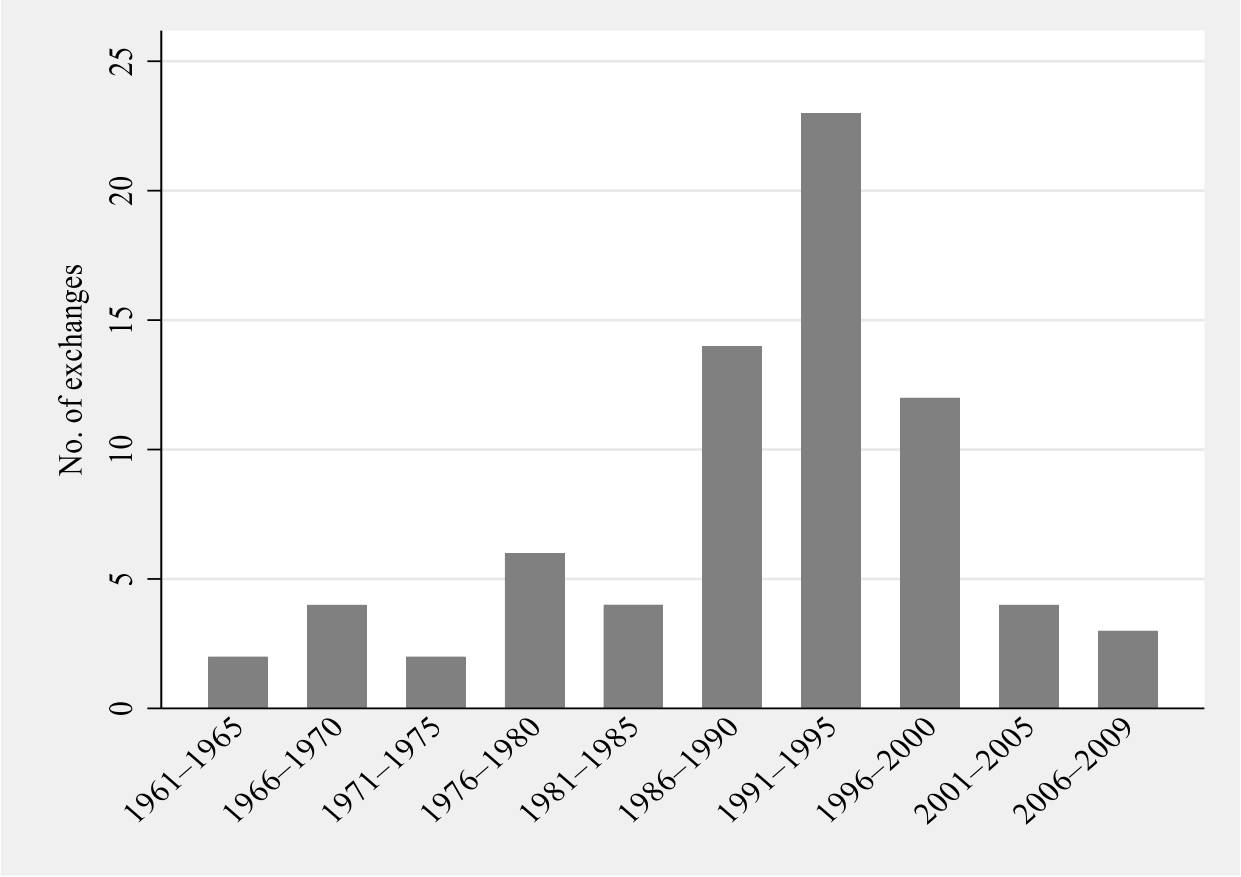

Fig. A1: Number of new stock exchanges established between 1961– 2009

Source: Author's compilation based on data from Weber et al. (2009).

A.2 Countries without a stock exchange

Table A1 List of countries without stock exchanges

Countries	**Income levels**	**Countries**	**Income levels**
Afghanistan	Low income	Liechtenstein	High income
Andorra	High income	Madagascar	Low income
Belize	Upper middle income	Marshall Islands	Upper middle income
Brunei	High income	Mauritania	Lower middle income
Burundi	Low income	Monaco	High income
Comoros	Lower middle income	Nauru	High income
Cuba	Upper middle income	North Korea	Low income
DRC	Low income	Palau	Upper middle income

Eritrea	Low income	Samoa	Lower middle income
Ethiopia	Low income	San Marino	High income
Federated States of Micronesia	Lower middle income	Solomon Islands	Lower middle income
Gambia	Low income	South Sudan	Low income
Guinea	Lower middle income	Timor-Leste	Lower middle income
Kiribati	Lower middle income	Tonga	Upper middle income
Kosovo	Upper middle income	Tuvalu	Upper middle income
Lesotho	Lower middle income	Vanuatu	Lower middle income
Liberia	Low income	Yemen	Low income

Source: Author's, based on data compiled from research of public sources.

Appendix B: Supplementary SCM results

B.1 Non-exchange countries and synthetic controls' predictor balance

Table B1 Predictor means in the pre-treatment period

	Guinea		Liberia		Madagascar	
GDP	**Actual**	**Synthetic**	**Actual**	**Synthetic**	**Actual**	**Synthetic**
Inflation	0.07	0.08	0.06	0.01	0.08	0.12
Pop. growth	2.22	2.70	1.58	2.73	2.87	3.00
Democracy	0.08	0.12	0.14	0.12	0.14	0.13
FID	0.07	0.13	0.08	0.18	0.12	0.13
GDP (1975)	14838.79	14308.88	3396.66	3420.64	12228.01	11913.59
GDP (1980)	16913.24	17178.84	3933.48	2991.88	13481.37	13314.36
GDP (1985)	18225.02	22198.25	3225.95	4389.42	15040.88	17592.62
GDP (1990)	21955.06	23889.75	1882.58	3888.09	16515.25	16793.09
GDP (1993)	23885.17	24370.94	739.51	3665.94	15298.80	16036.73
GCF	**Actual**	**Synthetic**	**Actual**	**Synthetic**	**Actual**	**Synthetic**
Inflation	0.11	0.08	0.08	0.01	0.09	0.06
Pop. growth	2.23	2.96	1.53	2.72	2.89	3.06
Democracy	0.08	0.10	0.14	0.10	0.14	0.27
FID	0.07	0.14	0.08	0.18	0.12	0.19
GCF (1975)	741.94	1098.31	510.53	524.96	609.59	671.69
GCF (1980)	829.01	591.64	501.55	365.80	797.99	687.98
GCF (1985)	891.33	1258.21	345.27	783.74	411.96	782.60
GCF (1990)	1969.16	1177.02	186.31	687.87	3040.40	2682.77
GCF (1993)	1814.08	1908.72	78.94	979.54	5153.35	5592.71

Employment Rate			**Actual**	**Synthetic**		
Inflation			-0.05	0.26		
Pop. growth			3.00	3.21		
Democracy			0.09	0.16		
FID			0.01	0.13		
Emprt(1985)			34.28	33.88		
Emprt(1990)			33.50	33.82		
Emprt(1992)			33.71	33.58		
	Burundi		**DRC**		**Ethiopia**	
GDP	**Actual**	**Synthetic**	**Actual**	**Synthetic**	**Actual**	**Synthetic**
Inflation	0.04	0.01	0.02	0.10	0.07	0.06
Pop. growth	2.23	2.61	2.92	2.41	2.73	2.25
Democracy	0.11	0.12	0.09	0.13	0.06	0.18
FID	0.07	0.19	0.01	0.14	0.25	0.19
GDP (1975)	3038.63	3149.58	52089.10	36630.49	21929.40	20932.81
GDP (1980)	4060.75	3971.84	57589.83	51747.69	25596.28	26600.69
GDP (1985)	4796.42	5331.93	64053.46	61690.02	39068.02	33083.77
GDP (1990)	5522.09	5480.76	51503.09	64203.54	39344.02	35664.44
GDP (1993)	5312.86	5480.75	42911.04	57953.34	35477.49	34532.94
GCF	**Actual**	**Synthetic**	**Actual**	**Synthetic**	**Actual**	**Synthetic**
Inflation	0.06	0.00	0.01	0.12	0.09	0.07
Pop. growth	2.25	2.71	2.92	2.58	2.77	2.72
Democracy	0.11	0.10	0.09	0.12	0.06	0.33
FID	0.07	0.18	0.01	0.13	0.25	0.24
GCF (1975)	310.94	512.98	7995.89	8646.56	1053.18	812.99
GCF (1980)	488.30	361.50	12895.39	11327.28	1169.64	1207.59
GCF (1985)	764.28	772.99	15892.79	10821.64	1555.42	1567.07
GCF (1990)	452.51	680.97	13607.79	6423.72	2760.57	2726.30
GCF (1993)	383.68	972.05	-3676.85	6360.61	3628.18	3680.22
Employment Rate			**Actual**	**Synthetic**		
Inflation			-0.05	0.26		
Pop. growth			3.00	3.21		
Democracy			0.09	0.16		
FID			0.01	0.13		
Emprt(1985)			34.28	33.88		
Emprt(1990)			33.50	33.82		
Emprt(1992)			33.71	33.58		

Source: Generated by the author using the *synth* command in Stata 17.

Appendix C: Supplementary SCUL results

C.1 Weights on donor countries, SCUL

Table C1 Donor countries' weights in the synthetic controls, SCUL

Controls	Burundi		DRC			Ethiopia	
	GDP	GCF	GDP	GCF	Emprt	GDP	GCF
Bhutan	1.682	1.055	4.809	22.893	0.292	17.474	4.01
Botswana					0.269	-0.876	0.679
Cyprus			2.765		0.252	0.755	
Malawi					-0.125	2.129	
Nepal			-2.452	-1.072	-1.322	-0.655	-0.307
Romania	0.007	0.009		0.062	0.225		
Zambia		-0.027	1.475		-0.644	0.897	0.142
Controls	**Guinea**			**Liberia**		**Madagascar**	
	GDP	GCF	Emprt	GDP	GCF	GDP	GCF
Bhutan	0.418		0.025	-1.21	-0.783	2.007	0.574
Botswana		0.364	-0.27		-0.09		
Cyprus	-0.082		0.138			0.218	
Malawi	-0.143		0.124			0.138	
Nepal	0.3		0.167	-0.159	0.024	-0.082	
Romania	0.023		-0.388	0.018	0.008	0.004	0.162
Zambia			0.877	0.047		0.182	

Source: Generated by the author using the *synth* command in Stata 17.

C.2 Placebo test results, SCUL

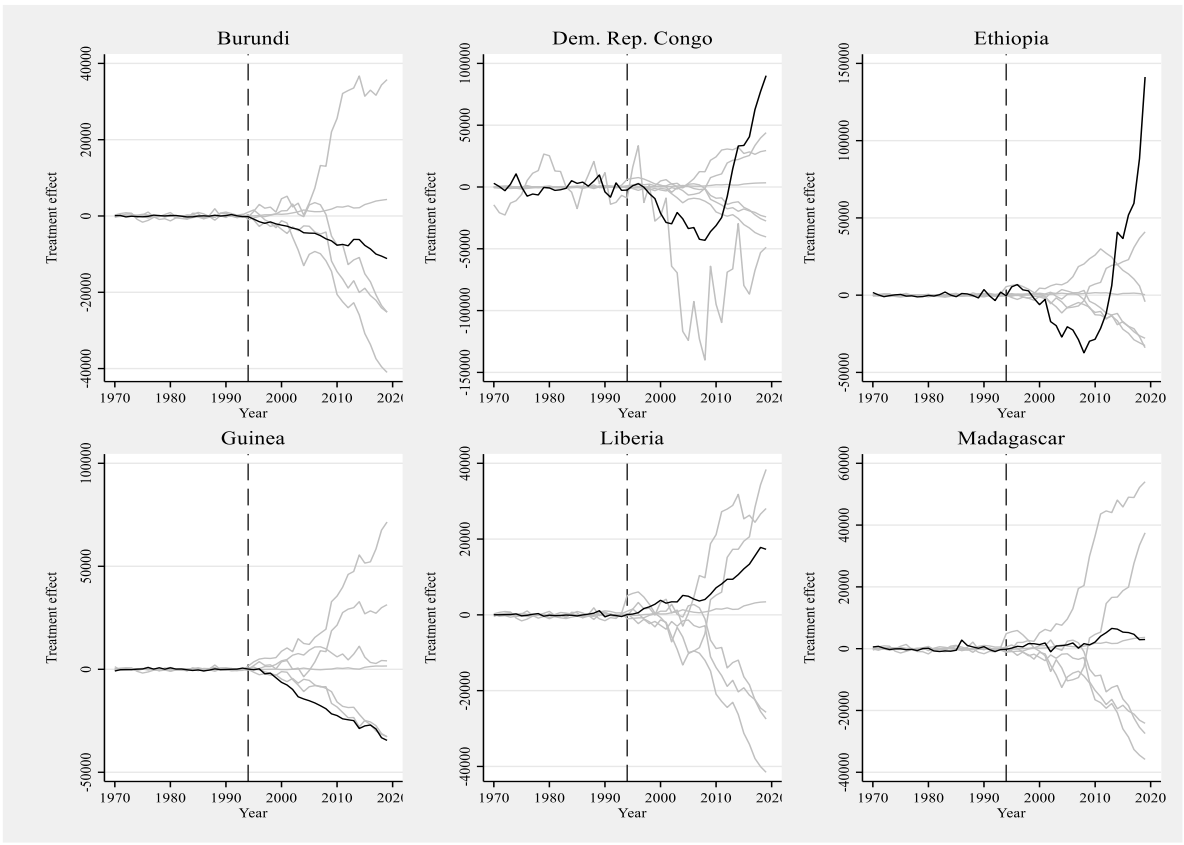

Fig. C1 Placebo distribution: GDP as the outcome variable, SCUL
Source: Generated by the author using the *scul* command in Stata 17.

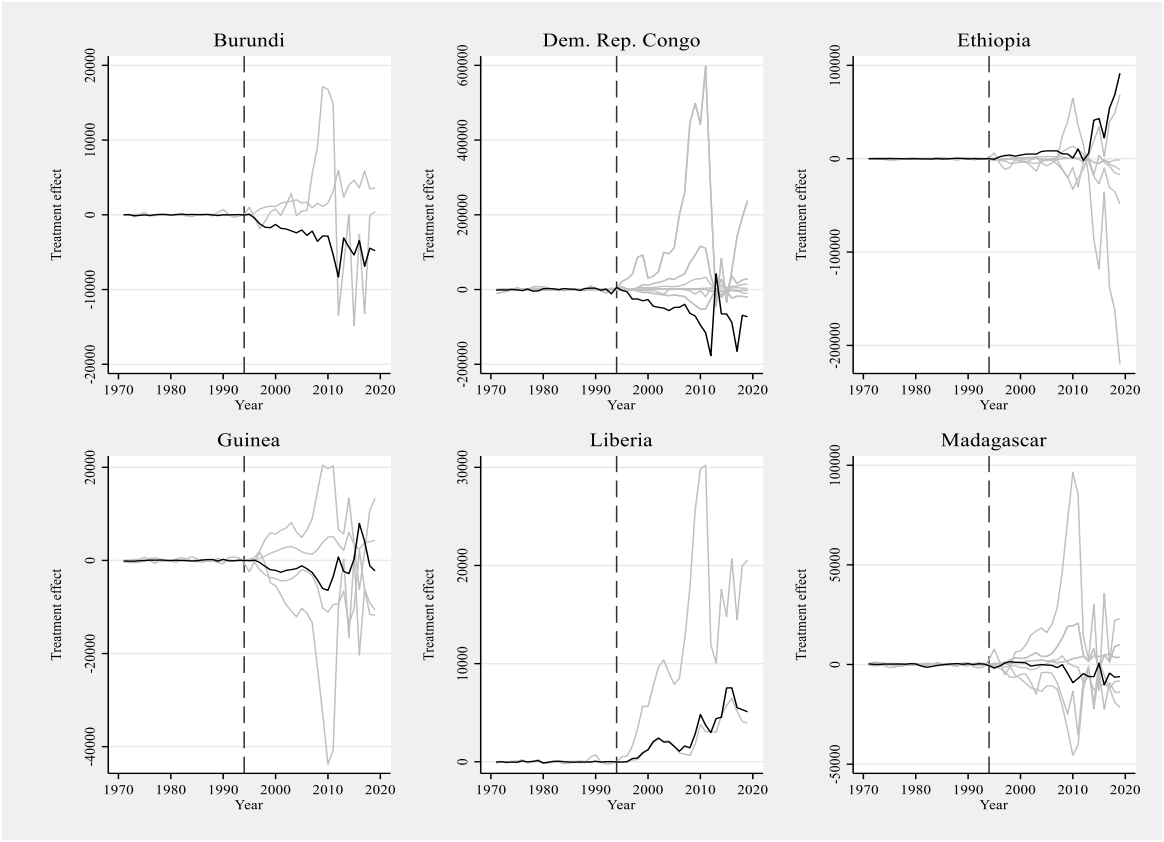

Fig. C2 Placebo distribution: GCF as the outcome variable, SCUL
Source: Generated by the author using the *scul* command in Stata 17.

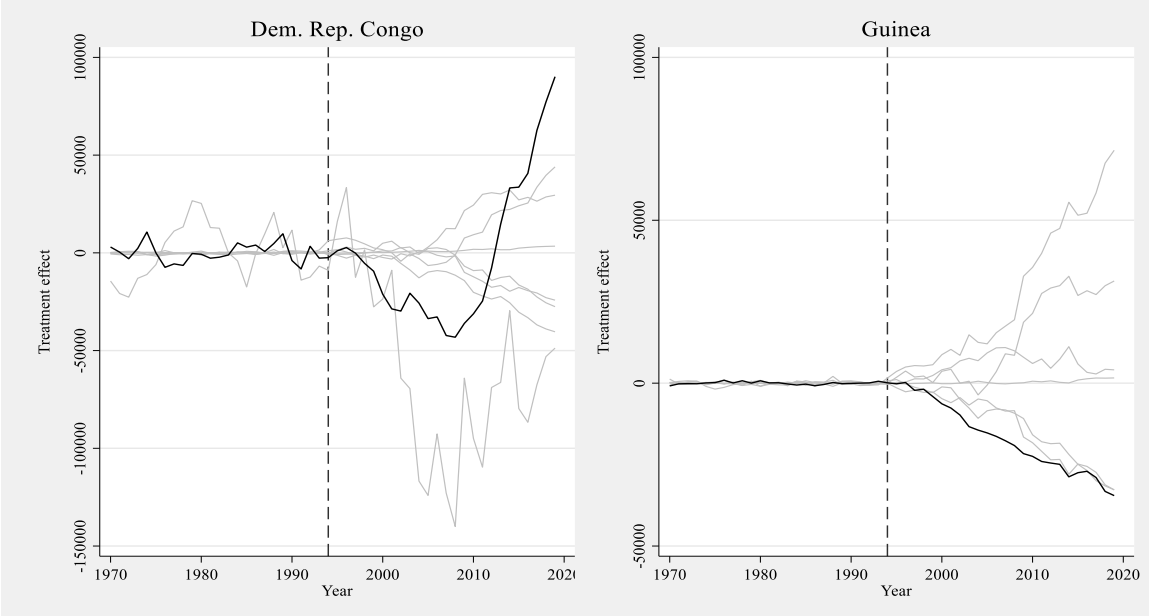

Fig. C3 Placebo distribution: Employment rate as the outcome variable, SCUL
Source: Generated by the author using the *scul* command in Stata 17.

Appendix D: SCM with additional covariates

D.1 Non-exchange countries and synthetic controls' output trends

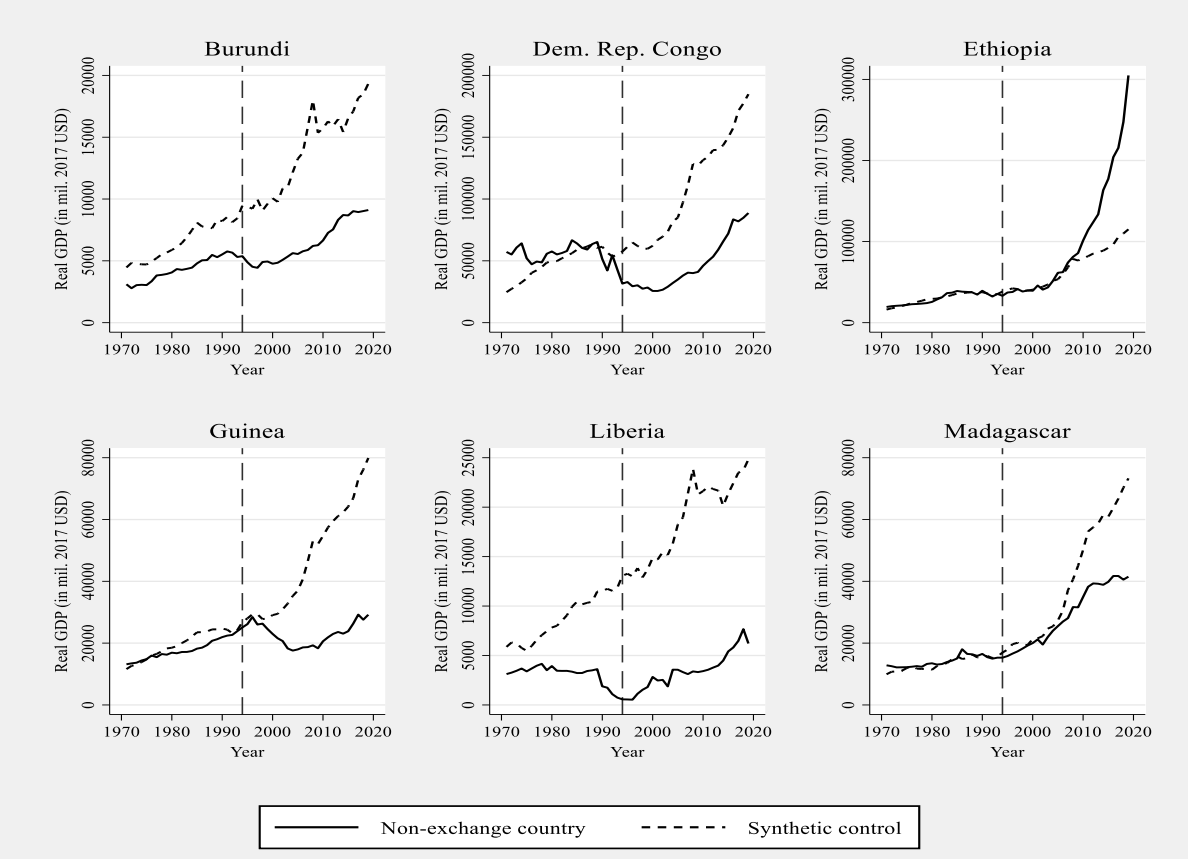

Fig. D1 GDP trends: Non-exchange countries vs. synthetic controls
Source: Generated by the author using the *synth* command in Stata 17.

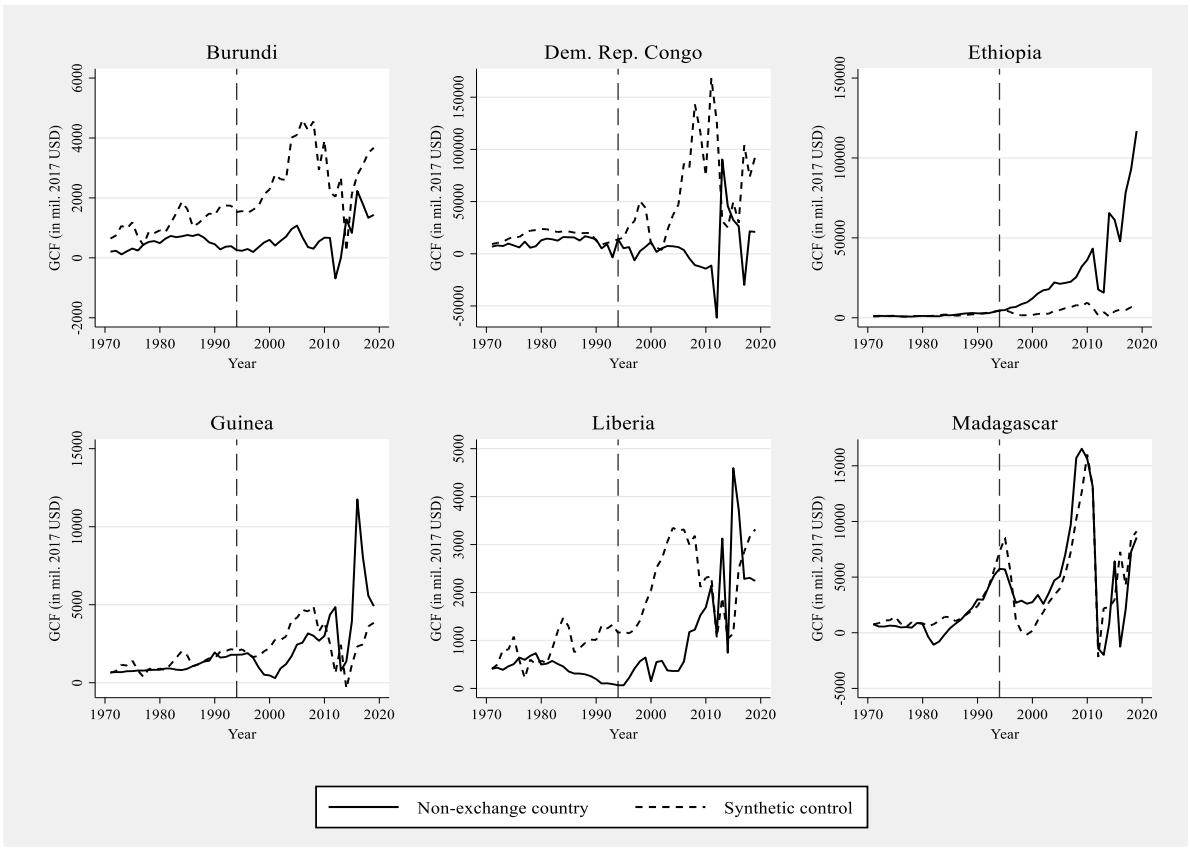

Fig. D2 GCF trends: Non-exchange countries vs. synthetic controls
Source: Generated by the author using the *synth* command in Stata 17.

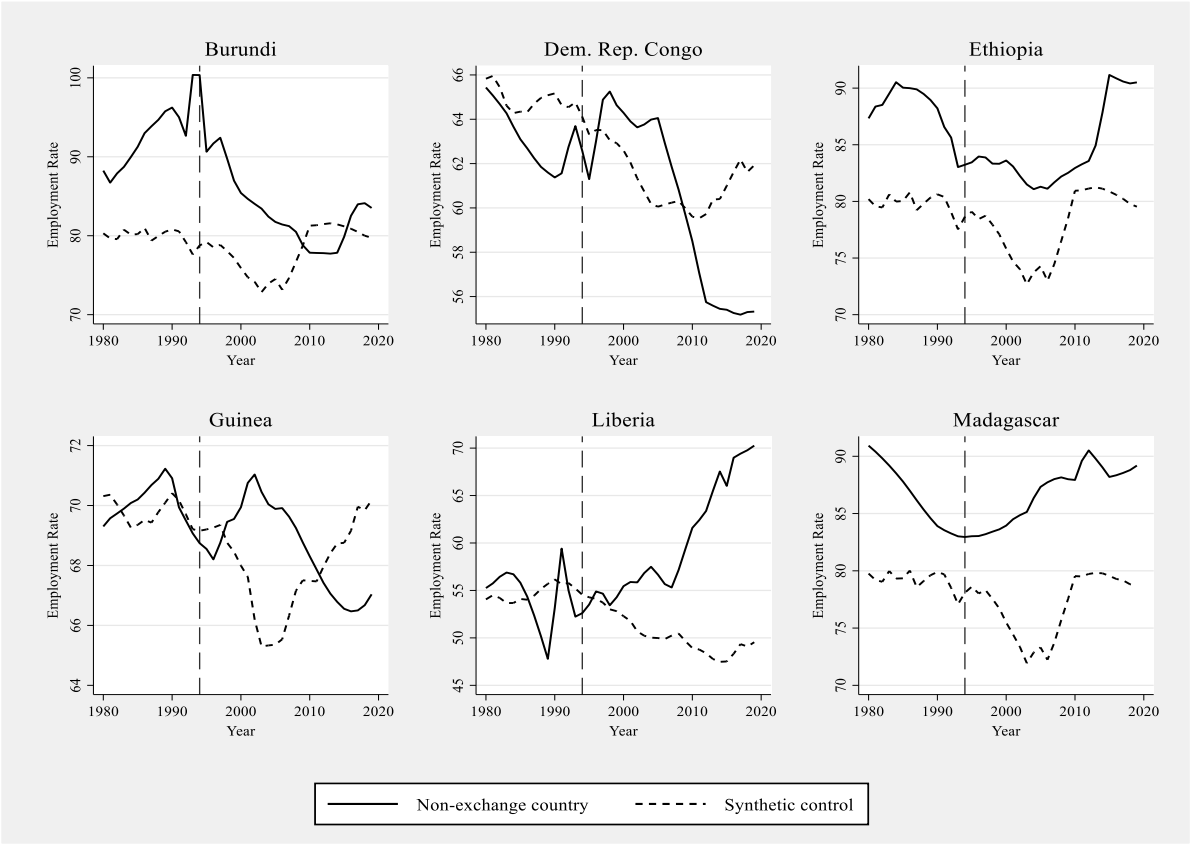

Fig. D3 Employment trends: Non-exchange countries vs. synthetic controls
Source: Generated by the author using the *synth* command in Stata 17.

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Skills

Technical skills: Statistical analysis - Regression modeling, econometrics

Statistical Software: Stata, R (intermediate)

Research skills: Data analysis and visualization; Study design and methodology; Literature review

Communication skills: Academic writing and publishing; Presentation skills

Scholarships and Awards

Czech government scholarships for students from developing countries, 2019 – 2024

Addis Ababa University female scholarship award for graduate study, 2015 –2017

Graduate student research grant by International Development Research Centre, 2016

Professional Association

Member of Ethiopian Economic Association

Etsub Tekola Jemberu

Forfeited Benefits or Mitigated Losses? The Economic Impact of Not Having a Stock Market: A Synthetic Control Approach

Propadlé výhody nebo zmírněné ztráty? Ekonomický dopad neexistence akciového trhu: Syntetický kontrolní přístup

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