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FINANCIAL DEVELOPMENT, TAX REVENUE MOBILIZATION AND PUBLIC SECTOR EFFICIENCY

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ABSTRACT

Given the recent fiscal challenges and the growing need to provide more public goods and services, especially in response to income reductions following the 2008 financial crisis and the COVID-19 pandemic, this thesis thoroughly examines the crucial role of economic factors, such as financial development, in shaping fiscal policy. It utilizes statistical and econometric methods to analyze mechanisms through which developed and developing countries can efficiently allocate public resources for development and offers policy recommendations for developing economies. In Chapter 1, we contribute to the literature on public sector efficiency using a comprehensive dataset spanning from 1990 to 2017. We compute efficiency scores for various sectors, revealing positive correlations with globalization, productivity, and institutional quality. Tobit analysis shows consistent impacts across economies, with tax revenues negatively affecting efficiency in advanced economies. The study suggests emphasizing globalization benefits, promoting productivity, and enhancing institutional quality for efficient management. It underscores the importance of fiscal governance and proposes future research avenues on government efficiency and the impact of fiscal reforms. In Chapter 2, we investigate the effect of financial development on public sector efficiency globally. Efficiency scores are computed for 158 countries from 1990 to 2017, revealing a positive link between financial development and public expenditure efficiency. Robustness checks confirm these results and explore the channels through which financial development influences efficiency. We emphasize the importance of financial stability in mitigating fiscal volatility. Policy implications recommend structural reforms to promote financial development, offering opportunities for social improvement in developing countries. Chapter 3 delves deeply into the effect of financial sector development on domestic tax revenue mobilization in 49 developing countries from 1995 to 2017. We highlight a more robust positive relationship with non-resource tax revenues, particularly in low-income countries with high financial openness and low public debt. The analysis identifies the significant influence of various aspects of financial development on tax mobilization. Policy recommendations stress the importance of combining financial development with sound fiscal or

monetary policies, especially in open and financially developed contexts, to maximize its effect on tax revenue mobilization and overall social welfare. In Chapter 4, we examine the effect of financial market access on tax revenue instability in developing countries using data from 30 countries from 1996 to 2020. Employing the GMM-system estimator reveals a causal relationship between this instability and sovereign rating and bond spreads. Theoretical implications highlight the importance of financial market access in mitigating tax revenue volatility, suggesting that reforms promoting financial development could enhance the effectiveness of fiscal policies in these countries.

Keywords: *Public finances, Fiscal policy, Public sector performance, Efficiency of public spending, Parametric approach, Tobit model, Financial development, Resource mobilization, Generalized method of moments (GMM), Economic growth, Development financing, Public expenditure, Tax revenues, Access to financial markets, Tax revenues instability, Institutional quality, Developing countries, Developed countries*

RESUME

Face aux défis fiscaux récents et à la nécessité croissante de fournir davantage de biens et services publics, notamment en réponse aux baisses de revenus subies par la population suite à la crise financière de 2008 et à la pandémie de COVID-19, cette thèse aborde de manière approfondie le rôle essentiel des facteurs financiers, tels que le développement financier, dans l'orientation de la politique budgétaire. Elle analyse les mécanismes par lesquels les pays développés et en développement peuvent efficacement allouer les ressources publiques pour le développement, en se basant sur des méthodes statistiques et économétriques, et elle propose des recommandations de politiques économiques pour les économies en développement.

Dans le Chapitre 1, nous contribuons à la littérature sur l'efficience du secteur public en utilisant un vaste ensemble de données de 1990 à 2017. Nous calculons les scores d'efficience pour divers secteurs, révélant des corrélations positives avec la mondialisation, la productivité et la qualité institutionnelle. L'analyse Tobit montre des impacts constants à travers les économies, avec des recettes fiscales affectant négativement l'efficience dans les économies avancées. L'étude suggère de mettre l'accent sur les avantages de la mondialisation, de promouvoir la productivité et d'améliorer la qualité institutionnelle pour une gestion efficiente. Elle souligne l'importance de la gouvernance fiscale et propose des pistes de recherche futures sur les retombées de l'efficacité gouvernementale et sur l'impact des réformes fiscales. Nous examinons, dans le Chapitre 2, l'effet du développement financier dans l'amélioration de l'efficience du secteur public à l'échelle mondiale. Des scores d'efficience sont calculés pour 158 pays de 1990 à 2017, révélant un lien positif entre le développement financier et l'efficience des dépenses publiques. Les vérifications de robustesse confirment ces résultats et explorent les canaux par lesquels le développement financier influence l'efficience, en mettant en avant l'importance de la stabilité financière pour atténuer la volatilité fiscale. Les implications politiques recommandent des réformes structurelles pour favoriser le développement financier, offrant ainsi des opportunités d'amélioration sociale dans les pays en développement. Dans le Chapitre 3, nous explorons de manière approfondie l'effet du développement du secteur financier sur la mobilisation des recettes fiscales intérieures dans 49 pays en

développement sur la période de 1995 à 2017. Nous mettons en évidence une relation positive, plus robuste, avec les recettes fiscales non liées aux ressources, particulièrement prononcée dans les pays à faible revenu avec une grande ouverture financière et une faible dette publique. L'analyse identifie l'influence significative de divers aspects du développement financier, tels que les marchés financiers, les institutions, la profondeur, l'accès et l'efficacité, sur la mobilisation fiscale. Les recommandations politiques insistent sur l'importance de combiner le développement financier avec des politiques fiscales ou monétaires saines, surtout dans les contextes ouverts et financièrement développés, pour maximiser son impact sur la mobilisation des recettes fiscales et le bien-être social global. Nous étudions dans le Chapitre 4, l'effet de l'accès aux marchés financiers sur l'instabilité des recettes fiscales dans les pays en développement en utilisant des données de 30 pays de 1996 à 2020. L'utilisation de l'estimateur GMM-système révèle une relation de causalité entre cette instabilité et la notation souveraine ainsi que les spreads obligataires. Les implications théoriques mettent en avant l'importance de l'accès aux marchés financiers pour atténuer cette volatilité des recettes fiscales, suggérant que des réformes favorisant le développement financier pourraient améliorer l'efficacité des politiques fiscales dans ces pays.

Mots clés : *Finances publiques, Politique budgétaire, Performances du secteur public, Efficience des dépenses publiques, Approche paramétrique, Modèle Tobit, Développement financier, Mobilisation des ressources, Système GMM, Croissance économique, Financement du développement, Dépenses publiques, Recettes fiscales, Accès au marché financier, Instabilité des recettes fiscales, Qualité des institutions, Pays en développement, Pays développés*

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General Introduction

In 2022, after providing simultaneous extraordinary support in 2020, both monetary and fiscal policies tightened in nearly three-quarters of countries due to high inflation and the expiration of pandemic-related spending measures. This change occurred in an unstable environment marked by a rapid economic rebound from the COVID-19 recession, limited fiscal space, a cost-of-living crisis, Russia's invasion of Ukraine, and financial sector instability. Despite these challenges, households and economies, supported by governments, demonstrated resilience, leading to a rapid global economic recovery. However, progress on poverty reduction was reversed, potentially delaying the international goal of eradicating extreme poverty by 2030. The lack of fiscal space in developing countries and high borrowing costs have hampered progress toward other Sustainable Development Goals. The short-term fiscal outlook remains complex, with fiscal and monetary policies needing to be closely aligned to ensure price and financial stability in the face of economic uncertainty and rapidly changing financial conditions. In 2023, overall fiscal deficits were expected to increase slightly to 5 per cent of GDP on average, reflecting rising interest costs and the need to boost public spending to address past inflation, including expenditures on wages and pensions (IMF, 2023)[1]. The global economic outlook faces substantial downside risks, as highlighted in the April 2023 World Economic Outlook and Global Financial Stability Report (IMF). Financial sector instability may strain public sector balance sheets if it escalates, necessitating government intervention. Medium-term projections indicate that fiscal deficits will persist above prepandemic levels, with uncertainty tied to the pace of long-term economic growth and global interest rates. The planned gradual fiscal tightening is unlikely to prevent a resurgence of public debt ratios, particularly in some large advanced and emerging market economies where nominal GDP is slowing. Interest

[1] https://www.imf.org/-/media/Files/Publications/fiscal-monitor/2023/April/English/execsum.ashx

payments as a percentage of revenues are expected to remain high in emerging market economies and low-income developing countries, raising concerns about increased debt vulnerability. Tax revenues in low-income developing countries are notably insufficient despite multiple tax reforms, emphasizing the need to enhance tax capacity. The recent crises underscore the potency of fiscal policy in building resilience, urging governments to prioritize rebuilding fiscal buffers. Developing credible risk-based fiscal frameworks is crucial for maintaining consistent macroeconomic policies, reducing debt vulnerabilities, and creating room to address future shocks.

In the post-pandemic era characterized by dynamic fiscal and economic changes, including high inflation, geopolitical crises, and financial sector instability, how does financial development impact public finances' fiscal resilience and sustainability in both developed and developing countries? Furthermore, what strategic policies can leverage financial development to promote sustainable public finances, particularly in addressing extreme poverty, advancing progress towards Sustainable Development Goals, and navigating evolving fiscal landscapes amid volatile financial conditions and high borrowing costs? This research question encompasses the complexities of the interaction between financial development, public finances, and broader global economic challenges outlined in the context. It calls for a comprehensive investigation into the impact of financial development on fiscal resilience and the strategic policy measures needed to optimize this impact to achieve development goals and fiscal stability in a dynamic and uncertain economic environment. The relationship between public finances and development financing is a critical nexus in the current economic landscape, characterized by complexity and interconnection. Public finances, often regarded as the financial core of a nation, serve as the central element for delivering public goods, social services, and infrastructure. Concurrently, the evolution and expansion of the financial sector play a determining role in shaping a nation's economic landscape, influencing its growth trajectory and overall well-being. The complex synergy between these two dynamic forces is crucial for understanding the transformative potential of financial development in the context of public finances and development financing. This thesis explores the multifaceted role of financial development in transforming public finances and, by extension, achieving

development goals. Public finances revolve around government revenue generation, resource allocation, and public expenditure management responsibilities. Effective management of public finances is essential for maintaining budgetary discipline, ensuring the provision of public goods and services, and achieving broader economic and social objectives. However, inadequate management of public finances can lead to budget deficits, debt accumulation, and macroeconomic instability.

This general introduction is structured in two main sections to set the background of this thesis. First, it defines and presents the literature on the determinants of financial development and discusses the limits of financial development measures. Second, it analyses the macroeconomic impact of financial development.

1 The literature on financial development

The literature on financial development is still developing, with new definitions, determinants and measurement procedures being suggested. The factors that facilitate, restrict or reverse financial development are documented Huang (2010, 2011); Girma and Shortland (2008); Herger, Hodler and Lobsiger (2008); Yang (2011); Roe and Siegel (2011). These include institutional quality, macroeconomic policies, and geographic and cultural characteristics. The measurement of financial development remains an important issue for empirical studies. Different authors use various sources and analytical methodologies to estimate the value of financial development from developing countries (IMF; World Bank; European Statistics; Levine and Zervos, 1998; Levine, 2005; Svirydzenka, 2016)

1.1 Definition of the concept of financial development

The concept of financial development extends back to the seminal work of Schumpeter (1961); McKinnon (1973) and Shaw (1973). The definition of this concept has emerged considerably over time. For example, Shaw (1973) defined financial development broadly as "the accumulation of financial assets at a faster rate than the accumulation of non-financial assets". Next, Levine (2005) expands on this definition: " *Financial development is achieved when financial instruments, markets, and financial intermediaries reduce, but not necessarily eliminate, the costs of obtaining*

information, the costs of enforcing contracts, and the costs of transactions, and consequently do a better job of providing five financial functions". Levine's five main functions that require financial development are: (i) producing ex-ante information on projects and promoting optimal allocation of resources, (ii) monitoring investments and controlling enterprises, (iii) facilitating financial transactions, risk hedging, asset diversification and risk pooling, (iv) ensuring the mobilization of savings, and (v) facilitating the exchange of goods and services. In this thesis, for a summary of different definitions, we define our financial development following the World Bank (Washington, 2020). Financial development is: " *the set of institutions, instruments, markets, as well as the legal and regulatory framework that permit transactions to be made by extending credit. Fundamentally, financial sector development is about overcoming "costs" incurred in the financial system. Reducing the costs of acquiring information, enforcing contracts, and making transactions resulted in the emergence of financial contracts, markets, and intermediaries. Different types and combinations of information, enforcement, and transaction costs in conjunction with different legal, regulatory, and tax systems have motivated distinct financial contracts, markets, and intermediaries across countries and throughout history. Financial sector development thus occurs when financial instruments, markets, and intermediaries ease the effects of information, enforcement, and transaction costs and therefore do a correspondingly better job at providing the critical functions of the financial sector in the economy* ".

1.2 New broad-based index of financial development.

From a theoretical perspective, drawing upon the analyses of Levine (1997, 2005) and Beck (2013), financial development characterizes a process in which different components of a financial system, primarily banks and financial markets, contribute to a reduction in informational and transaction costs associated with financial operations. Quantitatively, this translates into an increase in the supply of lendable funds for financing agents' consumption and investment expenses. Qualitatively, it results in a more efficient allocation and utilization of available resources and improved risk management and diversification. While this definition forms a necessary foundation for an initial theoretical approach to financial development, it has two limitations.

Firstly, it does not yield specific indicators for measuring a country's financial development level. Secondly, it does not explicitly underscore the structurally multidimensional nature of financial development. Since the 1970s, most empirical studies have gauged financial development through the prism of two measures of financial depth: the private credit-to-GDP ratio and, to a lesser extent, market capitalization, also scaled as a ratio to GDP. For example, in a pivotal industry-level analysis, Rajan and Zingales (1996) harnessed both metrics to show the positive impact of heightened financial development on economic growth. Arcand, Berkes and Panizza (2015) utilized the credit-to-GDP ratio to delineate a threshold beyond which further financial development ceases to positively influence economic growth. In terms of macroeconomic stability, Dabla-Norris and Srivisal (2013) uncovered that financial development, as quantified by the private credit-to-GDP ratio of banks and other financial institutions, significantly mitigates volatility in the growth of production, consumption, and investment—albeit up to a particular juncture. Most researchers employ variations of these two measures to scrutinize the financial system's role in economic development.[2] Financial development is a complex, multifaceted process. Over time, financial sectors have evolved globally, leading to diverse modern financial systems. While banks typically remain the largest and most prominent players, investment banks, insurance companies, mutual funds, pension funds, venture capital firms, and other non-bank financial institutions now have significant influence. Similarly, financial markets have expanded, allowing individuals and businesses to diversify their savings. Companies can now source funds through stocks, bonds, and wholesale money markets, bypassing traditional bank loans. This diverse landscape of financial institutions and markets facilitates the provision of financial services. Moreover, accessibility and efficiency are vital attributes of financial systems. Large financial systems serve limited purposes if they are not accessible to a broad section of the population and businesses. Although financial systems are indispensable and possess extensive reach, their contribution to economic development hinges on their

[2] Indeed, the scope of these papers encounters several limitations. First, different measures of financial development are generally highly correlated and are frequently subject to measurement error. Second, previous studies tend to examine a single indicator, such as bank credit or stock market capitalization, as a proxy for FD, which leads to failure in capturing the complex multidimensional nature of the FD process.

efficiency and waste avoidance. This aspect is also explored in works such as Čihák *et al.* (2012) and Aizenman, Jinjarak and Park (2015). Given the diversity of financial systems across countries, examining multiple indicators is essential for gauging financial development.

Confronted with the inherently multidimensional nature of financial development, a pivotal query naturally emerges: Which singular financial development indicator assumes paramount importance within our study? Which one offers the most meaningful insights for analyzing the impact of financial development on public finances? To address the limitations of single indicators as measures of financial development, we employ in this thesis a set of indices that encapsulate the level of development in financial institutions and financial markets in terms of depth, accessibility, and efficiency, culminating in the final financial development index (see *Figure 1.1*). Initially developed in the context of an IMF discussion note titled "Rethinking Financial Deepening: Stability and Growth in Emerging Markets" (Sahay *et al.*, 2015), these indices offer a fresh perspective on financial development. They've been meticulously crafted to reveal the subtleties of market depth, accessibility to financial services, and the efficiency of institutions. These indices consider various financial players, from banks to insurance companies and mutual funds to pension funds. Financial markets, whether stock or bond markets are scrutinized with great precision. As we define it, financial development hinges on a delicate blend of market depth, accessibility to financial services, and institutional efficiency. It results from multidimensional thinking, falling in line with the matrix of financial system characteristics developed by Čihák *et al.* (2012). The work of Čihák *et al.* (2012) represents a significant advancement in this regard, as it provides a more precise definition of financial development, one that is not only operational but also accommodates the multidimensional nature of this concept. The financial development typology proposed by these authors referred to as the '4x2 matrix,' is based on a dual distinction. On one side, it distinguishes the four dimensions of size, access, efficiency, and stability associated with the financial development process. On the other side, it differentiates between the two components of a financial system, namely financial institutions (banks and institutional investors) and financial markets (stock markets and

money markets). By traversing the various rows and columns of this 4x2 matrix, a clear and easily quantifiable typology of the different dimensions of financial development emerges. For example, one can assess the size of the banking sector within the economy, the extent of access that the population has to financial services provided by banks, the efficiency with which financial intermediaries manage their financial operations, and the stability of their activities, including factors such as capital holdings, asset quality, and debt present on their balance sheets. Due to these numerous advantages, the definition of financial development by Čihák *et al.* (2012) is not only the one presently adopted by the World Bank but also widely embraced within academic literature.

Figure 1.1. Financial Development Index Pyramid

Source: IMF staff, based on Čihák *et al.* (2012)

1.3 What determines financial development ?

Questions related to the determinants of financial development have been the subject of several research studies. For example, Huang (2005, 2010) suggests that the level of financial development is determined by its institutional factors (legal and regulatory environment, democratic, corruption, political instability), macroeconomic factors (Inflation, income level, saving rate), structural factors (trade openness and financial openness), geographic and cultural factors (latitude, access to the sea, distance from large markets, colonization, population level, religious, language, and ethnic characteristics). Various scholars have investigated the relationships between financial development and institutional factors, but not in a single study. For example, Girma

and Shortland (2008) and Huang (2010) studied the effects of political institutions on financial development and financial structure and found positive effects of political institutions on financial development. Bhattacharyya (2013) analyzes the impact of democratization on financial structure in a sample of 96 countries covering the period 1970–2005. He finds that democratization leads to a more market-based financial system. La Porta *et al.* (1997) empirically establish the link between the legal environment and financial markets in 49 countries and find that countries with a lower level of investor protection, measured by both the nature of legal rules and the quality of law enforcement, have smaller and narrower capital, equity, and debt markets. Similarly, Porta *et al.* (1998) examine legal rules covering the protection of corporate shareholders and creditors, the origin of these rules, and the quality of their enforcement. They claim that national legal origin strongly affects the legal and regulatory environment of financial transactions and explains the differences in financial development between countries. They show that French-civil-law countries generally have the weakest legal protections for investors and common-law countries the strongest, with German and Scandinavian-civil-law countries located in the middle. Acemoglu, Johnson and Robinson (2001) and Beck, Demirgüç-Kunt and Levine (2003) assign differences in countries' financial development to colonial strategies. He finds that differences in early settler mortality can explain cross-country variation in financial development among former colonies. Rajan and Zingales (2003) investigate the role of interest group politics in financial development and find that interest group politics is an essential factor in financial development across countries. They argue that interest groups, especially incumbent industrial firms and the domestic financial sector opposition, will weaken when a country allows trade openness and capital flows. Macroeconomic conditions could affect the development of the financial system. According to Huybens and Smith (1999), inflation, one of these macroeconomic variables, hurts financial performance. Indeed, an inflation rate increase reduces the real return on money and assets, resulting in credit rationing. The financial sector would then grant fewer loans, the allocation of resources would become less efficient, and the activity of intermediaries would reduce, with negative consequences for capital investment (Gultekin, 1983; Boudoukh and Richardson, 1993; Boyd, Levine and

Smith, 1996, 2001; Ely and Robinson, 1997; Barnes, Boyd and Smith, 1999; Huybens and Smith, 1999; Schotman and Schweitzer, 2000). Some studies have also examined structural factors' impact on financial development. For example, Ibrahim and Sare (2018) analyze the determinants of financial sector development in Africa, relying on data from 46 countries spanning 1980–2015, and show that, while human capital robustly influences financial development, trade openness robustly matters more for private credit than domestic credit. They found that trade openness and human capital are substitutes and are influential in Africa's financial development. The role of foreign banks in promoting financial development in developing countries is stressed in the literature. Thus, Levine (1996) postulates that foreign banks promote financial development directly by providing high-quality banking services and indirectly by spurring domestic banks to improve quality and cut costs, stimulating the growth of the bank supervisory and legal framework and intensifying pressures on governments to enhance the legal, regulatory, and supervisory systems. Claessens, Demirgüç-Kunt and Huizinga, (2001) examine the extent and effect of foreign presence in domestic banking markets and find that foreign banks have higher profits than domestic banks in developing countries. An analysis of Stulz and Williamson (2003) on the impact of cultural differences, proxied by differences in religion and language, shows two pieces of evidence on the process of financial development. First, culture predicts cross-country variation in protecting and enforcing investor rights, especially for creditor rights. Second, the influence of culture on creditor rights protection is mitigated by the introduction of trade openness. The analysis also shows that the main monotheistic religions, such as Catholicism, Islam, and Protestantism, are consistently linked to establishing and enforcing creditor rights and affect the efficiency of the financial system. Studies have analyzed how natural resources influence financial development. For example, Beck (2011) shows that resource-based economies have less developed financial systems. Their banks are more liquid, better capitalized, and more profitable but give fewer loans to firms. Firms in resource-based economies use less external finance, and a smaller share of them use bank loans, although there is the same level of demand as in other countries, thus pointing to supply constraints. Overall, there is some indication of a natural resource curse in financial development, which falls more

on enterprises than households. Zaidi *et al.*, (2019) probed the influence of globalization, natural resources, and human capital on financial development in a panel of thirty-one OECD countries. They found that natural resources have Granger causality and positive effects on financial development. Gokmenoglu and Rustamov (2019) investigate the role of the World Bank lending and natural resource abundance on the financial development in the case of four natural resource-rich developing countries: Kazakhstan, Azerbaijan, Russia, and Turkmenistan (KART) during the period from 1992 to 2017 and find that in the long-run the World Bank lending and an abundance of natural resources positively affects financial development. By contrast, Bhattacharyya and Hodler, (2014) studied whether natural resource revenues hinder financial development and what role political institutions played in this process in 133 countries from 1970–2005. The results show that resource rents negatively affect financial development in countries with weak political institutions. Still, this negative effect decreases in absolute value and eventually vanishes as the quality of political institutions improves. Phuc Canh and Trung Thong (2020) find that natural resource rent negatively affects financial institutions.

2 What are the macroeconomic effects of financial development?

Several studies such as Robert G King and Levine (1993), Levine, Loayza and Beck (2000), Ang and McKibbin (2007), Greenwood, Sanchez and Wang (2013), find a positive effect of financial development on growth. For instance, McKinnon (1973) and Shaw (1973) underline the importance of the financial system in promoting economic growth. In the same vein, Levine (1991) shows that stock markets accelerate growth by facilitating the firm's ownership without disrupting the production processes within firms and allowing agents to diversify portfolios. Robert G King and Levine (1993) find that financial development is strongly associated with economic growth. Levine and Zervos (1998) find a strong and positive link between financial development and economic growth. Levine (2005) argues that financial systems may influence saving rates, investment decisions, technological innovation, and long-run growth rates. However, the positive effect of financial development on economic growth needs to be interpreted with some caution since it could reflect the impact of

omitted variables, unobserved country-specific effects, and the simultaneity problem (Levine, Loayza and Beck, 2000a). Although past work shows that the level of financial development is a good prediction of economic growth, these results do not settle for causality. The importance of financial development for economic growth is still debatable (Robinson, 1952; McKinnon, 1973; Lucas Jr, 1988; Levine, 2001). For example, Lucas Jr (1988) asserts that economists "badly over-stress" the role of financial factors in economics. In contrast, McKinnon (1973; 1989) declares that financial development can be a significant source of economic growth. Also, McKinnon (1973; 1989) suggests that whether or not financial development is an effective driver of subsequent economic growth is conditional on the efficiency of financial institutions and other related economic conditions.

More empirical work provides evidence that shows the changing nature of the finance–growth nexus. For example, Rousseau and Wachtel (2011) provide proof of either vanishing positive impact. In parallel, Benczúr, Karagiannis and Kvedaras (2019), Arcand, Berkes and Panizza (2015), Samargandi, Fidrmuc and Ghosh (2015), Cournède and Denk (2015), Sahay *et al.*(2015), Law and Singh (2014), Cecchetti and Kharroubi (2012) provide evidence of a potentially non-linear (often an inverted U-shape) relationship. Demetriades and Rousseau (2016) argue that some financial reforms have significant growth effects, positive or negative, depending on bank regulation and supervision quality.

Regarding the effects on growth volatility, Ferreira da Silva (2002) shows that countries with more developed financial systems exhibit less volatile business cycles after controlling for other factors that may affect the fluctuations in economic activity. A well-developed financial system in Ahamada and Coulibalyb (2011) prevents remittances from creating significant GDP growth volatility. The financial markets may channel remittances to non-remittances-receiving agents with investment needs and allow them to smooth their investments, decreasing total output volatility. Moradbeigi and Law (2016) provide evidence that supports the dampening effect of financial development in the propagation of oil terms of trade volatility. Specifically, a well-developed financial system can offset some of the negative impacts of oil volatility on growth volatility.

Some studies have looked at the relationship between financial development and trade policy with various conclusions, particularly on the impact of financial development on trade liberalization (Beck, 2002; Svaleryd and Vlachos, 2002; Do and Levchenko, 2007; Kim, Lin and Suen, 2010; Yakubu *et al.*, 2018; Sare, Aboagye and Mensah, 2019; Sare, 2021). First, Beck (2002) explores a link between financial development and the structure of the trade balance. He finds that the level of financial development impacts both exports and the trade balance of manufactured goods. Similarly, Svaleryd and Vlachos (2002) also find a positive and economically significant relationship between trade policy and financial markets, with causation running in both directions. Then, Kim, Lin and Suen (2010) study the long, short-run relationships between financial development and trade openness and show that long-run complementarity between financial development and trade openness coexists with short-run substitutability between the two policy variables. Lastly, Kim, Lin and Suen (2012) have provided evidence that financial development positively impacts trade and negatively affects financial development in poorer countries. Financial development stimulates trade openness in wealthier countries, whereas trade has an ambiguous impact on financial development. Using data from 46 African countries from 1980-2015, Yakubu *and al.* (2018) reveal the differential effects of finance on trade. The authors provide evidence that private credit does not promote trade. In contrast, domestic credit positively affects trade, and , studying the impact of finance on trade as well as sectoral channels through which finance influences international trade in 46 countries in Africa spanning 1980–2016, find that financial sector development does not have a significant effect on international trade. Sare (2021) seeks to quantify the threshold beyond which financial sector development no longer positively affects international trade. To do this, they use data on 46 African countries between 1980 and 2016 and employ a sample splitting and threshold estimation approach. The author finds evidence of threshold effects for several countries.

Several papers have examined the impact of financial development on poverty and inequality (Jalilian and Kirkpatrick, 2005; Clarke, Xu and Zou, 2006; Beck, Demirgüç-Kunt and Levine, 2007; Huang, 2010). On the one hand, Jalilian and Kirkpatrick (2005) examine the contribution of financial development to poverty reduction in developing

countries and show that, up to a threshold level of economic development, financial sector growth contributes to poverty reduction growth-enhancing effect. However, Clarke, Xu and Zou (2006) examined the relationship between financial development and the level of the Gini coefficient. They reject the hypothesis that financial development benefits only the rich and argue that inequality is less when financial development is more significant in the long run. On the other hand, Ang (2010) examines how finance impacts income inequality in India using annual time series data for over half a century and finds that financial development reduces income inequality. Finally, Beck, Demirgüç-Kunt and Levine (2007) find that financial development reduces income inequality, exerts a disproportionately positive impact on the relatively poor, and is strongly associated with poverty alleviation. Sanfilippo-Azofra *et al.* (2018) examined the influence of financial development on the bank lending channel. They observed that in countries with less developed financial systems, monetary policy changes do not significantly affect banks' loan supply. However, in countries with more advanced financial systems, the bank lending channel becomes effective, particularly after financial crises. In such environments, banks have diverse financial instruments to mitigate risks and access various funding sources, reducing the impact of monetary policy changes on loan supply. Conversely, in less financially developed countries, where financial markets are limited and bank funding relies heavily on deposits, the bank lending channel tends to have a more significant impact. Despite previous research on the relationship between financial development and monetary policy, the specific effect of financial development on banks' loan supply remains largely unexplored.

3 Theoretical foundations

The theoretical foundations of this thesis are multiple. First, we rely on the theory of public economy (Musgrave, 1959; Jackson and McLeod, 1982; Jackson, 2011; Pollitt and Bouckaert, 2011; M. Lewis, 2015; Desmarais-Tremblay, 2021; De Waele *et al.*, 2021; Hallaert and Primus, 2022), to analyze mechanisms for allocating public resources and assess the effectiveness of public policies. This theory is complemented by contributions in welfare economics (Arrow and Kurz, 1969; Lindbeck, 1985;

Aschauer, 1989; Barro, 1990; Ravallion, 1997; Baffes and Shah, 1998; Cornia and Reddy, 1999; Jung and Thorbecke, 2003; Wilhelm and Fiestas, 2005; Carboni and Medda, 2011; Chauvet and Ferry, 2021), which shed light on the impact of public policies on social well-being and the optimization of collective choices. Other contributions assess local efficiency (e.g., see Eeckaut, Tulkens and Jamar, 1993; Worthington, 2000; Afonso and Fernandes, 2008). Secondly, we rely on classical financial theories such as the theory of financial intermediation (Bohn, 1990; De Gregorio and Guidotti, 1995; Khan Mohsin and Senhadji Abdelhak, 2000; Demirgüç-Kunt and Huizinga, 2001; Tavares and Valkanov, 2001; Levine, 2005; Gordon and Li, 2009; Gilbert and Ilievski, 2016), as well as the theory of financial market efficiency (Levine, 1997; Ardagna, 2009; Mu, Stotsky and Phelps, 2013; Harford and Uysal, 2014). Some researchers note that financial development is a potential source of tax mobilization for developing countries (Bohn, 1990; Gordon and Li, 2009). These theories provide a framework for understanding how financial development influences resource allocation and the effectiveness of public investments. Thirdly, the thesis is also based on the theory of taxation and development (Tanzi *et al.*, 1981; Tanzi, 1992a; Burgess and Stern, 1993; Andreoni, Erard and Feinstein, 1998; Ghura, 1998; Emran and Stiglitz, 2005; Bird, Martinez-Vazquez and Torgler, 2008; Mahdavi, 2008; Besley and Persson, 2009, 2010, 2013; Baunsgaard and Keen, 2010; Crivelli and Gupta, 2014). This theory focuses on various tax issues in developing countries, such as the level and structure of taxation, tax evasion, capital and income taxation, tax distortions, and tax reforms, and their impact on tax revenue mobilization. Finally, we rely on macroeconomic theories such as economic cycle theory (Schumpeter, 1961; Rodrik, 1989; Stiglitz, 2000; Broz, 2002; Dye, 2004; Dye and Merriman, 2004; Talvi and Vegh, 2005; Vaaler, Schrage and Block, 2006; Afonso, Agnello and Furceri, 2010; Agnello and Sousa, 2014; Amin *et al.*, 2014; Ma and Lv, 2023). This theory provides information on economic fluctuations and how they can affect the stability of tax revenues.

4 Value-added of the thesis (contribution)

In summary, the thesis significantly contributes to our understanding of the intricate economic landscape in the post-pandemic era. Collectively, these contributions establish a robust foundation for comprehensive research into the profound interplay between financial development and public finance, addressing pressing global economic challenges and the intricate dynamics within the financial realm.

While extensive literature exists on the advantages and potential adverse consequences of financial development, my interest is to contribute to the ongoing discourse and conduct a more profound investigation into the effects of financial development. This involves examining its influence on two pivotal aspects: **i**) public expenditures and their implications for the efficiency of the public sector, and **ii**) public revenues, encompassing their impact on tax revenue mobilization and revenue stability. Also, this dissertation is geared towards formulating policy recommendations designed to help countries optimize their resource allocation and utilization. The thesis brings substantial value by providing a detailed and comprehensive analysis of the relationships between financial development, tax revenue mobilization, and public sector efficiency. Its solid conclusions, policy-oriented approach, and methodological rigor make it an invaluable resource for policymakers seeking to improve public sector performance, stabilize tax revenues, and ensure efficient resource allocation in developing countries. The thesis's ability to uncover important determinants, identify transmission channels, and explore heterogeneities and nonlinearities adds depth and practical relevance to the existing body of knowledge.

5 Outline and Main results :

This dissertation offers the research results, organized across two main sections comprising four chapters. The initial section, spanning two chapters, delves into a dual examination. First, it scrutinizes the factors influencing public sector efficiency, and second, it explores the impact of financial development on the efficiency of the public sector. In Chapter 1, we provide a large dataset on PSE using a parametric approach and covering 158 countries of all income levels from 1990–2017. The analysis includes

four sectors: education, health, infrastructure, and public administration. We further consider three efficiency indicators regarding the 'Musgravian' tasks for government: allocation, distribution, and stabilization. After computing the efficiency scores for our sample countries, we examine their determinants using a wide range of economic and institutional factors. Our key findings are that trade globalization, factor productivity, and institutional quality are important determinants of total PSE. The results remain robust to alternative specifications and methods. Finally, we provide additional evidence by exploring the sensitivity of the main determinants to different country groups, considering the level of economic development, geographical regions, and fragile states. Then, Chapter 2 moves to assess the extent to which financial sector development can increase public sector efficiency. To address this issue, we take advantage of new global public sector efficiency scores for developing and developed countries. Then, we rely notably on panel methodology to estimate the effect of financial development on changes in efficiency scores. For a sample of 158 developing and developed countries from 1990–2017, financial development significantly increases expenditure efficiency, with economically significant effects. Robustness has been checked in several ways, including considering alternative samples, using alternative measures, additional controls, and alternative estimation strategies, especially ordinary least squares (OLS) or fixed-effects regression, the generalized method of moments (GMM), and an instrumental variables (IV) approach. Next, we analyze three transmission channels through which financial development could affect expenditure efficiency. We show that improving tax performance through increased revenue mobilization, higher GDP per capita, and better institutional quality (especially corruption control) are channels through which financial development positively affects expenditure efficiency. Finally, we deepen the analysis by exploring several potential heterogeneities in the effect of financial development, depending on various macroeconomic and institutional factors. The second part studies the relationship between financial development and tax revenue. In Chapter 3, we examine the effect of financial development on tax revenue mobilization in developing countries. Our empirical analysis uses the aggregate financial index that comprises the banking system's depth (size and activity), access, and efficiency of financial institutions and

financial markets. Using panel data from developing countries from 1995-2017, our findings suggest that more developed financial sectors positively and significantly influence the government's ability to raise tax revenue. More interestingly, this favorable effect is sensitive to developing countries' characteristics, namely the level of economic development, the degree of financial openness and the stance of fiscal policies. When we more precisely look at the effects of disaggregated financial development components on tax revenue mobilization, we find that the estimated coefficients on the sub-components of financial development are statistically significant, except for the financial market's efficiency. The results denote that tax revenue in developing countries depends on financial institutions and financial markets.

Furthermore, we investigate whether financial market access affects a country's stability of tax revenue in developing countries in Chapter 4, using extensive panel data from 30 countries from 1996-2020. We use an appropriate method, namely the GMM-system estimator. We find a causal effect between the tax revenues instability, defined as the standard deviation of the tax revenue ratio over the five-year rolling window, as in Bekaert, Harvey and Lundblad (2006) and low bond spreads and high sovereign rating. A higher ranking in sovereign debt significantly reduces tax revenue instability, whereas increased bond spreads raise it. This result is robust to various tests, including alternative specifications and alternative tax revenue instability measures. Our findings reveal that financial market access firmly and robustly decreases tax revenue instability, even after controlling for banking crises. Transmission channel analysis indicates that FDI and economic growth stabilize financial market access. However, results reveal some heterogeneity across structural factors such as fiscal conditions, the level of GDP, financial openness, and the quality of the institutions.

In the following chapters, we comprehensively explore our findings, the methodology at our disposal, the data we've harnessed, and the paramount policy recommendations. We intend to provide policymakers with valuable insights to enhance their public sector performance, bolster tax revenues, and ensure effective allocation.

Part 1. Financial development, Public sector efficiency and Determinants of Public Sector Efficiency

Chapter 1

Determinants of Public Sector Efficiency: A Panel Database from a Stochastic Frontier Analysis.[3]

[3] **This chapter is joint work with Ablam Estel Apeti and Bao-We-Wal Bambe. A slightly different version of this chapter is published in Oxford Economic Papers**

1 Introduction

Typically associated by economists and political scientists with the size of the state in the economy, government spending helps influence economic conditions to achieve economic and social policy objectives such as stabilization, allocation, and resource redistribution (Musgrave, 1959; Desmarais-Tremblay, 2021). From the middle of the 20th century onwards, public spending — especially social spending — rose sharply in the first industrialized countries, while public revenues increased historically over the same period. Similarly, the structure of public expenditure in developing countries has changed significantly since the mid-1990s, with a growing focus on social sectors. Prevailing tax rates in industrialized countries today leave little scope for increased taxation, especially in countries with the most significant pressures from ageing. Developing countries, on the other hand — generally characterized by strong unequal income distribution, macroeconomic instabilities, poor infrastructure, and high levels of poverty — are facing a considerable development challenge, moving fiscal choices to the top of the political agenda for achieving the Sustainable Development Goals.

Governments in both industrialized and developing countries should adopt a much more ambitious fiscal policy, given their scope for manoeuvre, to better align public policies with their set objectives. In other words, governments need to do 'more' with 'less', especially in the post-COVID era of prolonged recession and monetary policy normalization, where economies worldwide face budgetary and financing capacity constraints (Hallaert and Primus, 2022). Against this background, a growing body of literature focuses on the utility of public sector activities, with empirical assessments of government efficiency. Essential contributions include, among others, Tanzi and Schuknecht (1997, 2000); Gupta and Verhoeven (2001), or Afonso, Schuknecht and Tanzi (2005, 2010). Furthermore, Hauner and Kyobe (2010) compiled a cross-country panel data set on health and education expenditure efficiency, covering 114 countries over the 1980-2006 period, and examined some determinants of the computed scores.

Data are needed to determine the factors that influence and shape public sector efficiency, to help governments improve their spending efficiency to ensure their

economic and social role and thus limit the need for painful reforms with high political costs, as currently illustrated by the French context with the pension reform, causing social unrest and protests (The Economist, 2023). In addition, data on public sector efficiency help inform citizens about public sector management, comparing differences in performance between countries and identifying areas where improvements can be made. In their influential paper published in Public Choice, Afonso, Schuknecht and Tanzi (2005) provides cross-sectional public sector efficiency data for 23 industrialized countries from 1990 to 2000. Accordingly, this paper aims to use new methods to give a panel database on public sector efficiency, including a country-year dimension. A secondary motivation is to analyze some robust determinants of efficiency, also exploring those that can explain the efficiency gap between developed and developing countries.

This chapter contributes to the literature on public expenditure efficiency on two grounds. First, while Afonso, Schuknecht and Tanzi (2005) compile efficiency scores for 23 industrialized countries over 1990-2000 using non-parametric methods, we provide the same indices using panel data over a more extended period, 1990-2017 and include a large sample of 158 countries of all income levels. Furthermore, here efficiency scores are measured through a parametric approach — a Stochastic Frontier Analysis (SFA) following Kumbhakar, Wang and Horncastle (2015) — in contrast to the existing literature, which generally uses non-parametric approaches, namely the Data Envelopment Analysis (DEA) or the Free Disposal Hull (FDH) method.[4] Although non-parametric methods have the main advantage of not imposing any specific functional form on data distribution, they have two significant limitations. On the one hand, they are susceptible to random variations in the data and to measurement errors, sample variations, heterogeneity between units, outliers, and degrees of freedom. On the other hand, as deterministic methods, they ignore measurement errors and any stochastic influence, considering any variation between units as inefficiency

[4] For example, Herrera and Pang (2005) used the FDH and DEA approaches to estimate health and education expenditure efficiency for 140 developing countries between 1996 and 2002. Afonso, Schuknecht and Tanzi (2005) analyze expenditure efficiency in 23 industrialized countries using the DEA and FDH methods. Using the DEA approach, Hauner and Kyobe (2010) compiled a cross-country panel data set on education and health expenditure efficiency for 114 countries between 1980 and 2004. Finally, Wang and Alvi, (2011) also use the DEA method with an application to Asian countries.

(Kumbhakar and Lovell, 2003a). The SFA approach allows measurement errors and country-independent randomness to be considered to disentangle inefficiency resulting from exogenous factors and public sector mismanagement. This method is all the more relevant as public expenditure is affected by exogenous shocks such as commodity prices or environmental shocks. A few studies using parametric methods are found in the literature. For example, Evans *et al.*(2000) utilized the SFA approach to assess health expenditure efficiency for a sample of 191 countries from 1993-1997. Likewise, estimating a stochastic frontier model, Grigoli and Kapsoli (2018) analyze health expenditure efficiency for 80 emerging and developing countries from 2001-2010.

Second, we provide descriptive analyses and econometrically correlate the calculated scores with economic and institutional determinants. On the descriptive side, advanced economies report a higher and statistically significant score (0.71) than developing countries (0.65). Furthermore, the 10 best-performing countries are advanced, while the 10 worst-performing are developing countries, mainly in Africa. On the econometric side, a Tobit analysis suggests that trade globalization, factor productivity, and institutional quality tend to be associated with greater efficiency. Robustness was checked by controlling for some additional determinants and using alternative measures of expenditure efficiency. In addition, we address endogeneity issues by re-estimating our baseline model using the system Generalized Method of Moments (GMM) estimator. Finally, we deepen the analysis by examining our main determinants according to the level of economic development — distinguishing between advanced and developing countries — and geographical regions. First, our data suggest that trade globalization, factor productivity, and institutional quality increase efficiency in advanced and developing countries. In contrast, taxation seems to decrease efficiency in advanced countries. Second, trade globalization, factor productivity, and the level of democracy appear to reduce the efficiency gap between advanced and developing economies. Third, factor productivity and democracy positively correlate with public expenditure efficiency in all groups (Africa, Asia, Latin America, and Europe). In contrast, the positive impact of trade globalization on efficiency seems to be driven by Asian and European countries. Likewise, the negative effect of taxation on efficiency appears to be mainly caused by Latin American and

European countries. Finally, government durability seems to promote efficiency in European countries while reducing efficiency in fragile states.

We organize the chapter as follows. The following section defines the conceptual framework for measuring efficiency. Section 3 describes the methodology for calculating the scores. Some stylized facts are then reported in Section 4. Section 5 examines some potential determinants of the computed scores. Sections 6 and 7 analyze the robustness and heterogeneity of our main results. The last section concludes.

2 Conceptual Framework

Government deficits, particularly in developing and emerging market economies, have grown significantly in recent years (Gnimassoun and Do Santos, 2021). Public finances deteriorated further in the COVID-19 crisis, including in advanced economies, where several measures have been introduced to support social policies, leading to a substantial increase in public debt. That said, governments should promote sound fiscal management, given their room for manoeuvre, to better achieve the targets set. Furthermore, as long argued by the public choice school, given the lack of competition in public services, waste is likely to occur in the public sector, leading to inefficiency (Jackson and McLeod, 1982). Against this background, firstly used to assess firm performance, the concept of efficiency has been progressively extended to the public sector to judge to what extent government spending contributes to the objectives set in the quest for better public sector management. Indeed, researchers argue that attempts to measure public sector efficiency are not entirely new (Pollitt and Bouckaert, 2011). This literature has expanded considerably in recent years, with significant contributions from, among others, Tanzi and Schuknecht, 1997, 2000; Gupta and Verhoeven, 2001; Afonso, Schuknecht and Tanzi, 2005, 2010 or Hauner and Kyobe, 2010.[5] Conceptually, efficiency implies achieving an objective in an economy of means, i.e., the relationship between the results obtained, and the resources used to achieve them. In other words, greater efficiency is essential to ensure governments deliver high-quality services to

[5] Other contributions assess local efficiency (e.g., see Eeckaut, Tulkens and Jamar, 1993; Worthington, 2000; Afonso and Fernandes, 2008).

their citizens while responsibly using public resources. Empirically, efficiency scores are derived based on the relative distances of inefficient observations from an ideal frontier, comprised of the best-performing units in the sample (see Farrell, 1957). The literature distinguishes between technical and allocative efficiency. The first is defined as the ability of a unit to produce a given set of outputs with minimal inputs, regardless of input prices. The latter measures the ability of a unit to use inputs in optimal proportions given their prices. In this study, we choose the first approach, as estimating allocative efficiency requires information on the price structure of inputs (which, in our context, would be challenging to obtain), while the former requires only quantity data (Lovell, 2000; Afonso and Fernandes, 2008).

Measuring efficiency in organizational units such as the public sector is challenging, as public objectives are usually poorly defined, complex, and multidimensional (M. Lewis, 2015). In other words, public sector performance is a multifaceted concept, sometimes involving hybrid public sector organizations that combine elements of the public and private sectors, thus generating complexity in public management (Jackson, 2011; De Waele *et al.*, 2021). Therefore, the economy's dimensions likely to be affected by public sector activities must be rigorously grounded in the literature to avoid ad hoc indicators that could bias the analysis. Such an exercise is not straightforward, as internationally comparable, relevant, valid, and reliable data are not always available, coupled with measurement difficulties and the potential effects of many external factors. The existing literature has often examined government efficiency in sectors such as education, health, and infrastructure, as public spending in these sectors has been shown to have a significant impact on economic growth, human capital, poverty or inequality, and business conditions (see, among others, Aschauer, 1989; Barro, 1990; Baffes and Shah, 1998; Jung and Thorbecke, 2003; Wilhelm and Fiestas, 2005; Chauvet and Ferry, 2021). Similarly, the study by Afonso, Schuknecht and Tanzi (2005), which we follow in this paper, attempts to approach the public sector through several dimensions, considering two categories of performance indicators. The opportunity performance includes the following sectors: education, health, infrastructure, and public administration. The Musgravian indicators allow for considering the traditional tasks of government, including three dimensions:

distribution, stability, and economic performance. We further discuss the relevance of the selected indicators in subsection 3.1.

3 Methodology

As mentioned above, Public Sector Efficiency (PSE) refers to the relationship between the socio-economic indicators targeted by the government and the public resources used to achieve them. Subsection 3.1 describes the socio-economic indicators utilized in the study (Public Sector Performance —PSP— indices). Next, subsection 3.2 discusses the methodology for calculating the efficiency scores.

3.1 Public Sector Performance (PSP) Indices

We compute sectoral performance indices from a series of social indicators. For a given country *i* and *j* areas of government activity, the PSP is defined as follows: [6]

$$PSP_i = \sum_{j=1}^{n} PSP_{i,j} \qquad (1)$$

with $PSP_{ij} = f(I_k)$. Therefore, an improvement in PSP depends on improving the values of the relevant socio-economic indicators:

$$\Delta PSP_{ij} = \sum_{i=k}^{n} \frac{\partial f}{\partial I_k} \Delta I_k. \qquad (2)$$

As mentioned earlier, this study follows Afonso, Schuknecht and Tanzi (2005), who attempted to approach the public sector through several dimensions, considering two categories of performance indicators.[7] The first, described as opportunity performance, includes the following sectors: education, health, infrastructure, and public administration. Education and health spending directly and indirectly impact economic growth, poverty, or inequality. Health is fundamental to improving population productivity and well-being. Education, in turn, provides skills that increase employment opportunities and incomes while helping to protect populations from socioeconomic risks (Wilhelm and Fiestas, 2005). Public investment in infrastructure improves business conditions and can positively affect domestic and foreign

[6] See Afonso, Schuknecht and Tanzi (2005).

[7] Section 3 (Online appendix) discusses the limitations of our measure of public sector efficiency and some possible extensions.

investment, raising employment and growth (Arrow and Kurz, 1969; Aschauer, 1989; Barro, 1990; Baffes and Shah, 1998; Carboni and Medda, 2011). Last but not least, good quality of public administration, characterized by an excellent judicial system, efficient property rights, and well-functioning markets, can be seen as preconditions for a level playing field in the organization of a society (Afonso, Schuknecht and Tanzi, 2005), and helps to build conditions for strong and sustained economic growth. The second category, described as 'Musgravian' performance, includes the traditional tasks for government: allocation, distribution, and stabilization. Indeed, the countercyclical role of fiscal policy is to promote macroeconomic stabilization and reduce economic fluctuations. Moreover, redistributive policies favouring the poorest households reduce poverty and inequality (Lindbeck, 1985; Ravallion, 1997; Cornia and Reddy, 1999). Finally, government spending, especially in social sectors, helps make households resilient to external shocks and prevents them from falling into a poverty trap.

Outcome indicators were selected based on data availability and previous work (e.g., see Afonso, Schuknecht and Tanzi, 2005; Herrera and Pang, 2005; Hauner and Kyobe, 2010). The education sector outcome index includes three sub-indicators: public primary enrollment, public secondary enrollment, and expected years of schooling.[8] The output indicators in health are life expectancy at birth and infant mortality rate (per 1000 live births). Following Donaubauer, Neumayer and Nunnenkamp (2016), we calculate an infrastructure sector outcome index using six infrastructure sub-indices, classified into three main groups: transport, communication, and energy. The output indicators in transport are the total length of roads in kilometers, normalized by the country's area, and the number of paved roads as a percentage of total roads. The outcome index for communication includes fixed telephone subscriptions (per 100 people), fixed broadband subscriptions (per 100 people), and faults for 100 fixed telephone lines per year. Three sub-indicators are also considered for the energy sector: the proportion of households with electricity, electric power consumption (in kWh per capita), and electric power transmission and distribution

[8] Qualitative indicators such as PISA (Program for International Student Assessment) measures could have been considered, but these data are partly available only for OECD countries. Here we do not include them due to our sample size.

losses (as a percentage of production). Following Afonso, Schuknecht and Tanzi (2005), we retain four sub-indicators for public administration: the independence of the judiciary, the quality of property rights, the quality of government, and the level of the shadow economy. On the input side, we consider public expenditure on education (as a percentage of GDP) for the educational sector, public expenditure on health (as a percentage of GDP) for the health sector, public capital stock (as a percentage of GDP) and public-private partnership stock (as a percentage of GDP) for infrastructure, and government final consumption expenditure (as a percentage of GDP) for administration.

As mentioned earlier, we also consider Musgravian indicators, including three sub-indicators: distribution, stability, and economic performance. The outcome indicator for distribution performance is proxied by the Gini index. We use the standard deviation of the three-year moving average of GDP growth and inflation for the stability sub-indicators. We include GDP per capita, GDP growth (10-year average), and unemployment rate (10-year average) to measure economic performance. We use total public expenditure (as a percentage of GDP) for economic stability and performance and social protection expenditure (as a percentage of GDP) as input for distribution.

Finally, we compute a composite outcome index for each sector to capture the standard features of the performance sub-indicators used, following Anderson (2008). This method applies generalized least squares estimators that account for variables with missing data, giving them less weight compared to the principal component analysis (PCA) method, which, moreover, is particularly sensitive to the presence of outliers.[9]

Section Appendix A.4 describes the variables used to compute the efficiency scores and their sources.

[9] We use the Stata procedure proposed by Schwab *et al.* (2020). Nevertheless, we compare the composite indicators obtained following obtained following Anderson (2008) with those obtained using the PCA method for robustness purposes. Overall, the two approaches lead to very similar results in our case. For example, for the four sectors — education, health, infrastructure, and administration — the Pearson correlations are 95%, 100%, 18%, and 96%, respectively.

3.2 Measuring Public Sector Efficiency

Both parametric and non-parametric approaches are used in the literature to estimate efficiency scores. Non-parametric techniques include Free Disposal Hull (FDH) analysis and Data Envelopment Analysis (DEA). These methods impose no restrictions on the distribution of inefficiency and no behavioral hypothesis (profit maximization objective), in contrast to parametric methods, which are based on econometric estimation techniques. However, as deterministic methods, non-parametric approaches ignore measurement errors and any stochastic influence, considering any variation between units as inefficiency (Kumbhakar and Lovell, 2000, 2003b). Such an assumption can lead to significant estimation biases, as public expenditure is impacted by exogenous shocks (e.g., commodity price shocks, environmental shocks, etc.), affecting public sector performance, irrespective of the resulting efficiency (or inefficiency). Moreover, these methods are susceptible to random variations in data, measurement errors, sample variations, heterogeneity between units, and outliers (Fiorentino, Karmann and Koetter, 2006). Among the non-parametric methods, the literature commonly uses the DEA approach. A few other studies use the FDH approach (e.g., see some pioneering work: Tulkens and Eeckaut, 1995; Tulkens, 2007). In contrast to the DEA analysis, the latter imposes only slight restrictions on the production technology while allowing for a comparison of efficiency between units (see Bauer, 1990B and Seiford and Thrall, 1990 for further discussion on the merits of these methods). However, as it remains a non-parametric approach, it does not allow for random factors unrelated to efficiency to be considered.[10]

Given the limitations of non-parametric methods, parametric techniques are often used in the literature. The latter uses a stochastic production function — a Stochastic Frontier Analysis (SFA) — and allows the error term to have two components: a negative term that measures inefficiency and an idiosyncratic error which captures idiosyncratic shocks (Aigner, Lovell and Schmidt, 1977; Meeusen and van Den

[10] Establishing the relative efficiency of municipal spending in Belgium, Eeckaut, Tulkens and Jamar, (1993) compare results of the FDH analysis with those of the DEA, and conclude that the assumption of convexity imposed by the DEA distorts the results of the efficiency analysis. Furthermore, in a study on public expenditure efficiency in developing countries, Gupta and Verhoeven (2001) found that the FDH analysis is strongly influenced by changes in the number of output indicators, highlighting the sensitivity of the results of this method to variations in the dataset.

Broeck, 1977). However, these methods require strong hypotheses on data distribution. The most commonly used distributions are semi-normal, exponential, and truncated normal.

3.3 Computation of the efficiency scores

Among the parametric methods, those of Kumbhakar (1991), Lee and Schmidt (1993), and Battese and Coelli (1992) have been widely used in the literature, especially on panel data. Here we adopt a more recent method, that of Kumbhakar, Wang and Horncastle (2015), for two main reasons. First, unlike older methods, notably those mentioned above, the latter approach allows distinguishing unobserved heterogeneity across units from inefficiency. This, therefore, improves the analysis by capturing countries' heterogeneous characteristics, such as their level of development, structural or institutional features, etc. Second, unlike Greene (2005) and Kumbhakar and Wang (2005) who merely separate individual heterogeneity from stochastic noise, Kumbhakar, Wang and Horncastle (2015) propose a further decomposition of inefficiency by distinguishing between persistent (long-run) and transitory or variant (short-run) inefficiency. This makes it possible to take into account inefficiency resulting from structural characteristics that persist over time and those resulting from short-term features.

We now describe the conceptual framework described in Kumbhakar, Wang and Horncastle (2015) to compute the efficiency scores. The econometric model is specified as follows:

$$Y_{i,t} = \alpha_0^* + f(x_{i,t};\beta) + v_{i,t} + u_{i,t}^* + n_i^* \quad (3)$$

with:

$$\alpha_0^* = \alpha_0 - E(n_i) - E(u_{i,t}) \quad (3.a)$$

$$u_{i,t}^* = u_{i,t} - E(u_{i,t}) \quad (3.b)$$

$$n_i^* = n_i - E(n_i) \quad (3.b)$$

where $Y_{i,t}$ is a measure of government performance, proxied by the public sector performance index, in country *i* in year *t*. $X_{i,t}$ is the vector of inputs. The model consists

of three steps. First, we estimate Equation 3 using a standard random effect regression. We thus obtain consistent measures of β and predicted values of η_i^* and u_{it}^*. Second, persistent technical inefficiency is computed using the predicted values of η_i^*. Then, persistent technical inefficiency can be obtained from:

$$\eta_i = \text{Max}(\eta_i^*) - \eta_i^* \quad (4)$$

Finally, persistent technical efficiency (PTE) is calculated from exp(-η_i), then residual technical efficiency (RTE) is computed in the last step. We return to the first step and obtain the residues (i. e, $Y_{i,t} - f(x_{i,t};\beta) + \eta_i = \alpha_0 + v_{i,t} - u_{i,t}$). Assuming that $v_{i,t}$ is *iid*, i.e., $v_{i,t} \sim \text{N}(0, \sigma_v^2)$, and $u_{i,t}$ is iid, i.e., $u_{i,t} \sim N(0, \sigma^2)$, we can maximize the log-likelihood function for the following standard normal stochastic frontier model for the grouped data:

$$r_{i,t} = \alpha_0 + v_{i,t} - u_{i,t} \quad (5)$$

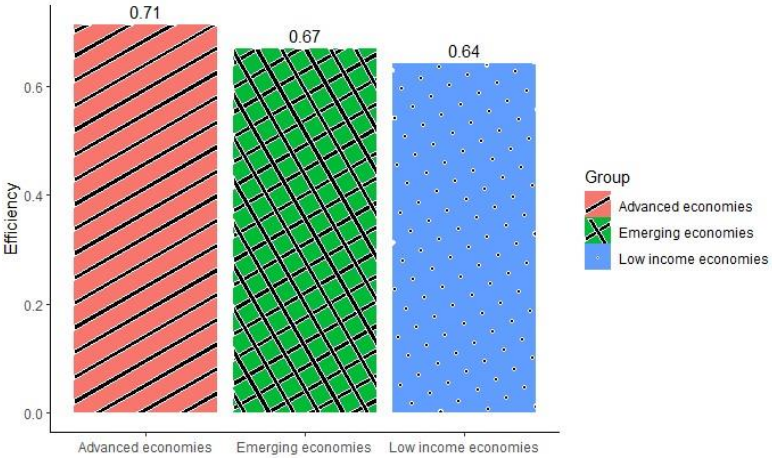
where $r_{i,t} = y_{i,t} - f(x_{i,t};\beta) + \eta_i$. In practice, we use the estimated values of β and η_i to define $r_{i,t}$. In other words, the sampling variability is associated with β and η_i is ignored. Using the standard boundary model on Equation 4, we obtain estimates of α_0, σ_v^2 and σ^2. Following Jondrow *et al.* (1982), we estimate residual technical inefficiency, $\hat{u}_{i,t}$, based on the estimated residues, $(v_{i,t} - u_{i,t})$. Thus, we can use $\hat{u}_{i,t}$ to calculate residual time-varying technical inefficiency defined as $RTE = exp(-\hat{u}_{i,t})$, and then estimate the overall technical efficiency (OTE) defined as the product of PTE and RTE ($OTE = PTE * RTE$).

4 Stylized facts

This section reports some stylized facts and descriptive statistics of the calculated scores for 158 countries from 1990-2017. The computed scores range from 0 to 1 (best performance) by construction. We report an average score of 0.66 over the sample and the period considered. Figure 2.1 displays the average scores, distinguishing between advanced, emerging, and low-income countries. On average, advanced countries are the closest to their efficiency frontier, with a score of 0.71, while the average efficiency scores reported for emerging and low-income countries are 0.67 and 0.64,

respectively.[11] Furthermore, statistical tests suggest that the differences in efficiency between country groups are statistically significant. Last, Section Appendix A.3 presents country rankings based on average efficiency scores. On the one hand, the 10 best-performing countries report scores ranging from 0.80 to 0.72 and are all advanced economies. On the other hand, the bottom 10 ranked countries report scores between 0.48 and 0.60, and most are African economies. Finally, Figure 2.2 provides some highlights. Indeed, we observe a high concentration of the worst-performing countries in Africa, i.e., those with an average score below the sample average, while the best-performing countries are almost exclusively located in North America, Europe, and the South Pacific.

Figure 2. 1 Average government efficiency scores (1990-2017)



Source: Authors' calculations. **Notes:** The statistics cover 158 countries over 1990-2017, including 35 advanced, 37 emerging, and 86 low-income economies.

[11] For instance, a score of 0.66 for a given country means that the latter could, on average, increase its performance by 34% for the same level of resources used to achieve the objectives set.

5 Determinants of Public Sector Efficiency

5.1 Theoretical predictions

This section examines the influence of some factors on government expenditure efficiency, notably trade globalization, factor productivity, tax revenues, institutional quality, and population density. We further discuss the expected signs of the considered variables before providing some empirical evidence in the following subsection.

The effects of trade globalization on public sector efficiency may be ambiguous. On the one hand, globalization can increase the economy's overall performance by promoting the transfer of skills, knowledge, and technologies (Hauner and Kyobe, 2010). Technology transfer may foster technological progress and the adoption of more efficient production methods and systems that can promote efficient public sector management. In addition, knowledge diffusion resulting from trade globalization — including in the public sector — can strengthen domestic knowledge and public administration capacities. On the other hand, globalization could indirectly affect government efficiency through taxation, with ambiguous effects. For instance, Schulze and Ursprung, (1999) document the literature on the link between globalization and fiscal policy, distinguishing two effects. The efficiency effect refers to the fact that in the context of liberalization, countries wishing to attract more international capital may be incentivized to reduce their domestic tax, thereby lowering their capacity to provide public goods. The compensation effect assumes that globalization, being likely to increase income inequalities, may raise the demand for social insurance programs, which in turn causes an upward shift in taxation and spending levels.[12] That said, whether globalization affects domestic tax revenues positively or negatively, the effect of taxation on expenditure efficiency is itself ambiguous (the following paragraph details this point).

Tax revenue mobilization is a critical issue for both advanced and developing economies. Indeed, the ageing population faced by advanced economies makes public spending more and more oriented towards social sectors, sometimes raising the fear of fiscal stress (Leeper and Walker, 2011). On the other hand, developing countries — heavily dependent on external financial flows — are implementing reforms to improve

[12] See also Dreher, Sturm and Ursprung (2008).

tax revenue mobilization in the context of increasing trade liberalization over the past decades, leading to a loss of tariff revenues. Last, domestic taxation allows these countries to finance their development and depend less on external financing to support the core functions of a compelling state, create the conditions for economic growth, and encourage governments

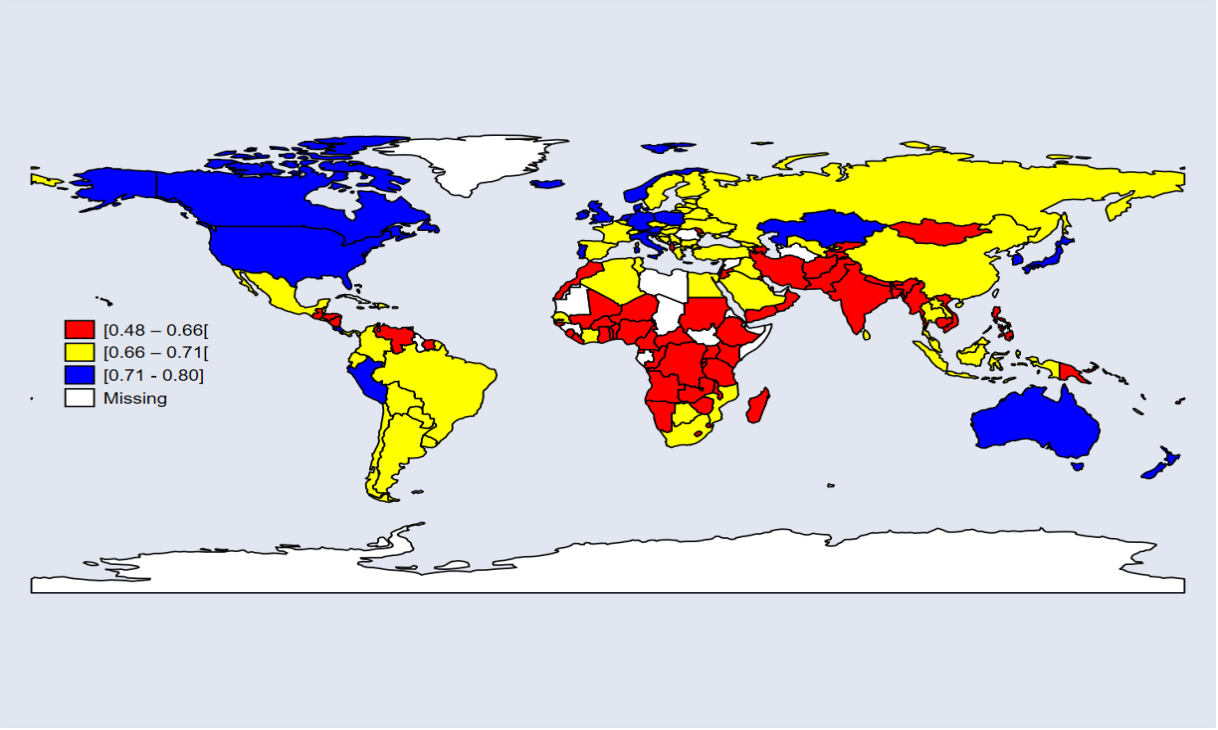


Figure 2. 2 Average efficiency scores around the world (1990-2017)

Source: Authors' calculations. Notes: This map displays the distribution of the average efficiency scores in the sample. The statistics cover 158 countries of all income levels over 1990-2017. The distribution ranges have been harmonized with the mean scores in the sample to improve the readability of the map. Countries in red register an average score below the sample average (0.66). Those in the yellow report a score above the sample average, but below the average for advanced countries (0.71). Finally, those in blue have a score above or equal to the average for developed countries.

to be more responsive and accountable for their decisions. From a theoretical point of view, Barro (1990) highlights a non-linear relationship between government spending and economic growth, conditioned by the level of taxation. In this model, an increase in taxes allows for the financing of productive public spending. In contrast, taxation generates distortions in the economy beyond a certain threshold — in the spirit of Laffer — resulting in a decline in the productivity of private capital. Therefore, in light of this analysis, the effect of taxation on government efficiency may be ambiguous and potentially driven by a threshold effect. Empirically, for a panel of over 100 countries, Chan, Ramly and Karim (2017) find that value-added taxes enhance the impact of government spending efficiency on economic growth, while for OECD countries over the period 2003-2017, Afonso, Jalles and Venâncio (2021) show that expenditure efficiency is negatively associated with taxation.

Better factor productivity may reflect technical progress, more incredible organizational and technological innovation, or more efficient use of factors of production. As discussed earlier, factors such as technological innovation or technical progress can encourage the adoption of techniques and systems to improve efficiency in the economy, including in public sector management. In addition, productivity gains from improved factors of production can generate additional resources for the government, which may be reallocated to the most productive sectors. Finally, as productivity gains are essential to the growth process (Bosworth and Collins, 2003), increasing factor productivity can help create a more dynamic economy and improve household welfare, especially if the resulting productivity gains are pro-poor.

Institutional quality (approximated here by the level of democracy and government durability) is essential to public sector management. A better institutional framework — such as good governance or more robust democracy — encourages governments to justify their control of the state machinery, promotes greater transparency in the budget approval process and regulation, and provides a comprehensive overview of public sector activity. This, in turn, helps to limit the risk of fraud or misappropriation of

public funds. On the other hand, government durability, i.e., the ability of a government to provide consistent policies and services to its citizens over a long period, may also be an essential determinant of expenditure efficiency since political volatility is likely to complicate coherent budget planning and undermine efficiency (Hauner and Kyobe, 2010). However, this argument needs to be nuanced as government durability in autocratic or less democratic regimes may reflect poor institutions, with potentially adverse effects on efficiency, mainly as it has been observed that countries with poorer governmental and institutional performance are often those with poor economic performance (Acemoglu and Robinson, 2008).

Last, Hauner and Kyobe (2010) argued that a higher population may improve public sector efficiency by reducing the cost of public service provision through economies of scale. We read that other channels may play a role, making the relationship complex. On the one hand, higher population density can also contribute to pressure on natural resources or public infrastructure such as public services and housing. For instance, in areas where public infrastructures or socio-economic opportunities are limited, this, in turn, can lead to social tensions or conflicts among communities. On the other hand, population density could play an indirect role through the taxation channel, as income or sales taxes may be more challenging to administer in sparsely populated areas (Riezman and Slemrod, 1987). But, as discussed earlier, the link between taxation and expenditure efficiency is unclear.

Trade globalization is measured by the KOF index (Dreher, 2006b; Gygli *et al.*, 2019), and ranges from 1 to 100 (higher degree of globalization). Total factor productivity measures the share of output not explained by the quantity of inputs used in production, and is from the Penn World Table (PWT). Tax revenues — excluding social contributions and natural resources — are from the UNU-WIDER Government Revenue Dataset. The level of democracy is captured by an index between 0 (least democratic) and 10 (most democratic), extracted from the Freedom House database. Government durability measures the number of years since the last change in the political regime and comes from the Polity IV dataset. Population density is the mid-

year population divided by the area in square kilometers and comes from the World Bank's WDI (World Development Indicators) database.

5.2 Empirical results

We conduct econometric estimations through a Tobit analysis, as our dependent variable is censored, i.e., it only takes values between 0 and 1 (the choice of this model is based on previous studies, e.g., Afonso and Aubyn, 2006; Afonso, Schuknecht and Tanzi, 2010). We regress the expenditure efficiency scores, δ, on the set of potential drivers, Z, as follows:

$$\delta_{i,t} = f(Z_{i,t}) + \varepsilon_{i,t} \quad (6)$$

The main estimates are reported in Column [1] of Table 2.1. We find a positive and statistically significant effect of trade globalization, factor productivity, the level of democracy, and government durability on government efficiency, while there is a negative and statistically significant influence of tax revenues on the efficiency scores.

As illustrated in Table 1, all estimated coefficients exhibit the expected signs a priori. According to the results, the coefficient of trade globalization is statistically significant at the 1% significance level. This implies that increased trade globalization can potentially enhance government efficiency at the aggregate level over the study period. This positive effect of trade globalization on government efficiency supports the argument put forth by Hauner and Kyobe (2010), suggesting that increased trade globalization can improve public expenditure efficiency by fostering increased competition and better resource allocation. Economies open to international trade are often compelled to manage their public expenditures more efficiently to remain competitive in the global market. Additionally, Rayp and Van De Sijpe (2007) argue that higher international trade pressures governments to adopt a more market-oriented approach, thereby enhancing government efficiency.

Moreover, the coefficient of factor productivity exhibits the expected positive sign and is statistically significant at the 1% significance level. In other words, factor productivity, which reflects technical progress, more significant organizational and technological innovation, or more efficient use of factors of production, has had a significant favorable effect on government efficiency. This indicates that an increase in

factor productivity, such as labor and capital, can stimulate economic growth and enable the government to achieve higher returns for each dollar spent. This may result in more efficient use of public resources. This finding aligns with the theory of Bosworth and Collins (2003), which suggests that increasing factor productivity can help create a more dynamic economy and improve household welfare, particularly if the resulting productivity gains benefit the disadvantaged.

Furthermore, the coefficient of tax revenue presents a negative sign and is statistically significant at the 5% significance level. In other words, taxation has hurt public sector efficiency over the study period. A negative correlation between tax revenue and the efficiency of public expenditures can be attributed to inefficient management of public funds or excessive reliance on tax revenue. A high level of taxation can sometimes lead to waste or misallocation of public resources, undermining overall government efficiency. This result also confirms the majority of findings in empirical studies. Specifically, it is consistent with the survey conducted by Afonso, Jalles and Venâncio (2021), which found a negative effect of taxation on public expenditure efficiency for OECD countries from 2003 to 2017.

Finally, institutions are essential, as stronger government performances are evident where governments are more accountable. As expected, the level of democracy also has a positive effect on government efficiency and is statistically significant at the 1% significance level. Democracy is measured by the polity2 indicator, which combines democracy and autocracy indicators from polity IV. In addition to autocracy and democracy, polity2 includes interruption, interregnum, and transition periods. A higher level of democracy is often associated with greater accountability and transparency in public expenditure management. Democratic governments are generally subject to greater scrutiny and pressure to utilize public resources efficiently for the benefit of the population. It is argued here that voting constitutes the fundamental link between citizens and politicians. A high turnout can reduce inefficiencies in public service provision through more effective monitoring of politicians. This result is also consistent with the theory of Putnam (1994) and Gellner (1994), who argued that the degree of development of civil society influences public sector efficiency: cooperation among citizens and the formation of non-state

institutions allows for more effective control over politicians and bureaucrats. Borge, Falch and Tovmo (2008) also argue that a high turnout may incentivize politicians to implement policies that improve efficiency. The finding also confirms the conclusions of empirical studies in the literature conducted by Hauner and Kyobe (2010) and Rayp and Van De Sijpe (2007), which found a positive effect of democratic control and good governance on public sector efficiency. Moreover, government durability positively affects government efficiency and is statistically significant at the 1% significance level. This means that stable and durable governments are better positioned to develop and implement long-term economic policies, which can promote better planning and more efficient use of public expenditures. This finding supports the argument put forth by Hauner and Kyobe (2010) that political instability can complicate coherent budget planning and undermine public sector efficiency.

6 Robustness

6.1 Additional variables

In Columns [2]-[9] of Table 2.1, we augment our baseline model by adding some additional controls. This allows us, on the one hand, to test the robustness of the previous results and, on the other hand, to examine some other potential determinants. In Column [2], instead of the trade globalization index used in the main model, we rely on an alternative measure, that is, the sum of exports and imports as a percentage of GDP. In this section, we discuss the theoretical relationship between public expenditure efficiency and the additional controls included in Columns [3]-[10] of Table 2.1 of the main manuscript: financial development, inflation, government fragmentation, corruption control, ethnic fractionalization, and fiscal institutions (fiscal rules, fiscal councils, and fiscal responsibility law).[13] A strong financial system

[13] The Financial Development Index measures the level of development of financial institutions and markets in terms of depth, access, and efficiency and is from the IMF Financial Development Index Database. Government fragmentation measures the probability that two deputies picked randomly from the government parties will be of different parties and is from the Database of Political Institutions (DPI). Corruption control ranges from 0 to 100, where higher values are better, and is from the Worldwide Governance Indicators database. Ethnic fragmentation is taken from Drazanova (2019) and ranges from 0 (total homogeneity) to 1 (total heterogeneity). Data related to fiscal rules are extracted from the IMF Fiscal Rules Dataset. The fiscal rules variable is measured by a dummy equal to 1 when a country i has adopted a fiscal rule in year t, and zero otherwise. Fiscal councils and fiscal responsibility law, which come from the Fiscal Council Dataset and IMF Fiscal Rules Dataset, are measured similarly.

promotes financial inclusion and better mobilization of tax revenues (Oz-Yalaman, 2019; Gnangnon, 2022; Santoro *et al.*, 2022; Apeti and Edoh, 2023; Bambe, 2023; Lompo, 2023), allowing countries, especially those in the developing world, to finance their economies and be less dependent on external sources of financing. Additionally, by promoting access to credit and investment by households and firms, financial development can be an important determinant of economic growth (e.g., see De Gregorio and Guidotti, 1995; Khan Mohsin and Senhadji Abdelhak, 2000). By reducing the predictability of the business cycle, inflation can discourage investment or generate a loss of purchasing power for households, worsening their conditions (Bambe *et al.*, 2022). On the other hand, an inflation surprise can help support economic activity. Institutional factors such as controlling corruption can be an important determinant of government budget management, as corruption leads to the misuse of public funds. Government fragmentation may also influence public sector management. For instance, Kontopoulos and Perotti, (1999) find that fragmentation tends to be associated with larger expenditures in OECD countries, since the most important representatives of individual spending interests in European governments are spending ministers. Similar results were found in other studies (e.g., see Edin and Ohlsson, 1991; Borrelli and Royed, 1995; Franzese Jr, 2000; Balassone and Giordano, 2001; Volkerink and De Haan, 2001; Artés and Jurado, 2018). However, other scholars fail to find any statistically significant effect from government fragmentation (De Haan and Sturm, 1994, 1997; Harrinvirta and Mattila, 2001; Ricciuti, 2004). Substantial literature, early examples being Canning and Fay (1993) and Mauro (1995), considers ethnic fragmentation to have a significant impact on governmental activities and institutional quality. For example, according to Easterly and Levine (1997), Africa's strong ethnic fragmentation explains its characteristics, such as economic growth, political instability, or poor infrastructure. La Porta *et al.* (1999) argued that ethnic fragmentation may reduce the quality of government by increasing the cost of public

services and benefits, especially due to communication problems.[14] Therefore, one may expect a negative effect of ethnic fragmentation on efficiency.

Last, fiscal institutions such as fiscal rules or councils might matter for public expenditure efficiency. Since the 1990s, fiscal rules have spread considerably worldwide and are increasingly shaping fiscal choices. Several studies examining the effects of fiscal rules suggest that they promote fiscal discipline (Debrun *et al.*, 2008; Asatryan, Castellón and Stratmann, 2018; Combes *et al.*, 2018; Caselli and Reynaud, 2020; Caselli and Wingender, 2021) economic growth (Afonso and Jalles, 2013), mitigate the pro-cyclicality of fiscal policy (Combes, Minea and Sow, 2017), improve the credibility of countries in international markets (Thornton and Vasilakis, 2018) or allow constraining political budget cycles (Gootjes, de Haan and Jong-A-Pin, 2021). Through deficit or debt reduction, fiscal discipline can be achieved by better tax revenue mobilization or by reducing public expenditure. Governments that choose the first option — as accountability and willingness to pay taxes are linked to the quality of public goods provided to taxpayers — should be more concerned with managing public resources to achieve the highest possible outcomes. However, as shown by Asatryan, Castellón and Stratmann (2018), the disciplining effect of fiscal rules is more likely to stem from the reduction in public spending, as the taxation channel is not statistically significant. Fiscal austerity can affect expenditure composition, leading to a greater reduction in current expenditure or a greater reduction in public investment. The literature on the composition effect of fiscal rules suggests that they protect productive or growth-enhancing spending, particularly public investment (e.g., see Ardanaz *et al.*, 2021). Furthermore, Castro (2011) and Afonso and Jalles (2013) provide evidence that fiscal rules foster economic growth, suggesting that better outcomes could be achieved with the same or fewer public resources. More specifically, the reduction in resources, by limiting the possibilities of debt financing within the framework of fiscal rules, leads governments to reallocate expenditure to productive sectors, i.e., to use less public resources efficiently to achieve better

[14] A large literature on U.S. localities also documents a negative correlation between ethnic fragmentation and the provision of public goods, participation in social activities, trust, and economic success (e.g., see Alesina *et al.*, 1996; Alesina, Baqir and Easterly, 1999; Alesina and Dollar, 2000; Alesina and La Ferrara, 2002).

outcomes. Finally, institutions such as independent fiscal councils or fiscal responsibility laws — aimed at strengthening commitments to sustainable public finances or monitoring fiscal aggregates — are also important factors in public sector management.

Overall, the new estimates support our main findings: there is a positive and statistically significant influence of trade globalization, factor productivity, and institutional quality on expenditure efficiency. However, the negative effect of tax revenues on expenditure efficiency does not appear to be robust. Finally, regarding the additional controls, our data suggest a positive and statistically significant effect of financial development, government fragmentation, corruption control, and fiscal institutions — notably fiscal rules and fiscal councils — on expenditure efficiency.

Table 2. 1 : Public Sector Efficiency (PSE) and Determinants

Dependent: PSE	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Trade globalization	0.0010***		0.0008***	0.0009***	0.0011***	0.0005**	0.0011***	0.0008***	0.0009***	0.0010***
	(0.0002)		(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Factor productivity	0.1168***	0.1228***	0.1055***	0.1321***	0.1274***	0.1063***	0.1245***	0.1099***	0.1174***	0.1169***
	(0.0115)	(0.0119)	(0.0118)	(0.0124)	(0.0127)	(0.0145)	(0.0123)	(0.0115)	(0.0115)	(0.0115)
Tax revenues (Log.)	-0.0125**	-0.0098	-0.0226***	-0.0109	-0.0141**	-0.0068	-0.0042	-0.0140**	-0.0131**	-0.0126**
	(0.0064)	(0.0065)	(0.0072)	(0.0072)	(0.0070)	(0.0070)	(0.0065)	(0.0063)	(0.0064)	(0.0064)
Democracy	0.0080***	0.0091***	0.0079***	0.0079***	0.0067***	0.0093***	0.0062***	0.0071***	0.0079***	0.0080***
	(0.0012)	(0.0013)	(0.0012)	(0.0013)	(0.0013)	(0.0016)	(0.0013)	(0.0012)	(0.0012)	(0.0012)
Government durability	0.0004***	0.0006***	0.0001	0.0005***	0.0003***	0.0001	0.0004***	0.0003**	0.0003***	0.0004***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Population density (Log.)	-0.0036	-0.0003	-0.0062*	-0.0020	-0.0040	-0.0023	-0.0028	-0.0039	-0.0038	-0.0036
	(0.0031)	(0.0030)	(0.0033)	(0.0033)	(0.0032)	(0.0033)	(0.0033)	(0.0030)	(0.0031)	(0.0031)
Trade openness (Log.)		0.0139**								
		(0.0057)								
Financial development			0.0646***							
			(0.0185)							
Inflation				0.0004						
				(0.0004)						
Government fragmentation					0.0143**					
					(0.0070)					
Corruption control						0.0003**				
						(0.0002)				
Ethnic fractionalization							-0.0042			
							(0.0177)			
Fiscal rules								0.0216***		
								(0.0040)		
Fiscal council									0.0125*	
									(0.0070)	
Fiscal Responsibility Law										-0.0001
										(0.0054)
Observations	2101	2062	2031	1961	2023	1519	1737	2101	2101	2101

Notes: This table reports the correlations between the calculated scores and the main potential determinants, from a Tobit analysis. Results from the main model are reported in Column [1]. Columns [2]-[10] include some additional variables. Standard errors are in parentheses. All regressions include the constant, not reported in the table. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

6.2 Alternative measures of public sector efficiency

In this section, we check the robustness of our main results in three ways. In Column [2] of Table 2.2, we re-estimate our efficiency scores following Greene (2005). Indeed, the model proposed by Kumbhakar, H.-J. Wang and Horncastle (2015) that we use to estimate our efficiency scores has the advantage, in addition to taking into account unobserved heterogeneity across countries, of breaking down inefficiency into persistent (long-term) and transient (short-term) inefficiency, which requires a two-stage estimation procedure. Although Greene's (2005) approach does not allow for this decomposition of inefficiency, it does allow for unobserved heterogeneity across countries. It offers a one-step specification model, allowing greater flexibility in the econometric procedure. In Column [3] (Table 2.2), we further exploit a 'subjective' measure of well-being for robustness purposes. Economic performance includes happiness, GDP growth (10-year average), and unemployment rate (10-year average). The happiness index is based on how respondents feel about their well-being, with the best possible life for them being a score of 10 and the worst 0.[15] Finally, several studies in the literature on public expenditure efficiency consider only education, health, and public infrastructure (see, among others, (Gupta and Verhoeven, 2001b; Hauner and Kyobe, 2010; Grigoli and Kapsoli, 2018). As discussed earlier, our approach follows Afonso, Schuknecht and Tanzi (2005) and tries to assess the overall efficiency of the public sector, considering not only the three sectors mentioned above but also the public administration and the Musgravian tasks of the government. Nevertheless, for robustness, In Column [4] (Table 2.2), we re-estimate the efficiency scores only from the three sectors (education, health, and public infrastructure), considering the same inputs as in the main model. New estimates suggest a positive, statistically significant, robust effect of trade globalization, factor productivity, and institutional quality on expenditure efficiency. Similarly, the effect of tax revenues on expenditure efficiency remains negative, statistically significant, and robust.

[15] The Data publisher's source is the Gallup World Poll surveys (life evaluation question): https://ourworldindata.org/happiness-and-life-satisfaction.

Table 2. 2 : Robustness: Alternative PSE measures

Dependent: PSE	Baseline	Alternative PSE		
	[1]	[2]	[3]	[4]
Trade globalization	0.0010***	0.0008***	0.0009***	0.0010***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Factor productivity	0.1168***	0.1425***	0.0751***	0.0267**
	(0.0115)	(0.0128)	(0.0112)	(0.0129)
Tax revenues (Log.)	-0.0125**	-0.0223***	-0.0193***	-0.0214***
	(0.0064)	(0.0074)	(0.0064)	(0.0080)
Democracy	0.0080***	0.0083***	0.0071***	0.0044***
	(0.0012)	(0.0014)	(0.0012)	(0.0014)
Government durability	0.0004***	0.0005***	0.0004***	0.0005***
	(0.0001)	(0.0001)	(0.0001)	(0.0002)
Population density (Log.)	-0.0036	-0.0006	-0.0052*	-0.0009
	(0.0031)	(0.0038)	(0.0031)	(0.0062)
Observations	2101	2239	2101	2107

Notes: This table reports the correlations between the calculated scores and the main potential determinants, from a Tobit analysis, and considering alternative measures of public sector efficiency. Results from the main model are reported in Column [1]. Column [2] re-estimates the main model using the scores obtained following Greene (2005). In Column [3], we include a «subjective» measure of well-being in the economic performance indices. Column [4] re-estimates the efficiency scores, only from the three sectors: education, health, and public infrastructure. Standard errors are in parentheses. All regressions include the constant, not reported in the table. * p < 0.1, ** p < 0.05, *** p < 0.01

6.3 Endogeneity concerns

Our main results are estimated from a Tobit regression without considering endogeneity issues. For instance, there may be a reverse causality between factor productivity and efficiency, as the least efficient governments may implement policies to improve organizational or technological innovation or more efficient use of factors of production for greater efficiency. Likewise, greater efficiency may lead to a reallocation of expenditure to other sectors of the economy, which could indirectly affect the tax system, given the close relationship between public expenditure and tax revenues. Finally, institutional factors can be correlated with aspects such as culture, customs, and ideological or religious orientation, leading to an omission bias. We re-estimate our main model using the Blundell and Bond, (1998) two-step system-GMM estimator to deal with potential endogeneity in the determinants examined. This method allows for addressing endogeneity, using lagged differences and levels of

explanatory variables as instruments while accounting for the persistence of government efficiency and controlling for the Nickell bias (Nickell, 1981) that arises in a dynamic panel model. The new results are reported in Column [2] of Table 2.3.[16] We find robust evidence of the positive and significant effect of trade globalization, productivity, and institutional quality on efficiency. In addition, the Hansen test does not reject the hypothesis of instrument validity. Likewise, the AR (1) test for the absence of autocorrelation of the first-order error term and the AR (2) test for the absence of autocorrelation of the second-order error term do not raise concerns about the validity of our estimates.

Table 2.3 : Robustness : GMM estimator

Dependent: PSE	Tobit estimates	GMM estimates
	[1]	[2]
Trade globalization	0.0010***	0.0002**
	(0.0002)	(0.0001)
Factor productivity	0.1168***	0.0191**
	(0.0115)	(0.0091)
Tax revenues (Log.)	-0.0125**	-0.0019
	(0.0064)	(0.0033)
Democracy	0.0080***	0.0020**
	(0.0012)	(0.0008)
Government durability	0.0004***	0.0001*
	(0.0001)	(0.0001)
Population density (Log.)	-0.0036	0.0003
	(0.0031)	(0.0011)
Lagged Expenditure efficiency (PSE)		0.7190***
		(0.0482)
Observations	2101	2019
Number of groups/Instruments		89/78
AR (1) / AR (2) p-values		0.000/0.116
Hansen overidentification test P-value		0.297

Notes: This table examines the robustness of our main determinants, using a two-step system-GMM (Column [2]). The results of the main model, estimated from a Tobit analysis, are reported in Column [1]. Standard errors are in parentheses. All regressions include the constant, not reported in the table. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

7 Heterogeneity

Table 2.4 expands the analysis by replicating the main model (Column [1] of Table 2.1) for advanced (Column [2]) and developing countries (Column [3]). Evidence suggests a positive and statistically significant influence of trade globalization, factor productivity, and the quality of institutions on efficiency for both advanced and

[16] See Ullah, Akhtar and Zaefarian (2018) for GMM's advantages.

developing countries. Moreover, estimates suggest a negative and statistically significant effect of taxation on efficiency in advanced countries — in line with Afonso et al. (2021) — while this factor does not seem to matter for developing economies. Finally, in the last column (Table 2.4), we deepen the analysis by examining the main model's determinants, those that could explain the efficiency gaps between advanced and developing economies. The efficiency gap is the difference between the average efficiency in advanced countries and the annual efficiency in developing countries. Thus, an increase in this variable reflects a higher efficiency gap favoring advanced countries. Results suggest that trade globalization, factor productivity, and the level of democracy seem to reduce the efficiency gap between advanced and developing economies. Finally, we examine the main determinants according to geographical regions and fragile states. Some countries may have some degree of geographical, cultural, economic, or institutional similarities. Since these factors can lead to cross-sectional dependencies in government efficiency, one might ask whether our main determinants are sensitive to geographical regions. Hence, in Columns [2]-[5] of Table 2.5, we examine the main determinants by considering different geographical areas.

Furthermore, our total sample includes 20 fragile states, i.e., countries classified by the IMF as having characteristics that significantly undermine their economic and social performance, with weak governance, limited administrative capacity, chronic humanitarian crises, persistent social tensions, and, often, violence or the legacy of armed conflict or civil war. In Column [6] (Table 2.5), we examine whether the determinants of the main model also matter for public expenditure efficiency in these countries. The results reveal some characteristics of heterogeneity in the main determinants considered. First, factor productivity and democracy appear to positively correlate with public expenditure efficiency in all the groups considered. Second, the positive impact of trade globalization on efficiency seems to be driven, particularly by Asian and European countries. Third, the negative effect of taxation on efficiency seems to be mainly driven by Latin American and European countries. Fourth, while government durability seems to favor efficiency in European countries, the opposite effect is observed in fragile states.

Table 2. 4 : Heterogeneity: Advanced versus developing countries

Dependent: PSE	Total sample	Advanced	Developing	Efficiency gap
	[1]	[2]	[3]	[4]
Trade globalization	0.0010***	0.0028***	0.0007***	-0.0008***
	(0.0002)	(0.0004)	(0.0002)	(0.0002)
Factor productivity	0.1168***	0.2520***	0.1019***	-0.1077***
	(0.0115)	(0.0324)	(0.0127)	(0.0136)
Tax revenues (Log.)	-0.0125**	-0.0919***	-0.0063	0.0077
	(0.0064)	(0.0255)	(0.0066)	(0.0070)
Democracy	0.0080***	0.0102	0.0079***	-0.0081***
	(0.0012)	(0.0077)	(0.0013)	(0.0014)
Government durability	0.0004***	0.0013***	-0.0001	0.0001
	(0.0001)	(0.0002)	(0.0002)	(0.0002)
Population density (Log.)	-0.0036	0.0005	-0.0055	0.0053
	(0.0031)	(0.0078)	(0.0040)	(0.0042)
Observations	2101	626	1475	1475

Notes: This table reports the correlations between the calculated scores and the main potential determinants, from a Tobit analysis, and distinguishes between advanced (Column [2]) and developing countries (Column [3]). Results from the full sample are reported in Column [1]. The last column re-estimates the main model, using the efficiency gap between advanced and developing countries as the dependent variable. An increase in the dependent variable reflects an efficiency gap in favor of advanced countries. Standard errors are in parentheses. All regressions include the constant, not reported in the table. * p < 0.1, ** p < 0.05, *** p < 0.01

Table 2. 5 : Heterogeneity Geographical regions

Dependent: PSE	Total sample	Africa	Asia	Latin America	Europe	Fragile states
	[1]	[2]	[3]	[4]	[5]	[6]
Trade globalization	0.0010***	0.0001	0.0020***	-0.0006	0.0026***	-0.0007
	(0.0002)	(0.0004)	(0.0004)	(0.0005)	(0.0005)	(0.0010)
Factor productivity	0.1168***	0.1047***	0.1285***	0.1317***	0.1375***	0.0836**
	(0.0115)	(0.0194)	(0.0197)	(0.0432)	(0.0315)	(0.0377)
Tax revenues (Log.)	-0.0125**	-0.0010	0.0141	-0.0568***	-0.0896***	-0.0000
	(0.0064)	(0.0109)	(0.0113)	(0.0220)	(0.0310)	(0.0129)
Democracy	0.0080***	0.0078***	0.0147***	0.0103*	0.0314***	0.0113***
	(0.0012)	(0.0018)	(0.0028)	(0.0059)	(0.0108)	(0.0043)
Government durability	0.0004***	0.0006	-0.0002	0.0003	0.0011***	-0.0027**
	(0.0001)	(0.0004)	(0.0003)	(0.0004)	(0.0004)	(0.0010)
Population density (Log.)	-0.0036	0.0044	-0.0126	-0.0105	-0.0233	-0.0092
	(0.0031)	(0.0047)	(0.0081)	(0.0068)	(0.0146)	(0.0086)
Observations	2101	483	446	405	604	135

Notes: This table reports the correlations between the calculated scores and the main potential determinants, from a Tobit analysis, and considering different geographical regions. Results from the full sample are reported in Column [1]. Column [2] includes Sub-Saharan African countries. Column [4] includes Latin American and Caribbean countries. Column [6] includes 20 fragile states. Standard errors are in parentheses. All regressions include the constant, not reported in the table. * p < 0.1, ** p < 0.05, *** p < 0.01

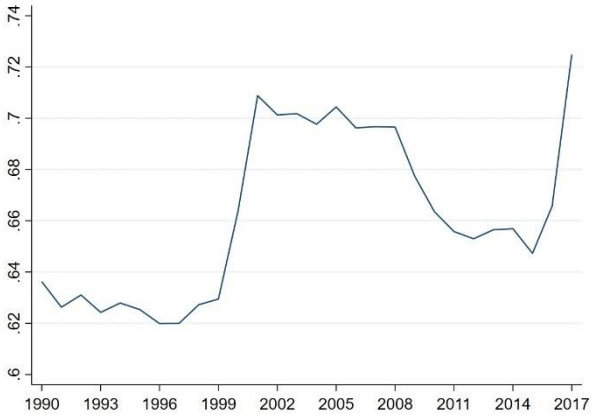
8 Conclusion and policy implications

A large body of literature has examined public sector efficiency. Unlike most of the contributions, we provide a large panel dataset on government efficiency using a parametric approach, referring to Kumbhakar, H.-J. Wang and Horncastle (2015). For a panel of 158 countries of all income levels over 1990-2017, we compute efficiency scores for four sectors: education, health, infrastructure, and public administration. We also include three efficiency indicators regarding the Musgravian tasks for government: allocation, distribution, and stabilization. Next, considering economic and institutional factors, the study empirically examines some determinants of the scores obtained. A Tobit analysis suggests that trade globalization, factor productivity, and institutional quality seem to be positively associated with public sector efficiency. Robustness was checked using alternative measures of government efficiency, additional controls, and the system-generalized Method of Moments (GMM) estimator. Furthermore, we examine heterogeneity according to the level of economic development and geographical regions, drawing some conclusions. First, estimates suggest that the positive effect of trade globalization, factor productivity, and institutional quality on efficiency appears to hold in advanced and developing economies. At the same time, tax revenues seem negatively associated with government efficiency in advanced economies but do not count for developing countries. Second, trade globalization, factor productivity, and the level of democracy seem to reduce the efficiency gap between advanced and developing economies. Third, regarding geographical areas, our data suggest that factor productivity and democracy positively correlate with public expenditure efficiency in all the groups considered (Africa, Asia, Latin America, and Europe).

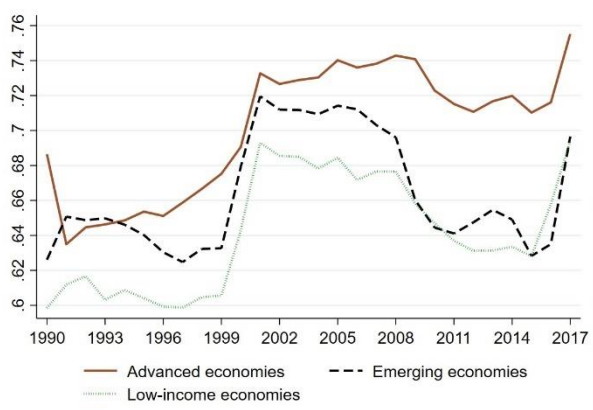
Some policy implications can be drawn from our main findings. First, governments should better grasp the benefits of trade globalization by promoting better transfer of skills, knowledge, and technology into the domestic economy, as these factors appear to be important for public sector efficiency. Similarly, policies promoting factor productivity, such as technological innovation or human capital formation, may lead to more efficient public sector management. Third, governments should further mobilize their efforts to improve the quality of their institutions and promote better fiscal

governance and transparency in the management of public funds through, among others, better supervision of budget execution, better control of financial and accounting reports, and better monitoring of public expenditure. Finally, some important questions remain for future research. For instance, it would be interesting to examine the spillover effects of government efficiency in neighboring countries — using, for example, a spatial econometric approach — or to conduct an in-depth analysis of the impact of fiscal reforms and frameworks on government efficiency.

Appendix A.1 Government efficiency trends from 1990 to 2017



(a) Overall public sector efficiency



(b) Public sector efficiency by income group

Figure A1 Government efficiency trends from 1990 to 2017

Appendix A.2 Sample and correlational evidence

Table A.2 1: Countries in the sample

Full Sample		
Afghanistan	Ghana	Netherlands
Angola	Guinea-Bissau	Norway
Albania	Equatorial Guinea	Nepal
Argentina	Greece	New Zealand
Armenia	Grenada	Oman
Australia	Guatemala	Pakistan
Austria	Hong Kong	Panama
Azerbaijan	Honduras	Peru
Burundi	Croatia	Philippines
Belgium	Hungary	Papua New Guinea
Benin	Indonesia	Poland
Burkina Faso	India	Portugal
Bangladesh	Ireland	Paraguay
Bulgaria	Iran, Islamic Rep.	Qatar
Bahrain	Iraq	Russian Federation
Bahamas, The	Iceland	Rwanda
Bosnia and Herzegovina	Israel	Saudi Arabia
Belarus	Italy	Sudan
Belize	Jamaica	Senegal
Bolivia	Jordan	Singapore
Brazil	Japan	Solomon Islands
Barbados	Kazakhstan	Sierra Leone
Bhutan	Kenya	El Salvador
Botswana	Kyrgyz Republic	Serbia
Central African Republic	Cambodia	Suriname
Canada	Kiribati	Slovak Republic
Switzerland	Korea, Rep.	Slovenia
Chile	Kuwait	Sweden
China	Laos	Swaziland
Cote d'Ivoire	Lebanon	Seychelles
Cameroon	Liberia	Togo
Congo, Dem Rep	Sri Lanka	Thailand
Congo, Rep	Lesotho	Tajikistan
Colombia	Lithuania	Timor-Leste
Cabo Verde	Luxembourg	Tonga
Costa Rica	Latvia	Trinidad and Tobago
Cyprus	Morocco	Tunisia
Czech Republic	Moldova	Turkey
Germany	Madagascar	Tanzania
Dominica	Maldives	Uganda
Denmark	Mexico	Ukraine
Dominican Republic	Mali	Uruguay
Algeria	Malta	United States
Ecuador	Myanmar	Uzbekistan
Egypt, Arab Rep.	Mongolia	St Vincent and the Grenadines
Spain	Mozambique	Venezuela, RB
Estonia	Mauritius	Vietnam
Ethiopia	Malawi	Vanuatu
Finland	Malaysia	Samoa
Fiji	Namibia	Yemen, Rep.
France	Niger	South Africa
United Kingdom	Nigeria	Zambia
Georgia	Nicaragua	Zimbabwe

Table A.2 2 : Pearson's correlations of the main variables

	PSE	PSE	PSE	PSE	PSE	PSE
Trade globalization	0.3088***					
Factor productivity		0.1478***				
Tax revenues			0.2570***			
Democracy				0.2728***		
Government durability					0.2741***	
Population density						0.0671***

Notes: This table reports the Pearson correlations of the main variables and the public sector efficiency (PSE) scores. ***

Appendix A.3 Country Rankings

Table A.3 1 : Country rankings by average efficiency scores: 1990-2017

Country	Score	Rank	Country	Score	Rank	Country	Score	Rank	Country	Score	Rank
United Kingdom	0.78973	1	Mauritius	0.68867	41	Dominican Republic	0.66272	81	Cambodia	0.63643	121
United States	0.75612	2	Sri Lanka	0.68838	42	Kuwait	0.66114	82	Sudan	0.63514	122
Japan	0.74748	3	Czech Republic	0.68658	43	Colombia	0.66078	83	Pakistan	0.63493	123
New Zealand	0.74223	4	Kiribati	0.68591	44	Paraguay	0.66048	84	Honduras	0.63477	124
Korea, Rep.	0.74117	5	Greece	0.68210	45	Mozambique	0.65968	85	Bangladesh	0.63400	125
Australia	0.73770	6	Kazakhstan	0.68210	46	El Salvador	0.65929	86	Central African Republic	0.63380	126
Netherlands	0.73134	7	Grenada	0.68178	47	Croatia	0.65925	87	Benin	0.63022	127
Norway	0.72870	8	Tonga	0.68160	48	Serbia	0.65908	88	Sierra Leone	0.62766	128
Italy	0.72766	9	Belarus	0.68127	49	Luxembourg	0.65880	89	Mongolia	0.62617	129
Malta	0.72749	10	Argentina	0.68112	50	Bosnia and Herzegovina	0.65844	90	Congo, Rep	0.62593	130
Bolivia	0.72685	11	Finland	0.68112	51	Russian Federation	0.65710	91	Malawi	0.62579	131
Belgium	0.72626	12	Tunisia	0.68099	52	Morocco	0.65699	92	Nepal	0.62567	132
Vietnam	0.72560	13	Barbados	0.68081	53	Trinidad and Tobago	0.65678	93	Namibia	0.62509	133
Denmark	0.72204	14	Bahrain	0.68078	54	Sweden	0.65602	94	Albania	0.62499	134
Egypt, Arab Rep.	0.72155	15	Mexico	0.68042	55	Burkina Faso	0.65581	95	Bhutan	0.62243	135
Iceland	0.72026	16	Turkey	0.67792	56	Slovak Republic	0.65566	96	Congo, Dem Rep	0.62177	136
Canada	0.72019	17	Uzbekistan	0.67790	57	Bulgaria	0.65544	97	Zimbabwe	0.62108	137
Germany	0.71912	18	Uruguay	0.67691	58	Ukraine	0.65295	98	Cameroon	0.62046	138
St Vincent and the Grenadines	0.71467	19	Dominica	0.67678	59	Timor-Leste	0.65140	99	Madagascar	0.61995	139
Austria	0.71420	20	Seychelles	0.67601	60	Oman	0.64884	100	Mali	0.61594	140
Ireland	0.71352	21	Panama	0.67561	61	Botswana	0.64773	101	Kenya	0.61425	141
Israel	0.71331	22	Latvia	0.67473	62	Guatemala	0.64706	102	Yemen, Rep.	0.61249	142
Slovenia	0.71251	23	Malaysia	0.67158	63	Venezuela, RB	0.64682	103	Afghanistan	0.60815	143

Spain	0.71234	24	Thailand	0.67117	64	Laos	0.64541	104	Burundi	0.60528	144
France	0.70855	25	Indonesia	0.66874	65	Solomon Islands	0.64468	105	Liberia	0.60472	145
Hong Kong	0.70809	26	Hungary	0.66793	66	Armenia	0.64425	106	Zambia	0.60415	146
Portugal	0.70622	27	Senegal	0.66722	67	Cote d'Ivoire	0.64353	107	Equatorial Guinea	0.60392	147
Singapore	0.70580	28	Qatar	0.66629	68	Suriname	0.64341	108	Lesotho	0.60321	148
Samoa	0.70569	29	Estonia	0.66537	69	Niger	0.64264	109	Bahamas, The	0.60224	149
Costa Rica	0.70558	30	Iran, Islamic Rep.	0.66520	70	Guinea-Bissau	0.64242	110	Myanmar	0.59897	150
Poland	0.70367	31	Belize	0.66520	71	Philippines	0.64210	111	Nicaragua	0.59793	151
Switzerland	0.69951	32	Saudi Arabia	0.66477	72	Rwanda	0.64180	112	Swaziland	0.59755	152
Cyprus	0.69787	33	Algeria	0.66423	73	Tajikistan	0.64123	113	Uganda	0.59539	153
Lithuania	0.69557	34	Jordan	0.66404	74	Ghana	0.63980	114	Angola	0.59468	154
China	0.69450	35	Jamaica	0.66403	75	Iraq	0.63866	115	Papua New Guinea	0.59086	155
Chile	0.69373	36	Georgia	0.66372	76	Maldives	0.63803	116	Ethiopia	0.57838	156
Lebanon	0.69321	37	Fiji	0.66315	77	Kyrgyz Republic	0.63793	117	Togo	0.56789	157
Peru	0.69309	38	Ecuador	0.66307	78	Azerbaijan	0.63745	118	Nigeria	0.56459	158
Brazil	0.69121	39	Vanuatu	0.66283	79	India	0.63730	119	Tanzania	0.56286	159
Cabo Verde	0.69083	40	Moldova	0.66280	80	South Africa	0.63648	120			

Appendix A.4 Variables and their sources

Table A.4 1 : Variables for calculating public expenditure efficiency.

Variables	Nature	Sources
Public expenditure (inputs)		
Education expenditure (%GDP)	Continuous	Public Expenditures for Economic Development (SPEED)
Health expenditure (%GDP	Continuous	SPEED
Infrastructure expenditure (%GDP)	Continuous	SPEED
Government final consumption (%GDP)		SPEED
Sectoral performance indices (outcomes)		
Education		
---Primary enrollment	Continuous	World Development Indicators (WDI)
---Secondary enrollment	Continuous	WDI
---Expected years of schooling	Continuous	WDI
Health		
---Life expectancy at birth	Continuous	World Development Indicators (WDI)
---Infant mortality rate (per 1000 live births)	Continuous	WDI
Infrastructure		
---Total length of roads in kilometers	Continuous	World Telecommunication/ICT Indicators Database
--- Number of paved roads (% total roads)	Continuous	World Telecommunication/ICT Indicators Database
--- Fixed telephone subscriptions (per 100 people)	Continuous	World Telecommunication/ICT Indicators Database
---Fixed broadband subscriptions (per 100 people)	Continuous	World Telecommunication/ICT Indicators Database
--- Faults for 100 fixed telephone lines per year	Continuous	World Telecommunication/ICT Indicators Database
---Proportion of households with electricity	Continuous	World Telecommunication/ICT Indicators Database
---Electric power consumption (in kWh per capita)	Continuous	World Telecommunication/ICT Indicators Database
---Electric power transmission and distribution losses (%production)	Continuous	World Telecommunication/ICT Indicators Database
Administration		
---Independence of the judiciary	Continuous	Teorell *et al.* (2021)
---Quality of property rights	Continuous	Teorell *et al.* (2021)
---Quality of government	Continuous	Teorell *et al.* (2021)
---Level of the shadow economy	Continuous	Teorell *et al.* (2021)
Stability		
---Standard deviation of the three-year moving average of GDP growth	Continuous	Authors, from WDI
---Standard deviation of the three-year moving of inflation	Continuous	Authors, from WDI
Distribution		
---Gini Index	Continuous	Standardized World Income Inequality Database (SWIID)

Economic performance		
---GDP Per capita	Continuous	WDI
--- GDP growth (10-year average)	Continuous	WDI
---Unemployment rate (10-year average)	Continuous	WDI
Main déterminants		
Trade globalization	Index ranging from 0 to 100	KOF (Dreher, 2006a; Gygli *et al.*, 2019)
Total factor productivity	Continuous	Penn World Table (PWT)
Tax revenues	Continuous	UNU-WIDER Government Revenue Dataset
Democracy Index	Index ranging from 0 to 10	Freedom House database
Government durability	Continuous	Polity IV
Population density	Continuous	WDI, World Bank

Table A.4 2 : Main determinants of public expenditure efficiency.

Trade globalization is measured by the KOF index (Dreher, 2006a; Gygli *et al.*, 2019), and ranges from 1 to 100 (higher degree of globalization).
Total factor productivity measures the share of output that is not explained by the quantity of inputs used in production, and is from the Penn World Table (PWT)
Tax revenues — excluding social contributions and natural resources — are from the UNU-WIDER Government Revenue Dataset.
Democracy is captured by an index varying between 0 (least democratic) and 10 (most democratic), extracted from the Freedom House Database.
Government durability measures the number of years since the last change in the political regime and comes from the Polity IV dataset.
Population density is the mid-year population divided by the area in the square kilometers and comes from the World Bank's WDI (World Development Indicators) database.

Chapter 2

Financial development and Public sector efficiency

1 Introduction

In both developed and developing countries, governments are concerned with efficiency in public provision. It has long been recognized that there are many sources of inefficiencies, but the workings of the financial system are important. The importance of the financial system is well-documented in the existing literature. The financial systems of most developing and developed countries (particularly developing countries) have witnessed an impressive evolution over the last two decades. Significant changes in business and political practices accompany this evolution. A higher level of financial development facilitates the provision of credit by banks to public companies, local authorities, and the State to finance public expenditure. Banks reduce credit costs, increase access to credit, and allocate resources to strategic projects; in other words, they allow the government to finance public spending at lower costs and produce the most significant possible benefit for the country's population.

There's scarce empirical evidence on how financial development influences the efficiency of public expenditures, both in developed and developing countries. Public expenditure is efficient when, given the amount spent, they produce the most significant possible benefit for the country's population (see also Afonso and Aubyn, 2006b)). According to Lonti and Woods (2008), López (2006), and López, (2009), efficiency is a relative concept that refers to the ratio of outputs to inputs about a standard ratio considered optimal. In other words, for Mandl, Dierx, and Ilzkovitz (2008), efficiency corresponds to the measure of productivity concerning the idea of the frontier of production possibilities, which indicates the achievable production levels given the scale of operations. Governments that create more of these outputs while spending less on inputs can be considered more efficient than governments that make fewer outputs and use more inputs, other things being equal (Gupta and Verhoeven, 2001b).

Public sector efficiency has been the focus of many studies in the theoretical literature. The first strand of this literature reviews studies of efficiency in the management of public services and its relationship with other economic and financial variables. Antonio Afonso, Schuknecht, and Tanzi (2010a), Giménez and Prior (2007), and Lonti and Woods (2008), attempt to identify the socioeconomic variables affecting public

expenditure efficiency and the consequences of this relationship on public expenditure management. Eugène (2007) states that the correlation between several indicators makes it more challenging to identify the individual impact of each of them, which is complex from a statistical point of view. Antonio Afonso, Schuknecht, and Tanzi (2005), Antonio Afonso, Schuknecht, and Tanzi (2010a), António Afonso and Aubyn (2005), Afonso and Aubyn (2006a), and Herrera and Pang (2005a) focused their work on analyzing the efficiency of certain expenditures, including those related to education and health, using non-parametric methods. Eugène (2007) studied the efficiency of health and education cost management in Belgian municipalities, while Aubyn (2002), analyzed public expenditure efficiency on health and education in Portugal. Other authors, such as Teresa Balaguer-Coll and Prior (2009), examine the factors that influence the efficient management of public services in municipalities and how these expenditures affect economic growth.

Despite the extensive literature on the impact of macroeconomic variables on public expenditure efficiency, no literature has dealt with the impact of financial development as a factor influencing public expenditure efficiency. One of the main problems that all the studies mentioned above have encountered is identifying and measuring efficiency. Research on the factors that impact public spending efficiency is highly complicated because of its methods (López 2006), data availability (homogeneous, relevant, valid, and reliable), measurement difficulties, and the potential effects of many external factors. To address some of these limitations and assess how financial development affects public expenditure efficiency, this chapter utilizes the new Public Sector Efficiency (PSE) calculated in Chapter 1 and then characterizes financial systems that successfully deliver public services. These countries are compelling case studies for two reasons. First, public expenditure efficiency has become a critical issue in public finance; increased public spending efficiency will complement increased social expenditure if the Millennium Development Goals are reached (Hauner and Kyobe, 2010). The latter is facing a new problem; rationalizing public spending to guarantee the priority burdens of the State better is the new objective that these countries have set themselves, namely, to reduce the excessive lifestyle of the State. Second, in most countries, public goods satisfy specific individuals who control the State for their interests. They act as they wish and reinforce their domination over the rest of the

population, abusive and unnecessary public spending to make it easier for some people to live (the conditions) in the dangerous conditions of others, a natural inequality. Citizens want more accountability and transparency from their governments.

This chapter contributes to the literature by analyzing whether financial development improves public expenditure efficiency for a large set of 158 countries[17] of all income levels from 1990-2017. Efficiency scores are limited to the interval]0; 1][18]. The most commonly encountered approach for modelling efficiency scores against exogenous variables is the Tobit regression, which is suitable when dependent variables are censored or corner solution outcomes.

The results suggest that financial development significantly increases expenditure efficiency, with economically significant effects. Robustness has been checked in several ways, including considering alternative samples, using alternative measures, additional controls, and alternative estimation strategies, especially ordinary least squares (OLS) or fixed-effects regression, the generalized method of moments (GMM), and an instrumental variables (IV) approach. Next, we analyze three transmission channels through which financial development could affect expenditure efficiency. We show that improving tax performance through increased revenue mobilization, higher GDP per capita, and better institutional quality (especially corruption control) are channels through which financial development positively affects expenditure efficiency. Finally, we deepen the analysis by exploring several potential heterogeneities in the effect of financial development, depending on various macroeconomic and institutional factors.

The rest of the paper is organized as follows. Section 2 describes our theoretical predictions, and Section 3 reports some stylized facts. Section 4 discusses the data. Section 5 presents the econometric model and empirical results. Section 6 focuses on channel transmission validity checks, Section 7 discusses their sensitivity, and the final section concludes.

[17] The issue is particularly relevant for these countries, where the population is deprived of essential services and marked income disparities exist among regions.

[18] and the model used to replicate the scores must therefore be limited to this interval, and thus nonlinear.

2 Theoretical predictions on financial development's impact on public sector efficiency

The literature on the effects of financial development, particularly its persistent constraints on fiscal policy management, is extensive. Drawing on this body of literature, we contend that a well-developed financial system can impact the efficiency of public expenditures for four primary reasons: promoting fiscal discipline and tax performance and controlling corruption and economic growth.

Financial development as a policy to promote fiscal discipline:

From a broad perspective, fiscal discipline is related to the ability of a government to maintain sustainable public finance. Several tools could enable us to reach this objective, namely fiscal consolidation programs (see Bamba et al. [2020]), fiscal rules, and external anchors, such as an IMF-supported program (see, for example, Celasun, Debrun, and Ostry, 2006; Debrun et al., 2008; Poplawski-Ribeiro, 2009; Ghosh et al., 2013), or the financial development (see, for example, Ma and Lv, 2023). Specifically, existing literature shows that the conduct of fiscal policy is undoubtedly linked to financial factors, and there are various channels through which finance can influence the behaviour of fiscal policy. For instance, fiscal deficits must be financed through financial resources, the availability of which is mainly contingent on the level of financial development. Another example is the impact of the financial cycle. Typically, during the upswing of the financial cycle, an economic expansion tends to occur, accompanied by a general increase in public revenues and expenditures. Conversely, during the downturn of the financial cycle, especially during financial instability, the economic cycle enters a phase of uncertainty, generally resulting in heightened volatility in fiscal policy. For example, Gruss, Nabar and Poplawski-Ribeiro (2020); Osei and Kim (2020), Jalles (2021), Mawejje and Odhiambo, (2022), Afonso and Carvalho (2022) show that financial development releases financing constraints for the real economy, which fosters economic growth and fiscal policy stability.

According to Apeti and Combes (2023) fiscal discipline through deficit or public debt reduction can originate from two primary areas. Similar to the literature on monetary delegation, where the government loses seigniorage opportunities, necessitating efforts to increase taxes or cut public expenditure (Lucotte, 2012; Barbier-Gauchard, Baret

and Minea, 2021) financial development provides governments with access to a variety of funding sources, including capital markets and financial institutions. As a result, the government can better manage its budget and exercise fiscal discipline in controlling expenditures. Suppose the government can borrow at favorable terms due to financial development. In that case, it can help manage public debt more efficiently and reduce its cost, allowing for better control over public expenditure. For governments opting for the tax avenue, the responsibility and willingness of taxpayers to contribute, linked to the quality of public goods provided, may lead to improved management of public resources to achieve the highest possible outcome.

From this perspective, a well-functioning financial system may promote fiscal discipline by ensuring transparent and accountable use of public funds. This can be achieved through effective monitoring mechanisms tied to credit disbursement. Improved fiscal discipline can lead to more efficient public spending, minimizing wastage and enhancing the overall effectiveness of government programs.[19]

The effectiveness of financial development in terms of tax performance:

The favorable effect of financial development on the efficiency of the public sector likely stems more from an impact on tax revenues than on public expenditures, contrary to the effect of budgetary rules, as demonstrated by Asatryan, Castellón and Stratmann (2018) and Apeti and Combes (2023).[20] Firstly, improved mobilization of tax revenues can provide additional resources to the government, allowing for increased investment in high-value projects for society. This may include investments in essential infrastructure such as roads, schools, and hospitals and social programs aimed at reducing inequalities and supporting vulnerable population groups. Furthermore, efficient mobilization of public resources can reduce the need for excessive borrowing to finance public expenditures. By alleviating the debt burden, the government can

[19] While financial development facilitates government borrowing, responsible fiscal policies and debt management practices are crucial to ensure that debt remains sustainable. Excessive or poorly managed debt can threaten a country's financial stability and economic health.

[20] In their study, the beneficial effect of fiscal rules on budgetary discipline is more likely to arise from a reduction in public expenditure, with the taxation channel not achieving statistical significance. The reduction in public expenditure may have compositional implications in two distinct ways: (i) a more substantial reduction in current expenditure and (ii) a more substantial reduction in public investment.

allocate more resources to programs and policies beneficial to the population rather than high-interest payments. Moreover, better mobilization of tax revenues can enhance citizens' trust in the government and its institutions. When taxpayers see that their taxes are being used effectively and transparently to finance quality public services, they are more likely to perform their tax obligations and support government policies. Finally, sound and transparent public financial management can attract more domestic and foreign investments, stimulating economic growth and creating new employment opportunities. By utilizing tax revenues wisely and efficiently, the government can create a conducive environment for business and investment, benefiting society. Tax revenues play an essential role in public expenditures by effectively providing resources. Despite this, existing empirical literature leaves enough ambiguity to warrant further exploration of the effect of tax revenues on the efficiency of the public sector. For example, António Afonso, Jalles, and Venâncio (2021) assess the relevance of taxation for the efficiency of public expenditures in a sample of OECD economies for 2003-2017 and find a negative association between expenditure efficiency and taxation. Based on the above discussion, we argue that improving public resource mobilization can increase public expenditures' efficiency through policymakers' accountability. Fiscal responsibility could encourage the government to use public resources wisely, thereby enhancing the efficiency of public spending. The subsequent discussion describes how financial development can influence tax performance. Financial development can influence tax performance through various revenue generation and management channels. **Main channel**: The financial sector represents significant value-added, employment, and potential tax revenue. Financial sector development facilitates the collection of taxes by the tax administration and the payment of taxes by taxpayers to finance public expenditures. For example, Elliott (2010) explains how financial development is a crucial determinant of government revenue. According to him, Banks, other financial institutions, and insurers provide liquidity to businesses and consumers by providing various payment systems essential for monetary transactions. Therefore, if a country has well-developed, transparent, and efficient financial institutions, taxpayers and businesses will use them to conduct transactions. Tax authorities can access their bank statements and use this information to tax more fairly and effectively. Countries with more efficient financial systems will raise more tax revenue than those with less

developed financial systems. According to Hur, Raj, and Riyanto (2006), dependence on external financing and the agency problem is inevitably linked and defines the entrepreneur-financier relationship. The level of financial system development, the extent of investor protection, productive monitoring technologies, and property rights enforcement are the degree of financial development factors that help limit the seriousness of the agency problem and protect the interests of financiers. Financiers are protected against possible non-payment by debtors in adequately functioning these factors. Banks reduce credit costs, increase access to credit, and allocate resources to strategic projects; in other words, they produce the most significant possible benefit for the country's population. **Indirect channel**: Beyond its direct impact on tax revenues, financial development can influence fiscal performance through various revenue generation and management channels. Financial development can stabilize the macroeconomic environment by reducing inflation. By facilitating financial transactions, reducing information asymmetries, and offering sophisticated financial products, financial development can reduce uncertainty and transaction costs in the economy, thereby contributing to price stabilization. Indeed, low inflation rates mitigate the negative Oliveira-Keynes-Tanzi effect, as the erosion in the actual value of taxes between the date of imposition and the date of collection will decrease (see Tanzi, 1992). Moreover, the decrease in inflation volatility engendered by financial development (see, Mehrotra and Yetman 2015) should help stabilize and make the tax base more predictable. As a result, better tax collection may be associated with financial development. Sound public financial management should improve fiscal performance and public spending efficiency. In addition, higher levels of financial sector development allow the central bank to use interest rates more effectively to manage the inflation rate and its variability. Suppose financial development implies better access to finance and financial inclusion. This will allow more significant consumption smoothing so that the central bank can focus more on inflation than on stabilizing output, thus facilitating lower and more stable inflation rates (Mehrotra and Yetman, 2015). According to Hauner and Kyobe (2010a), the ratio of spending to GDP - the denominator of efficiency scores - will be lower than the policy target if inflation is higher than budgeted and there is no supplementary budget to raise spending limits. This would tend to lead to a scramble for resources as the public sector is squeezed

realistically. By reducing the rise in inflation, fiscal development should achieve consistent budget planning and improve public spending efficiency.

Financial development's role in controlling corruption and economic growth

Based on the literature, we assume that financial development can impact the efficiency of public spending through better economic activity and institutional quality. The economic activity channel is justified by the financial sector's ability to mobilize savings, allocate resources to the most productive investments, reduce information and transactions, monitor costs, diversify risks, and facilitate the exchange of goods and services. This results in a more efficient allocation of resources, faster accumulation of physical and human capital, and quicker technological progress. For instance, studies have underscored the role of financial development in financing productive investments and fostering innovation, both of which promote growth (see (Schumpeter, 1961)). Financial development may impact the development of the private sector (both consumption and investment), the long-run output growth, and the GDP per capita. It should increase investment productivity and reduce transaction costs (increase investment liquidity), which would strengthen the competitiveness of firms, improve savings, and thus promote economic growth. An increase in investment productivity and a reduction in transaction costs directly impact companies. It should not be forgotten that productivity measures the efficiency with which an economy mobilizes resources to produce goods and services. Improving productivity requires better management of scarce resources and total employment of economic capacity. This then leads to an increase in efficiency. However, the effect of per capita income on the efficiency of public expenditure could be a two-way street. On the one hand, it could reduce efficiency by increasing the relative cost of public services (Baumol, 1967). On the other hand, it was often found that higher income was associated with better health and education outcomes (see Antonio Afonso, Schuknecht, and Tanzi 2010b; Herrera and Pang 2005b), while on the other hand, poorer countries had lower performance (La Porta *et al.*, 1999).

The second channel is the reduction of corruption[21] (or the promotion of better institutional quality). Firstly, by promoting transparency and efficiency in financial transactions, a developed financial system complicates the concealment of illicit activities or corrupt transactions for individuals and entities. Additionally, the use of technologies such as online banking and electronic payments reduces the circulation of cash, thereby limiting opportunities for corruption related to manipulating liquid funds. Limiting opportunities for corruption allows public resources to be allocated more effectively and targeted towards projects and programs with a real impact on society. For example, Krolikowski (2014) shows that by making payment data more transparent and limiting the availability of economic rents in the billing and payment process, mobile money can reduce potential fraud and improve the delivery of public services. Secondly, a sophisticated financial system provides tools for monitoring and verifying financial transactions, facilitating the detection and prevention of corruption by competent authorities. By more effectively detecting corruption cases, governments can take appropriate measures to combat them, reducing losses of public funds associated with corruption and ensuring that resources are used efficiently. Thirdly, by encouraging the formalization of transactions and businesses, financial development also promotes good governance and accountability among economic actors, thereby reducing incentives for corruption. When economic actors are subject to stricter governance standards and increased oversight, they are less inclined to engage in illicit activities or corrupt practices, which promotes better management of public resources. For instance, Levine (2004) shows that financial sector development includes the role of finance in governance. Bank credits reduce corruption to the extent that they are associated with conditions that limit the discretionary power of officials in the beneficiary country. In the end, financial development help to reduce corruption and thus will increase public spending efficiency.

[21] The corruption affects the provision of social services provided by the public. It can drive prices and reduce production and public services (Shleifer and Vishny, 1993), including feeding and financing health, education, and defense services in many countries. According to Jayasuriya and Wodon (2003), corruption reduces government and business efficiency by enabling people to assume power through patronage rather than ability and introduces inherent instability in the political system. Then, corruption reduces investment in human capital (Ehrlich and Lui, 1999). Lastly, corruption reduces public revenues (see Shleifer and Vishny (1993) and Hindriks, Keen, and Muthoo (1999)), which in turn can weaken the quality of services provided by the public sector. In other words, it negatively influences public spending efficiency. It reduces their willingness to pay for them (through tax evasion), reducing the tax base and reducing the government's ability to provide quality public services.

3 Stylized facts

We present descriptive statistics for the computed scores and financial development across the span of 1990-2017, examining a broad panel of 158 countries chosen based on data availability. Subsequently, we establish correlations between the scores calculated and the focal variable of interest—Financial Development.

3.1 Calculated efficiency scores

Figure 1 illustrates the evolution of average scores for 158 countries over the period 1990-2017, distinguishing between advanced and developing countries. It shows a steady increase in efficiency in both advanced and developing economies from the mid-1990s onwards, with a peak around the year 2000. While the latter marks the beginning of a gradual decline in efficiency in developing economies, advanced economies show a slight upward trend until 2007.[22] A downward trend in both groups of countries can be observed from 2008, with an acceleration of the pace for developing economies and further recovery from 2015. On average, advanced countries are closest to the efficiency frontier, with a score of 0.71, while the reported average efficiency for developing countries is 0.64 (see figure 3.2). The top 10 performing countries have scores ranging from 0.73 to 0.79, all of which are advanced economies, while the bottom 10 countries have scores between 0.56 and 0.60, with seven being African economies (see Table *B.2.2*).

[22] The steady increase in public sector efficiency in advanced and developing economies since the mid-1990s, peaking around 2000, can be attributed to structural reforms undertaken in many economies to enhance public sector efficiency. These reforms may include streamlining bureaucracy, rationalizing administrative processes, and improving transparency and accountability. Additionally, the 1990s and 2000s period was characterized by relatively strong economic growth in many regions, providing governments with increased resources and capacity to invest in improving public sector efficiency. However, the gradual decline in public sector efficiency in developing economies after the peak reached around 2000 can be attributed to various factors, such as corruption, political instability, budgetary constraints, and institutional weaknesses. As for the slight upward trend until 2007 in advanced economies, it may be linked to favorable economic and fiscal policies, as well as investments in critical sectors of public administration.

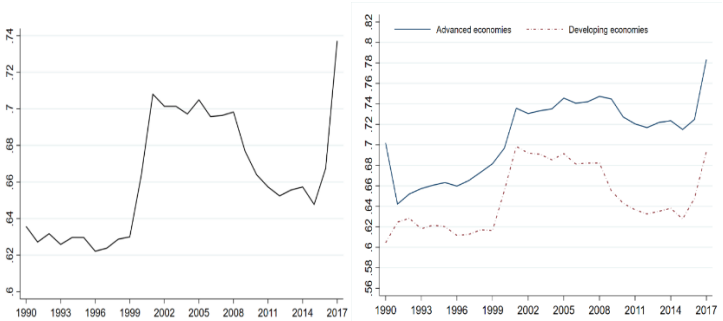


Figure 3. 1 Plot showing overall public and public sector efficiency by income group trends from 1990 to 2017.
Source : Author's calculations using SPEED-IFPRI /ICTD/UNU-WIDER GRD, 2019.

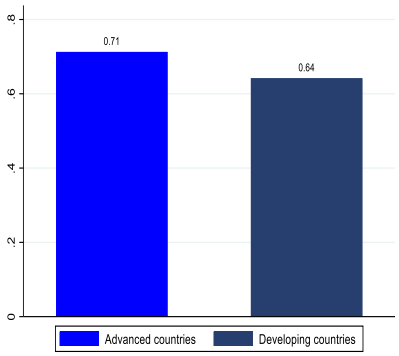


Figure 3. 2 Average public sector efficiency scores (1990-2017)
Source: Author's calculations using SPEED-IFPRI /ICTD/UNU-WIDER GRD, 2019.

3.2 Financial sector development

Focusing on the financial development index, Figure 3.3 depicts an upward trend in our sample, suggesting progress in financial sector. Specifically, the evolution of the financial sector has shown significant improvement, increasing from 0.21 in 1990 to 0.35 in 2017, on average.

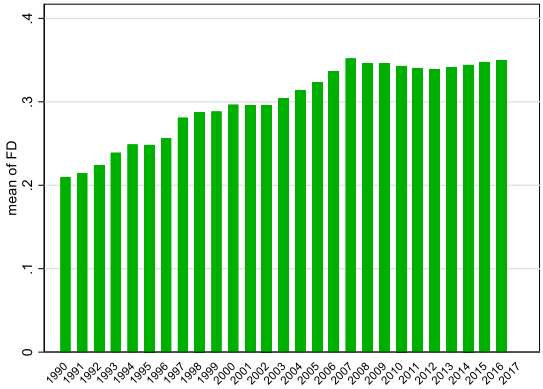


Figure 3. 3 Financial development index Over Time (1990-2017).
Source : Authors, from the IMF-Financial Development Index Database,

Figure 3.4 illustrates the level of financial development by income group. It appears that high-income countries have the highest level of financial development in the sample, with an average overall financial development index of 0.61. Conversely, it is evident that the level of financial development is lowest in low-income countries, with an average overall financial development index equal to 0.17. This remains significantly lower compared to developed countries over the period 1990-2017.

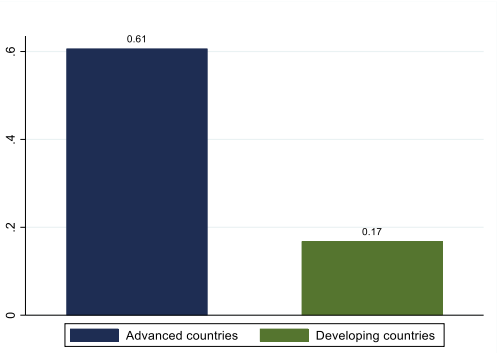


Figure 3. 4 Average financial development index (1990-2017).
Source : Authors, from the IMF-Financial Development Index Database

In Figure 3.5, we present the correlation between financial development and the scores measuring public sector efficiency. It clearly appears that increased financial sector development is linked to higher scores of public sector efficiency.

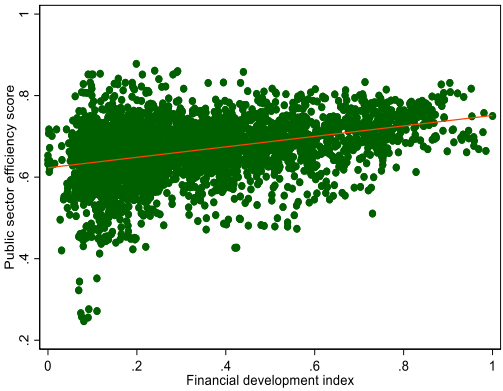


Figure 3. 5 Correlation Between the financial development and public sector efficiency score
Author's calculations using SPEED-IFPRI /ICTD/UNU-WIDER GRD, 2019 and IMF-Financial Development Index Database.

4 Data

Our study, dictated by data availability, covers the period 1990-2017. The dependent variable is represented by the previously calculated efficiency scores, which can range from 0 to 1. The variable of interest is the measure of the overall level of financial development of a country i during year t. We collected the financial development index from the IMF's Financial Development Index Database for its estimation.

Following the existing literature on the determinants of public sector efficiency, we retain several vital factors, including structural factors, that influence countries' public sector efficiency, which must be included in the public sector efficiency equation to avoid speciation bias in the financial development– public sector efficiency relationship. The following paragraphs discuss the justification of each control variable included in the equation:

GDP per capita - By taking **the logarithm of GDP per capita**, we account for the income effect. In reality, wealthier countries may exhibit lower efficiency due to higher

wage levels. However, they are also likely to possess better organizational structures, contributing to increased efficiency. Moreover , GDP per capita is expected to positively impact public expenditure efficiency because physical capital stock facilitates the efficient production of goods and services. But this may also enable monitoring of policymakers (Antonio Afonso, Schuknecht, and Tanzi 2010a).

Tax revenues - Tax revenue mobilization is a critical concern for both advanced and developing economies. Advanced economies, facing population aging, are increasingly channeling public spending toward social sectors, leading to concerns about potential fiscal stress (Leeper and Walker, 2011). On the other hand, developing countries, heavily reliant on external financial flows, are undertaking reforms to enhance tax revenue mobilization, especially in the context of growing trade liberalization over the past decades, resulting in a decline in tariff revenues. Domestic taxation is vital for these nations, enabling them to finance their development independently and reduce reliance on external funding. This self-sufficiency supports essential state functions, fosters economic growth, and encourages responsive and accountable governance. From a theoretical standpoint, Barro (1990) highlights a non-linear relationship between government spending and economic growth, influenced by taxation levels, and suggests potential threshold effects. According to this model, an increase in taxes can fund productive public spending. Still, beyond a certain threshold, taxation introduces distortions, akin to the Laffer curve, resulting in decreased private capital productivity. Consequently, the impact of taxation on government efficiency is ambiguous, potentially driven by a threshold effect. Empirically, studies by Chan, Ramly and Karim (2017) for a global panel and Afonso, Jalles and Venâncio (2021) for OECD countries from 2003-2017 reveal complex associations between taxation, government spending efficiency, and economic growth.

Trade globalization- The impact of trade globalization on the efficiency of the public sector is ambiguous. On one hand, globalization has the potential to enhance overall economic performance by facilitating the transfer of skills, knowledge, and technologies (Hauner and Kyobe, 2010). This, in turn, could foster technological progress and the adoption of more efficient production techniques, promoting effective public sector management. Additionally, knowledge diffusion resulting from trade globalization, including within the public sector, may strengthen domestic knowledge and enhance capacities in public administration (see, Apeti, Bambe and Lompo, 2023).

Conversely, globalization could indirectly influence government efficiency through taxation, yielding ambiguous effects. Schulze and Ursprung (1999) explore the relationship between globalization and fiscal policy, identifying two distinct effects. The efficiency effect suggests that in the context of liberalization, countries aiming to attract more international capital may be motivated to reduce domestic taxes, potentially limiting their ability to provide public goods. The compensation effect posits that globalization, likely contributing to increased income inequalities, may drive higher demand for social insurance programs, leading to an upward shift in taxation and spending levels.

The level of public debt - is a crucial factor influencing the government's capacity to achieve the specified goals for fiscal aggregates (Calderón and Schmidt-Hebbel, 2008). The expected effect of this variable is ambiguous. Well-managed public debt can be a valuable tool for economic development and enhancing public sector efficiency through strategic, long-term investments in human capital, such as education and healthcare. A well-educated and healthy workforce positively influences public sector services' efficiency. Public debt allows governments the flexibility to implement countercyclical policies, stabilizing the economy during downturns and maintaining public sector efficiency. Conversely, high public debt requires substantial interest payments, diverting resources from critical public services and limiting efficient fund allocation to sectors like education, healthcare, and infrastructure. Elevated public debt may challenge fiscal discipline, leading to deficit spending and potential financial instability. Additionally, high public debt levels may heighten the likelihood of implementing austerity measures, disproportionately impacting public services and further compromising overall efficiency.

Institutional quality, measured by the level of democracy[23] and government fragmentation, plays a crucial role in public sector management. A robust institutional framework, such as good governance or strengthened democracy, encourages governments to justify their control of the state apparatus, promotes budgetary transparency, and provides a comprehensive overview of public sector activity, thereby

[23] Democracy - which measured by the polity indicator from the Polity IV database. This index is a combination of democracy and autocracy indicators of polity IV. Polity2 represents the quality of governance that measures democracy in a country.

limiting the risk of fraud. On the other hand, **government fragmentation** [24], as studied by Kontopoulos and Perotti (1999), has implications for public sector management, particularly in OECD countries. Their research reveals a correlation between fragmentation and larger expenditures, especially since spending ministers play a pivotal role in representing individual spending interests in European governments. This trend is consistent with findings from other studies by Edin and Ohlsson (1991); Borrelli and Royed (1995); Franzese Jr (2000); Balassone and Giordano (2001); Volkerink and De Haan (2001); and Artés and Jurado (2018). Despite these observations, some scholars, including De Haan and Sturm (1994, 1997); Harrinvirta and Mattila (2001); Ricciuti (2004), have failed to identify statistically significant effects resulting from government fragmentation.

The data on control variables originate from the World Bank's World Development Indicators, the International Monetary Fund's World Economic Outlook (WEO), Penn World Tables (PWT9.1) and the Polity4 project.

[24] Government fragmentation measures the probability that two deputies picked at random among from the government parties will be of different parties.

Table 3.1 contains the list of variables used in this paper and a brief description of the data. [25]

Table 3. 1 Descriptive statistics for main variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Public Sector Efficiency	3802	.664	.078	.247	.896
Financial development	3617	.3	.218	0	1
Public debt (log)	3106	55.926	45.451	0	600.623
Tax revenues (log)	3509	17.482	8.465	.086	60.946
GDP per capita growth	3733	2.274	6.185	-64.992	140.371
Trade globalization	3794	53.171	17.529	11.275	96.028
Democracy	3583	6.719	2.995	0	10
Government Fragmentation	3381	.25	.286	0	1

Sources : *Author's estimate*

5 Econometric model and results

5.1 Econometric model and baseline results

Table 3.2 provides an overview of the distribution of technical efficiency (TE) scores. The scores, as constructed, can range from 0, indicating the worst performance, to 1, representing the best performance. We report 3,002 country-year observations with an average score of 0.66 over the sample and the period considered. There are 44.61% of countries with efficiency scores below this value. The results show that, on average, countries could increase about one-third (1-0.66) of their technical efficiency (TE).

Table 3. 2 Distribution of efficiency Score

Efficiency score	Nbr	Percent	Cum
0-0.5	119	3.13	3.13
0.6-0.7	571	15.02	18.15
0.7-0.8	1816	47.76	65.91
0.8-0.9	1188	31.25	97.16
0.9-0.1	108	2.84	100.00
Average	0.66		
Min	0.25		
Max	0.90		

From these technical efficiency (TE) scores, we assess the impact of financial development on TE with Tobit model (Table 3.3). Tobit regression is an alternative to ordinary least squares regression (OLS) and is used when the dependent variable is

[25] Table C in the appendix presents the matrix of correlation of the variables studied.

bounded from below, above, or both, with a positive probability of concentration at the interval ends, either due to censoring or corner solutions (Wooldridge, 2002). In the case of censoring, observations outside the limiting interval are recorded as the border values. For instance, if the range is [a; b], observed y < a is recorded as y = a, and observed y > b is recorded as y = b. In the case of corner solutions, observations are naturally limited from below, above, or both, with a positive probability at the 'corners' (interval ends). Technical efficiency (TE) scores range continuously between 0 and 1, with a positive probability of reaching 1. Therefore, it is logical to employ a two-limit Tobit technique to model these scores based on exogenous variables. Tobit has been widely chosen as the natural method for modeling DEA scores in second-stage evaluations in numerous studies(see, e.g., Coelli *et al.*, 2005; Afonso and Aubyn, 2006b; Bravo-Ureta *et al.*, 2007; Afonso, Schuknecht and Tanzi, 2010c).[26] Our main empirical specification is as follows: Our analysis is based on the following Tobit model:

$$\begin{cases} Eff_{i,t}^{*} = 0 & Eff_{i,t}^{*} < 0 \\ Eff_{i,t}^{*} = \beta X_{i,t} + \varepsilon_{i,t} & if\ 0 \le Eff_{i,t}^{*} \le 1 \\ Eff_{i,t}^{*} = 1 & Eff_{i,t}^{*} > 1 \end{cases} \quad (7)$$

Where: $Eff_{i,t}$ is the public sector efficiency measure (PSE) from a country *i* in period *t*; *FD* indicates the level financial development for a country *i* in year *t*. We are mainly interested in β_1, the coefficient of financial development. $X_{i,t}$ is the vector of control variables; these include the total factor productivity, the total non-resources tax ratio, the population density, the public debt, the trade globalization, the government fragmentation, and democracy.

The error term in panel data application is generally defined as follows:

$$\varepsilon_{i,t} = \lambda_i + \mu_{i,t} \quad (8)$$

where λ_i is the unobservable individual effects and $\mu_{i,t}$ is the unobservable individual and random effects. Individual effects are addressed in two different ways as follows: If λ_i is assumed fixed for each individual, then it is referred to as a "Fixed Effect"

[26] For sensitivity analysis we have also estimated a simple linear regression using OLS, GMM and IV estimations and our results remain qualitatively intact.

estimator; or if it is considered to be picked up randomly from a probabilistic distribution, then it should be referred to as a ‘‘Random Effect’’ estimator (Kaya Samut and Cafrı, 2016). Nevertheless, since each country has its characteristics that may or may not influence the predictors, we added country-fixed effects to control for this. However, in the present setting this is not possible as a fixed effects (conditional) Tobit model cannot be estimated parametrically (Adam, Delis and Kammas, 2011). Given the nonlinearity of the Tobit model, employing fixed effects in Panel Tobit Analysis would result in an augmentation of α_i with the increase in N, leading to incidental parameter issues and biased outcomes (Fernández-Val and Weidner, 2016). There is a highlighted concern about the distribution of the disturbance variance estimator in fixed-effect Tobit models, extending beyond the incidental parameter problem, as underscored by Greene (2004). Hence, opting for a random effect estimation for Panel Tobit is considered more suitable.

Table 3.3 presents the baseline results of estimating the effect of financial development on public sector efficiency. Column (1) estimated the effect using financial development index as an explanatory variable. The results show a positive and significant impact of financial development on public sector efficiency at the 1% threshold. However, this specification suffers from an omitted variable. Based on the literature, we then iterated the model using additional explanatory variables that may affect public sector efficiency. The effect of financial development on public sector efficiency remains positive and significant (columns 2-7). The results in column 7 indicate that, on average, for the countries in the sample, an increase in financial development level by one unit leads to an improvement of public sector efficiency by 10.9 percentage points. This effect is particularly robust when controlling for the favorable impact of annual GDP per capita growth, trade globalization, and democracy on the efficiency of public sector; also, by the negative impact of tax revenue, and the no significatively effect of public debt and government fragmentation (regression (7)). The results in table 3.3 support that financial development has a positive and significant impact on the efficiency of public sector.

Table 3. 3 Benchmark estimations of the impact of financial development on public sector efficiency.

Dependent Variable	**Public Sector Efficiency (PSE)**						
Regressions	Reg1	Reg2	Reg3	Reg4	Reg5	Reg6	Reg7
Financial development	0.1467***	0.1409***	0.1316***	0.1362***	0.1158***	0.1068***	0.1090***
	(0.0102)	(0.0111)	(0.0120)	(0.0120)	(0.0131)	(0.0140)	(0.0141)
Public debt (log)		-0.0056**	-0.0024	-0.0011	0.0020	0.0019	0.0020
		(0.0022)	(0.0023)	(0.0023)	(0.0024)	(0.0024)	(0.0025)
Tax revenues (log)			0.0109**	0.0090*	0.0047	-0.0111**	-0.0121**
			(0.0047)	(0.0048)	(0.0048)	(0.0055)	(0.0057)
GDP per capita growth				0.0017***	0.0017***	0.0017***	0.0016***
				(0.0002)	(0.0002)	(0.0003)	(0.0003)
Trade globalization					0.0299***	0.0217***	0.0228***
					(0.0075)	(0.0078)	(0.0079)
Democracy						0.0066***	0.0049***
						(0.0011)	(0.0011)
Government Fragmentation							0.0077
							(0.0066)
Constant	0.6178***	0.6439***	0.6053***	0.5995***	0.4872***	0.5225***	0.5301***
	(0.0040)	(0.0093)	(0.0155)	(0.0155)	(0.0309)	(0.0321)	(0.0326)
/							
sigma_u	0.0253***	0.0287***	0.0297***	0.0299***	0.0295***	0.0297***	0.0274***
	(0.0020)	(0.0023)	(0.0024)	(0.0024)	(0.0024)	(0.0026)	(0.0025)
sigma_e	0.0647***	0.0626***	0.0613***	0.0608***	0.0603***	0.0606***	0.0603***
	(0.0008)	(0.0009)	(0.0009)	(0.0009)	(0.0008)	(0.0009)	(0.0009)
Observations	3246	2829	2692	2686	2679	2506	2307
Number of countries	134	134	134	134	133	126	121
Log likelihood	4179	3712	3581	3596	3608	3361	3110
Countries/Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Chi2	206.2	163.5	158	204.4	226.7	223.3	199.5

Note: Robust Standard Errors are in parenthesis.
*Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01*

5.2 Additional controls

We further enhance our main specification by including additional covariates. In column [2] of Table 3.4, we include openness degree instead of trade globalization, as is the case in the baseline specification, we rely on an alternative measure, namely, the combined value of exports and imports expressed as a percentage of GDP. In columns [3] to [12], we augment our main specification with the following variables: Total factor productivity, government durability, political stability and the absence of violence/terrorism, financial openness, credit rating, a dummy variable banking crisis, a dummy variable for monetary union, a dummy variable for inflation targeting regime, presidential system, and political checks and balances, respectively. The results remain robust.[27]

[27] In addition to the control mentioned above variables, we also consider the possibility that Foreign Direct Investment (FDI) and Official Development Assistance (ODA) may affect public sector efficiency. According to Rayp and Van De Sijpe (2007), the sign of net FDI inflows is ambiguous. Indeed, as a proxy for integration into the global economy, an increase in net FDI inflows may compel the government to adopt more market-friendly behaviour and adhere to higher performance standards expected by multinational corporations. However, according to Todaro and Smith (2003), FDI in developing countries may also be associated with rent extraction and sharing between the political elite and foreign companies, leading to favoritism, corruption, and, ultimately, less efficiency.

The population density - as one of the demographic indicators. Hauner and Kyobe (2010) contend that a larger population, leveraging economies of scale, could enhance public sector efficiency by reducing the cost of public service provision. However, our interpretation introduces complexity by considering other factors. Higher population density may not only yield economic benefits but also impose pressure on natural resources and public infrastructure, potentially leading to social tensions in areas with limited opportunities. Additionally, population density might indirectly impact fiscal efficiency, as administering income or sales taxes becomes more challenging in sparsely populated regions.

Total factor productivity - as a measure of firm-level productivity. The effect of the business cycle may be ambiguous since it is well known that fiscal policy is primarily procyclical in developing economies, with an excess of debt and spending in the high cycle period. Increasing spending when economic conditions improve is inconsistent with Keynesian optimality and may produce poor outcomes. Better factor productivity may reflect better organizational or technological innovation or more efficient use of production factors. This can lead to efficiency gains in the economy, including in managing government expenditure. Furthermore, improved factors of production leading to increased productivity can provide additional government resources, potentially allocated to more productive sectors. Finally, as productivity gains are crucial components of the growth process (Bosworth and Collins, 2003), enhancing factor productivity is crucial for a dynamic economy and improved household welfare, especially if gains benefit the less privileged.

Government durability- The durability of a government, reflecting its capacity to implement consistent long-term policies, influences expenditure efficiency. However, this argument requires nuance, as government durability in less democratic regimes may indicate weak institutions, potentially adversely affecting efficiency, especially

The net ODA received as a percentage of Gross National Income (GNI) represents disbursement flows (net of principal repayment) meeting the Development Assistance Committee's (DAC) definition of ODA. It raises the concern that recipient countries of ODA, not burdened by taxation, may lack the incentive to use these resources effectively (Bulíř and Hamann, 2003). Additionally, it addresses the volatility and unpredictability of aid flows, which complicate medium-term planning for public expenditures (Herrera and Pang, 2005a). In conclusion, a negative association between aid and public expenditure efficiency is expected. The results remain robust.

considering that countries with poorer institutional performance often exhibit poor economic performance (Acemoglu and Robinson, 2008).

Political stability and the absence of violence/terrorism allude to the perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically motivated violence and terrorism. Political volatility can complicate coherent budget planning and undermine effectiveness (Hauner and Kyobe, 2010). Political stability and the absence of violence/terrorism could positively affect public spending efficiency.

Financial openness- the impact of financial openness on the efficiency of the public sector is nuanced. Financial openness allows for diversification and access to international financial markets. This can be crucial in mitigating the impact of external economic shocks, providing the public sector with greater resilience and adaptability. However, financial openness poses challenges in terms of managing debts and external risks. Ineffective financial management can lead to vulnerabilities, hindering the public sector's ability to allocate resources efficiently.

A **positive credit rating** indicates to investors that a government is a trustworthy borrower, attracting investments for productive projects and improving overall public sector efficiency. Higher credit ratings typically result in lower borrowing costs, allowing the public sector to fund projects efficiently and allocate resources wisely. On the flip side, lower credit ratings may create budgetary constraints, restricting the government's access to funds and potentially leading to less efficient resource allocation. Membership in a **monetary union** typically involves following shared fiscal rules, fostering fiscal discipline within the public sector and promoting responsible budgetary practices, thereby enhancing overall efficiency. The use of a common currency within the union results in decreased transaction costs and minimized exchange rate uncertainties. This stability is advantageous for the public sector, facilitating more seamless fiscal planning and mitigating financial risks associated with currency fluctuations. **Inflation targeting** necessitates disciplined fiscal policies, fostering efficient resource allocation and reducing the risk of financial mismanagement in the public sector. However, strict adherence to inflation targets may limit fiscal flexibility, hindering the effective implementation of counter-cyclical policies and potentially impeding efficient resource allocation in challenging economic periods. In a **presidential system**, centralized executive leadership facilitates decisive

decision-making, positively impacting public sector efficiency by streamlining policymaking and enabling prompt responses to emerging issues. The clear delineation of executive powers enhances accountability, contributing to efficient public sector operations through transparent decision-making and responsible resource allocation. **Checks and balances** - enhance accountability and transparency in the public sector by holding decision-makers accountable for actions and resource allocations. These mechanisms serve as a safeguard against the abuse of power, distributing authority and implementing oversight measures to prevent inefficiencies and corruption resulting from unchecked decision-making. A **banking crisis** poses a substantial threat to financial stability, impeding the public sector's access to essential funds and introducing economic uncertainties that disrupt the efficiency of public service delivery. The fiscal pressures arising from such crises often require government interventions and financial bailouts, diverting resources from public programs and exacerbating challenges in resource allocation. The direct consequences, including credit shortages and economic downturns, can hinder the public sector's ability to deliver essential services efficiently. Reduced revenues and heightened demands for public assistance may strain existing resources further.

Table 3. 4 Robustness / The impact of financial development on public sector efficiency: Additional controls

Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Regressions	Reg1	Reg2	Reg3	Reg4	Reg5	Reg6	Reg7	Reg8	Reg9	Reg10	Reg11	Reg12	Reg13	Reg14	Reg15
Financial development	0.1090***	0.1260***	0.1079***	0.1101***	0.1016***	0.1232***	0.1053***	0.1194***	0.1076***	0.1103***	0.1173***	0.1119***	0.1343***	0.0423**	0.1117***
	(0.0141)	(0.0138)	(0.0141)	(0.0167)	(0.0173)	(0.0153)	(0.0146)	(0.0185)	(0.0142)	(0.0145)	(0.0145)	(0.0141)	(0.0158)	(0.0166)	(0.0145)
Public debt (log)	0.0020	0.0034	0.0025	0.0125***	0.0018	0.0062**	0.0016	0.0116***	0.0021	0.0020	0.0030	0.0022	-0.0032	0.0046*	0.0002
	(0.0025)	(0.0026)	(0.0025)	(0.0030)	(0.0026)	(0.0027)	(0.0025)	(0.0035)	(0.0025)	(0.0025)	(0.0025)	(0.0025)	(0.0027)	(0.0027)	(0.0026)
Tax revenues (log)	-0.0121**	-0.0207***	-0.0125**	-0.0304***	-0.0125**	-0.0207***	-0.0098*	-0.0297***	-0.0122**	-0.0121**	-0.0134**	-0.0126**	-0.0204***	-0.0064	-0.0096
	(0.0057)	(0.0064)	(0.0058)	(0.0085)	(0.0059)	(0.0064)	(0.0058)	(0.0076)	(0.0058)	(0.0057)	(0.0059)	(0.0057)	(0.0072)	(0.0060)	(0.0061)
GDP per capita growth	0.0016***	0.0020***	0.0016***	0.0010***	0.0017***	0.0017***	0.0016***	0.0022***	0.0016***	0.0016***	0.0017***	0.0016***	0.0017***	0.0025***	0.0018***
	(0.0003)	(0.0003)	(0.0003)	(0.0004)	(0.0003)	(0.0004)	(0.0003)	(0.0004)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Trade globalization	0.0228***		0.0248***	0.0227**	0.0211**	0.0114	0.0178**	0.0153	0.0232***	0.0228***	0.0162**	0.0200**	0.0185**	0.0070	0.0199**
	(0.0079)		(0.0080)	(0.0095)	(0.0082)	(0.0086)	(0.0082)	(0.0104)	(0.0080)	(0.0079)	(0.0080)	(0.0079)	(0.0084)	(0.0089)	(0.0083)
Democracy	0.0049***	0.0056***	0.0051***	0.0073***	0.0049***	0.0063***	0.0046***	0.0035**	0.0049***	0.0050***	0.0046***	0.0046***	0.0051***	0.0033***	0.0061***
	(0.0011)	(0.0012)	(0.0011)	(0.0015)	(0.0012)	(0.0013)	(0.0011)	(0.0014)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0012)	(0.0012)	(0.0013)
Government Fragmentation	0.0077	0.0195***	0.0084	0.0096	0.0070	0.0116	0.0070	0.0240***	0.0076	0.0077	0.0147**	0.0081	0.0074	0.0169**	0.0011
	(0.0066)	(0.0069)	(0.0066)	(0.0074)	(0.0069)	(0.0072)	(0.0067)	(0.0077)	(0.0066)	(0.0066)	(0.0067)	(0.0068)	(0.0068)	(0.0071)	(0.0069)
Trade openness (Log)		0.0154***													
		(0.0054)													
Population density			-0.0018												
			(0.0021)												
Total factor productivity				0.1083***											
				(0.0143)											
Government durability					0.0001										
					(0.0001)										
Government Stability						0.0057***									
						(0.0009)									
Financial openness							0.0137**								
							(0.0070)								
Credits rating								0.0007							
								(0.0008)							
Monetary union (dummy)									0.0050						
									(0.0059)						
Inflation targeting(dummy)										-0.0022					
										(0.0055)					
Presidential System											0.0002***				
											(0.0000)				
Checks and Balances												0.0000			
												(0.0012)			
Bank crisis (dummy)													0.0199*		
													(0.0108)		
Control Corruption														0.0007***	
														(0.0001)	
Inflation															0.0005
															(0.0007)
Constant	0.5301***	0.5603***	0.5288***	0.4216***	0.5388***	0.5193***	0.5415***	0.5719***	0.5278***	0.5297***	0.5544***	0.5433***	0.5808***	0.5647***	0.5314***
	(0.0326)	(0.0269)	(0.0329)	(0.0409)	(0.0340)	(0.0364)	(0.0329)	(0.0433)	(0.0329)	(0.0327)	(0.0332)	(0.0326)	(0.0344)	(0.0358)	(0.0344)
sigma_u	0.0274***	0.0319***	0.0274***	0.0381***	0.0278***	0.0304***	0.0272***	0.0347***	0.0279***	0.0276***	0.0289***	0.0272***	0.0301***	0.0266***	0.0285***
	(0.0025)	(0.0029)	(0.0025)	(0.0040)	(0.0027)	(0.0029)	(0.0026)	(0.0035)	(0.0026)	(0.0026)	(0.0026)	(0.0025)	(0.0029)	(0.0024)	(0.0027)
sigma_e	0.0603***	0.0577***	0.0602***	0.0524***	0.0616***	0.0549***	0.0606***	0.0530***	0.0603***	0.0603***	0.0597***	0.0601***	0.0593***	0.0581***	0.0592***
	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0010)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0010)	(0.0009)
Observations	2307	2225	2292	1780	2156	1907	2262	1778	2307	2307	2307	2293	2192	1837	2147
Number of countries	121	120	121	89	113	98	120	103	121	121	121	121	113	121	114
Log likelihood	3110	3078	3094	2615	2862	2736	3040	2595	3110	3110	3130	3099	2983	2537	2929
chi2	199.5	193.1	204.7	197.3	182.7	224.6	205.1	137.4	198	198.4	231.8	196	202.2	208.3	202.7

Note: Robust Standard Errors are in parenthesis.

*Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01*

5.3 Alternatives estimations methods

On the econometrics side, we further extend our tests by using four alternative estimation methods: panel fixed effects, Generalized Method of Moments (GMM), and Instrumental Variable (IV) estimation.

OLS estimates. Tobit has commonly been chosen as the natural method for modeling DEA or SFA scores in second-stage evaluations. However, the two-limit Tobit technique is inherently mis-specified when applied to DEA or SFA scores, given that these only take on the value 1 with positive probability (and not the opposite limiting value 0). Despite this mis-specification, Tobit still produces sensible results in second-stage DEA or SFA analyses[28](Hoff, 2007). For sensitivity analysis we have also estimated a simple linear regression using OLS estimation or panel fixed effects. The results presented in Column [1] of Table 3.5 indicate a positive and significant impact of financial development on expenditure efficiency, with an estimated magnitude of approximately 8.94 percentage points. This effect is qualitatively comparable to the main model, which shows a 1.96 percentage point decrease. The findings suggest that financial development contributes positively to the efficiency of expenditures.

GMM estimates. Second, a possible reserve causal effect between financial development and public spending efficiency was suspected. Here, we assume that public spending efficiency impacts financial sector development. One of the dependent variables (TE) is public spending variability over time. (Colombo and Caldeira, 2018) and (Schandlbauer, 2017) have found that the level of taxes (and hence tax revenue) could affect financial institutions and, therefore, the depth of financial development. For example, an increase in tax revenue provides more public expenditure, which generally contributes to improving the state of infrastructure, leading to a better environment for developing the financial sector in the economy. Consequently, there is a causality bias due to the correlation between the error term and the financial development variable. Second, this public spending efficiency also tends to be persistent since the country's current public spending efficiency may depend on the previous year's efficiency. If this consideration is not considered, the regressions may

[28] Even so tobit yields sensible results in second-stage DEA or SFA, and it has as such never been questioned whether tobit is actually the most appropriate method, regarding predictability of scores and effects of the exogenous variables.

suffer from the severe problem of a lack of relevant explanatory variables. Third, the error term in equation (8) incorporates unobserved country heterogeneities, inducing a bias of the omitted variables if correlated with the other explanatory variables. These findings imply that a potential endogeneity problem may exist for our study. We confront this potential problem by using generalized method of moments (GMM) systems estimators[29]. This method allows for controlling the persistence of budgetary outcomes, particularly the efficiency of public expenditures. It addresses the (Nickell, 1981)'s bias present in a dynamic panel model with fixed effects, limits the influence of time-varying unobservable factors that may affect both the outcome and treatment variable, and mitigates the challenge of finding an exogenous instrument to estimate the effect of public sector efficiency. Finally, to address potential issues related to non-stationarity in certain variables and the public sector efficiency score over the 28-year analysis period (1990 to 2017), we adopt an approach from the existing literature (Combes and Ebeke, 2011; Docquier *et al.*, 2016; Fosu and Abass, 2020; Pleninger and Sturm, 2020). We restructure our panel data into six sub-periods, each spanning five non-overlapping years. This division into five-year averages is designed to enhance the efficiency of our estimates and alleviate concerns about spurious regressions.

The results of the GMM estimation using the two-stage dynamic panel system are presented in Table 4. Statistical tests confirm the validity of this econometric method: the null hypotheses of the Sargen/Hasen and AR (2) tests are accepted. To minimize the number of instruments in the regressions, we collapse the matrix of instruments as suggested (Roodman, 2009). Moreover, the positive coefficient of the lagged dependent variable highlights an inertia effect that legitimizes the specification of the dynamic panel. The new results presented in Column [2] of Table 3.5 lead to qualitatively similar conclusions as the baseline results.

IV estimates. Third, to address the endogeneity issue, other studies in the literature employ an instrumental variable (IV) approach using origin of law as the instrument.

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[29] Therefore, the model can be written as follows:

$$Eff_{i,t} = \theta_0 + \alpha_1 Eff_{i,t-1} + \beta_1 FD_{i,t} + X_{i,t}\beta_2 + \mu_i + \delta_t + \varepsilon_{i,t} \quad (8)$$

The origin of law[30], initially proposed by Porta *et al.*(1998) and Levine (1998), is linked to investor protection and contract enforcement. A country with better investor protection and a conducive environment for contract enforcement is more likely to experience high financial development, particularly in banking. Column [1] of Table 3.6 presents the first-stage equation, where financial development is regressed on the instrument and all other explanatory variables of the baseline model. The instrument ("the origin of law") significantly and positively explains financial development, suggesting the relevance of the instrument used. Column [1] reports the results of the causal impact of financial development on expenditure efficiency after instrumentation. The findings suggest a significant improvement in expenditure efficiency with financial development at the 1% threshold. Moreover, the estimated effect (18.49 percentage points) remains comparable to that of the baseline model (10.9 percentage points).

[30] The data on the origin of law are obtained from the International Country Risk Guide (ICRG).

Table 3. 5 Robustness/ The impact of financial development on public sector efficiency Alternatives estimations methods

Dependent Variable	**Public Sector Efficiency**	
Regression	Reg1 **(Fixed effect)**	Reg2 **(System GMM)**
Lagged. Public Sector Efficiency		0.6312***
		(0.0996)
Financial development	0.0894***	0.0915***
	(0.0282)	(0.0323)
Public debt (log)	0.0025	0.0005
	(0.0043)	(0.0044)
Tax revenues (log)	-0.0018	-0.0032
	(0.0127)	(0.0056)
GDP per capita growth	0.0012**	0.0037***
	(0.0006)	(0.0008)
Trade globalization	-0.0084	-0.0098
	(0.0116)	(0.0111)
Democracy	0.0078***	0.0017
	(0.0017)	(0.0011)
Government Fragmentation	0.0145*	0.0201**
	(0.0082)	(0.0099)
Constant	0.5639***	0.2104**
	(0.0701)	(0.0854)
Observations	2307	511
Number of countries	121	121
R-Squared	0.4675	
Countries/Times fixed effect	Yes	Yes
Instruments		29
AR1-pvalue		0.0193
AR2-pvalue		0.7694
Hansen-P-value		0.2839

*Note: Robust Standard Errors are in parenthesis. The variables "Public debt (log)"; "GDP growth ", "Financial development ", "Trade globalization", Tax Revenue over GDP "have been. considered as endogenous across all model specifications. The variables "*Democracy *", and "Government Fragmentation " have been considered as exogenous. Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01*

Table 3. 6 Robustness/ The impact of financial development on public sector efficiency Alternatives estimations methods

Dependent Variable	**Financial development**	**Public Sector Efficiency**
Regression	Panel A : First stage	Panel B : IV estimates
Law and order (Instrument)	0.0887***	
	(0.0034)	
Financial development		0.1842***
		(0.015)
Public debt (log)	0.0341***	0.0013
	(0.0048)	(0.002)
Tax revenues (log)	0.0206***	-0.0067
	(0.0077)	(0.004)
GDP per capita growth	-0.0038***	0.0022***
	(0.0009)	(0.000)
Trade globalization	0.1411***	-0.0226***
	(0.0128)	(0.006)
Democracy	0.0170***	0.0015**
	(0.0016)	(0.001)
Government Fragmentation	-0.0159	0.0007
	(0.0123)	(0.005)
Constant	-0.8495***	0.6743***
	(0.056)	(0.028)
IV		Law and order
Stock-Yogo Stats test.		90
Stock-Wright p-value		
Observations	1935	1571
Number of countries	98	90
R-Squared	0.6346	
Countries /Time fixed effect	Yes	Yes

Notes: This table presents the results of the effect of financial development on expenditure efficiency, using as an instrumentation strategy the geographical diffusion of rule adoption. The instrument (Law and order) captures the protection of investors and implementation of contracts. Panel A reports the first stage equation, where the endogenous variable (financial development) is regressed on the instrument and on the set of controls in the baseline model. Panel B reports the results of the causal effect of financial development after instrumentation.
*Robust standard errors in parentheses.*p<0.1,**p<0.05,***p<0.01 * p < 0.10, ** p < 0.05, *** p < 0.01.*

5.4 Alternative measures of efficiency scores

We investigate the robustness of their results by exploring various alternative measures of the dependent variable. The outcomes are presented in Table 3.7, with the baseline model result detailed in Column [1]. The study explores the robustness of its findings through alternative measures of the dependent variable, employing True Fixed Effects (TFE) using Greene (2005)'s approach. Initially, the Kumbhakar, Lien and Hardaker (2014)'s model was utilized for efficiency score estimation, considering unobserved heterogeneity and distinguishing inefficiency into persistent and transient components. This involved a two-stage estimation procedure and four error term components. Shifting to Greene (2005) for efficiency estimators adds flexibility to the specification.

Re-estimating efficiency scores under Greene's methodology validates the qualitative robustness of the baseline results, reinforcing the consistency of the findings. The analysis also introduces a subjective indicator of well-being for robustness. This involves adopting a "subjective" well-being approach, replacing GDP per capita with a happiness measure as an outcome indicator for economic performance. The economic performance now considers happiness, GDP growth (10-year average), and unemployment rate (10-year average). The happiness index[31] reflects respondents' feelings about their well-being, with a score of 10 representing the best possible life and 0 the worst. The new estimates, presented in Column [3] of Table 3.7, maintain consistency with previous results, affirming the robustness of the findings. In the third step, the analysis excludes public administration based on the considerations outlined by Afonso, Schuknecht and Tanzi (2005). This decision stems from the recognition that high-quality public administration, characterized by a strong judicial system, efficient property rights, and well-functioning markets, is essential for establishing a level playing field in society and fostering conditions conducive to robust and sustained economic growth. The outcome indicators for public administration encompass variables such as the independence of the judiciary, the quality of property rights, the quality of government, and the level of the shadow economy. While these indicators may seem intuitive, skepticism arises as they can be strongly influenced by various other factors. For robustness, public administration is removed from the studied sectors, focusing solely on education, infrastructure, and health. The new results, presented in Column [4] of Table 3.7, confirm the validity of this adjustment.

[31] Data on the happiness index comes from the World Happiness Report.

Table 3. 7 Robustness/ The impact of financial development on public sector efficiency: Alternative efficiency estimators

Dependent Variable	**Public Sector Efficiency (PSE)**			
Regressions	PSE (Kumbhakar et al. (2015))	PSE (Greene 2005)	PSE (Including a subjective indicator of well-being)	PSE (Excluding Public administration)
Financial development	0.1090***	0.1408***	0.1113***	0.2290***
	(0.0141)	(0.0191)	(0.0142)	(0.0160)
Public debt (log)	0.0020	-0.0067**	0.0072***	-0.0099***
	(0.0025)	(0.0028)	(0.0025)	(0.0026)
Tax revenues (log)	-0.0121**	-0.0320***	-0.0152***	-0.0354***
	(0.0057)	(0.0073)	(0.0058)	(0.0069)
GDP per capita growth	0.0016***	0.0008***	0.0017***	0.0014***
	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Trade globalization	0.0228***	0.0308***	0.0116	0.0610***
	(0.0079)	(0.0097)	(0.0079)	(0.0083)
Democracy	0.0049***	0.0082***	0.0046***	0.0036***
	(0.0011)	(0.0015)	(0.0011)	(0.0013)
Government Fragmentation	0.0077	-0.0001	0.0147**	0.0181***
	(0.0066)	(0.0074)	(0.0066)	(0.0063)
Constant	0.5301***	0.5263***	0.5636***	0.4301***
	(0.0326)	(0.0405)	(0.0329)	(0.0346)
/				
sigma_u	0.0274***	0.0482***	0.0284***	0.0484***
	(0.0025)	(0.0040)	(0.0026)	(0.0038)
sigma_e	0.0603***	0.0631***	0.0598***	0.0486***
	(0.0009)	(0.0010)	(0.0009)	(0.0008)
Observations	2307	2360	2307	2167
Number of countries	121	121	121	118
Log likelihood	3110	3022	3125	3307
Chi2	199.5	149.5	190.8	448.9
Countries fixed effect	Yes	Yes	Yes	Yes

Note: Robust Standard Errors are in parenthesis.
*Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01*

5.5 Alternative measures of financial development

We employ alternative measures of financial development to check the robustness of our results. The outcomes are presented in Table 3.8, with the baseline model result detailed in Column [1]. Our alternative measure of financial development in a country, is defined as the domestic credit to the private credit as a share of GDP. This variable measured banking sector performance and size come from the World Bank's Financial Structure dataset. Domestic credit to the private sector refers only to financial resources provided to the private sector by financial corporations through loans, purchases of nonequity securities, trade credits, and other accounts receivable that establish a claim for repayment. Table 3.8 suggests that across all the specification, the estimated

coefficient of financial development is positive and generally statistically significant, implying that our findings are not significantly affected by the measurement of financial development.

Table 3. 8 Robustness/ The impact of financial development on public sector efficiency: Alternative measures of financial development

Dependent Variable	**Public Sector Efficiency (PSE)**	
Regressions	Reg1	Reg2
Financial development	0.1090***	
	(0.0141)	
Domestic credit to private sector (Log)		0.0095***
		(0.0037)
Public debt (log)	0.0020	0.0061**
	(0.0025)	(0.0028)
Tax revenues (log)	-0.0121**	-0.0024
	(0.0057)	(0.0061)
GDP per capita growth	0.0016***	0.0015***
	(0.0003)	(0.0003)
Trade globalization	0.0228***	0.0368***
	(0.0079)	(0.0089)
Democracy	0.0049***	0.0065***
	(0.0011)	(0.0012)
Government Fragmentation	0.0077	0.0133*
	(0.0066)	(0.0076)
Constant	0.5301***	0.4250***
	(0.0326)	(0.0341)
/		
sigma_u	0.0274***	0.0287***
	(0.0025)	(0.0026)
sigma_e	0.0603***	0.0621***
	(0.0009)	(0.0010)
Observations	2307	1893
Number of countries	121	122
Log likelihood	3110	2491
Chi2	199.5	153.2
Countries fixed effect	Yes	Yes

Note: Robust Standard Errors are in parenthesis.
*Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01*

6 Channel transmission validity checks

Our findings indicate that financial development increases public sector efficiency. This section aims to shed light on the mechanisms underlying this result. Building upon the discussion in Section 3 (theoretical predictions), we test the relevance of our potential transmission channels using tax revenues, GDP per capita, and corruption control as indicators of tax performance, economic activity, and institutional quality. We adopt a simple two-step approach to test the primary transmission channels. In the first step, before testing our channels, we assess their relevance for public sector

efficiency using simple Pearson correlations[32]. The goal of this approach is to determine if our identified channels are individually correlated with public sector efficiency. The results presented in Table 3.9 suggest that tax revenues, GDP per capita, and corruption control are strongly correlated with public sector efficiency, representing potentially significant transmission channels through which financial development can positively affect public sector efficiency. Additionally, the magnitude of the relationship extends from 26% to 40%, significant at the 1% threshold.

Table 3. 9 Correlation between Financial development and main channels.

Panel A	Reg1	Reg2	Reg3
	Public Sector Efficiency	**Public Sector Efficiency**	**Public Sector Efficiency**
Tax revenue (Log)	0.2570***		
GDP per capita (log)		0.4043***	
Control corruption			0.4062***

Notes**: This table reports the results of the main channels through which financial development may affect public sector efficiency (PSE). Columns [1]–[3] of Table 9 present the relationship between different channels and public sector efficiency, based on simple Pearson's correlations. **** indicates significance at the 1% threshold.*

In the second step, we use the same covariates as in our baseline specification, carefully controlling for country and time fixed effects, to test if our three channels are linked to financial development. The results compiled in Table 3.10 show that financial development is associated with a significant increase in tax performance, GDP per capita, and institutional quality. In summary, financial development enhances public sector efficiency through improved fiscal performance, institutional quality, and a broader tax base due to higher GDP per capita. This finding is in line with our main hypothesis.

[32] to capture the relationship between the potential channels and public sector efficiency.

Table 3. 10 Transmission channels.

Panel A	Reg1	Reg2	Reg3
	Tax revenue	**GDP per capita**	**Control corruption**
Financial development	0.1261***	1.0541***	0.2424**
	(0.0389)	(0.0704)	(0.1075)
Including all controls	Yes	Yes	Yes
Countries fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Number of countries	89	89	89
Observations	2208	2208	1764
R-Squared	.9341	.9745	.9737

Notes: *This table reports the effect of financial development on the potential channels, based on panel fixed-effects regression(OLS). The equation specified is the same as in the main model, replacing the dependent variable with the potential channel. Channel is either Tax revenue (column (1)),* GDP per capita *(column (2)) or Control of corruption (column (3)). Robust Standard Errors are in parenthesis * p < 0.10, ** p < 0.05, *** p < 0.01*

7 Heterogeneity

In summary, our findings indicate a positive association between financial development and public sector efficiency. To further validate this result, we conduct a sensitivity analysis examining different components of financial development services and various structural factors.

7.1 Financial development components

The study, utilizing the IMF's Financial Development Index Database, breaks down the financial development variable into eight key indicators : Financial institutions, Financial markets, Financial institutions depth, Financial markets depth, Financial institutions access, Financial markets access, Financial institutions efficiency, and Financial markets efficiency. The objective is to examine whether public sector efficiency responds differently based on the specific financial development indicator. The objective is to examine whether public sector efficiency responds differently based on the specific financial development indicator. The findings in Table 3.11 support this hypothesis. The study reveals that the financial development increases public sector efficiency irrespective of the indicator type. Nonetheless, there are observed relative variations in the coefficients based on the type of financial service, corroborating our intuition.

Table 3. 11 Heterogeneity/ The impact of financial development on public sector efficiency: disaggregating financial development services

Dependent Variable	**Public Sector Efficiency (PSE)**								
Regressions	Reg1	Reg2	Reg3	Reg4	Reg5	Reg6	Reg7	Reg8	Reg9
Financial development	0.1090***								
	(0.0141)								
Financial institutions		0.0743***							
		(0.0152)							
Financial markets			0.0866***						
			(0.0105)						
Financial institutions depth				0.0688***					
				(0.0133)					
Financial institutions access					0.0290**				
					(0.0115)				
Financial institutions efficiency						0.0437***			
						(0.0147)			
Financial markets depth							0.0787***		
							(0.0096)		
Financial markets access								0.0624***	
								(0.0097)	
Financial markets efficiency									0.0398***
									(0.0069)
Public debt (log)	0.0020	0.0025	0.0022	0.0015	0.0030	0.0031	0.0019	0.0029	0.0025
	(0.0025)	(0.0025)	(0.0025)	(0.0026)	(0.0025)	(0.0025)	(0.0025)	(0.0025)	(0.0025)
Tax revenues (log)	-0.0121**	-0.0122**	-0.0085	-0.0143**	-0.0089	-0.0083	-0.0082	-0.0081	-0.0076
	(0.0057)	(0.0057)	(0.0057)	(0.0060)	(0.0057)	(0.0058)	(0.0059)	(0.0057)	(0.0057)
GDP per capita growth	0.0016***	0.0016***	0.0015***	0.0016***	0.0016***	0.0015***	0.0015***	0.0015***	0.0014***
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Trade globalization	0.0228***	0.0315***	0.0286***	0.0351***	0.0419***	0.0434***	0.0260***	0.0358***	0.0422***
	(0.0079)	(0.0081)	(0.0077)	(0.0078)	(0.0079)	(0.0077)	(0.0079)	(0.0075)	(0.0073)
Democracy	0.0049***	0.0051***	0.0058***	0.0053***	0.0059***	0.0066***	0.0061***	0.0057***	0.0064***
	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)
Government Fragmentation	0.0077	0.0078	0.0088	0.0100	0.0091	0.0078	0.0091	0.0094	0.0091
	(0.0066)	(0.0066)	(0.0066)	(0.0067)	(0.0067)	(0.0068)	(0.0067)	(0.0066)	(0.0067)
Constant	0.5301***	0.4966***	0.5068***	0.5021***	0.4597***	0.4295***	0.5166***	0.4790***	0.4549***
	(0.0326)	(0.0331)	(0.0318)	(0.0338)	(0.0331)	(0.0306)	(0.0327)	(0.0312)	(0.0306)
/									
sigma_u	0.0274***	0.0263***	0.0286***	0.0285***	0.0271***	0.0287***	0.0301***	0.0279***	0.0279***
	(0.0025)	(0.0024)	(0.0026)	(0.0025)	(0.0025)	(0.0025)	(0.0026)	(0.0025)	(0.0024)
sigma_e	0.0603***	0.0610***	0.0601***	0.0607***	0.0611***	0.0610***	0.0600***	0.0606***	0.0607***
	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)
Observations	2307	2307	2307	2307	2307	2307	2307	2307	2307
Number of countries	121	121	121	121	121	121	121	121	121
Log likelihood	3110	3090	3114	3093	3082	3083	3114	3100	3096
Chi2	199.5	176.9	206.6	169	159.9	155.8	206.1	184.4	182.9
Countries fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust Standard Errors are in parenthesis.

*Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01*

7.2 The role of macroeconomic and institutional factors

We investigate the sensitivity of our baseline finding relative to several structural characteristics. The idea here is that structural factors can magnify or alleviate the effect of financial development on public sector efficiency.

7.2.1 Macroeconomic factors

Various macroeconomic factors contribute to heterogeneity, including the position in the business cycle, fiscal policy stance, macroeconomic stability, government size, human capital (education level), international trade and capital account openness, and exchange rate regime. Firstly, one concern over the abovementioned findings is that these parameters may be heterogeneous across countries. Since the sample includes developing and developed countries, one would assume that a specific group drives financial development's positive and significant effect. A natural way to confront this problem is to investigate more homogeneous subsamples. Therefore, we have split the sample into developing and developed countries. Table 3.12 presents the result obtained for the Tobit benchmark estimation when splitting the model into two groups. Results presented in columns [2]-[3] of Table 3.12 show that financial development increases public sector efficiency in both groups. However, the effect of financial development is higher in developed countries than in developing countries. Secondly, we investigate the fiscal stance by categorizing countries into "low" and "high" levels of public debt, using the median of total government debt as a percentage of GDP to delineate the two groups. As indicated by our findings in Table 3.12, columns [4]-[5], financial development significantly enhances public sector efficiency specifically in countries characterized by "high" levels of debt. Thirdly, we explore the potential influence of capital account openness on the relationship between financial development and public sector efficiency. By using the median level of the Chinn-Ito index, we distinguish between "low capital openness" and "high capital openness" countries. Table 3.12, columns [5]-[6], indicate that the impact of financial development on public sector efficiency appears to be more substantial in countries with a high capital account openness. Fourthly, we scrutinize the role of natural resources by dividing the sample into "Rich" and "Poor" natural resources based on the IMF classification. Table 3.12, columns [7]-[8], indicate that financial development has a more significant impact on public sector efficiency in countries with abundant natural

resources. Fifthly, we examine the sensitivity of our findings in relation to education levels. The objective is to evaluate whether education plays a role in enhancing the efficiency of financial development. Education is viewed as a facilitator of financial literacy among individuals. The sample is divided into two groups based on the sample median: countries with high and low human capital. Table 3.12, columns [9]-[10], indicate that the impact of financial development on public sector efficiency appears to be more substantial in countries with a high education condition. Sixthly , we investigate the impact of inflation on financial development, considering its potential to alleviate inflationary pressures. We hypothesize that financial development can enhance tax performance by mitigating the Keynes-Oliveira-Tanzi effect. Utilizing the sample median, columns [11]-[12] in Table 3.12 reveal a more substantial effect of financial development during periods of high inflationary pressure, supporting our intuition.

Table 3. 12 Heterogeneity / The role of macroeconomic factors

Regressions	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Public Sector Efficiency (PSE)	Developed countries	Developing countries	Low debt	High debt	Low capital openness	High capital openness	Poor resources	Rich resources	Low education	High education	Low inflation	High inflation
Financial development	0.2364***	0.0424*	0.1151***	0.1543***	0.0931***	0.1268***	0.1475***	0.1480***	0.0933***	0.1668***	0.1599***	0.0378*
	(0.0192)	(0.0231)	(0.0219)	(0.0193)	(0.0323)	(0.0170)	(0.0180)	(0.0344)	(0.0285)	(0.0226)	(0.0185)	(0.0215)
Public debt (log)	-0.0347***	0.0037	-0.0091**	-0.0011	-0.0060	0.0091***	-0.0037	0.0016	0.0065*	-0.0106***	0.0034	0.0001
	(0.0051)	(0.0030)	(0.0046)	(0.0064)	(0.0044)	(0.0031)	(0.0033)	(0.0046)	(0.0037)	(0.0038)	(0.0035)	(0.0034)
Tax revenues (log)	-0.1867***	-0.0041	0.0046	-0.0351***	0.0116	-0.0213***	-0.0480**	0.0046	-0.0178**	-0.0182*	-0.0198**	-0.0033
	(0.0228)	(0.0059)	(0.0075)	(0.0091)	(0.0108)	(0.0074)	(0.0094)	(0.0079)	(0.0072)	(0.0103)	(0.0086)	(0.0068)
GDP per capita growth	-0.0005	0.0018***	0.0022***	0.0003	0.0021***	0.0006	0.0013***	0.0017***	0.0006	0.0019***	0.0012***	0.0022***
	(0.0005)	(0.0003)	(0.0003)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0005)	(0.0003)	(0.0003)	(0.0004)
Trade globalization	0.1341***	0.0276***	0.0129	0.0274***	-0.0031	0.0271**	0.0458***	-0.0196	0.0142	0.0401***	0.0040	0.0358***
	(0.0237)	(0.0089)	(0.0129)	(0.0104)	(0.0128)	(0.0110)	(0.0097)	(0.0150)	(0.0105)	(0.0141)	(0.0118)	(0.0099)
Democracy	0.0141**	0.0054***	0.0060***	0.0024	0.0041***	0.0042***	0.0053***	0.0029*	0.0065***	0.0060***	0.0041**	0.0047***
	(0.0071)	(0.0012)	(0.0016)	(0.0017)	(0.0016)	(0.0016)	(0.0015)	(0.0017)	(0.0016)	(0.0021)	(0.0017)	(0.0012)
Government Fragmentation	0.0132	0.0051	0.0196**	0.0092	-0.0057	0.0205**	0.0147**	-0.0043	-0.0094	0.0223**	0.0399***	-0.0136
	(0.0114)	(0.0079)	(0.0096)	(0.0098)	(0.0115)	(0.0080)	(0.0072)	(0.0145)	(0.0093)	(0.0098)	(0.0096)	(0.0088)
Constant	0.5947***	0.4988***	0.5443***	0.5936***	0.6026***	0.5104***	0.5496***	0.6528***	0.5601***	0.4898***	0.5982***	0.4866***
	(0.1278)	(0.0371)	(0.0521)	(0.0506)	(0.0502)	(0.0463)	(0.0420)	(0.0630)	(0.0439)	(0.0615)	(0.0486)	(0.0412)
/												
sigma_u	0.0638***	0.0260***	0.0354***	0.0418***	0.0255***	0.0334***	0.0365***	0.0158***	0.0280***	0.0487***	0.0341***	0.0243***
	(0.0099)	(0.0029)	(0.0036)	(0.0042)	(0.0039)	(0.0036)	(0.0041)	(0.0057)	(0.0037)	(0.0055)	(0.0036)	(0.0030)
sigma_e	0.0369***	0.0652***	0.0614***	0.0492***	0.0715***	0.0509***	0.0507***	0.0794***	0.0529***	0.0599***	0.0540***	0.0642***
	(0.0011)	(0.0012)	(0.0013)	(0.0011)	(0.0018)	(0.0010)	(0.0009)	(0.0023)	(0.0013)	(0.0012)	(0.0012)	(0.0014)
Observations	638	1669	1196	1111	858	1449	1682	625	875	1432	1209	1098
Number of countries	26	95	98	97	72	89	84	37	56	82	98	115
Log likelihood	1144	2126	1566	1674	1016	2171	2529	687.3	1286	1901	1734	1412
Chi2	476.6	86.65	136.5	118	62.98	128.2	161.8	46.94	45.34	146.4	148.2	86.14

Note: Robust Standard Errors are in parenthesis.

*Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01*

7.2.2 Institutional factors

From the political standpoint, we account for control corruption, government stability, investment profile, law and order, internal and external conflict, and state fragility. In our first analysis, we explore the impact of institutions, specifically corruption, on our results as good institutions are believed to enhance public sector efficiency. We categorize countries into low and high corruption based on the sample median. Table 3.13, columns [1]-[2] show that financial development positively influences public sector efficiency irrespective of institutional quality. Notably, the effect of financial development on public sector efficiency is more pronounced in the presence of better institutional quality, indicating a stronger impact in countries with lower corruption levels. Second, we incorporate the phase of political stability into our analysis, distinguishing between "low" and "high" stability. The estimations in columns [3]-[4] reveal that, contrary to its positive impact in periods of high political stability, financial development does not exhibit a statistically significant effect on public sector efficiency during periods of low political stability. Third, as indicated in columns [5]-[6], our findings show that financial development enhances public sector efficiency irrespective of the investment profile, with a more pronounced effect observed under a high investment profile. Fourth, we examine the role of the rule of law. By categorizing countries into "high" and "low" rule of law based on the median level, columns [7]-[8] show that, unlike its positive impact in contexts of high rule of law, financial development does not statistically affect public sector efficiency in situations of low rule of law. Fifth, a more detailed examination of conflicts reveals that in a context of relatively low internal conflicts (captured by values below the median of the variable internal conflict) financial development strengthens its impact on public sector efficiency, while its significant enhancement of public sector efficiency is less effective under relatively high internal conflicts (captured by values of internal conflict above the median) as shown in estimations on lines [9]-[10] in Table 3.13. Sixth, we explore the sensitivity of financial development to internal conflict by distinguishing between "low" and "high" levels of external conflict using the median of the variable. As highlighted in columns [11]-[12], financial development significantly increases public sector efficiency regardless of the level of external conflict, with a more pronounced

effectiveness observed under low levels of external conflict. Lastly, our analysis reveals distinctions between fragile states and non-fragile states. According to estimations in columns [13]-[14], financial development is less effective in increasing public sector efficiency in fragile states compared to non-fragile states. In summary, these results show that the effect of financial development on public sector efficiency displays some heterogeneity related to the various economic contexts.

Table 3. 13 Heterogeneity/ The role of institutional factors

Regressions	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Public Sector Efficiency (PSE)	Low corruption	High corruption	Low stability	High stability	Low Invest profile	High Invest profile	Low rule/ law	High rule/ law	Low internal conflict	High Internal conflict	Low external conflict	High external conflict	Fragile state	Nonfragile state
Financial development	0.1155***	0.0548	0.0141	0.1719***	0.0621***	0.0840***	0.0283	0.1279***	0.0533**	0.1608***	0.0755***	0.1328***	-0.0659	0.1000***
	(0.0164)	(0.0354)	(0.0287)	(0.0188)	(0.0238)	(0.0151)	(0.0364)	(0.0177)	(0.0241)	(0.0177)	(0.0239)	(0.0179)	(0.1399)	(0.0146)
Public debt (log)	0.0060*	-0.0008	0.0095**	-0.0072**	0.0007	0.0047	-0.0013	0.0092***	0.0092**	-0.0089***	0.0104***	-0.0061*	0.0181***	-0.0011
	(0.0032)	(0.0043)	(0.0043)	(0.0032)	(0.0045)	(0.0029)	(0.0041)	(0.0034)	(0.0042)	(0.0032)	(0.0037)	(0.0034)	(0.0061)	(0.0027)
Tax revenues (log)	-0.0133*	-0.0118	-0.0027	-0.0207***	-0.0230***	-0.0009	-0.0004	-0.0134*	0.0119	-0.0311***	0.0124	-0.0325***	0.0131	-0.0094
	(0.0069)	(0.0111)	(0.0088)	(0.0073)	(0.0087)	(0.0061)	(0.0109)	(0.0074)	(0.0076)	(0.0073)	(0.0084)	(0.0076)	(0.0158)	(0.0062)
GDP per capita growth	0.0006**	0.0033***	0.0024***	0.0011***	0.0025***	0.0012***	0.0033***	0.0007**	0.0022***	0.0013***	0.0024***	0.0013***	-0.0004	0.0018***
	(0.0003)	(0.0005)	(0.0005)	(0.0003)	(0.0006)	(0.0003)	(0.0005)	(0.0003)	(0.0006)	(0.0003)	(0.0005)	(0.0003)	(0.0007)	(0.0003)
Trade globalization	0.0443***	0.0028	0.0062	0.0280***	0.0069	0.0178*	-0.0078	0.0486***	0.0046	0.0344***	0.0192	0.0272**	-0.0172	0.0307***
	(0.0103)	(0.0125)	(0.0124)	(0.0104)	(0.0114)	(0.0098)	(0.0125)	(0.0107)	(0.0122)	(0.0106)	(0.0122)	(0.0106)	(0.0178)	(0.0087)
Democracy	0.0060***	0.0020	0.0045**	0.0043***	0.0029*	0.0053***	0.0025	0.0062***	0.0041***	0.0040***	0.0033**	0.0063***	0.0061*	0.0048***
	(0.0014)	(0.0016)	(0.0017)	(0.0015)	(0.0016)	(0.0012)	(0.0016)	(0.0015)	(0.0016)	(0.0015)	(0.0017)	(0.0015)	(0.0032)	(0.0012)
Government Fragmentation	-0.0060	0.0223**	0.0303***	-0.0053	-0.0077	0.0086	0.0140	0.0065	0.0292***	-0.0176**	0.0284***	-0.0091	0.0285	0.0058
	(0.0082)	(0.0110)	(0.0110)	(0.0084)	(0.0107)	(0.0076)	(0.0108)	(0.0086)	(0.0111)	(0.0080)	(0.0108)	(0.0085)	(0.0180)	(0.0071)
Constant	0.4303***	0.6367***	0.5573***	0.5601***	0.6408***	0.5215***	0.6540***	0.3905***	0.5162***	0.5797***	0.4607***	0.5883***	0.5497***	0.5080***
	(0.0432)	(0.0513)	(0.0508)	(0.0434)	(0.0470)	(0.0406)	(0.0486)	(0.0459)	(0.0485)	(0.0449)	(0.0500)	(0.0442)	(0.0774)	(0.0359)
/														
sigma_u	0.0333***	0.0265***	0.0345***	0.0348***	0.0286***	0.0255***	0.0258***	0.0372***	0.0241***	0.0344***	0.0342***	0.0340***	0.0218***	0.0274***
	(0.0037)	(0.0043)	(0.0040)	(0.0039)	(0.0036)	(0.0025)	(0.0040)	(0.0043)	(0.0037)	(0.0036)	(0.0039)	(0.0035)	(0.0070)	(0.0028)
sigma_e	0.0528***	0.0683***	0.0620***	0.0538***	0.0598***	0.0573***	0.0670***	0.0527***	0.0616***	0.0563***	0.0564***	0.0576***	0.0484***	0.0610***
	(0.0010)	(0.0018)	(0.0016)	(0.0011)	(0.0016)	(0.0011)	(0.0017)	(0.0010)	(0.0017)	(0.0011)	(0.0015)	(0.0011)	(0.0026)	(0.0010)
Observations	1487	820	870	1437	747	1560	855	1452	719	1588	770	1537	193	2114
Number of countries	113	74	80	117	88	110	72	110	72	107	81	107	14	107
Log likelihood	2175	1003	1130	2069	1001	2178	1064	2118	953.1	2222	1065	2116	301.5	2831
Chi2	151.9	51.17	48.77	168.7	32.55	153	49.48	157.6	70.01	171.1	89.17	139.2	22.1	174.2

Note: Robust Standard Errors are in parenthesis.

*Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01*

Conclusion and policy implications

This chapter assesses the impact of financial development on the efficiency of public expenditures. Initially, using a parametric approach, we calculate efficiency scores for 158 developed and developing countries over the period 1990-2017. Subsequently, based on the obtained scores, we employ the Tobit method to evaluate the effect of financial development on public expenditure efficiency, specifically used when the dependent variable is limited from below, from above, or from both, with a positive probability of concentration at the ends of the interval due to censorship or corner solutions (Wooldridge, 2002). Evidence indicates that an increase in financial development positively and significantly enhances public expenditure efficiency, with economically significant effects. Robustness is verified through a set of economic and econometric tests. Additionally, we show that our results are not due to model misspecification and are not confounded by potential biases induced by omitted variables, simultaneity, or reverse causality. To check consistency, we have also used a pure cross-sectional instrumental variable. Both the panel and cross-sectional results tell the same story: the exogenous component of financial development is positively associated with expenditure efficiency; more precisely, the significant and positive link between financial development and expenditure efficiency is not due to potential biases induced by omitted variables, simultaneity, or reverse causality. In the continuation of this article, we examine the channels through which financial development is associated with expenditure efficiency. In this chapter, we argue that the link between finance and efficiency primarily occurs through fiscal performance, the level of per capita income, and institutional quality (especially corruption control). Finally, we deepen the analysis by examining some sources of heterogeneity in the effectiveness of financial development, depending on the types of financial development variables, and macroeconomic and institutional factors. On the one hand, all components and sub-components of the overall financial development index have a positive and significant effect on public expenditure efficiency. On the other hand, economic cycle, fiscal policy orientation, macroeconomic stability, government size, education level, international trade and capital account openness, development level, and institutional quality (especially political stability, corruption control, government stability, investment profile, public order, internal and external conflicts, and state fragility)

amplify the positive effect of financial development on public expenditure efficiency. Our results have both theoretical and policy implications. Theoretically, unlike previous literature that mainly focused on the economic and institutional determinants of fiscal policy volatility, our article highlights the significant role of finance in determining fiscal policy volatility, where a broad and stable financial system proves useful in mitigating fiscal policy volatility. From a policy perspective, this implies that strong structural reforms, including budgetary rules, aimed at reducing fiscal policy volatility, should also consider the impact of financial factors. Firstly, these reforms aimed at correcting political biases that drive decision-makers to overspend and generate deficits not only promote greater budgetary discipline while preserving the countercyclical stabilizing role of fiscal policy but also improve the efficiency of government spending. Secondly, mechanisms such as the legal and regulatory system and institutional quality are important to foster greater reform effectiveness. In particular, policymakers must be aware that promoting financial development and maintaining financial stability are essential for the smooth conduct of fiscal policy. These results also emphasize that there are still opportunities for improvement in public expenditure management in developing countries where the level of financial sector development is limited. This also indicates that countries could achieve significantly higher levels of outcomes. This means that governments still have the opportunity to achieve social improvements at a relatively low cost.

Appendix B

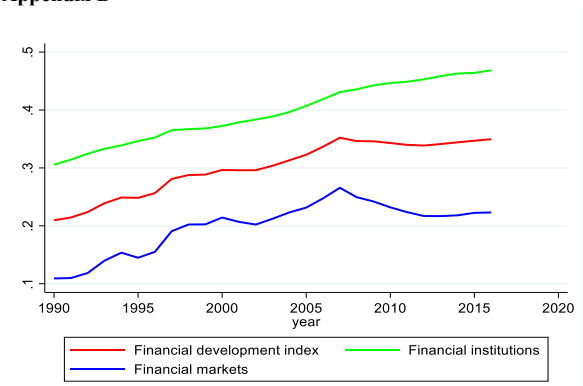

Figure B.1 1 Evolution of financial development index, financial institutions and financial markets(1990-2017)
Source : *Authors construction, from the IMF's Financial Development Index Database*

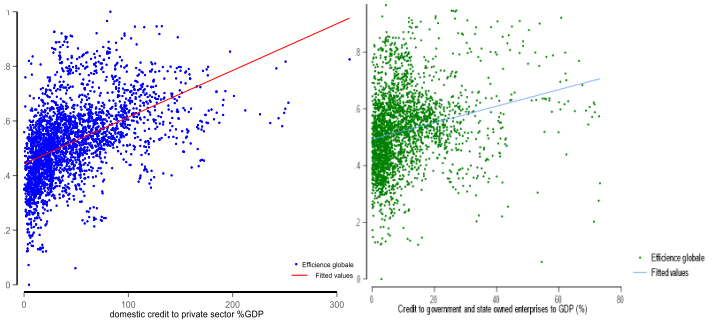

Figure B.1 2. Plot showing domestic credit to private sector / Credit to government and state-owned enterprises and public sector efficiency.
Source : *Authors construction, from the Financial Structure and Economic Development Dataset (FSED), 2019*

Table B.1 1 Definition and sources of variables.

Variables	Descriptions	Sources
Public sector efficiency	Public spending scores	Authors calculator
Education expenditure (%GDP)	Government expenditure on education, total (% of GDP)	Public Expenditures for Economic Development (SPEED)
Health expenditure (%GDP	Government expenditure on health, total in percentage of GDP	Public Expenditures for Economic Development (SPEED)
Infrastructure expenditure (%GDP)	Government expenditure on Infrastructure, total (% of GDP)	Public Expenditures for Economic Development (SPEED)
Government final consumption (%GDP)	It includes domestic and foreign liabilities such as currency and money deposits, securities other than shares, and loans.	World Economic Outlook (WEO)
Primary enrollment	Primary school enrolment ratio,	World Development Indicators (WDI)
Secondary enrollment	Secondary school enrolment ratio,	World Development Indicators (WDI)
Expected years of schooling	The number of years during which a 2-year-old child can expect to spend in schooling, based on the school enrolment rates at a given date	World Development Indicators (WDI)
Life expectancy at birth	Life expectancy at birth reflects the overall mortality level of a population. It summarizes the mortality pattern that prevails across all age groups - children and adolescents, adults, and the elderly.	World Development Indicators (WDI)
Infant mortality rate (per 1000 live births)	The number of infants dying before reaching one year of age, per 1,000 live births each year.	World Development Indicators (WDI)
Total length of roads in kilometers	Total road length (in kilometer)	World Telecommunication/ICT Indicators Database
Number of paved roads (% total roads	Paved roads are those surfaced with crushed stone (macadam) and hydrocarbon binder or bituminized agents, with concrete, or with cobblestones, as a percentage of all the country's roads, measured in length.	World Telecommunication/ICT Indicators Database
Fixed telephone subscriptions (per 100 people)	A fixed telephone line (previously called main telephone line in operation) is an active line connecting the subscriber's terminal equipment to the public switched telephone network (PSTN) and which has a dedicated port in the telephone exchange equipment. The number of fixed telephone lines is measured relative to population.	World Telecommunication/ICT Indicators Database
Fixed broadband subscriptions (per 100 people)	Refers to fixed subscriptions to high-speed access to the public Internet (a TCP/IP connection), at downstream speeds equal to, or greater than, 256 kbit/s.	World Telecommunication/ICT Indicators Database
Faults for 100 fixed telephone lines per year	The total number of reported faults to fixed telephone lines for the year. Faults, which are not the direct responsibility of the public telecommunications operator, should be excluded. The number of faults per 100 fixed lines per year should reflect the total reported by all PSTN service providers in the country.	World Telecommunication/ICT Indicators Database
Proportion of households with electricity	The percentage of population with access to electricity.	World Telecommunication/ICT Indicators Database
Electric power consumption (in kWh per capita)	Electric power consumption (in kWh) measures the production of power plants and combined heat and power plants less transmission, distribution, and transformation losses and own use by heat and power plants. The variable is measured relative to population.	World Telecommunication/ICT Indicators Database
Electric power transmission and distribution losses (%production)	Electric power transmission and distribution losses include losses in transmission between sources of supply and points of distribution and in the distribution to consumers, including pilferage.	World Telecommunication/ICT Indicators Database
Independence of the judiciary	Quality of judiciary index	(Teorell *et al.*, 2021)
Quality of property rights	Quality of property rights	(Teorell *et al.*, 2021)
Quality of government	Quality of government	(Teorell *et al.*, 2021)
Level of the shadow economy	Shadow economy index	(Teorell *et al.*, 2021)
Standard deviation of the three-year moving average of GDP growth	Standard deviation of the three-year moving average of GDP growth	Authors, from WDI
Standard deviation of the three-year moving of inflation	Standard deviation of the three-year moving of inflation	Authors, from WDI
Gini Index	The Gini index is a measure of the distribution of income across a population.	Standardized World Income Inequality Database (SWIID)
GDP Per capita	GDP Per capita	World Development Indicators (WDI)
GDP growth (10-year average)	The annual percentage growth rate of GDP at market prices is based on constant local currency (average).	World Development Indicators (WDI)

Unemployment rate (10-year average)	Average Unemployment with advanced education (% of total labor force with advanced education)	World Development Indicators (WDI)
Domestic credit to private sector (% of GDP)	Domestic credit to private sector refers to financial resources provided to the private sector. (as a proxy for financial development)	World Bank's Financial Structure dataset (FSED)
Credit to government and state-owned enterprises to GDP (%)	Ratio between credit by domestic money banks to the government and state-owned enterprises and GDP.	World Bank's Financial Structure dataset (FSED)
Tax revenue	Tax revenue divided by GDP	World Development Indicators (WDI), World Bank
Non-Resource Tax Revenue	It is Calculated as total tax revenue (excluding grants and social contributions) minus resource tax revenue (% GDP).	International Centre for Tax and Development (ICTD).
Trade Openness	Sum of exports and imports of goods and services, % of GDP.	World Development Indicators (WDI), World Bank
Total factor productivity	TFP at constant national prices (2017)	Penn World Table (PWT
Government fragmentation	The probability that two deputies picked at random from among the government parties will be of different parties. Equals NA if there is no parliament. If there are any government parties where seats are unknown (Cell is blank), GOVFRAC is also blank. No parties in the legislature (0 in 1 GOVSEAT) results in NA, just as in the Herfindahl.	World Bank DPI database
Democracy Index	Index ranging from 0 to 10	Freedom House database

Table B.1 2 Definition and sources of variables (continued).

Definition and sources of variables.		
Control of corruption	Control of corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as" capture" of the state by elites and private interests.	International Country Risk Guide (ICRG)
Government effectiveness	capturing perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.	(Kaufmann, Kraay and Mastruzzi, 2011)

Table B.2 1 List of countries used in the analysis

Full Sample		
Afghanistan	Ghana	Netherlands
Angola	Guinea-Bissau	Norway
Albania	Equatorial Guinea	Nepal
Argentina	Greece	New Zealand
Armenia	Grenada	Oman
Australia	Guatemala	Pakistan
Austria	Hong Kong	Panama
Azerbaijan	Honduras	Peru
Burundi	Croatia	Philippines
Belgium	Hungary	Papua New Guinea
Benin	Indonesia	Poland
Burkina Faso	India	Portugal
Bangladesh	Ireland	Paraguay
Bulgaria	Iran, Islamic Rep.	Qatar
Bahrain	Iraq	Russian Federation
Bahamas, The	Iceland	Rwanda
Bosnia and Herzegovina	Israel	Saudi Arabia
Belarus	Italy	Sudan
Belize	Jamaica	Senegal
Bolivia	Jordan	Singapore
Brazil	Japan	Solomon Islands
Barbados	Kazakhstan	Sierra Leone
Bhutan	Kenya	El Salvador
Botswana	Kyrgyz Republic	Serbia
Central African Republic	Cambodia	Suriname
Canada	Kiribati	Slovak Republic
Switzerland	Korea, Rep.	Slovenia
Chile	Kuwait	Sweden
China	Laos	Swaziland
Cote d'Ivoire	Lebanon	Seychelles
Cameroon	Liberia	Togo
Congo, Dem Rep	Sri Lanka	Thailand
Congo, Rep	Lesotho	Tajikistan
Colombia	Lithuania	Timor-Leste
Cabo Verde	Luxembourg	Tonga
Costa Rica	Latvia	Trinidad and Tobago
Cyprus	Morocco	Tunisia
Czech Republic	Moldova	Turkey
Germany	Madagascar	Tanzania
Dominica	Maldives	Uganda
Denmark	Mexico	Ukraine
Dominican Republic	Mali	Uruguay
Algeria	Malta	United States
Ecuador	Myanmar	Uzbekistan
Egypt, Arab Rep.	Mongolia	St Vincent and the Grenadines
Spain	Mozambique	Venezuela, RB
Estonia	Mauritius	Vietnam
Ethiopia	Malawi	Vanuatu
Finland	Malaysia	Samoa
Fiji	Namibia	Yemen, Rep.
France	Niger	South Africa
United Kingdom	Nigeria	Zambia
Georgia	Nicaragua	Zimbabwe

Table B.2 1 : Countries' rankings by average efficiency global scores:

Country	Score	Rank	Country	Score	Rank	Country	Score	Rank	Country	Score	Rank
United Kingdom	0.78973	1	Mauritius	0.68867	41	Dominican Republic	0.66272	81	Cambodia	0.63643	121
United States	0.75612	2	Sri Lanka	0.68838	42	Kuwait	0.66114	82	Sudan	0.63514	122
Japan	0.74748	3	Czech Republic	0.68658	43	Colombia	0.66078	83	Pakistan	0.63493	123
New Zealand	0.74223	4	Kiribati	0.68591	44	Paraguay	0.66048	84	Honduras	0.63477	124
Korea, Rep.	0.74117	5	Greece	0.68210	45	Mozambique	0.65968	85	Bangladesh	0.63400	125
Australia	0.73770	6	Kazakhstan	0.68210	46	El Salvador	0.65929	86	Central African Republic	0.63380	126
Netherlands	0.73134	7	Grenada	0.68178	47	Croatia	0.65925	87	Benin	0.63022	127
Norway	0.72870	8	Tonga	0.68160	48	Serbia	0.65908	88	Sierra Leone	0.62766	128
Italy	0.72766	9	Belarus	0.68127	49	Luxembourg	0.65880	89	Mongolia	0.62617	129
Malta	0.72749	10	Argentina	0.68112	50	Bosnia and Herzegovina	0.65844	90	Congo, Rep	0.62593	130
Bolivia	0.72685	11	Finland	0.68112	51	Russian Federation	0.65710	91	Malawi	0.62579	131
Belgium	0.72626	12	Tunisia	0.68099	52	Morocco	0.65699	92	Nepal	0.62567	132
Vietnam	0.72560	13	Barbados	0.68081	53	Trinidad and Tobago	0.65678	93	Namibia	0.62509	133
Denmark	0.72204	14	Bahrain	0.68078	54	Sweden	0.65602	94	Albania	0.62499	134
Egypt, Arab Rep.	0.72155	15	Mexico	0.68042	55	Burkina Faso	0.65581	95	Bhutan	0.62243	135
Iceland	0.72026	16	Turkey	0.67792	56	Slovak Republic	0.65566	96	Congo, Dem Rep	0.62177	136
Canada	0.72019	17	Uzbekistan	0.67790	57	Bulgaria	0.65544	97	Zimbabwe	0.62108	137
Germany	0.71912	18	Uruguay	0.67691	58	Ukraine	0.65295	98	Cameroon	0.62046	138
St Vincent and the Grenadines	0.71467	19	Dominica	0.67678	59	Timor-Leste	0.65140	99	Madagascar	0.61995	139
Austria	0.71420	20	Seychelles	0.67601	60	Oman	0.64884	100	Mali	0.61594	140
Ireland	0.71352	21	Panama	0.67561	61	Botswana	0.64773	101	Kenya	0.61425	141
Israel	0.71331	22	Latvia	0.67473	62	Guatemala	0.64706	102	Yemen, Rep.	0.61249	142
Slovenia	0.71251	23	Malaysia	0.67158	63	Venezuela, RB	0.64682	103	Afghanistan	0.60815	143
Spain	0.71234	24	Thailand	0.67117	64	Laos	0.64541	104	Burundi	0.60528	144
France	0.70855	25	Indonesia	0.66874	65	Solomon Islands	0.64468	105	Liberia	0.60472	145
Hong Kong	0.70809	26	Hungary	0.66793	66	Armenia	0.64425	106	Zambia	0.60415	146
Portugal	0.70622	27	Senegal	0.66722	67	Cote d'Ivoire	0.64353	107	Equatorial Guinea	0.60392	147
Singapore	0.70580	28	Qatar	0.66629	68	Suriname	0.64341	108	Lesotho	0.60321	148
Samoa	0.70569	29	Estonia	0.66537	69	Niger	0.64264	109	Bahamas, The	0.60224	149

Costa Rica	0.70558	30	Iran, Islamic Rep.	0.66520	70	Guinea-Bissau	0.64242	110	Myanmar	0.59897	150
Poland	0.70367	31	Belize	0.66520	71	Philippines	0.64210	111	Nicaragua	0.59793	151
Switzerland	0.69951	32	Saudi Arabia	0.66477	72	Rwanda	0.64180	112	Swaziland	0.59755	152
Cyprus	0.69787	33	Algeria	0.66423	73	Tajikistan	0.64123	113	Uganda	0.59539	153
Lithuania	0.69557	34	Jordan	0.66404	74	Ghana	0.63980	114	Angola	0.59468	154
China	0.69450	35	Jamaica	0.66403	75	Iraq	0.63866	115	Papua New Guinea	0.59086	155
Chile	0.69373	36	Georgia	0.66372	76	Maldives	0.63803	116	Ethiopia	0.57838	156
Lebanon	0.69321	37	Fiji	0.66315	77	Kyrgyz Republic	0.63793	117	Togo	0.56789	157
Peru	0.69309	38	Ecuador	0.66307	78	Azerbaijan	0.63745	118	Nigeria	0.56459	158
Brazil	0.69121	39	Vanuatu	0.66283	79	India	0.63730	119	Tanzania	0.56286	159
Cabo Verde	0.69083	40	Moldova	0.66280	80	South Africa	0.63648	120			

Part 2. Financial development and tax revenue mobilization

Chapter 3

How does financial sector development improve tax revenue mobilization for developing countries ? [33]

[33] A slightly different version of this chapter is accepted for publication in Comparative Economic Studies.

1. Introduction

Tax revenue has been documented as particularly important factor in economic growth, poverty reduction, and economic development (Burgess and Stern, 1993; Engen and Skinner, 1996; Hill, 2008; Gordon and Li, 2009; Besley and Persson, 2013; Ramírez, Díaz and Bedoya, 2017). Developing countries remain the region with the lowest tax revenues as a percentage of GDP in the world (Goodbye, 2017). However, public expenditure needs are much higher in these countries. Domestic resource mobilization could help these countries address these development challenges. There exists a large and increasing literature on the determinants of tax revenue mobilization. Several papers have studied the structural factors of the economy (see Tanzi *et al.*, 1981; Tanzi, 1992a; Ghura, 1998; Bird, Martinez-Vazquez and Torgler, 2008; Mahdavi, 2008; Baunsgaard and Keen, 2010; Crivelli and Gupta, 2014) and the quality of institutions (see (Gupta, 2007; Bird, Martinez-Vazquez and Torgler, 2008; Dioda, 2012) as the main determinants of revenue mobilization in developing countries. However, few studies have shed light on the link between financial development and tax revenue in developing countries: examples include (Bohn, 1990; Tavares and Valkanov, 2001; Ardagna, 2009; Gordon and Li, 2009; Gilbert and Ilievski, 2016) investigate the effects of the financial system on either banking or non-banking activities. Financial development[34] constitutes a potential source of tax revenue mobilization for developing countries (Bohn, 1990; Gordon and Li, 2009). The literature on financial development is still developing, with new definitions, determinants, and measurement procedures being suggested. The factors that facilitate, restrict or reverse financial development are documented in Huang, (2010, 2011); Girma and Shortland, (2008); Herger, Hodler and Lobsiger, (2008); Yang, (2011) ; and Roe and Siegel, (2011). These include institutional quality, macro-economic policies, geographic and cultural characteristics. The measurement of financial development remains an important issue for empirical studies. Different authors use various sources and analytical methodologies to estimates the value of financial development from developing countries (Levine, 2005; Svirydzenka, 2016; World Bank (Washington,

[34] Following the World Bank (Washington 2020), financial development is: "*conceptually, a process of reducing the costs of acquiring information, enforcing contracts, and making transactions*. "

2020). Taking stock of these studies, the goal of this paper is to analyze the effect of financial development on the tax revenue mobilization. This paper contributes to the literature on the tax revenue mobilization in several ways. First, the study most similar to ours is a paper by Gnangnon (2022). Gnangnon investigates the effect of financial development on non-resource tax revenue performance in developing countries through the international trade channel. He measures the overall financial sector development by relying on a composite indicator of financial development obtained by combining several existing financial development indicators, using the principal components analysis (PCA). A key difference from our work is that Gnangnon combines four indicators of financial development, which are the liquid liabilities (% GDP); the private credit by deposit money banks and other financial institutions (% GDP); the bank deposits (% GDP); and the financial system deposit (% GDP), while we draw upon Svirydzenka (2016)[35]'s new measure of financial development, which takes into account the complex multidimensional nature of financial development (in addition to Gnangnon's four measures, the measure considers 147 other indicators). Another difference from our work is that Gnangnon only investigates the relationship between financial development on non-resource tax revenue performance in developing countries. The tax structures of developing countries are different (Modica, Laudage and Harding, 2018). Consequently, in our work, we also look at the effect of financial development on tax revenue composition by disaggregating tax data between indirect taxes and direct taxes. Our results are, therefore, informative of the effect of financial development on tax structures. The analysis of how financial development facilitates tax revenue mobilization is an essential issue in developing countries. The relation between financial development and tax revenue mobilization is essential for policymakers. Policymakers want to know policies affect tax revenue as well as how they affect growth. Understanding this relationship will allow policymakers to assess whether financial development will improve tax revenue mobilization. The remainder of the paper is organized as follows. Section 2 reviews the previous literature and section 3 describes the data and identification strategies. Section 4 discusses our

[35] The World Economic Forum publishes a Financial Development Index annually. The index database provides nine (09) indices for over 180 countries with annual frequency from 1980.

empirical results. Section 5 analyzes their robustness, Section 6 analyzes the effect financial development on the composition of tax revenue, and section 7 explores heterogeneities in the effect of financial development on tax revenue related with economic, and structural factors. Section 8 concludes.

2 Financial development and tax revenue mobilization: literature review

This section discusses whether financial development is essential for fiscal policy. Conceptually, We review ways in which the services provided by the financial system may affect tax revenue collection. Those countries with financial systems that are better at performing will mobilize more tax revenues than those with less developed financial systems. So far, little evidence exists of the effects of financial development on tax revenue in developing countries. Financial development plays a significant role in the mobilization of tax revenue. Broadly speaking, financial development can have a direct and indirect effect on tax revenue.

Financial development on tax revenue mobilization: direct channel

The direct effect stems from the state's ability to tax the financial sector. For instance, Demirgüç-Kunt and Huizinga (2001) show that the financial sector represents significant value-added, employment, and potential tax revenues. In theory, the financial system provides five critical services for economic growth (see (Levine, 2005)). We argue that these services offered by financial systems could improve the tax administration's performance in collecting tax revenues. To begin with, better access to financial services may facilitate the tax recovery and compliance by taxpayers, i.e., the financial system aids in the tracking and recovery of taxes. In fact, banks, insurances companies and other financial institutions provide liquidity to the companies and consumers by providing various types of payments systems that are essential for their money transactions (see Elliott (2010)). For example, a country with well-developed, transparent and efficient financial institutions will be used by companies and taxpayers to carry out their transactions. In turn, tax collecting authorities may obtain precious information from those financial institutions, such as the income and assets of taxpayers. In contrast, for underdevelopment financial institutions, the size of the informal economy increases and makes the acquisition of

tax information more accurate. In the same vein, Gilbert and Ilievski (2016) postulate that Tax-to-GDP ratios increase when bank deposits increase, meaning that taxes on GDP increase for a given value of bank deposits. Bank deposits act here as a source of information for governments. More households use financial instruments to spend their income, its spending is observed by the government and so taxed. In general, the efficient perception of people's income taxes is sometimes very complicated even in advanced economics which have a high level of financial development, and seemingly impossible if income is frequently received and spent in cash. The situation would be much worse in developing countries with an underutilized banking system, where the large majority of tax revenues come from local and foreign companies. Similarly, governments could tax bank deposits to increase tax revenues. Another strand of research that has been pursued is the role of the lack of state capacity in developing countries (Besley and Persson, 2009, 2010, 2013).[36] Governments in developing countries are trying to collect more taxes from businesses but are failing, and their tax revenues are limited by their incapacity to collect them (see, Besley and Persson, 2009, 2010, 2013; Gordon and Li, 2009; Guo and Hung, 2020). After accounting for state capacity variables, firms in countries with a more developed financial sector report a larger share of their sales to the tax authority (Guo and Hung, 2020). Guo and Hung (2020) assume that if the state capacity is enforced, analytically show that with a less developed financial sector which exhibits higher agency/monitoring costs, the government of a developing country will decrease its optimal tax-auditing probability on operating establishments, which in turn leads to more tax evasion. The above theoretical studies of the positive relationship between finance and tax revenue also accord with previous empirical studies, which show a positive relationship. For example, Bohn (1990) emphasizes a positive relationship between financial development and tax revenue. Taha, Colombage and Maslyuk (2010) find a significant relationship between direct tax revenues and financial activities. In a similar vein, the development of the bonds and stocks market plays a crucial role in revenue generation. Empirical work by Taha *et al.* (2013) concluding that the development of the financial system positively influences direct tax revenue in Malaysia.

[36] These studies pointed out that developing countries are limited by two complementary aspects of state capacity: (i) fiscal capacity and (ii) legal capacity.

Financial development on tax revenue mobilization: indirect channels

To the extent that financial development impacts the state of the economy, it will also have an indirect effect on domestic tax mobilization, although alternative macroeconomic channels could be important. These factors include international trade, the underground economy, tax evasion activities, and corruption. According to Beck (2002), Svaleryd and Vlachos (2002), Kim, Lin and Suen (2010) and Sare (2019) find that financial development facilitates international trade. Dabla-Norris, Gradstein and Inchauste (2008); Beck, Lin and Ma (2014b); Guo and Hung (2020) find that financial development reduces a company's degree of tax evasion. In turn, Capasso and Jappelli (2013) show that financial development can reduce tax evasion and the size of the underground economy. We argue that economic growth is the main indirect channel through which financial development could affect domestic tax revenue mobilization. Financial systems impact investment decisions on productivity enhancement activities through two mechanisms: (i) by assessing potential investors and investing in the most successful ones, (ii): they may also provide research, assessment, and supervisory support more efficiently and cost-effectively than individual investors or individuals, they are equally able to mobilize and provide the appropriate financing to investors rather than to individuals (see, Robert G. King and Levine, 1993). In sum, the assessment and screening of investors reduce the cost of investment in improving productivity and stimulates economic growth. As a result, economic growth would increase considerably, and the country's government could collect higher tax revenues. There is a large literature ((Levine, 1996; Rajan and Zingales, 1996; Levine and Zervos, 1998; Beck, Levine and Loayza, 2000; Ang and McKibbin, 2007; Greenwood, Sanchez and Wang, 2013) provided empirical evidence of a positive impact of the financial development on the economic growth. Likewise, a developed financial system may facilitate exchanges of goods and services, contributing to boosting the competitiveness of companies on the international market. Consequently, this will result in increasing exports and imports, and the country concerned could be able to generate higher tax revenues. Specifically, the positive effect of international trade on tax revenues is expressed through revenues generated from taxes on international trade and domestic tax revenues. Moreover, financial development may contribute to reducing a company's degree of tax evasion. For example, larger companies and

societies owned by foreign investors and other societies whose financial statements are reviewed by external auditors are less likely to escape taxes. Individuals and companies escaping taxes or irregularly operating tend to hide their income. Indeed, access to external credits is very costly for companies having greater tax avoidance practices. Financial development encourages more transparency of companies that depend increasingly on external financing. Thus, developing countries being the most affected by tax evasion, with a certain high level of financial development, may reduce the tax revenue lost due to tax evasion. Finally, financial development is a potential disincentive to the spread of the informal economy.[37] According to Capasso and Jappelli (2013), when companies or individuals work informally, their ability to report income and assets is lower and the cost of credit higher. Thus, as financial markets become more developed, more efficient intermediaries penetrate the market, and the cost of credit decreases, increasing the cost of the opportunity cost of continuing underground exploitation.[38] In Brief, financial development leads to the formalization of firms or individuals, i.e., it pushes firms to reveal information about their income and assets to financial intermediaries and tax officials.

3 Data, and methodology

3.1 Variables and data description

To assess the effect of financial development on tax revenue mobilization, this study uses data from 46 developing countries from 1995-2017. Our dependent variable is the non-resource tax revenue data stemming from the International Centre for Tax and Development (ICTD), and the main explanatory variable is the financial development index according to the IMF's Financial Development Index Database. This sample period is determined by the availability of non-resource tax revenue and financial development (FD) Index data. Drawing from the literature on the determinants of tax revenue (Tanzi *et al.*, 1981; Tanzi, 1992a; Ghura, 1998; Khattry and Rao, 2002; Gupta,

[37] Many factors explain the emergence and size of informal activities, such as high taxation, high social charges, heavy legislation, and labor costs, as factors that may push firms into informality. Among these factors, credit availability and its price have received little attention.

[38] The starting point of this analysis is that the ability to reveal and report income reduces the frictions of information and the cost of credit ((Ellul *et al.*, 2016)

2007; Bird, Martinez-Vazquez and Torgler, 2008; Baunsgaard and Keen, 2010) we retain several key factors, including structural factors, that influence countries' tax revenue, namely: Gdp growth, trade openness, natural resources rents, share of agriculture, polity2. Table A1 in the appendix report the sources, definitions of variables used in this paper.

Tax revenue

Following Brun, Chambas, and Mansour (2015) our principal domestic tax revenue measure is the non-resource tax revenue (as a % of GDP) from the International Centre for Tax and Development (ICTD), which is calculated as total tax revenue (excluding grants and social contributions) minus revenues from resource taxes (% of GDP)—using of non-resource tax revenue as a dependent variable result in much greater homogeneity than total government revenue.

Financial development

The financial development index measures the level of financial development measured by five banking sector performance indicators and size. Financial development summarizes depth (market size and liquidity), access (the ability of individuals and companies to access financial services), and efficiency (the power of institutions to provide financial assistance at low cost and with sustainable incomes and the level of activity in capital markets).

Gdp-growth.

The gross domestic product growth rate controls the economic cycle and monetary conditions. This variable is assumed to have a positive effect on tax revenue. The gross domestic product growth rate (Gdp_growth) controls the economic cycle and monetary conditions. This variable is assumed to have a positive effect on non-resource tax revenue.

Trade openness.

The degree of trade openness measured by the share of exports and imports should also impact tax revenue, but its expected sign is controversial. The more open a country is to the outside world, the more a positive effect of trade openness on tax revenue can be expected. Trade openness might have a positive sign because the increase in trade

volume increases economic growth and tax revenue. For example, Thomas and Trevino (2013) observe a positive effect of trade openness on non-resource tax revenue. On the other hand, trade openness leads to at least tariff liberalization, which could be associated with lower tax revenue. The empirical literature on the impact of trade openness has provided evidence that trade openness is negatively related to total tax revenue and tax revenue from international trade (Khattry and Rao 2002).

Natural resource rents in the percentage of GDP.

The natural resource measure is the ratio of resource rents to GDP. These rents include rents from energy, minerals, and forestry. The effect of natural resources on tax revenue is ambiguous. Indeed, on the one hand, a resource-rich country can generate a sizeable taxable surplus Gupta (2007), while on the other hand, natural resources might reduce the governments' incentives for collecting taxes (Lim, 1988; Martinez-Vazquez, 2001).

Share of agriculture in the GDP.

The share of agriculture in the GDP (Agriculture/GDP) measures the value-added in the agricultural sector as a proportion of total value-added. We expect agriculture to harm tax revenue, considering the difficulty of taxing the farm sector (Khattry and Rao, 2002; Baunsgaard and Keen, 2010; Brun, Chambas and Mansour, 2015).

Polity2.

The polity2 score corresponds to the difference between the democracy and the autocracy scores. It measures the competitiveness of political participation, the openness and competitiveness of executive recruitment, and constraints on the executive. This variable represents the quality of governance, which measures the degree of democracy in a country. This variable is also expected to impact tax revenue positively (Gupta 2007).

Table 4.1 contains the list of variables used in this paper and a brief description of the data. [39]

[39] Table C in the appendix presents the matrix of correlation of the variables studied.

Table 4. 1 Descriptive statistics for main variables

Variable name	Obs	Mean	Std.Dev.	Min	Max
Tax revenue over GDP	1010	24.1954	10.0382	5.89	60.68
Non-Resource Tax Revenue over GDP	939	15.6737	6.3472	1.916	56.92
Direct taxes	878	5.6406	3.3630	0.6767	24.0737
Indirect taxes	948	10.7724	5.1950	0.9757	47.8479
Taxes on income	908	5.4747	3.3302	0.6766	24.0737
Total taxes on goods and services	940	7.5420	3.6209	0.4706	18.8459
Value-added tax (VAT)	746	5.303	2.2381	0.02	14.46
Financial Development Index	1058	0.2540	0.1434	0.0308	0.7299
GDP Growth	1057	4.4335	4.1270	-14.7586	34.4662
Trade Openness over GDP	1036	75.4580	33.8562	0.1674	220.407
Natural resource rents over GDP	1053	6.3340	8.3695	0.0227	55.8521
Inflation	1057	19.6206	168.061	-18.8992	4,800.53
Agriculture over GDP	1052	14.0530	10.1237	1.8283	57.2386
Polity2	1058	3.8449	5.5469	-10	10

3.2 Stylized facts

In Figures 4.1 & 4.2, we first outline the relation between domestic tax revenue (respectively, non-resources tax revenue) and various indices of financial development. The financial development global index is positively related to non-resource tax revenue. Also, Financial Institutions and Financial Markets seem to increase non-resource tax revenue. Financial institutions' depth, financial institutions' access, financial institutions' efficiency, and financial markets' depth positively affect non-resource tax revenue. In contrast, non-resource tax revenue negatively affects financial market access and efficiency.

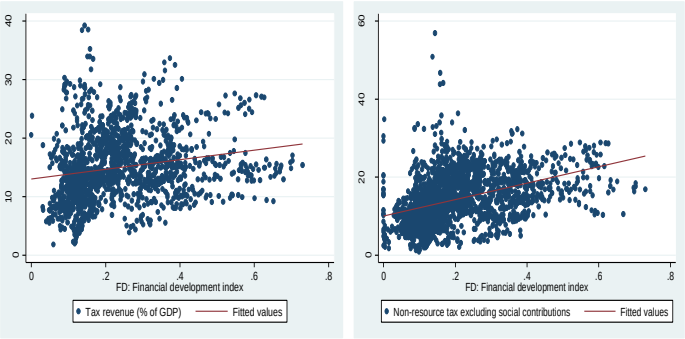

Figure 4. 1 Domestic tax revenue (& non-resource tax excluding social contributions) and financial development index, financial institutions index and financial markets index.
Author's calculations using the IMF's financial development index database and ICTD GRD, 2019

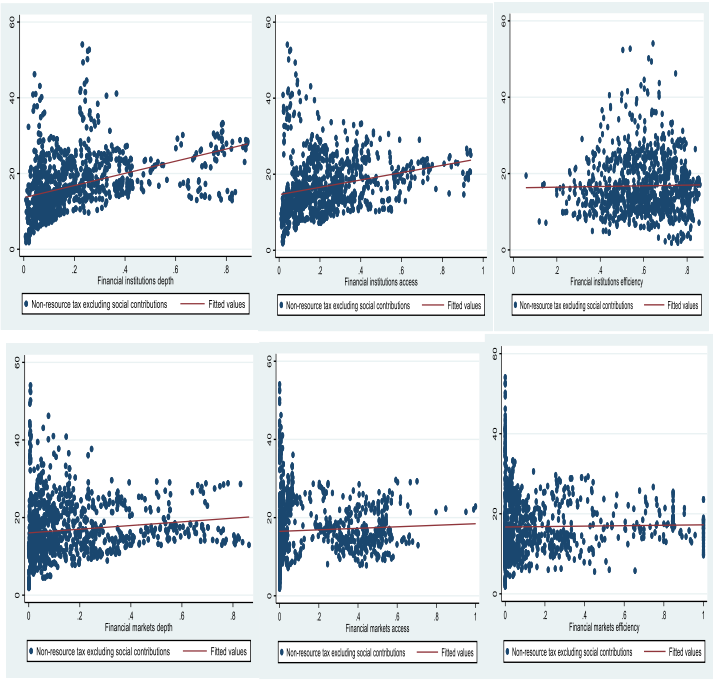

Figure 4. 2 Non-resource tax revenue and financial institutions index sub-components and financial markets index sub-components. Author's calculations using the IMF's financial development index database and ICTD GRD, 2019

The evolution of financial development highlights that the financial development index increases over the years in developing countries from 0.19 to 0.30 between 1995 to 2017. The financial development index is higher in the Middle East North Africa countries than in other regions worldwide.

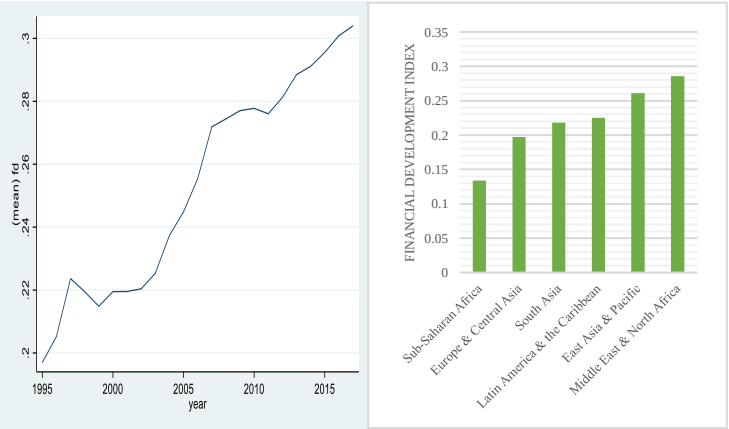

Figure 4. 3 Evolution of financial development index over time and financial development by region from 1995 to 2017.
Sources: Author's calculations using the IMF's financial development index database

4. Identification strategy

Following numerous studies on the determinants of the performance of public revenues, especially in developing countries (see (Baunsgaard and Keen, 2010; Crivelli and Gupta, 2014; Gnangnon and Brun, 2018), we use the dynamic panel model:

$$Y_{i,t} = \theta_1 Y_{i,t-1} + \beta_1 FD_{i,t} + X_{i,t}\beta_2 + \alpha_i + \mu_t + \varepsilon_{i,t} \qquad (1)$$

Where $Y_{i,t}$ represents the mobilization of non-resource tax revenue from country i in period t. θ_1 is the coefficient of lagged non-resource tax revenue mobilization (tax revenue/ GDP). FD represents the level of financial development. We are mainly interested in β_1, which is the coefficient of FD. X is the vector of control variables; these include GDP growth, trade openness, natural resource rents, the share of agriculture, polity2. α_i and μ_t are the country and time fixed effects, and $\varepsilon_{i,t}$ an error term.

Linear dynamic panel models, such as Eq. (1), contain unobserved panel effects that can be fixed or random (see (Arellano and Bond, 1991)). By construction, the

unobserved panel-level effects are correlated with the lag(s) of the dependent variable, making most standard estimation approaches inconsistent (see (Arellano and Bond, 1991)). An important concern when estimating equation *(1)* is the potential endogeneity. We have to solve three main problems to consistently estimate the equation *(1)*. First, the error term incorporates unobserved country heterogeneities λ_i, which could induce a bias of the omitted variables, if they are correlated with the other explanatory variables.

$$E\left[(\lambda_i)(X_{i,t}) \neq 0\right] \quad (2)$$

$$o\grave{u}\ \mu_{i,t} = \lambda_i + \varepsilon_{i,t}\ et\ \varepsilon_{i,t}\ est\ i.i.d\ (0,1$$

Second, financial development influence tax revenue performance, it is also possible that the level of taxes (and hence tax revenue) could influence financial institutions and hence the depth of financial development (see (Colombo and Caldeira, 2018; and Schandlbauer, 2017)). For example, an increase in tax revenue provides more public expenditure which generally contributes to improving the state of infrastructure, leading to a better environment for the development of the financial sector in the economy. Consequently, there is a causality bias, due to the correlation between the error term and financial development variable:

$$E\left[(\mu_{i,t})(X_{i,t})\right] \neq 0 \quad (3)$$

Third, this equation *(1)* could generate a dynamic endogeneity bias concerns because of the presence of the lagged value of the tax revenue/GDP variable among the explanatory variables, it can be correlated with the error term:

$$E\left[(Y_{i,t} - 1)(\mu_{i,t})\right] \neq 0 \quad (4)$$

Linear dynamic panel models, such as Eq. (1), contain unobserved panel effects that can be fixed or random (see, Arellano and Bond, 1991). By construction, the unobserved panel-level effects are correlated with the lag(s) of the dependent variable, making most standard estimation approaches inconsistent (see, Arellano and Bond, 1991). Indeed, as explained by Baltagi (2008), standard estimators, such as the pooled ordinary least squares estimator, the fixed effects model and the random effects model,

are inconsistent due to these problems cited above. Given the need to solve the problems of unobserved country heterogeneity, causality bias and dynamic endogeneity bias, estimating this equation by a fixed-effects model would lead our results to suffer from Nickell's bias (Nickell, 1980) which can be severe given the short duration of our data. The dynamic panel GMM estimators developed by Arellano and Bond (1991) and improved by Arellano and Bover (1995) and then by Blundell and Bond (1998) develop a method for estimating the generalized method of moments (GMM), which gives consistent parameter estimates for models of this type. We estimate our dynamic panel model using the generalized moment method (GMM) estimator. Two specific econometric methods were used: Arellano and Bond (1991) generalized first difference moment method (GMM in difference) and Blundell and Bond (1998) generalized system moment method (GMM System). The GMM dynamic panel estimator is suitable for estimating our dynamic equation in which a one-year delay of the dependent variable is included as an explanatory variable. These two methods make it possible to control the heterogeneity of countries, but also to address the problem of endogeneity of variables, which may (necessarily) arise when studying the relationship between financial development and tax mobilization (tax revenue mobilization). Indeed, the OLS estimate is biased (upwards) because of the correlation between the error term (which contains specific effects) and the delayed endogenous variable. In addition, the Within estimate is also lowered (downward), because the transformation results in a negative correlation between the error term and the delayed endogenous variable on small samples (Nickell, 1980). Thus, to correct for Nickell (1980) estimation bias, an instrumental variable method will be applied. The GMM estimator uses model-internal instruments (delayed values of variables suspected of endogeneity) to counter the problem of weak instruments and difficulties in processing several endogenous variables.

The GMM first-difference estimator consists of associating the first difference of the equation to be estimated to eliminate country-specific effects with each period, and then to instrument our explanatory variables of the first-difference equation by their level values lagged by one period. The GMM estimator in the Blundell and Bond system combines the first difference equations with the level equations in which the variables are instrumented by their first differences. Finally, the system GMM provides a smaller bias (in terms of size) than the difference-GMM or the fixed-effects

estimators, even when the required stationary condition is doubtful (Hauk and Wacziarg, 2009).

In order to verify the validity of our estimate three (03) tests were carried out so that the following assumptions could be verified:

- the AR (1) or m1 test of Arellano-Bond to test for the presence of 1st order autocorrelation, (under the alternative hypothesis). In this test the null hypothesis of absence of first-order serial correlation in the error terms must be rejected, the p-value of the test must be less than 0.10 (P-value 0.10)
- the AR (2) or m2 Arellano-Bond test to test the absence of second order autocorrelation, (Under the null hypothesis). In this test the null hypothesis of absence of second order serial correlation in the error terms should not be rejected, the p-value of the test must be greater than 0.10 (p-value 0.10).
- Hansen's instrument exogeneity test for testing instrument exogeneity, and the p-value of the test must be greater than 0.10 (p-value 0.10). We also apply Roodman**'s** criterion by limiting the number of instruments to no more than the number of individuals. We use the xtabond2 command of Roodman (2009) on Stata to make the estimates and assuming that tax revenue, the level of financial development, GDP growth, and trade openness are endogenous, and only natural resource rents over GDP, the share of agricultural value added, and Polity2 are assumed to be weakly exogenous or exogenous.

5. Empirical results

The regressions have been used at only a period of the lagged tax revenue variable.[40] Table 4.2 presents the results for Specification 1, using the dynamic panel two-step system GMM estimations[41]. The statistical tests do not invalidate the econometric method: the null hypotheses of the Sargen/Hasen and AR (2) tests are accepted.

[40] To determine the ideal number of lags in this study, we have estimated a linear model that uses one of the standard information criteria, for example, the adjusted R-squared, and the results (reported in Table A4) show that the ideal number of lags of the dependent variable is 1. From 2 lags onwards, we no longer have this inertia effect, i.e., the persistence effect of tax revenues, since the lagged variable is no longer statistically significant.

[41] In this paper, our preferred estimator is the system-GMM. It has been highlighted that the lagged values of variables in level, as done with the difference-GMM estimator, are sometimes imperfect instruments for variables in first differences.

Moreover, the positive coefficient of the lagged dependent variable highlights an inertia effect that legitimates the dynamic panel specification. Column [6] is the baseline model, including the lagged tax revenue variable, the financial development variable, real GDP growth, trade openness, natural resource rents, agriculture value, and polity2. The lagged tax revenue variable's estimated coefficient is positive and statistically significant at 1%. This is a common finding in the literature indicating that non-resource tax revenue in one year is heavily influenced by non-resource tax revenue in the previous year, as Gnangnon and Brun (2018) highlighted. The coefficient of financial development is positive and statistically significant at the 1% level. Financial development has a significant and positive effect on non-resource tax revenue. A 1% increase in financial development is associated with a 0.290 percentage point increase in non-resource tax revenue. These results can be explained by the fact that the well-functioning financial sector of developing countries enables tax collection by the administration and the payment of taxes by taxpayers. In facilitating financing, banks and financial institutions provide different payment systems essential for monetary transactions; therefore, if a country has well-developed, transparent and efficient financial institutions, businesses and taxpayers will use them to carry out their transactions. In turn, tax collecting authorities (tax collectors) can obtain valuable information from these financial institutions, such as the income and assets of taxpayers. As for the control variables, Trade openness positively and significantly impacts non-resource tax revenue. We observe that the level of natural resource rents is positively associated with non-resource tax revenue. These results are consistent with previous works (Tanzi, 1992a; Ghura, 1998; Gupta, 2007). We also note that non-resource tax revenue is negatively and significantly driven by high value-added agriculture (as % of GDP). The other control variables are insignificant, including quality of governance (polity2) and real GDP growth.

Table 4. 2 ***Baseline: The effect of Financial Development on non-resource tax revenue***

Dependent variable : Log. non-resource over GDP	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**
Lag (log. non-resource over GDP)	0.719***	0.701***	0.743***	0.712***	0.732***	0.731***
	(0.104)	(0.100)	(0.060)	(0.065)	(0.060)	(0.059)
Financial Development Index	0.455***	0.420***	0.294***	0.310***	0.290***	0.290***
	(0.166)	(0.134)	(0.107)	(0.095)	(0.093)	(0.095)
GDP growth		0.005***	0.005**	0.002	0.001	0.001
		(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
Log. Trade Openness over GDP			0.052***	0.074*	0.075*	0.073*
			(0.026)	(0.041)	(0.044)	(0.038)
Log. Natural resource rents over GDP				0.011*	0.013**	0.013**
				(0.006)	(0.006)	(0.006)
Log. Agriculture over GDP					-0.002*	-0.003**
					(0.001)	(0.041)
Polity2						0.001
						(0.002)
Constant	0.652***	0.681***	0.383**	0.382**	0.361*	0.373*
	(0.249)	(0.243)	(0.165)	(0.150)	(0.203)	(0.201)
Observations	998	998	980	977	976	976
Countries	46	46	46	46	46	46
Instruments	13	19	22	22	23	24
Hansen	0.542	0.828	0.655	0.692	0.511	0.511
AR1	0.001	0.000	0.000	0.000	0.000	0.000
AR2	0.674	0.504	0.698	0.946	0.962	0.985

Note: Robust Standard Errors are in parenthesis. The variables "GDP growth ", "Financial Development Index " and "Log. Trade Openness over GDP" has been considered as endogenous across all model specifications.
The variables "Log. Natural Rents ", " Log.Agriculture over GDP ", " Polity2 " have been considered as exogenous.
*Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01*

6. Robustness checks

In this section, we explore the robustness of our baseline results in several ways.

6.1 An alternative measure of tax revenue

We begin by taking a closer look at our dependent variable. We use the tax revenue ratio (as a % of GDP) from the International Centre for Tax and Development (ICTD), Government Revenue Dataset (GRD), and the IMF's tax revenue dataset as an alternative measure of tax revenue. As we can observe, the coefficient associated with financial development is positive and enormously significant, suggesting that the increase in tax revenue does not change with the tax revenue measure. Finally, the estimated coefficient in domestic tax revenue in absolute value is 0.307 percentage points, somewhat higher than our benchmark findings.

Table 4. 3 Robustness: The effect of Financial Development on non-resource tax revenue (Alternative measure of tax revenue).

Dependent variable: Log. Domestic Tax revenue over GDP	**[1]**	**[2]**
Alternatives		
	Baseline	**Alternative 1**
	[1]	**[2]**
Lag (Log. Tax revenue)	0.731***	0.716***
	(0.059)	(0.104)
Financial Development Index	0.290***	0.307**
	(0.095)	(0.152)
Constant	0.373*	0.611*
	(0.201)	(0.356)
Observations/	976	945
Countries	46	46
Instruments	24	25
Hansen	0.629	0.613
AR1	0.000	0.004
AR2	0.985	0.881
Controls	Yes	Yes

Note: *Robust Standard Errors are in parenthesis. The variables "GDP growth ", "Financial Development Index "and "Log. Trade Openness over GDP" has been considered as endogenous across all model specifications. The variables "Log. Natural Rents ", " Log. Agriculture over GDP ", " Polity2 " have been considered as exogenous.*
*Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01*

6.2 Testing for additional controls

We alternatively introduce additional covariates that may affect non-resource tax revenue mobilization. We add these additional covariates into the main specification to address the issue of omitted variables. (Column [1] is the baseline model. Columns [2]-[8] include additional covariates). We control for the population density, financial (capital) openness index, migrants' remittances (% of GDP), inflation, Foreign direct investment (% of GDP), aid (% of GDP), and government debt (% of GDP). In the second column [2], we control for population density, which measures the proportion of people under 15 and those over 65. This variable is also expected to harm tax revenue. According to Bahl (2004), in countries with high population growth, the tax system may lag in attracting new taxpayers. The coefficient of this variable is negative, as expected and significant. We find that financial development still positively affects non-resource tax revenue. Adding the capital openness index in column [3] as a control variable, we find that this variable negatively and significantly affects non-resource tax revenue. Financial development remains enormously substantial and positive.

In column [4], we add migrants' remittances as a control variable. This variable may increase recipient endowments and their capacity to pay taxes. Ebeke (2014) reveals

that remittances contribute significantly to both levels and stability of the government's tax revenue ratio in recipient countries. Table 4.4 shows a positive and significant effect of migrant remittances, while financial development remains substantial and positive. In column [5], we add the inflation rate, which captures macroeconomic stability. This shows that the high level of inflation leads to low tax revenue. We expect this variable to reduce non-resource tax revenue. We observe that inflation negatively impacts non-resource tax revenue mobilization, but financial development remains substantially positive.

In column [6], we include the Foreign direct investment (% of GDP), which measures the capacity of a given country to attract foreign investors. This variable positively affects economic growth, and therefore, it might positively affect non-resource tax revenue. Even controlling for this variable, financial sector development still positively affects non-resource tax revenue. In column [7], we control for aid[42] (% of GDP). This variable should also positively impact non-resource tax revenue, but that depends on the type of aid. Aid is also expected to harm non-resource tax revenue. Clist and Morrissey (2011) argued that aid flows reduce government revenue efforts, reducing aid effectiveness. We find that the coefficient relating to the aid is positive and statistically significant. The most striking result is that aid positively impacts non-resource tax revenue mobilization. Remember that this topic is where the sizeable existing literature provides no robust evidence. Following Clements, Gupta and Inchauste (2004)'s research findings, countries that receive higher levels of foreign assistance will collect less domestic tax revenue owing to weaker incentives to pursue politically costly local tax revenue mobilization. Similarly, Yohou, Goujon and Ouattara (2016) show that aid directly reduces tax revenues but enhances tax performance for higher levels of government stability. Then, Clist and Morrissey (2011) present evidence that there was likely no consistent effect of aid on domestic tax revenue mobilization. Brun, Chambas and Guerineau (2011) argued that the positive impact of aid was contingent on the quality of institutions in recipient countries. Lastly, Clist (2016) points to a modest but positive effect on foreign aid, generally on domestic tax revenue. Even controlling for this variable, financial

[42] The amount of official development assistance (grants plus concessional loans, measured in U.S. dollars) divided by Gross National Income

development positively affects non-resource tax revenue. In the last column [8], we add the government debt, which may directly affect fiscal policy by affecting government resources and, thus, potentially affect the tax revenue ratio.). We find that this variable has no significant effect on non-resource tax revenue. Financial development remains firmly substantial and positive.

Adding corruption in the last column [9] as a control for institutional factors, we find that this variable has no significant effect on non-resource tax revenue. However, financial development remains enormously substantial and positive.

According to columns [2]-[9] in Table 4.4, the additional variables confirm the robustness of our baseline model. Whenever significant, their effect is consistent with what one may expect. Accounting for other control variables proves financial development's intensely substantial and positive effect on non-resource tax revenue mobilization.

Table 4. 4 Robustness: Effects of Financial Sector Development on Non-resource tax revenue (additional controls)

Dependent variable : Log. Non-resource tax revenue over GDP	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**	**[7]**	**[8]**	**[9]**
Lag (log. Non-resource tax revenue)	0.731***	0.767***	0.744***	0.732***	0.730***	0.707***	0.768***	0.763***	0.789***
	(0.059)	(0.061)	(0.061)	(0.053)	(0.064)	(0.065)	(0.048)	(0.059)	(0.096)
Financial Development Index	0.290***	0.271***	0.269***	0.263***	0.255***	0.336***	0.749***	0.294***	0.350***
	(0.095)	(0.103)	(0.104)	(0.092)	(0.099)	(0.102)	(0.260)	(0.107)	(0.129)
GDP growth	0.001	0.005*	0.004*	0.003	0.006	0.004	0.006	0.005***	0.004
	(0.003)	(0.003)	(0.003)	(0.002)	(0.004)	(0.004)	(0.015)	(0.002)	(0.004)
Log. Trade Openness over GDP	0.073*	0.047*	0.055*	0.068	0.055	0.059***	0.038**	0.064	0.043
	(0.044)	(0.028)	(0.031)	(0.044)	(0.049)	(0.007)	(0.018)	(0.041)	(0.043)
Log.Agriculture to GDP	-0.003**	-0.001	-0.002*	-0.004***	-0.004**	-0.003*	-0.004***	-0.004***	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.006)
Log. Natural resource rents over GDP	0.013**	0.001	-0.004	0.000	-0.001	-0.003	-0.001	-0.004	-0.003
	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)	(0.007)	(0.002)
Polity2	0.001	0.001	0.002*	0.000	0.001	-0.001	0.002	0.001	0.001
	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.005)	(0.002)	(0.002)
Log. Population Density		-0.020*	-0.023**	-0.031***	-0.035***	-0.005	0.031	-0.020	-0.021*
		(0.011)	(0.010)	(0.010)	(0.012)	(0.011)	(0.031)	(0.013)	(0.013)
Financial Openness Index			-0.018***	-0.020***	-0.019***	-0.039***	-0.051	-0.025***	-0.019
			(0.014)	(0.006)	(0.005)	(0.015)	(0.054)	(0.008)	(0.013)
Log. Remittances				0.014*	0.014	-0.146***	-0.043*	0..008	0.006
				(0.008)	(0.010)	(0.053)	(0.023)	(0.008)	(0.009)
Log. Inflation					-0.014***	-0.011*	0.039*	-0.016**	-0.001
					(0.010)	(0.007)	(0.021)	(0.006)	(0.040)
Log. Foreign direct investment over GDP						0.009*	0.011*	0.007	0.013*
						(0.005)	(0.006)	(0.007)	(0.007)
Log. Aid over GDP							0.767*	0.874*	0.784
							(0.461)	(0.504)	(0.723)
Log. Government debt								0.011	0.037
								(0.022)	(0.031)
Corruption									-0.003
									(0.007)
Constant	0.373*	0.443**	0.488**	0.529**	0.638**	0.602**	0.470**	0.376	0.252
	(0.201)	(0.188)	(0.196)	(0.248)	(0.341)	(0.292)	(0.197)	(0.249)	(0.409)
Observations/	976	976	976	937	907	880	854	781	724
Countries	46	46	46	46	46	46	46	43	39
Instruments	24	30	29	28	25	26	34	34	27
Hansen	0.629	0.362	0.431	0.908	0.794	0.784	0.651	0.820	0.612
AR1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR2	0.985	0.716	0.751	0.626	0.600	0.118	0.106	0.119	0.213

Note: Robust Standard Errors are in parenthesis. The variables "GDP growth ", "Financial Development Index "and "Log. Trade Openness over GDP" has been considered as endogenous across all model specifications. The variables "Log. Natural Rents ", " Log. Agriculture over GDP ", " Polity2 " have been considered as exogenous.
Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01

6.3 The sub-components of financial development

So far, we have focused on the aggregate financial development (FD) index. We now investigate the effects of disaggregated financial development components on non-resource tax revenue mobilization.

Financial development is defined as a combination of depth (size and liquidity of markets), access (the ability of individuals and companies to access financial services), and efficiency (ability of institutions to provide financial assistance at low cost and with sustainable revenues, and the level of activity of capital markets). Nine indices of the International Monetary Fund Financial Development Index (IMF-FDI) are used in this section to measure various dimensions of financial development and to consider the complex multidimensional nature of financial development other than just the financial depth of credit or the stock market (Svirydzenka, 2016). Using these indices would provide an excellent understanding of the true relationships between the different dimensions of financial development and tax revenues, i.e., overall financial development and two sub-dimensions (including financial institutions and financial markets) and finally, the second level of dimensions that include financial depth, financial access, and financial efficiency. First, Financial institutions (FI) include banks, insurance companies, mutual funds, pension funds, and other non-bank financial institutions. Second, financial markets (FM) include mainly stock and bond markets. Thirdly and to finish, within financial institutions (FI) and financial markets (FM), different dimensions of the financial system were measured: depth, access, and efficiency. The estimated coefficients on the sub-components of financial development are statistically significant, except for the efficiency of the financial markets. Note that the financing of the developing economies relies more on banking intermediation than the stock market. For example, there is evidence that financial sectors are essentially bank-based (Creane *et al.*, 2006; Senbet and Otchere, 2006; Andrianaivo and Yartey, 2010; Gaies, Goutte and Guesmi, 2019).

Finally, we pose the following question. Can one dimension of institutions—banking and nonbanking—and markets complement the other? The answer to this question may suggest that the three dimensions of institutions—banking and nonbanking—and markets may reinforce each other's effectiveness. If possible, such complementarity needs to be exploited. That is, the choice may not be between one or the other but to

capture the multidimensional nature of the financial development process. Our central question is also related to a strand of the empirical literature since the 1970s, which approximates financial development by the ratio of private credit to GDP and, to a lesser extent, by stock market capitalization, also as a ratio to GDP. We observe positive coefficients for the interaction terms involving financial institutions' depth and efficiency, financial institutions' access and efficiency, financial markets' depth and access, and financial markets' depth and efficiency and financial markets' access and efficiency. This indicates a complementary relationship between these variables, suggesting that greater depth or access in financial institutions or markets tends to enhance efficiency and vice versa.

Table 4. 5 Robustness: The effect sub-components of financial development on non-resource tax revenue

Dependent variable : Log. Non resource tax revenue over GDP	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**	**[7]**	**[8]**	**[9]**	**[10]**	**[11]**	**[12]**	**[13]**	**[14]**
Lag (log. Non-resource tax revenue over GDP)	0.753***	0.739***	0.670***	0.743***	0.779***	0.759***	0.727***	0.990***	0.731***	0.743***	0.847***	0.857***	0.651***	0.732***
	(0.056)	(0.069)	(0.071)	(0.0.57)	(0.057)	(0.065)	(0.075)	(0.056)	(0.066)	(0.148)	(0.079)	(0.117)	(0.084)	(0.061)
Financial institutions	0.237***													
	(0.070)													
Financial markets		0.144**												
		(0.071)												
Financial institutions depth			0.309***						0.220	-0.443				
			(0.102)						(0.287)	(0.309)				
Financial markets depth				0.132***								-0.051	-0.185	
				(0.045)								(0.102)	(0.133)	
Financial institutions access					0.371***				0.133		-0.760*			
					(0.0115)				(0.185)		(0.398)			
Financial markets access						0.182***						-0.446**		-0.173*
						(0.068)						(0.182)		(0.099)
Financial institutions efficiency							0.212**			-0.169*	-0.222*			
							(0.103)			(0.091)	(0.114)			
Financial markets efficiency								0.057					-0.121*	-0.157*
								(0.062)					(0.072)	(0.094)
Financial institutions depth* Financial institutions access									-0.208					
									(0.826)					
Financial institutions depth* Financial institutions efficiency										0.928*				
										(0.755)				
Financial institutions access * Financial institutions efficiency											1.288**			
											(0.642)			
Financial markets depth * Financial markets access												0.992*		
												(0.517)		
Financial markets depth * Financial markets efficiency													0.633*	
													(0.347)	
Financial markets access * Financial markets efficiency														0.836**
														(0.349)
Observations/ Countries	976/46	976/46	976/46	976/46	976/46	976/46	976/46	976/46	976/46	976/46	976/46	976/46	976/46	976/46
Instruments	30	19	19	25	30	30	24	19	23	19	21	14	20	25
Hansen	0.831	0.206	0.704	0.826	0.529	0.788	0.417	0.455	0.424	0.341	0.922	0.998	0.910	0.840
AR1	0.008	0.010	0.012	0.008	0.008	0.006	0.008	0.006	0.000	0.003	0.000	0.001	0.000	0.000
AR2	0.948	0.868	0.716	0.823	0.947	0.943	0.987	0.828	0.868	0.486	0.497	0.581	0.845	0.875
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust Standard Errors are in parenthesis. The variables "GDP growth ", "Financial Development Index " and "Log. Trade Openness over GDP" has been considered as endogenous across all model specifications. The variables "Log. Natural Rents ", " Log. Agriculture over GDP ", " Polity2 " have been considered as exogenous. Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01

6.4 Traditional (Alternative) measures of financial development

We now look at each type of measure. First, our empirical analysis uses six financial development measures: liquid liabilities, central bank assets, deposits money bank assets, private credit by money banks, financial system deposits and private credit by money banks and other financial institutions. Liquid liabilities measure the size or financial depth used in the literature by Robert G. King and Levine (1993) among others. Central and deposit money bank assets measure the size of two financial sectors relative to GDP. These measures give evidence of the importance of the financial services performed by the two financial sectors relative to the size of the economy. Private credit by money banks and private credit by money banks and other financial institutions are measures of the activity of financial intermediaries in one of their main functions: channeling savings to investors. Both measures isolate credit issued to the private sector instead of governments and public enterprises. Furthermore, they concentrate on credit issued by intermediaries other than the central bank. Also, they have been used in the literature the first by Levine and Zervos (1998), and the second by Levine, Loayza and Beck (2000b) and Beck, Levine and Loayza (2000). We look at the level and the magnitude effect using these variables. Second, following Huang, 2010; Samargandi, Fidrmuc and Ghosh, 2015; Gnangnon (2022), we use a composite indicator of financial development to measure the overall financial sector development, obtained by combining several existing financial development indicators using the principal components analysis (PCA). We look at the level and the magnitude effect using these variables. In particular, when the liquid liabilities, the central bank assets, the deposits money bank assets, the private credit by money banks, or the private credit by money banks and other financial institutions measure financial development, the empirical evidence supports the hypothesis that financial development significantly increases non-resource tax revenue. Interestingly, the financial development indicator coefficient is also positive and significant. However, we observe some relative variations in the coefficients according to the type of measure, corroborating our intuition.

Table 4. 6 Robustness: The effect of traditional measures of financial development on non-resource tax revenue

Dependent variable : Log. Non-resource tax revenue over GDP	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**	**[7]**
Lag (log. Non-resource tax revenue over GDP)	0.726***	0.866***	0.686***	0.689***	0.686***	0.701***	0.691***
	(0.070)	(0.048)	(0.076)	(0.067)	(0.061)	(0.062)	(0.083)
Log. Liquid liabilities to GDP (%)	0.113**						
	(0.044)						
Log. Central bank assets to GDP (%)		0.004*					
		(0.003)					
Log. Deposit money bank assets to GDP (%)			0.086***				
			(0.030)				
Log. Private credit by money banks to GDP				0.084***			
				(0.027)			
Log. Private credit by money banks and other financial institutions to GDP					0.093***		
					(0.104)		
Log. Financial system deposits to GDP						0.093***	
						(0.028)	
Indicator "Financial development"							0.014**
							(0.007)
Constant	0.434**	0.130	0.467**	0.469**	0.377*	0.396*	0.614***
	(0.170)	(0.179)	(0.229)	(0.230)	(0.209)	(0.216)	(0.235)
Observations/ Countries	973/46	950/46	974/46	974/46	973/46	974/46	973/46
Instruments	16	38	19	22	25	18	22
Hansen	0.448	0.394	0.763	0.817	0.967	0.893	0.509
AR1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR2	0.622	0.322	0.506	0.671	0.741	0.609	0.986
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust Standard Errors are in parenthesis. The variables "Log. GDP growth ", "Financial Development measures "and "Log. Trade Openness over GDP" have been considered as endogenous across all model specifications. The variables "Log. Natural Rents ", " Log.Agriculture over GDP ", " Polity2 " have been considered as exogenous. Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01

7. Financial development and the composition of tax revenue

We look at the effect of financial development on tax revenue composition by disaggregating tax data between indirect taxes and direct taxes. The tax structures of developing countries are different (Modica, Laudage and Harding, 2018). For example, some countries have high direct taxes that account for a high proportion of the total tax revenue, while others have low tax rates and tax structures that rely heavily on indirect taxes. This may result in insufficient capacity for tax revenue mobilization. The financial sector can play a critical role in the functioning of the tax structure. Thus, consistent with our hypothesis, the results support a positive effect of financial sector development on all subcomponents of total tax revenue (Column [2]-[6]). More specifically, the coefficient associated with financial sector development is more sizeable for direct taxes (Column [2]) compared to the one for indirect taxes (Column [3]). This might suggest that the development of the financial sector allows the government to access each firm's or taxpayer's bank records and can use this information in enforcing the tax law and, thereby, more direct taxes to collect. This is

confirmed by the positive and statistically positive coefficient of financial sector development on taxes on income (Column [5]).

Table 4. 7 Robustness: The effect of financial development on the composition of tax revenue

Regressions	[1]	[2]	[3]	[4]	[5]	[6]
Dependent variable :	Log.non resource tax over GDP	Log. Direct taxes	Log. Indirect Taxes	Log. Taxes on Income	Log. Taxes on goods and services	Log.Value-added tax
Dependent variable (lagged)	0.731***	0.741***	0.825***	0.705***	0.879***	0.782***
	(0.059)	(0.156)	(0.079)	(0.147)	(0.052)	(0.070)
Financial Development Index	0.290***	0.500*	0.393**	0.471*	0.179**	0.178*
	(0.095)	(0.294)	(0.186)	(0.280)	(0.079)	(0.100)
GDP growth	0.001	0.028***	0.003**	0.019***	0.001	0.005*
	(0.003)	(0.008)	(0.002)	(0.006)	(0.003)	(0.003)
Log. Trade Openness over GDP	0.073*	0.121	0.112*	0.111*	0.042	0.079*
	(0.044)	(0.109)	(0.062)	(0.066)	(0.049)	(0.044)
Log. Natural resource rents over GDP	0.013**	0.005	-0.003	0.018	-0.005	0.002
	(0.006)	(0.008)	(0.008)	(0.015)	(0.005)	(0.006)
Agriculture over GDP	-0.003**	-0.001	0.002	-0.003	0.001	-0.000
	(0.001)	(0.003)	(0.002)	(0.004)	(0.001)	(0.001)
Polity2	0.001	0.002	0.001	0.002	0.001*	-0.000
	(0.002)	(0.002)	(0.002)	(0.003)	(0.001)	(0.001)
Constant	0.373*	-0.296	-0.202	-0.130	0.019	0.003
	(0.201)	(0.631)	(0.342)	(0.402)	(0.164)	(0.187)
Observations	976	781	874	757	866	695
Countries	46.000	42.000	45.000	42.000	45.000	41.000
Instruments	24.000	22.000	38.000	25.000	18.000	23.000
Hansen	0.629	0.323	0.367	0.458	0.933	0.705
AR1	0.000	0.000	0.002	0.001	0.002	0.009
AR2	0.985	0.419	0.146	0.359	0.839	0.804

*Note: Robust Standard Errors are in parenthesis. The variables "GDP growth ", "Financial Development Index "and "Log. Trade Openness over GDP" has been considered as endogenous across all model specifications. The variables "Log. Natural Rents ", " Log. Agriculture over GDP ", " Polity2 " have been considered as exogenous. Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01*

8. Heterogeneity

One concern over the abovementioned findings is that these parameters may be heterogeneous across countries. In principle, the system GMM estimates impose homogeneity on all slope coefficients. A natural way to confront this problem is to investigate more homogeneous subsamples. This section turns to three subsamples: lower-income countries, higher-income countries, lower-openness degree, higher-openness degree, lower-public debt levels countries, and higher-public debt levels countries. This section analyzes the sensitivity of the effect of financial development on non-resource tax revenue mobilization concerning the overall state of the economy, financial openness level, and debt level.

The state of the economy

We focus on the level of economic development. Indeed, we search for a potential impact of the level of economic development on the effect of financial development by distinguishing between "low" and "high" GDP growth levels, using the median of GDP growth to separate the two groups. For low-income countries, the net impact of financial development on non-resource tax revenue mobilization in the short term is

positive and significant (column [2]) and is 0.112 percentage points (= 0.312 – 0.200). The magnitude of this impact appears to be far higher than the net impact of this variable on non-resource tax revenue in high-income countries (column [3]), which is positive and significant and amounts to 0.108 percentage points. Moreover, results presented in columns [2]– [3] in Table 4.8 show that fiscal potential is more significant in "low-income" countries in most cases. Although financial development significantly improves tax revenue mobilization in both "high" and "low" levels of economic growth, the estimated coefficient of a financial product is more robust in "low-income."

The financial openness level

We examine the potential influence of financial openness. According to Balima, Combes and Minea (2016), more open countries may attract more foreign investors and be more vulnerable to risk. Therefore, non-resource tax revenue mobilization could serve as a social protection tool and provide a "spare tire" for governments, particularly against adverse shocks affecting access to financial markets. Thus, we expect the estimated effect to be more critical in relatively more financially open countries. We test this hypothesis by dividing the sample into "high" and "low" openness degrees, using the median level of the Chinn-Ito index to separate the two groups. For high-openness countries, the net impact of financial development on non-resource tax revenue mobilization in the short term is positive and significant (column [4]) and is 0.227 percentage points. The magnitude of this impact appears to be far higher than the net impact of this variable on non-resource tax revenue in low-openness countries (column [5]), which is positive and significant and amounts to 0.014 percentage points (= 0.227 – 0.213). Results depicted in lines [4]– [5] in Table 4.8 confirm our hypothesis, as estimated coefficients of financial development are larger in "high" openness contexts.

The debt level

We condition the effect of financial development on the debt levels by splitting our sample into "low" and "high" public debt levels, using the median of total government debt in % of GDP to separate the two groups. Indeed, significant debt levels make it more difficult to raise taxes since large debt may reflect less fiscal space (Ostry *et al.*, 2010). Thus, we expect the estimated effect to be more critical in relatively less indebted countries. For low-debt countries, the net impact of financial development on

non-resource tax revenue mobilization in the short term is positive and significant (column [6]) and is 0.409 percentage points. The magnitude of this impact appears to be far higher than the net impact of this variable on non-resource tax revenue in high-debt countries (column [7]), which is positive and significant and amounts to 0.351 percentage points (= 2.927– 2.576).

Results reported in columns [6]– [7] of Table 4.8 shows that financial development significantly improves non-resource tax revenue mobilization exclusively in "low" debt countries, consistent with theoretical insights.

Table 4. 8 Heterogeneity in the effect of financial development on non-resource tax revenue

Dependent variable : Log. Non-resource tax revenue over GDP	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**	**[7]**
[1] Lag (log. Non-resource tax revenue over GDP)	0.731***	0.811***	0.893***	0.846***	0.879***	0.763***	0.881***
	(0.059)	(0.067)	(0.045)	(0.072)	(0.071)	(0.103)	(0.089)
[2] Financial Development Index	0.290***	0.312**	0.108*	0.227*	0.227*	0.409*	2.957**
	(0.095)	(0.152)	(0.064)	(0.127)	(0.127)	(0.243)	(1.152)
[3] Financial development*Low Income		-0.200***					
		(0.073)					
[4] Financial development*High Income			-0.050				
			(0.056)				
[5] Financial development*Low Openness				-0.213***			
				(0.065)			
[6] Financial development*High Openness					-0.238		
					(0.149)		
[7] Financial development*Low Debt ratio						-0.270	
						(0.284)	
[8] Financial development*High Debt ratio							-2.576**
							(1.089)
[9] Low Income		0.019					
		(0.029)					
[10] High Income			0.011				
			(0.034)				
[11] Low Openness				0.052**			
				(0.021)			
[12] High Openness					0.074		
					(0.067)		
[13] Low Debt ratio						0.095	
						(0.108)	
[14] High Debt ratio							0.599**
							(0.258)
Observations/ Countries	976/46	458/44	518/45	534/36	442/26	554/40	422/36
Instruments	24	33	43	35	24	25	22
Hansen	0.629	0.217	0.479	0.317	0.365	0.567	0.872
AR1	0.000	0.010	0.036	0.009	0.062	0.001	0.000
AR2	0.985	0.429	0.691	0.454	0.565	0.576	0.987
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust Standard Errors are in parenthesis. The variables "Log. GDP growth ", "Financial Development Index "and "Log. Trade Openness over GDP" has been considered as endogenous across all model specifications. The variables "Log. Natural Rents ", " Log. Agriculture over GDP ", " Polity2 " have been considered as exogenous. Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Conclusion and policy implications

The main objective of this study was to analyze the relationship between financial development and tax revenue mobilization from theoretical and empirical perspectives in developing countries from 1995 to 2017. Our work contributes to the literature on this topic in several ways.

First, using an appropriate method, namely the GMM-system estimator, on a sample of 49 developing countries, we have shown that financial development contributes positively and significantly to non-resource tax revenue mobilization. This result is supported by an extensive set of robustness tests, including alternative tax revenue measures, additional covariates, and traditional measures of financial development for estimating the coefficient of our financial development variable.

Second, we explore the possible heterogeneity of our findings by disaggregating the sample based on various economic and structural characteristics. Financial development increases non-resource tax revenue mobilization more in “low-income” compared to “high-income” countries. Moreover, we reveal that the beneficial effect of financial development on non-resource tax revenue is more robust in the “high” financial openness compared to “low” financial openness. Besides, we emphasize that the favorable effect of financial development on non-resource tax revenue mobilization is significant exclusively when public debt is relatively low.

Finally, we extend our analysis to examine the effect of components of financial development on domestic tax revenue mobilization in developing countries. We find that financial markets, financial institutions, financial markets depth, financial institutions' depth, financial markets access, financial institutions access, and the financial institutions' efficiency positively and significantly influence the government's ability to raise tax revenue, except for the financial institutions market's efficiency. Given these results, this analysis provides straightforward and valuable policy recommendations. On the practical side, the highest effect of financial development in terms of tax revenue mobilization arises when combined with sound fiscal or monetary policy frameworks and in relatively more open and financially developed contexts. We believe that efforts should help developing countries, particularly low-income countries, build their financial systems to make valuable information easily accessible from these financial institutions. The low development of the financial sector has long

been identified as one of the most binding constraints on economic growth, especially in developing countries. In this regard, spurring the development of a country's financial sector not only helps improve economic growth but also contributes positively to domestic tax revenue mobilization, which may improve the country's social welfare at the same time.

Appendix C
Tables C1-C4.

Table C.1 1 Definition and sources of variables.

Variables	Descriptions	Sources
Tax revenue	Tax revenue divided by GDP	World Development Indicators (WDI)
Non-Resource Tax Revenue	It is Calculated as total tax revenue (excluding grants and social contributions) minus resource tax revenue (% GDP).	International Centre for Tax and Development (ICTD).
Non-Resource direct tax	Direct taxes including social contributions, excluding resource revenue	International Centre for Tax and Development (ICTD).
Total non-resource indirect taxes.	Total Indirect Taxes, excluding resource revenues. Includes taxes on goods and services, taxes on international trade and other taxes.	International Centre for Tax and Development (ICTD).
Financial Development Index	Index for overall financial development	IMF's Financial Development Index Database
GDP growth	The annual percentage growth rate of GDP at market prices is based on constant local currency.	World Development Indicators (WDI)
Agriculture	Share of agriculture in aggregate value-added.	World Development Indicators (WDI)
Trade Openness	Sum of exports and imports of goods and services, % of GDP.	World Development Indicators (WDI)
Population density	The midyear population is divided by land area in square kilometers.	World Development Indicators (WDI)
Government debt	It includes domestic and foreign liabilities such as currency and money deposits, securities other than shares, and loans.	World Development Indicators (WDI)
Inflation	The annual percentage change of consumer price index.	World Development Indicators (WDI)
External debt	Total external debt stocks, % of GDP (External public and private sector debt)	World Development Indicators (WDI)
FDI net inflows	It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments	World Development Indicators (WDI)
Aid	Net official development assistance and official aid received (constant 2016 US$	World Development Indicators (WDI)
Natural resource rents	Total natural resources rents (percentage of GDP)	World Development Indicators (WDI)
Remittances	Remittances in percentage of GDP	World Development Indicators (WDI)
Control of corruption	Control of corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as" capture" of the state by elites and private interests.	International Country Risk Guide (ICRG)
Polity2	Polity2 index	Polity4 Project
Capital openness index	It captures the degree of financial openness	(Chinn and Ito, 2008)
Liquid liabilities	Ratio of liquid liabilities to GDP	World Bank's Financial Structure dataset (FSED)
Central bank assets	Claims on the domestic real nonfinancial sector by the Central Bank as a share of GDP	World Bank's Financial Structure dataset (FSED)
Deposit money bank assets	Claims on the domestic real nonfinancial sector by deposit money banks as a share of GDP	World Bank's Financial Structure dataset (FSED)
Private credit by money banks	Private credit by deposit money banks to GDP	World Bank's Financial Structure dataset (FSED)
Private credit by money and other financial institutions	Private credit by deposit money banks and other financial institutions to GDP	World Bank's Financial Structure dataset (FSED)
Financial institutions	The "Financial institutions index	IMF's Financial Development Index Database
Financial markets	The Financial markets index	IMF's Financial Development Index Database
Financial institutions depth	The Financial institution's depth index	IMF's Financial Development Index Database
Financial institutions access	The Financial institution's access index	IMF's Financial Development Index Database
Financial institutions efficiency	The Financial institution's efficiency index	IMF's Financial Development Index Database
Financial markets depth	The Financial markets depth index	IMF's Financial Development Index Database
Financial markets access	The Financial markets access index	IMF's Financial Development Index Database
Financial markets efficiency	The Financial markets efficiency index	IMF's Financial Development Index Database

Table C.1 2 List of countries used in the analysis

Full Sample				
Angola	Burkina Faso	Indonesia	Morocco	South Africa
Albania	China	Jamaica	Myanmar	Thailand
Argentina	Colombia	Jordan	Namibia	Togo
Azerbaijan	Costa Rica	Lesotho	Nepal	Tunisia
Bangladesh	Cote d'Ivoire	Madagascar	Paraguay	Ukraine
Belarus	Dominican Republic	Malaysia	Peru	Zambia
Bhutan	Gabon	Mali	Philippines	
Botswana	Ghana	Mexico	Russian Federation	
Brazil	Guatemala	Moldova	South Africa	
Bulgaria	India	Mongolia	Sri Lanka	

Table C.1 3 Pairwise correlation between variables used in the analysis.

Variable	Tax revenue	Non-Resource Tax Revenue	Financial Development	GDP growth	Trade Openness	Natural rents	Inflation	Agriculture	Polity2
Tax revenue	1.000								
Non-Resource Tax Revenue	0.6009*	1.000							
Financial Development Index	0.1307*	0.3649*	1.000						
GDP growth	-0.0539*	-0.1609*	-0.0509*	1.000					
Trade openness	0.4038*	0.2713*	-0.1188*	-0.0260	1.0000				
Natural rents	0.1928*	-0.2464*	-0.2074*	0.1916	0.1242*	1.0000			
Inflation	0.0749*	0.0824*	-0.0520*	0.0684*	0.0774*	0.2160*	1.0000		
Agriculture	-0.4537*	-0.3968*	-0.4435*	0.1910*	-0.2204*	0.0024	-0.0202	1.0000	
Polity2	-0.0946*	-0.1102*	0.1318*	-0.1746*	-0.0969*	-0.2866*	-0.0733*	-0.1870*	1.0000

Table C.1 4 The effect of Financial Development on non-resource tax revenue with lags.

Dependent variable : Log. non-resource over GDP	**[1]**	**[2]**	**[3]**
log. non-resource over GDP (t-1)	0.756***	0.834***	0.834***
	(0.038)	(0.065)	(0.068)
log. non-resource over GDP (t-2)		-0.091*	-0.087
		(0.049)	(0.067)
log. non-resource over GDP (t-3)			-0.023
			(0.044)
Financial Development Index	0.040**	0.050**	0.056**
	(0.019)	(0.020)	(0.023)
GDP growth	0.004***	0.004***	0.004***
	(0.001)	(0.001)	(0.001)
Log. Trade Openness over GDP	0.058***	0.056***	0.056***
	(0.016)	(0.014)	(0.014)
Log. Natural resource rents over GDP	0.007	0.006	0.004
	(0.005)	(0.005)	(0.006)
Log. Agriculture over GDP	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)
Polity2	0.002	0.001	0.002
	(0.002)	(0.002)	(0.002)
Constant	0.436***	0.503***	0.564***
	(0.110)	(0.109)	(0.127)
Observations	976	931	887
Countries	46	46	46
Adjusted_R-squared	0.731	0.725	0.714
Fixed effects	Yes	Yes	Yes

Note: Robust Standard Errors are in parenthesis.
*Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01*

Chapter 4

Does Financial Market Access Affect Tax Revenue Instability ?

1 Introduction

Financial markets refer broadly to any marketplace where the trading of securities occurs. Financial markets trade in all types of securities and are critical to the smooth operation of a capitalist society. The literature on the financial market for financial development is still developing, with new definitions, determinants, and measurement procedures being suggested. Cho (2014) documents the factors facilitating or restricting financial market access. These include government partisanship, macro-economic policies, and institutional quality.

For instance, Cho (2014) finds left-of-center governments tend to suffer from more significant credibility problems in financial markets than right-wing governments because they are typically believed to pursue expansionary policies and have less respect for debt obligations. The measurement of financial market access remains an important issue for empirical studies because data on access to financial markets are scanter (see Čihák *et al.* 2012 and Svirydzenka, 2016) and focus on the stock market and debt market. To approximate access to stock and bond markets, measures of market concentration are used, the idea that a higher degree of concentration reflects more significant difficulties for access for newer or smaller issuers (Čihák *et al.*, 2012).

Financial market access can have substantial and important effects on tax revenue stability. Financial market access constitutes a potential way of dealing with revenue instability (Ebeke and Ehrhart, 2012). In doing so, they draw attention to the differences in access to financial markets and the problem of tax revenue instability. These financial market access difficulties matter; African countries often cannot resort to financial markets to smooth their revenue (Ebeke and Ehrhart, 2012). Indeed, according to Tomz (2007), international investors usually lack complete information about foreign governments' preferences and policy directions[43]. However, restoring financial market confidence is essential to prevent further capital flight in times of economic crisis.

Predicting policy outcomes can be complex in developing countries due to the lack of good data and transparency in policy-making (Rodrik, 1989; Broz, 2002; Vaaler,

[43]International investors face significant information asymmetry because it is costly for them to obtain detailed information on each country, especially when their portfolio is diversified to minimize investment risks (Calvo and Mendoza 2000; Santiso 2003)

Schrage and Block, 2006). Ebeke and Ehrhart (2012) hypothesize that having access to financial markets (domestic or international) affects tax revenue instability such that countries having access to financial markets have lower instability levels relative to those not having access. Tax revenue instability was the major cause of expenditure instability (Lim, 1983) and the instability of public investment and government consumption (Ebeke and Ehrhart, 2012). In this paper, we build on their findings by asking how differential access to the financial market affects countries' tax revenue instability. Public debt market access would have a real value effect on firms by affecting investment decisions.

Scholars and policymakers should be concerned about tax revenue stability and instability. Slow developing countries' tax revenue or outright declines are problematic for countries' economic growth and investments to achieve sustainable development objectives. According to Dye and Merriman, (2004), there are at least three reasons we should think carefully about measuring tax revenue stability. First, understanding revenue stability is important for budgetary planning. A "fiscal crisis" occurs when the revenue generated by the existing policy regime is insufficient to fund expenditures under that regime. However, as shown by Dye (2004), designing policies, such as rainy-day funds, to avoid fiscal crises requires estimates of revenue volatility over time. Second, suppose political or technical constraints exist on implementing cyclically balanced budgets. In that case, revenue authorities might want to design systems that increase stability even at the cost of other goals, such as efficiency and equity. [44] The third reason is that researchers might be interested in positively assessing whether there are systematic differences in public finance choices made under stable, as opposed to unstable, revenue regimes. [45] A large body of literature on the determinants of tax revenue instability has extensively analyzed the exogenous forces causing significant variations in tax revenue between countries. This literature explicitly recognizes that real tax revenues are less stable in developing countries than in developed countries

[44] For example, with the existing revenue systems in many states, it probably is not politically feasible to accumulate rainy-day funds sufficient to weather severe economic downturns. Thus, under current conditions, "fiscal crises" are likely to occur at irregular intervals. Arguably, policies enacted during fiscal crises may be systematically less efficient or equitable than those enacted at other times. If so, a useful designer of fiscal systems might choose a stable but relatively inefficient fiscal system over an unstable but more efficient design.

[45]For example, are states with volatile revenue systems less likely to undertake long-term public commitments? Are they more likely to contract out rather than perform tasks in-house? Does the size of the public sector differ systematically with volatility? Are more volatile revenue systems more or less generous to low-income residents?

due to many reasons, such as the agricultural sector's greater importance and dependence on exports of primary products whose prices are volatile. In light of these findings, evidence shows that real tax revenues are less stable in Least Developed Countries (LCDs) than in developed market economies. Bleaney, Gemmell and Greenaway (1995) stress that governments in developing countries are generally more concerned with tax revenue instability, probably because such instability leads to adverse consequences, including procyclical fiscal policy (Talvi and Vegh, 2005) or public investment and consumption volatility.

Despite researchers' efforts to better understand the factors governing tax revenue instability, particularly in developing countries (and poorest countries), the previous studies have overlooked or at least neglected one major factor. This included the financial market access. Following the development of endogenous growth models where financial market access plays an important role, there is also an interest in determining the influence of financial market access on tax revenue stability. Demirgüç-Kunt and Huizinga (2001) show that the financial sector represents significant value-added, employment, and potential tax revenues. Tax revenue stability could help these countries address these development challenges. Analyzing how financial market access affects tax revenue instability is essential in developing countries. Thus, developing countries' financial market access appears necessary in economic development because resort financial markets allow developing countries to smooth out their income. Therefore, we ask the following question: How does financial market access impact tax revenue instability in developing countries? We contribute to the literature by assessing the impact of financial market access on tax revenue instability in developing countries. As far as we are concerned, this is the first study to investigate the relationship between financial market access and tax revenue instability. Indeed, the relationship between financial market access and tax revenue instability is essential for policymakers. Policymakers want to know how to deal with tax revenue instability and how it affects investment decisions. Understanding this relationship will allow policymakers to assess whether financial market access will deal with tax revenue instability.

To explore the relationship between financial market access and tax revenue instability, we use the system-GMM estimator of Blundell and Bond (1998) that properly tackles

endogeneity. Our analysis conducted on a broad panel of 30 developing countries over the period 1996-2020 reveals the following:

(i) We confirm that financial market access decreases tax revenue instability.

(ii) Our finding is strengthened by a rich robustness analysis that includes alternative tax revenue instability, financial market access, and additional control variables.

The remainder of the paper is organized as follows. Section **2** reviews the previous literature and section **3** presents the empirical approach. Section **4** discusses the data and descriptives statistics, and section **5** discusses our empirical results. Section **6** investigates its robustness, section **7** explores possible heterogeneity in the effect of financial market access on tax revenue instability, and section **8** concludes.

2 Theoretical discussion

The fundamental role of a financial market is to serve as a source of financing for economic activities. In theory, Levine (1997) described financial markets as fulfilling several essential functions. The financial market can influence the rate of economic growth by altering productivity growth and the efficiency of capital. Similar to previous comprehensive analyses (Balima, Combes and Minea, 2016) etc.), we focus in this paper on bonds markets (debt markets) and stocks markets. The justification for this choice is the limited data on access to financial markets in developing countries (see Čihák *et al.*, 2012 and Svirydzenka, 2016) over the last two decades and the more significant role that stock and bond markets play. In the 1990s, policymakers focused on creating long-term government bond markets in domestic and foreign currencies. So far, little evidence exists of the effects of financial market access on tax revenue instability. Several articles have highlighted the significant role of exogenous shocks in explaining the outcomes of fiscal policy, especially the dynamics of tax revenues in developing countries (Adams and Behrman, 1982; Tanzi, 1986; Talvi and Vegh, 2005; Böwer, Geis and Winkler, 2007; Narayan and Liu, 2011; Solimano and Guajardo, 2017). In the same vein, Gnangnon and J. Brun (2019) provided empirical evidence that the type of tax reform involving a convergence of the revenue structure of developing countries towards that of developed countries induces less instability in tax revenues. The authors argue that by reducing the share of international trade tax revenue in total tax revenues (in the tax structure), tax reform contributes to mitigating fluctuations in tax revenues. Indeed, international trade tax revenues depend on the value of imports and exports, whose prices are subject to the uncertainties of international trade markets. This chapter complements these works by studying the effect of access to financial markets on tax revenue instability. However, we do not argue here that access to financial markets would affect tax revenue instability by directly reducing the occurrence of these shocks or mitigating the effects of shocks on the economy.

On the contrary, we postulate firstly that access to financial markets can affect tax revenue instability, given that financial market access allows for tax smoothing. Secondly, we argue that financial market access can impact tax revenue instability through economic activity growth (or a broader tax base), given the relationship

between financial market access and economic growth (or tax revenues). Below, we discuss how financial market access can affect tax revenue volatility through these different channels[46]. For, example, Ebeke and Ehrhart (2012) emphasized the critical importance of access to financial markets, as it enables tax smoothing (the primary objective being to ensure a stable and predictable revenue base for the government, facilitating long-term budget planning and the achievement of economic and social objectives). Access to financial markets can generate other taxes, such as capital gains and income taxes.

Tax revenues provide valuable information about the government's solvency for investors (both domestic and international). As such, access to financial markets can help governments establish credibility and reputation regarding their ability to honor long-term obligations to investors (World Bank 2001). Moreover, attracting new investors to financial markets may encourage governments to improve their fiscal performance by reforming the tax system and combating tax evasion and corruption. Consequently, this will result in a significant decrease in tax revenue instability. In an innovative analysis of the relationship between introducing a sovereign bond market (BM) and tax revenue mobilization behavior in developing countries' revenues, Balima, Combes and Minea (2016) explore the effect of BM participation on the composition and instability of tax revenues. By employing various propensity score matching (PSM) methods and based on probit regression, they reveal that BM participation significantly reduces tax revenue instability, particularly internal fiscal instability in developing countries. BM participation can decrease tax revenue instability by a range between 12% and 19%, and even more if exclusively considering countries with tax revenues exceeding the median level. The authors concluded that BM participation increases internal taxes; conversely, the effect of BM participation on international trade taxes is considerably weaker in significance and magnitude. The volatility of tax revenues is indeed costly as taxes are distortionary and lead to reductions in output that increase non-linearly with the tax-to-output ratio. Increasing tax revenues could deplete the economy's short-term fiscal capacity, resulting in a

[46]The economic effects of financial markets access are multiple. They influence the mobilization of tax revenue, inflation, external debt, investment, and economic growth. There is much empirical literature which finds a positive effect of bond markets on fiscal outcomes, economic growth, and investment.

slowdown and placing the economy on the downward portion of the Laffer curve. Therefore, governments may finance wars or social programs during severe recessions, utilizing debt to smooth the profile of tax revenues over time.

Based on the literature, we posit that access to financial markets may impact tax revenue instability through enhanced economic activity (or a broader tax base). The economic activity channel is justified by the financial market system's ability to broaden financing channels for businesses and governments, thereby improving the efficiency of financial resource allocation (Ma and Lv, 2023). Access to financial markets can positively impact overall economic activity by fostering investment and economic growth. A more dynamic and expanding economy can generate higher tax revenues from various sources, such as income taxes, corporate profits, and financial transactions. This increase in tax revenues can help reduce tax revenue instability by ensuring a more stable income stream for the government. For example, Harford and Uysal (2014) find that access to financial markets affects business (or household) investment decisions. In turn, Alfaro *et al.* (2004); Hermes and Lensink (2003) and Carkovic and Levine (2005) show that economies with better-developed financial markets can benefit more from FDI to promote their economic growth. Mu, Stotsky and Phelps (2013) show that a long-maturity BM is more appropriate for financing long-term government infrastructure projects and can also sustain economic stability by providing funds that could finance fiscal stimuli during economic downturns. Likewise, a financial market access affect investment decision.

Access to financial markets can encourage businesses to invest more by providing more diversified financing opportunities. Companies can finance their investment projects using external funding sources, such as issuing stocks or bonds. This can stimulate economic activity and increase business tax revenues, thereby stabilizing tax revenue. Access to financial markets can also influence household investment decisions. Individuals may be incentivized to invest in financial assets such as stocks or bonds when financial markets are accessible and offer attractive returns. These investments can generate capital gains or interest income, often subject to taxation. Therefore, increased household investments can increase tax revenues from income and capital gains taxes, thus contributing to tax revenue stability.

3 Empirical approach

3.1 Empirical specification

To understand the effects of financial market access on the tax revenue instability we estimate the following regression, which builds on previous few studies on the determinants of instability of tax revenue (Lim, 1983; Bleaney, Gemmell and Greenaway, 1995; Ebeke and Ehrhart, 2012) :

$$\boldsymbol{Tax\ rev\_instab_{i,t} = \alpha + \beta_1 * Tax\ rev\_instab_{i,t-1} + \beta_2 * Fin\_MA_{i,t} + \beta_3 * X_{i,t} + \mu_i + \gamma_t + \varepsilon_{i,t}} \quad \textbf{(1)}$$

where the subscript $\boldsymbol{i}$ represents a developing country and $\boldsymbol{t}$ the time period. The analysis used an unbalanced panel dataset (based on available data) containing 30 developing countries over the period 1996-2020. Following the macroeconomic literature, the volatility variables used in the model (1) have been computed as the standard deviation of each over non-overlapping 5-year sub-periods. These sub-periods are 1996–2000, 2001–2005, 2006–2010, 2011–2015 and 2016–2020. Consequently, all other variables (non-volatility variables) used in the analysis have also been calculated over the non-overlapping subperiods of 5 years. α, β_1, β_2 and β_3 are unknown parameters to be estimated. μ_i and γ_t are the country and time fixed effects, and ε_{it} an error term. Table D.1 defines and sources all variables used in eq.(1). Table D.3 displays the standard descriptive statistics on these variables, and Table D.2 presents the list of countries used in the analysis.

$Tax\ rev\_instab_{it}$ represents the measure of non-resource tax revenue instability. Following Bekaert, Harvey and Lundblad (2006), we define the tax revenue variability, $Stdev_{i,t+5}$, as the standard deviation of the tax revenue variability estimated over 5 years, that is, with$\{ y_{i,t+1}\}$, j = 1, …, 5. The one-period lag of this variable has been included in the eq. (1) to capture the potential state-dependence nature of tax revenue instability. In fact, Bond (2002) has argued that even if the coefficient of the lagged dependent variable(s) is not the main coefficient of interest in the analysis, allowing for dynamics in the underlying process may be crucial for recovering consistent estimates of other parameters in the model. $Fin\_MA_{i,t}$ represents the level of financial market access for the country *i* in period *t*. $Tax\ rev\_instab_{i,t-1}$ is a lagged variable that measures the memory effect of the tax revenue instability process in country i at time t-1. $\boldsymbol{\beta_1}$ is the coefficient of lagged non-resource tax revenue instability (tax

revenue/ GDP). X is the vector of control variables associated with tax revenue instability and are as defined in the previous section.

3.2 Estimation technique

The model specification and the control variable are largely inspired by Lim (1983), Bleaney, Gemmell and Greenaway (1995), Ebeke and Ehrhart (2012), and regarding the determinants of the tax revenue instability. The main estimation models are two-step System-GMM models with Windmeijer corrected robust standard errors, using orthogonal deviations for unbalanced data with missing values, as Roodman (2009) recommended. A significant concern when estimating equation *(1)* is the potential endogeneity. We must solve three main problems to estimate equation *(1)* consistently. First, the error term incorporates unobserved country heterogeneities λ_i, inducing a bias of the omitted variables if correlated with the other explanatory variables. Second, there is a causality bias due to the correlation between the error term and financial market access variable. The biggest challenge of empirical work is establishing a causal link between financial market access and tax revenue instability. Third, this equation (1) could generate dynamic endogeneity bias concerns because of the lagged value of the tax revenue instability variable among the explanatory variables; it can be correlated with the error term. System GMM is very common when estimating fiscal equations because most such studies have "Large-N, Small-T" samples, in which there is dynamic severe panel bias by estimating the parameters in both first differences and levels while instrumenting the lagged-DV in differences and levels. We also apply Roodman's criterion by limiting the number of instruments to no more than the number of individuals, and the number of lags is limited to a maximum of one, as in Jacolin, Keneck Massil and Noah (2021). Moreover, we use the Windmeijer (2005) finite-sample correction to avoid downward-biased standard errors and reduce the possibility of spurious precision. Finally, to avoid the eventual problem of non-stationarity of some variables eventually tax revenue indicator—as the period of the analysis runs from 1996 to 2020, i.e., 25 years—and mitigate spurious regressions concern, we follow Combes and Ebeke (2011); Docquier *et al.* (2016); Fosu and Abass (2020); Pleninger and Sturm (2020); Apeti and Edoh (2023) by reorganizing our panel data into five sub-periods of 5 non-overlapping years. Thus, using five-year averages allows us to obtain more efficient estimates.

4 Data, and descriptives statistics

We use an annual panel of 30 developing and emerging countries from 1996 to 2020 to assess the effect of financial market access.[47] We drop all developed countries from the analysis as they exhibit strong government ratings. Moreover, this allows me to increase the homogeneity of the sample. Since some data are unavailable for all countries or periods, the panel data are unbalanced, and the number of observations depends on the choice of explanatory variables.

4.1 Data

For the measure of instability, our dependent variable is the instability of non-resource tax revenue. The non-resource tax revenue is from the International Centre for Tax and Development (ICTD). The measure of the instability follows the approach of Bekaert, Harvey and Lundblad (2006), which define the tax revenue variability, $Stdev_{i,t+5}$, as the standard deviation of the tax revenue variability estimated over five years, that is, with$\{ y_{i,t+1}\}$, j = 1, …, 5. Since we are mainly interested in the effect of financial market access on tax revenue instability, we use various measures to capture the effects of the various channels of influence discussed above. In this paper, we consider two measures of financial market access: sovereign bond spread and sovereign debt rating. Sovereign debt rating assesses credit risk, i.e., the possibility that the debtor will not fulfil its obligations in full and on time (Ferrucci, 2003). For sovereign debt, the default risk depends on the issuer's fundamental characteristics and the lender's ability to enforce the contract. The bond spread reflects market risk (the possibility that secondary market bond prices may move against the bondholder) and liquidity risk (the risk that investors cannot liquidate their portfolios without depressing secondary market prices). The proponents of the efficient market hypothesis argue that investors are rational and able to exploit all the available information to discriminate among borrowers. Edwards (1983) highlights that asset prices always reflect publicly available information, as evidenced by the yield differential on bonds issued by sovereign borrowers with different credit ratings and macroeconomic characteristics. If the efficient market hypothesis holds, investors and rating agencies share the same

[47] Our data are organized into 5 non-overlapping 5-year averages.

interpretation of public information about sovereign risks (Cantor and Packer, 1996). However, the opponents of this hypothesis emphasize that market failures and imperfect information lead to distortions in asset pricing (Calvo and Mendoza, 1996; Chari and Kehoe, 2003). Better financial market access leads to lower bond spreads and higher sovereign debt ratings.

For the set of control variables, we include the standard determinants of the instability of taxes that have been suggested in the literature (Lim, 1983; Bleaney, Gemmell and Greenaway, 1995; Ebeke and Ehrhart, 2012; Balima, Combes and Minea, 2016; Gnangnon and J.-F. Brun, 2019) and additional potential correlates. We retain several key factors, including structural factors: GDP per capita, trade openness and natural resource rent. Other determinants comprise GDP per capita instability, the occurrence of elections and the Government stability. A detailed description of these variables can be found in Appendix D.1. Appendix D.3 provides summary statistics. The **variable GDP per capita** is controlled in the first place. It controls the level of economic development. Non-resource tax revenue instability is closely correlated with the level of economic development.

We expect a negative association between the level of economic development (GDP per capita) and tax instability, considering it a proxy for risk management and production diversification, which can mitigate volatility. The variable GDP per capita is controlled in the first place. It controls the level of economic development. Non-resource tax revenue instability is closely correlated with the level of economic development. We expect a negative association between the level of economic development (GDP per capita) and tax instability, considering it a proxy for risk management and production diversification, which can mitigate volatility. **The share of exports and imports** measures the degree of openness. Trade openness should also impact tax revenue instability, but its expected sign is controversial. On the one hand, trade openness may serve as a proxy for a policy of openness, indicating a commitment to better economic management and robust institutions for competitiveness. On the other hand, trade openness may be a proxy for 'natural openness,' heightening the vulnerability of a small open economy to external shocks. Consequently, the sign of the coefficient of the trade openness variable (exports plus imports divided by GDP) remains ambiguous. Lastly, we anticipate a positive association between **natural resource rent** levels and tax revenue instability due to the known high volatility of

natural resource prices**.** The measure of natural resource rent utilized environmental economic data from the World Bank, incorporating the cost of production and global prices. The **election variable** was sourced from the Database of Political Institutions.

4.2 Descriptive statistics

The first look at the relationship between tax revenue instability and financial market access (measured by the bond spreads and sovereign debt rating) can be revealed by exploring the unconditional correlation between these two variables. Better financial market access leads to lower bond spreads and higher sovereign debt ratings. Results of column [1] of Table D.4 in Appendix D, which presents the unconditional correlation between these two variables- reveal that financial market access is negatively and significantly correlated with tax revenue instability at the 1% confidence level. In Figure 5.1 below, we first outline the relation between tax revenue instability and our two financial market access variables.

Figure 5. 1 Tax revenue instability and Sovereign debt rating (& Emerging market bond spreads).
Author's calculations using DataStream, and a cross-country database of fiscal space, and ICTD GRD, 2019

Next, we look at tax revenue instability in the developing and developed countries. We graphically analyze some key statistics offered in Figure 5.2 A closer look at this figure reveals a difference in the instability of tax revenue between developing and developed countries. Indeed, developed countries exhibit a median (the middle line of the box), 25th (bottom hinge of the box,) and 75th (top hinge of the box) percentiles of tax revenue instability lower than developing countries. This finding is justified because the box's median line, bottom hinge, and top hinge for developed countries are below

those of developing countries. While this figure exhibits a difference between developed and developing countries, it cannot assess its magnitude or significance. Thus, to judge the significance of the difference between these two groups of countries, we then rely on statistics from tests of difference in means. Table 5.1 (Panel (A), which tracks these statistics by comparing the average tax revenue instability in the two groups of countries, reveals that financial access appears to reduce tax revenue instability.

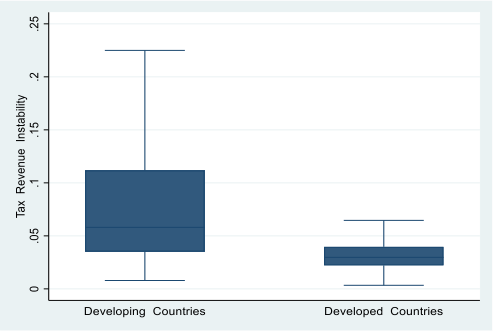

Figure 5. 2 Tax revenue instability by income group. Note: In box plots, the lower and upper hinges of each box show the 25th and 75th percentiles of the samples, the line in the box indicates the respective medians, and the endpoints of whiskers mark next adjacent values.

Table 5. 1 Tax revenue instability by income group: mean-comparison tests

	Developed countries	Developing countries	Diff	Ttest	P-value
Panel. A	0.0358	0.0849	0.0491	11.2907	0.000

5 Empirical results

This section presents the results of the impact of financial market access on tax revenue instability. Table 5.2 presents the results for specification 1, using the dynamic panel two-step system GMM estimations. The statistical tests do not invalidate the econometric method: the null hypotheses of the Sargen/Hasen and AR (2) tests are accepted. Moreover, the positive coefficient of the lagged dependent variable highlights an inertia effect that legitimates the dynamic panel specification. Column [7] is the baseline model, including the lagged tax revenue instability variable, sovereign debt ratings, GDP per capita, GDP per capita instability, trade openness,

natural resource rent, government stability, and election year dummy. The estimated coefficient of the lagged tax revenue instability variable is negative and statistically significant at a 1% level. The coefficient of sovereign debt ratings is negative and statistically significant at the 1% level. Sovereign debt rating has a significant and negative effect on tax revenue instability. One unit increase in sovereign debt rating is associated with a 0.32 percentage point decrease in tax revenue variability. The more a country is characterized by a significant sovereign debt rating (increase in the level of its sovereign debt ratings), the more there will be an increase in the flow of non-renewable tax revenue. The well-functioning financial sector (banking system, stock market, bond market activity, etc.) of the developing countries enables tax collection by the administration and the payment of taxes by taxpayers. As for the control variables, trade openness and the level of natural resource rent positively and significantly impact tax revenue instability.

Table 5. 2 Baseline: The effect of Financial market access on non-resource tax revenue

Dependent Variable	**Tax revenue instability over GDP**						
Regressions	Reg1	Reg2	Reg3	Reg4	Reg5	Reg6	Reg7
Lag (Tax instability)	0.3796***	0.3721***	0.3722***	0.3839***	0.3605***	0.3242***	0.4561***
	(0.1132)	(0.1138)	(0.1247)	(0.1088)	(0.1356)	(0.1092)	(0.0975)
Sovereign rating	-0.3759***	-0.3766***	-0.3368**	-0.3058***	-0.3268***	-0.3754**	-0.3222***
	(0.1357)	(0.1286)	(0.1339)	(0.0995)	(0.1177)	(0.1807)	(0.1072)
GDP per capita		-0.0236	-0.0173	-0.0549	-0.0850	-0.0982	0.0032
		(0.0732)	(0.0846)	(0.0917)	(0.1108)	(0.1095)	(0.1192)
GDP per capita_instability			-0.0000	0.0000	-0.0000	-0.0000	-0.0001
			(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Trade openness				0.0060***	0.0061***	0.0058***	0.0048**
				(0.0022)	(0.0016)	(0.0019)	(0.0020)
Natural resources					0.0232**	0.0276**	0.0204*
					(0.0118)	(0.0134)	(0.0112)
Government stability						0.0333	0.0232
						(0.0393)	(0.0474)
Elections Year							-0.5539
							(0.3621)
Constant	1.2477***	1.4791*	1.3536	1.2481	1.9404*	1.9303*	1.0483
	(0.3888)	(0.8275)	(0.9145)	(0.9046)	(1.0995)	(1.1710)	(1.3538)
Observations	133	133	133	133	133	133	130
Countries	30	30	30	30	30	30	29
Instruments	19	19	19	21	27	26	25
Time/country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hansen	.4891	.393	.3227	.3665	.4354	.3823	.4592
AR1	.0109	.0108	.0152	.0109	.0178	.0182	.0105
AR2	.4923	.4785	.4835	.5485	.5824	.5218	.7109

Note: Robust Standard Errors are in parenthesis. The variables "GDP per capita ","Sovereign debt rating ","natural resources" and "Log. Trade Openness over GDP" has been considered as endogenous across all model specifications. Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01

6 Robustness checks

Our baseline result is that financial market access significantly reduces tax revenue instability in the developing countries in our sample. It is important to note that this finding is obtained in a model that verifies the assumptions of the dynamic panel two-step system GMM model. As illustrated by Table 5.3, the null hypotheses of the Sargen/Hasen and AR (2) tests are accepted. At the same time, the positive coefficient of the lagged dependent variable highlights an inertia effect that legitimates the

dynamic panel specification. In the subsequent analysis, we evaluate the robustness of the significant impact of financial market access on the volatility of tax revenue instability in various approaches.

6.1 Additional controls

We extend the baseline specification (column [7] in Table 5.2) to incorporate additional covariates that may affect tax revenue instability. We add these additional covariates into the main specification to address the issue of omitted variables. Firstly, we incorporate two widely referenced variables, namely, the GDP growth rate (Growth) and the inflation rate (Inflation), to account for the overall macroeconomic conditions prevailing in an economy. Secondly, we account for the public debt ratio (Public debt), which is determined by dividing government debt by GDP. Thirdly, we also control for banking crisis (Banking crisis), a dummy variable that takes the value of 1 if a country experiences a banking crisis for a given year. Banking crises, characterized by significant disruptions in the financial system, have the potential to exert a substantial influence on tax revenue instability. These crises can lead to a decline in economic activity, decreased tax compliance, and heightened government expenditures on bailouts or measures to stabilize the financial sector. Furthermore, banking crises can disrupt financial intermediation and impede the collection of tax revenues. Fourthly, we account for the impact of country size by introducing the logarithm of total population (Population). This variable considers the disciplining effect that country size has on fiscal policy volatility, as highlighted in studies by Afonso, Agnello and Furceri, (2010) and Agnello and Sousa, (2014). Fifthly, we integrate financial openness (Financial openness) into our analysis to manage a country's vulnerability to financial shocks. The KAOPEN index, alternatively known as the "Ito-Chinn index," developed and regularly updated by Chinn and Ito (2008), is a proxy for financial openness in this context. This fifth point emphasizes the impact of financial openness on tax revenue instability by examining the degree to which the capital account is open. Economic fluctuations resulting from capital movements can affect businesses, investment patterns, and overall economic performance, directly influencing tax revenue. Financial openness also creates opportunities for tax avoidance and evasion, as companies and individuals may exploit loopholes in international financial systems to minimize tax liabilities, thereby contributing to revenue instability (see, (Stiglitz,

2000; Amin *et al.*, 2014; Ma and Lv, 2023)). Sixthly, incorporating migrants' remittances (% of GDP) as a control variable, we account for the potential influence of these inflows on the economic resources of recipient countries and their capacity to generate tax revenue. Previous research by Ebeke and Ehrhart (2012) highlights the significant contribution of remittances to both the level and stability of the government's tax revenue ratio in recipient countries. Lastly, we enhance our analysis by incorporating additional control variables related to government institutions, namely the level of democracy and control of corruption. These variables are introduced to account for the influence of institutional factors. Surprisingly, our findings indicate that these variables do not have a statistically significant effect on tax revenue instability.

Table 5. 3 Robustness: Financial market access and tax revenue instability (additional controls)

Dependent Variable	**Tax revenue instability**										
Regressions	Reg1	Reg2	Reg3	Reg4	Reg5	Reg6	Reg7	Reg8	Reg9	Reg10	Reg11
Lag (Tax instability)	0.4561***	0.3619***	0.4595***	0.4559***	0.3527**	0.4619***	0.3932***	0.4604***	0.3282***	0.3727***	0.4383***
	(0.0975)	(0.1059)	(0.1779)	(0.1008)	(0.1452)	(0.0906)	(0.1387)	(0.0934)	(0.1173)	(0.0586)	(0.0894)
Sovereign debt rating	-0.3222***	-0.4334***	-0.9399***	-0.3150***	-0.7598**	-0.3194***	-0.4966**	-0.3022**	-0.2797**	-0.3442***	-0.3553***
	(0.1072)	(0.1277)	(0.3138)	(0.1127)	(0.3727)	(0.1010)	(0.2131)	(0.1252)	(0.1283)	(0.1235)	(0.1302)
GDP per capita	0.0032	-0.1695	0.5234	0.0099	-0.0508	-0.0161	0.0175	-0.0518	0.0008	-0.0136	-0.1650
	(0.1192)	(0.2597)	(0.3532)	(0.1192)	(0.1682)	(0.0897)	(0.1814)	(0.1085)	(0.1636)	(0.1253)	(0.1215)
GDP per capita instability	-0.0001	0.0005**	0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0000	-0.0001	0.0001
	(0.0001)	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Trade openness	0.0048**	0.0038	-0.0138	0.0047**	0.0110**	0.0049***	0.0136***	0.0037	0.0038	0.0051**	0.0085**
	(0.0020)	(0.0033)	(0.0125)	(0.0018)	(0.0052)	(0.0017)	(0.0047)	(0.0024)	(0.0031)	(0.0022)	(0.0036)
Natural resources	0.0204*	0.0110	-0.0528	0.0205*	0.0074	0.0219*	0.0164	0.0214	0.0350***	0.0236**	0.0092
	(0.0112)	(0.0185)	(0.0518)	(0.0114)	(0.0184)	(0.0114)	(0.0110)	(0.0132)	(0.0113)	(0.0118)	(0.0123)
Government stability	0.0232	-0.0720	0.2482	0.0242	0.0398	0.0241	0.0386	0.0185	0.0477	0.0043	0.0249
	(0.0474)	(0.0790)	(0.2214)	(0.0480)	(0.0619)	(0.0486)	(0.0343)	(0.0478)	(0.0418)	(0.0485)	(0.0448)
Elections Year	-0.5539	0.3909	0.3816	-0.5809*	0.7324	-0.5194	1.0046	-0.5745	-0.5416	-0.4656	1.5935
	(0.3621)	(0.5451)	(0.5175)	(0.3448)	(1.8361)	(0.3786)	(0.6953)	(0.4389)	(0.9105)	(0.2972)	(1.8954)
Economic growth		-0.0268*									
		(0.0145)									
Inflation instability			-0.0014								
			(0.0016)								
Inflation Targeting				-0.0456							
				(0.0729)							
Public debt					-0.4196*						
					(0.2421)						
Banking crises dummy						-0.1203					
						(0.1148)					
Logarithm of population							0.1012*				
							(0.0610)				
Financial openness								0.1963*			
								(0.1073)			
Remittances									0.0029		
									(0.0064)		
Control corruption										0.0109	
										(0.0499)	
Democracy											-0.0362
											(0.0428)
Constant	1.0483	3.3365	-3.3962	1.0078	3.4591*	0.8257	-1.1265	1.4850	0.5197	1.4226	2.4895**
	(1.3538)	(2.7066)	(4.2540)	(1.3410)	(1.9602)	(1.0359)	(2.5563)	(1.2846)	(1.5926)	(1.3541)	(1.2190)
Observations/countries	130/29	130/29	121/27	130/29	122/29	130/29	130/29	130/29	121/27	130/29	125/28
Instrument	25	27	20	26	24	26	28	26	24	29	24
Time/country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hansen	.4592	.7695	.894	.48	.4059	.4389	.7563	.3853	.6897	.4964	.7124
AR1	.0105	.007	.0489	.0098	.0159	.009	.0165	.0109	.024	.0042	.006
AR2	.7109	.8139	.4722	.7328	.6164	.6309	.4526	.869	.5762	.5801	.26

*Note: Robust Standard Errors are in parenthesis. The variables "GDP growth ", "GDP per capita ","Sovereign debt rating ","natural resources"," inflation", " public debt" and "Log. Trade Openness over GDP" has been considered as endogenous across all model specifications. Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01*

6.2 Alternative measures of the main variables

6.2.1 Alternative measures of financial market access

Our main estimates employ sovereign debt ratings to measure financial market access. However, related literature often uses a second measure, sovereign bond spreads, to gauge market access. Bond spreads encompass market risk (price fluctuations on the secondary market) and liquidity risk (investors' ability to liquidate portfolios without significantly affecting secondary market prices). We utilize sovereign bond spreads as a second measure to test result sensitivity. The findings in Column [2] of Table 5.4 align with our baseline observations. Notably, the average reduction in tax revenue volatility following financial market access is smaller (in absolute terms) for sovereign bond spreads compared to sovereign debt ratings (0.12 versus 0.32 percentage points on average). The observed difference in the reduction of tax revenue instability between sovereign bond spreads, and sovereign debt ratings may be explained by the distinct information conveyed by these metrics. Sovereign debt ratings predominantly evaluate credit risk, indicating the likelihood of default based on fundamental issuer characteristics and contractual enforcement.

In contrast, sovereign bond spreads encompass both market risk and liquidity risk. The smaller reduction in tax revenue volatility with bond spreads suggests that, while credit risk is significant, market dynamics and liquidity considerations inherent in spreads may introduce additional complexities or nuances influencing the overall impact on fiscal stability. Further exploration of the specific market conditions and liquidity aspects tied to bond spreads could offer deeper insights into this observed difference. Furthermore, we employ a new index for measuring access to financial markets using the Financial Structure and Economic Development Dataset. The results in Column [3] of Table 5.4 align with our baseline findings.

Table 5. 4 Robustness: alternative measure of financial market access

Dependent Variable	Tax revenue instability over GDP		
Regressions	Reg1	Reg2	Reg3
L. Tax revenue instability	0.4561***	0.2345**	0.4404***
	(0.0975)	(0.1034)	(0.0683)
Sovereign debt rating	-0.3222***		
	(0.1072)		
Sovereign bond spreads		0.1223***	
		(0.0417)	
Financial Market Access			-0.2117***
			(0.0683)
GDP per capita	0.0032	-0.1835*	-0.0393
	(0.1192)	(0.1097)	(0.0744)
GDP per capita_instability	-0.0001	0.0000	-0.0001**
	(0.0001)	(0.0001)	(0.0000)
Trade openness	0.0048**	0.0055**	0.0022
	(0.0020)	(0.0025)	(0.0034)
Natural resources	0.0204*	0.0205	0.0342***
	(0.0112)	(0.0129)	(0.0094)
Government stability	0.0232	0.0257	0.0316
	(0.0474)	(0.0437)	(0.0221)
Elections Year	-0.5539	-0.2534	-0.4385
	(0.3621)	(0.2634)	(0.2673)
Constant	1.0483	1.0590	0.9658*
	(1.3538)	(1.1660)	(0.5364)
Observations	130	112	130
Countries	29	29	29
Instruments	25	28	28
Time/country fixed effects	Yes	Yes	Yes
Hansen	.4592	.5551	.4038
AR1	.0105	.0312	.0042
AR2	.7109	.7009	.7141

Note: Standard Errors are in parenthesis. The variables "GDP per capita ", "Sovereign debt rating ", "Sovereign bond spreads ", " Financial Market Access", "natural resources" and "Log. Trade Openness over GDP" has been considered as endogenous across all model specifications.
Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01

6.2.2 Alternative measures of tax revenue instability

Firstly, the robustness of the results is tested concerning the choice of the window in Table 5.5. The instability of tax revenue is calculated over moving windows of 4, 3, and 2 years instead of the original 5-year window. The results from these three new dependent variables reveal the non-sensitivity of the conclusions to the window choice, as all coefficients remain significant (at 1%) and close to those in Table 5.5. Secondly, Fatás and Mihov's (2013) residual approach is employed to estimate tax revenue instability compared with existing studies. Tax revenue instability is defined as the standard deviation (over a 5-year moving window) of the residual from a regression where its lag and time trend explain the logarithmic difference of tax revenue. The regression considers the growth rate of tax revenue, economic growth rate (based on

real GDP), and other determinants (inflation, squared inflation for better-capturing inflation dynamics, and a deterministic time trend for unobserved temporal variables). Using GMM estimators, the effect of financial market access is estimated based on this new instability measure. Tables 5.5 and 5.6 show a negative effect of financial market access on tax revenue instability, with coefficients close to the baseline results.

Table 5. 5 Financial market access and tax revenue instability: changing the moving window

Dependent Variable	Tax revenue instability (5-year moving windows)	Tax revenue instability (4-year moving windows)	Tax revenue instability (3-year moving windows)	Tax revenue instability (2-year moving windows)
Regressions	(1)	(2)	(3)	(4)
Lagged. Tax revenue instability	0.4561***	0.2766***	0.2581***	0.2529***
	(0.0975)	(0.0628)	(0.0283)	(0.0557)
Sovereign debt rating	-0.3222***	-0.2913***	-0.2701***	-0.2262***
	(0.1072)	(0.1074)	(0.0594)	(0.0463)
GDP per capita(log.)	0.0032	-0.0660	-0.1502***	-0.1032**
	(0.1192)	(0.0650)	(0.0491)	(0.0483)
GDP per capita_instability	-0.0001	-0.0001**	0.0000	0.0000
	(0.0001)	(0.0000)	(0.0001)	(0.0000)
Trade openness	0.0048**	0.0056***	0.0051***	0.0043***
	(0.0020)	(0.0012)	(0.0013)	(0.0012)
Natural resources	0.0204*	0.0268***	0.0203***	0.0161***
	(0.0112)	(0.0062)	(0.0048)	(0.0040)
Government stability	0.0232	0.0039	0.0070	0.0153
	(0.0474)	(0.0219)	(0.0203)	(0.0201)
Elections Year	-0.5539	0.0003	0.4609	0.2751
	(0.3621)	(0.4706)	(0.2943)	(0.2858)
Constant	1.0483	1.4046*	2.2142***	1.3936***
	(1.3538)	(0.8330)	(0.4884)	(0.4625)
Observations/ Countries	130/29	131/29	133/29	135/30
Instruments	25	26	27	24
Time/country fixed effects	Yes	Yes	Yes	Yes
Hansen	.4592	.2932	.3944	.1358
AR1	.0105	.0209	.0294	.0052
AR2	.7109	.8872	.89	.9924

Standard errors in brackets. *** p < 0.01, ** p< 0.05, * p< 0.1. Note: The differences between observations in this table and those in Table 2 are mainly due to the manner the outcome variable is computed. Table 2 uses a 5-year moving window while, here, we use 4-, 3-, and 2-year moving windows, respectively.

Table 5. 6 Financial market access and tax revenue instability: alternative measure of instability

Regressions	(1)	(2)
Dependent Variable	Tax revenue instability (5-year moving windows)	Tax revenue instability (Residual Approach)
Lagged. Tax revenue instability	0.4561***	0.2504***
	(0.0975)	(0.0470)
Sovereign debt rating	-0.3222***	-0.1743***
	(0.1072)	(0.0590)
GDP per capita(log.)	0.0032	-0.0752*
	(0.1192)	(0.0404)
GDP per capita_instability	-0.0001	0.0002***
	(0.0001)	(0.0001)
Trade openness	0.0048**	0.0024
	(0.0020)	(0.0019)
Natural resources	0.0204*	0.0216***
	(0.0112)	(0.0037)
Government stability	0.0232	0.0116
	(0.0474)	(0.0161)
Elections Year	-0.5539	-0.4114
	(0.3621)	(0.3301)
Constant	1.0483	1.0522**
	(1.3538)	(0.4140)
Observations/ Countries	130/29	150/30
Instruments	25	28
Time/country fixed effects	Yes	Yes
Hansen	.4592	.494
AR1	.0105	.0164
AR2	.7109	.5642

Standard errors in brackets. *** p < 0.01, ** p< 0.05, * p< 0.1. **Note:** The differences between observations in this table and those in Table 2 are mainly due to the manner the outcome variable is computed. Table 2 uses a 5-year moving window while, here, we use Fatás and Mihov residual approach .

6.3 Dropping country-year observations in the top 1% and bottom 1% of sovereign debt ratings

The results where country-year observations in the top 1% and bottom 1% of sovereign debt ratings are dropped out in the analysis are reported in Table 5.7 for the full, up, and down samples, respectively. We do so to reduce the influence of outliers with very high and low sovereign ratings. Extreme values of sovereign debt ratings do not drive the results; they are quite qualitative and quantitatively robust.

Table 5. 7 Robustness: dropping country-year observations in the top 1% and bottom 1% of sovereign debt ratings

Regressions	(1)	(2)
Dependent Variable	Top 1%	Bottom 1%
Lagged. Tax revenue instability	0.4023***	0.3472***
	(0.0699)	(0.0447)
Sovereign debt rating	-0.3260***	-0.3209***
	(0.1053)	(0.0604)
GDP per capita(log.)	-0.0647	-0.0779
	(0.0645)	(0.0585)
GDP per capita_instability	-0.0000	-0.0001
	(0.0000)	(0.0000)
Trade openness	0.0056***	0.0047***
	(0.0014)	(0.0011)
Natural resources	0.0290***	0.0308***
	(0.0058)	(0.0060)
Government stability	0.0299	0.0044
	(0.0268)	(0.0243)
Elections year	0.1234	-0.3115
	(0.3754)	(0.2872)
Constant	1.1535	1.9399***
	(0.7941)	(0.6609)
Observations/ Countries	128/29	130/29
Instruments	26	28
Time/country fixed effects	Yes	Yes
Hansen	.2026	.3361
AR1	.0067	.005
AR2	.6181	.5723

Standard errors in brackets. *** p < 0.01, ** p< 0.05, * p< 0.1.

7 Heterogeneity

After confirming the robustness of our baseline finding through different alternative specifications, the following section investigates its sensitivity concerning various structural characteristics. First, since developing countries display substantial heterogeneity in their macroeconomic performances, we distinguish between "developing countries (low-income countries)" and "emerging countries" based on IMF's classifications classification. Columns [1]–[2] show that financial market access decreases tax revenue instability in both groups. However, the effect of financial market access is higher in emerging than in developing countries. Second, we look at the fiscal stance to test the hypothesis of fiscal dominance. Using the median level of total government debt, we distinguish between "strong" and "loose" fiscal stance. As emphasized by columns [3]–[4], a good fiscal stance favors the effect of financial market access on the instability of tax revenue, while poor fiscal conditions inhibit financial market access. These results may illustrate the benefits of sound coordination between fiscal and monetary policies to strengthen the effect of financial market access.

Third, we account for the role of institutions, namely corruption, since good institutions may foster tax revenue stability. Using the median level of control of corruption, we distinguish between "high" and "low" control of corruption. As emphasized by columns [3]–[4], financial market access significantly decreases tax revenue, irrespective of the level of control of corruption. However, we notice that financial market access's effect on tax revenue instability is more significant in the context of better institutional quality, i.e., a lower level of corruption. Its effectiveness is more pronounced under high control. Consequently, by strengthening financial markets' credibility, better coordination between political and monetary policies improves the effect of financial market access on stability. Finally, our analysis extended to investigate the potential impact of capital account openness. Drawing on insights from Woo, (2011) and Agnello and Sousa, (2014), who point out that trade and financial openness are explicitly associated with increased risks and shocks, we considered the possibility that higher openness might result in greater fiscal policy volatility. We categorized countries into "high" and "low" openness based on the median level of trade openness. Notably, our findings in columns [4]-[5] reveal that financial market access has a significant mitigating effect on tax revenue instability, particularly in countries characterized by "low" levels of openness.

Table 5. 8 Heterogeneity in the effect of financial market access on tax revenue instability

Dependent Variable	Relatively Low GDP	Relatively High GDP	Loose fiscal stance	Strong fiscal stance	Low control of corruption	High control of corruption	Low openness	high openness
Regressions	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Lagged. Tax revenue instability	0.3419***	0.2364**	0.1826	0.2422***	0.2378***	0.4367***	0.2378***	0.4367***
	(0.0998)	(0.1130)	(0.1215)	(0.0293)	(0.0858)	(0.0570)	(0.0858)	(0.0570)
Sovereign debt rating	-0.3973**	-0.3805*	-0.5649***	-0.0291	-0.6089***	-0.2834**	-0.6089***	-0.2834**
	(0.2018)	(0.2126)	(0.2114)	(0.1551)	(0.2305)	(0.1289)	(0.2305)	(0.1289)
GDP per capita(log.)	-0.1963	0.3434**	-0.2628***	0.3899**	-0.3233**	0.0805	-0.3233**	0.0805
	(0.1628)	(0.1641)	(0.0696)	(0.1872)	(0.1486)	(0.0634)	(0.1486)	(0.0634)
GDP per capita_instability	0.0002	-0.0002	-0.0001	-0.0002	0.0002	-0.0001	0.0002	-0.0001
	(0.0001)	(0.0003)	(0.0001)	(0.0001)	(0.0002)	(0.0001)	(0.0002)	(0.0001)
Trade openness	-0.0082	0.0076	0.0037	-0.0100**	0.0071**	0.0054	0.0071**	0.0054
	(0.0061)	(0.0052)	(0.0042)	(0.0043)	(0.0036)	(0.0036)	(0.0036)	(0.0036)
Natural resources	0.0142**	0.0395*	0.0519***	-0.0110	0.0288***	0.0359***	0.0288***	0.0359***
	(0.0068)	(0.0220)	(0.0104)	(0.0177)	(0.0092)	(0.0054)	(0.0092)	(0.0054)
Government stability	0.0528*	0.2759***	-0.0638	0.0901	0.0324	0.0891**	0.0324	0.0891**
	(0.0314)	(0.0450)	(0.0388)	(0.0554)	(0.0275)	(0.0415)	(0.0275)	(0.0415)
Elections year	-0.7562	-0.0162	-2.1957***	-3.4423**	1.0227**	-1.3779**	1.0227**	-1.3779**
	(0.4951)	(0.7747)	(0.7523)	(1.4206)	(0.4521)	(0.6576)	(0.4521)	(0.6576)
Constant	3.3998***	-4.2167***	4.9401***	-2.6702	4.1452***	-0.5947	4.1452***	-0.5947
	(1.1276)	(1.4683)	(1.1108)	(1.7537)	(1.3792)	(0.6005)	(1.3792)	(0.6005)
Observations/ Countries	71/19	59/16	72/24	58/23	56/21	63/23	56/21	63/23
Instruments	18	15	20	22	18	18	18	18
Time/country fixed effects	18	15	20	22	18	18	18	18
Hansen	.723	.7864	.9196	.2226	.4684	.3164	.4684	.3164
AR1	.0071	.0366	.0048	.0033	.0092	.004	.0092	.004
AR2	.5701	.1333	.4464	.38	.4332	.3734	.4332	.3734

Standard errors in brackets. *** p < 0.01, ** p< 0.05, * p< 0.1.

Conclusion and policy implications

In this paper, we explore the capacity of financial market access to reduce tax revenue instability in developed and developing countries. We consider a sample of 30 countries for the period 1996 to 2020. We use an appropriate method, namely the GMM-system estimator. We find a causal effect between tax revenue instability, low bond spreads, and high sovereign rating. A higher ranking in sovereign debt significantly reduces tax revenue instability by more than 0.32%, whereas an increase in bond spreads raises it by more than 1 grade. This result is robust to various tests, including alternative specifications and alternative tax revenue instability measures. However, results reveal some heterogeneity across structural factors such as trade openness, inflation, rural population, the rule of law, and level of development.

The findings of the paper have both theoretical and policy implications. On the theoretical side, in contrast to the previous literature that focuses primarily on the economic and institutional determinants of tax revenue instability, our paper highlights the important role of financial market access in determining tax revenue instability, where a large and stable financial system is found to help smooth tax revenue volatility. From a policy perspective, this implies that policy reforms aimed at reducing tax revenue volatility should also consider the impact of financial factors. In particular, policymakers should be aware that it is essential to promote financial development and maintain financial stability for the smooth conduct of fiscal policy. Our findings suggest that developing countries could reduce tax revenue instability by improving financial market access. Our study also indicates that a better-developed government bond market and stock market can contribute to the stability of tax revenue.

Appendix D

Tables D1-D4.

Table D. 1 Definition and sources of variables.

Variables	Descriptions	Sources
Non-Resource Tax Revenue	It is Calculated as total tax revenue (excluding grants and social contributions) minus resource tax revenue (% GDP).	International Centre for Tax and Development (ICTD).
Tax revenue instability	Standard deviation of the non-resource tax estimated over a 5-year moving window.	Authors' calculation based on ICTD.
Non-Resource direct tax	Direct taxes including social contributions, excluding resource revenue	International Centre for Tax and Development (ICTD).
Sovereign debt rating	Foreign currency long-term sovereign debt ratings (index ranging from 1 to 21, higher value means better rating).	(Kose *et al.*, 2022)
Sovereign bond spreads	It covers all sovereign foreign debt instruments issued by emerging countries, including international borrowings denominated in US dollars such as Brady bonds, loans, and Eurobonds with a face value of at least US$ 500 million and a maturity of 12 years.	JP Morgan, Datastream
Real GDP per capita	GDP per capita is gross domestic product (constant 2010 U.S. dollars) divided by midyear population.	World Development Indicators (WDI)
GDP per capita instability	Standard deviation of the GDP per capita estimated over a 5-year moving window.	Authors' calculation based on WDI
GDP growth	The annual percentage growth rate of GDP at market prices is based on constant local currency.	World Development Indicators (WDI)
Trade Openness	Sum of exports and imports of goods and services, % of GDP.	World Development Indicators (WDI)
Natural resource rents	Total natural resources rents (percentage of GDP)	World Development Indicators (WDI)
Government stability		
Elections Year	Presidential election year	
Population density	The midyear population is divided by land area in square kilometers.	World Development Indicators (WDI)
Government debt	It includes domestic and foreign liabilities such as currency and money deposits, securities other than shares, and loans.	World Development Indicators (WDI)
Inflation	Inflation, average consumer prices (Percent change).	World Development Indicators (WDI)
FDI net inflows	It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments	World Development Indicators (WDI)
Aid	Net official development assistance and official aid received (constant 2016 US$	World Development Indicators (WDI)
Remittances	Remittances in percentage of GDP	World Development Indicators (WDI)
Control of corruption	Control of corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as" capture" of the state by elites and private interests.	International Country Risk Guide (ICRG)
Polity2	Polity2 index	Polity4 Project
Capital openness index	It captures the degree of financial openness	(Chinn and Ito, 2008)
Financial markets	The Financial markets index	IMF's Financial Development Index Database
Financial markets access	The Financial markets access index	IMF's Financial Development Index Database

Table D. 2 List of countries used in the analysis

Full Sample			
Argentina	Dominican Republic	Malaysia	Republic of Serbia
Bahrain	El Salvador	Mexico	Russian Federation
Brazil	Hungary	Morocco	South Africa
Bulgaria	Indonesia	Panama	Thailand
Chile	Iraq	Peru	Tunisia
China	Jordan	Philippines	Turkey
Colombia	Kazakhstan	Poland	Ukraine
Croatia	Lebanon	Qatar	Uruguay

Table D. 3 Descriptive Statistics on the variables used in the analysis

Variable	Obs	Mean	Std. Dev.	Min	Max
Tax revenue instability	142	.936	.508	.093	3.114
Sovereign debt rating	155	11.224	3.086	4.039	18.949
Sovereign bond spreads	135	792.057	4493.228	31.692	51614.261
GDP per capita	159	17188.623	14811.763	2803.342	96479.092
GDP per capita_instability	159	804.543	539.971	84.471	3068.861
Trade openness	160	56.629	14.512	26.878	84.2
Natural resources	159	6.119	10.015	.002	64.15
Government stability	158	8.221	1.382	5.708	12
Elections Year	155	.128	.135	0	.4

Table D. 4 Bivariate correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Tax revenue instability	1.000								
(2) Sovereign debt rating	-0.164*	1.000							
(3) Sovereign bond spreads	0.046*	-0.286*	1.000						
(4) GDP per capita	-0.177*	0.409*	-0.044	1.000					
(5) GDP per capita_instability	-0.030	0.272*	-0.046	0.653*	1.000				
(6) Trade openness	0.011	0.259*	0.035	0.371*	0.269*	1.000			
(7) Natural resources	0.035	0.318*	-0.030	0.334*	0.382*	0.067	1.000		
(8) Government stability	0.258*	0.129	-0.078	0.179*	0.209*	-0.059	0.185*	1.000	
(9) Elections Year	-0.097	-0.131	-0.054	-0.128	-0.036	-0.287*	-0.123	-0.081	1.000

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

General Conclusion

In summary, this dissertation aimed to investigate the impact of financial development on public finance in both developed and developing countries from a first standpoint. The importance of financial development in financing development is crucial, particularly in a context where domestic revenues are limited in many developing countries and below 20% of GDP (UNDP, 2010), which should allow for the achievement of development goals. Financial development lacks credibility in many developing countries. This dissertation analyzed how financial development can be an asset for development finance. The dissertation addressed empirically four main questions: What determines public sector efficiency in developed and developing countries? Can financial development improve public sector efficiency for developed and developing countries? Does financial sector development improve tax revenue mobilization for developing countries? Can financial market access curb tax revenue instability in developing countries?

The first part of the dissertation addresses the efficiency of government spending in developed and developing countries. It focuses on the determinants of government spending efficiency and financial development's role in improving public sector efficiency. The second part of the dissertation focuses on the issue of external resource mobilization and what developing countries could do to improve internal resource mobilization through two chapters in developing countries. The first chapter assesses the effects of financial sector development on domestic tax revenue mobilization. The second chapter examines the effects of financial market access on tax revenue instability.

Specifically, from the first part, Chapter 1 contributes to the extensive literature on public sector efficiency by offering a large panel dataset covering 158 countries from 1990 to 2017. Utilizing a parametric approach, the study computes efficiency scores for sectors like education, health, infrastructure, and public administration, along with indicators for government tasks. Empirical analysis reveals that factors such as trade globalization, factor productivity, and institutional quality are positively associated with public sector efficiency. Robustness checks, including alternative measures and controls, support these findings. Tobit's analysis indicates that the positive impact of

trade globalization, factor productivity, and institutional quality on efficiency is consistent across both advanced and developing economies. Interestingly, tax revenues are negatively associated with government efficiency in advanced economies but not developing countries. The study also explores heterogeneity based on economic development and geographical regions, finding that trade globalization, factor productivity, and democracy reduce efficiency gaps between advanced and developing economies. Regarding policy implications, the study suggests that governments should emphasize the benefits of trade globalization, promote factor productivity through innovation and human capital development, and enhance institutional quality for more efficient public sector management. The findings also highlight the importance of fiscal governance and transparency in public fund management. Finally, the study proposes avenues for future research, including examining spillover effects of government efficiency in neighboring countries and conducting a detailed analysis of the impact of fiscal reforms on government efficiency.

Financial development effectively improves public sector efficiency for developed and developing countries (Chapter 2). The Tobit method assesses how financial development influences public expenditure efficiency. The findings indicate a significant positive relationship between increased financial development and enhanced public expenditure efficiency, with economically significant effects. Robustness checks confirm these results and rule out potential biases from omitted variables, simultaneity, or reverse causality. The article explores the channels through which financial development influences expenditure efficiency, emphasizing the role of fiscal performance, per capita income, and institutional quality, particularly corruption control. The analysis also examines heterogeneity in the effectiveness of financial development based on various factors, such as types of financial development variables, macroeconomic conditions, and institutional factors. Theoretical implications highlight the role of finance in determining fiscal policy volatility, emphasizing the usefulness of a broad and stable financial system in mitigating such volatility. From a policy perspective, the study suggests that structural reforms aimed at reducing fiscal policy volatility should consider the impact of financial factors. It underscores the importance of budgetary rules, political bias correction, and institutional quality in promoting greater efficiency of government spending. The

results emphasize opportunities for improvement in public expenditure management, particularly in developing countries with limited financial sector development. This implies that governments have the potential to achieve social improvements at a relatively low cost, reinforcing the importance of promoting financial development for effective fiscal policy.

The examination of the effects of financial sector development on domestic tax revenue mobilization (Chapter 3) in 49 developing countries from 1995 to 2017 highlights a positive and significant contribution of financial development to non-resource tax revenue mobilization, supported by robustness tests. Heterogeneity analysis reveals that financial development has a greater impact on non-resource tax revenues in low-income compared to high-income countries. The beneficial effect is stronger in countries with high financial openness and is significant when public debt is relatively low. The analysis extends to examine the effect of financial development components on domestic tax revenue mobilization, identifying positive and significant influences from financial markets, institutions, depth, access, and efficiency. The study provides practical policy recommendations, emphasizing the highest impact of financial development when combined with sound fiscal or monetary policies, especially in more open and financially developed contexts. We believe that efforts should help developing countries, particularly low-income countries, build their financial systems for better information accessibility. We highlight the role of the financial sector in economic growth and stress that improving financial development positively contributes to domestic tax revenue mobilization, potentially enhancing the overall social welfare of the country.

Finally, we investigate the impact of financial market access on tax revenue instability for developing countries (Chapter 4) using a sample of 30 countries from 1996 to 2020. Employing the GMM-system estimator, the study identifies a causal relationship between tax revenue instability, sovereign rating, and bond spreads. A higher sovereign debt rating significantly reduces tax revenue instability, while increased bond spreads lead to higher instability. The results remain robust across various tests, including alternative specifications and measures of tax revenue instability. The analysis supports that foreign direct investment (FDI) and economic growth drive the stabilizing effect

of financial market access. However, heterogeneity exists across structural factors such as trade openness, inflation, rural population, the rule of law, and development level. Theoretical implications emphasize the crucial role of financial market access in determining tax revenue instability, highlighting the significance of a large and stable financial system in smoothing tax revenue volatility. From a policy perspective, the study suggests that reforms to reduce tax revenue volatility should consider the impact of financial factors. Policymakers should prioritize promoting financial development and maintaining stability for effective fiscal policy. The findings propose that developing countries could enhance tax revenue stability by improving financial market access, and a well-developed government bond market and stock market can contribute to tax revenue stability.

In summary, this dissertation demonstrates that enhancing public sector efficiency in both developed and developing countries requires fostering financial development. A key consideration is the quality of governance, as the impact of financial development on public expenditure efficiency is contingent on institutional quality. Therefore, there is a need to underscore the advantages of trade globalization, promote factor productivity through innovation and human capital development, promote fiscal discipline and tax performance, and elevate institutional quality to achieve more effective public sector management. The study recommends that both developed and developing countries embrace and diligently implement financial reforms, given their efficacy in enhancing public sector efficiency. Developing countries should particularly implement policies to strengthen the financial sector and boost domestic tax revenue mobilization. Additionally, improving financial market access is crucial, as it is not neutral concerning tax revenue instability. By enhancing financial market access, developing countries can sustainably finance their development by reducing tax revenue instability.

Section 2 of Chapter 1 mentions that measuring efficiency in organizational units such as the public sector is challenging, as government objectives are usually poorly defined, complex, and multidimensional. The choice of indicators and dimensions of public sector performance in this study is based on existing literature, notably Afonso, Schuknecht and Tanzi (2005), who attempt to approach the public sector through

several dimensions by considering two categories of performance indicators. The opportunity performance includes the following sectors: education, health, infrastructure, and public administration. The Musgravian indicators allow for considering the traditional tasks of government, including three dimensions: distribution, stability, and economic performance. As discussed in subsection 3.1 (Chapter 1), education, health, and infrastructure are dimensions affected by the size of government, as public spending in these sectors has been shown to have a significant impact on economic growth, the reduction of poverty and inequality, and business conditions (see, among others, Aschauer, 1989; Barro, 1990; Wilhelm and Fiestas, 2005; Chauvet and Ferry, 2021). Although the education indicators used in this study only consider public schools, it can be assumed that country-specific characteristics may also be relevant. We believe that these factors are, to some extent, taken into account in our approach to calculating efficiency scores, which is based on Kumbhakar, H.-J. Wang and Horncastle (2015), as the latter allows distinguishing unobserved heterogeneity across units from inefficiency. Another limitation of the analysis is that the information we have does not allow for taking into account the amount of infrastructure or hospitals built by private companies. Next, regarding public administration, other agencies, institutions, or authorities may operate with an independent budget and autonomous management, although in the public domain. In the same vein, factors such as the judiciary's independence, the government's quality, or the shadow economy's size are strongly correlated to long-term institutional factors or the economy's overall performance. Given these limitations and the potential shortcomings of the Musgravian indicators, for robustness purposes, we have re-estimated the efficiency scores only from three sectors (education, health, and public infrastructure) and considered the same inputs as in the main model. The results reported in Column [4] of Table 2.2 support our baseline model, which includes administration and the Musgravian indicators. In other words, the results from the baseline model scores do not seem to be very sensitive to changes in the measurement of specific outcome indicators. Nevertheless, we expect that the overall measures of government performance will be further refined over time by considering factors not included in this analysis to better address this study's shortcomings.

Second, our study acknowledges the limitations of not empirically accounting for financial instability. It notes theoretical reasons supporting the idea that financial

development may contribute to instability, particularly due to the risk associated with the liquidity function provided by financial intermediaries.

Financial development is accompanied by scriptural money, which may lead to serial bank failures if it is too fast. A bank's failure, unable to ensure deposit liquidity, can be transmitted to the entire banking system in the absence of an effective system of bank supervision and deposit insurance, even in the presence of a failure of the State accumulating backlogs of payments.

In addition, banks may take excessive risks in an unstable macroeconomic environment, increasing the likelihood of a financial crisis. The increasing instability may diminish the positive impact of financial development on public finances, affecting fiscal policy credibility, effectiveness, and government borrowing costs. However, we must consider the relationship between financial development and instability to assess its contribution to public finance, especially in the post-COVID-19 pandemic context. To create significant fiscal space for crisis response, we see several developments in our work. Firstly, considering that financial development has enhanced the mobilization of tax revenues and the efficiency of the public sector, it becomes intriguing to delve deeper into additional variables that could influence this positive impact, particularly in light of the omission of financial instability as a factor in our study. This study limitation prompts us to pose the following question: How does the link between financial development and financial instability impact the connection between financial development and tax revenues and public sector efficiency? Secondly, beyond its impact on the overall efficiency of the public sector, exploring how financial development affects other sectors like health, education, infrastructure, or the military would provide valuable insights. Thirdly, as reliable international data on illicit financial flows becomes available, there is an opportunity to investigate the relationship between financial development and illicit financial flows. We leave such topics for future research.

RÉSUMÉ EXTENSIVE EN FRANÇAIS

RÉSUMÉ EXTENSIVE EN FRANÇAIS

En 2022, après avoir simultanément fourni un soutien extraordinaire en 2020, les politiques monétaires et budgétaires se sont resserrées dans près des trois quarts des pays en raison de l'augmentation de l'inflation et de l'épuisement des mesures de dépenses liées à la pandémie. Ce changement s'est produit dans un environnement instable marqué par une reprise économique rapide de la récession de la COVID-19, un espace budgétaire limité, une crise du coût de la vie, l'invasion de l'Ukraine par la Russie et l'instabilité du secteur financier. Malgré ces défis, les ménages et les économies, soutenus par les gouvernements, ont fait preuve de résilience, conduisant à une reprise économique mondiale rapide. Cependant, les progrès réalisés dans la réduction de la pauvreté ont été inversés, retardant potentiellement l'objectif international d'éradication de l'extrême pauvreté d'ici 2030. L'absence d'espace budgétaire dans les pays en développement et les coûts d'emprunt élevés ont entravé les progrès vers d'autres objectifs de développement durable. Les perspectives fiscales à court terme restent complexes, les politiques fiscales et monétaires devant être étroitement alignées pour assurer la stabilité des prix et la stabilité financière face à l'incertitude économique et aux conditions financières changeantes. En 2023, les déficits fiscaux globaux devraient augmenter légèrement pour atteindre en moyenne 5 % du PIB, reflétant la hausse des coûts d'intérêt et la nécessité de stimuler les dépenses publiques pour faire face à l'inflation passée, y compris les dépenses en matière de salaires et de pensions. Les perspectives économiques mondiales font face à des risques substantiels à la baisse, comme souligné dans les Perspectives économiques mondiales et le Rapport sur la stabilité financière mondiale d'avril 2023 (IMF, 2023). L'instabilité du secteur financier peut mettre à rude épreuve les bilans du secteur public si elle s'aggrave, nécessitant une intervention gouvernementale. Les projections à moyen terme indiquent que les déficits fiscaux persisteront au-dessus des niveaux d'avant la pandémie, avec une incertitude liée au rythme de la croissance économique à long terme et aux taux d'intérêt mondiaux. Le resserrement fiscal progressif prévu est peu susceptible d'empêcher une résurgence des ratios de dette publique, en particulier dans certaines grandes économies avancées et émergentes où le PIB nominal ralentit. Les paiements d'intérêts en pourcentage des revenus devraient rester élevés dans les économies émergentes et les pays en développement à faible revenu, ce qui suscite des

inquiétudes quant à l'augmentation de la vulnérabilité de la dette. Les recettes fiscales dans les pays en développement à faible revenu sont notamment insuffisantes malgré plusieurs réformes fiscales, ce qui souligne la nécessité de renforcer la capacité fiscale. Les crises récentes soulignent la puissance de la politique fiscale dans la construction de la résilience, exhortant les gouvernements à donner la priorité à la reconstruction des tampons fiscaux. Développer des cadres fiscaux fondés sur le risque crédible est crucial pour maintenir des politiques macroéconomiques cohérentes, réduire les vulnérabilités de la dette et créer des marges de manœuvre pour faire face à des chocs futurs.

Dans l'ère post-pandémique caractérisée par des changements dynamiques sur le plan fiscal et économique, notamment une inflation élevée, des crises géopolitiques et une instabilité du secteur financier, comment le développement financier impacte-t-il la résilience et la durabilité fiscale des finances publiques dans les pays développés et en développement ? De plus, quelles politiques stratégiques peuvent tirer parti du développement financier pour promouvoir des finances publiques durables, en particulier dans le contexte de la lutte contre l'extrême pauvreté, de la progression des objectifs de développement durable et de la navigation dans des paysages fiscaux en évolution au milieu de conditions financières volatiles et de coûts d'emprunt élevés ? Cette question de recherche englobe les complexités de l'interaction entre le développement financier, les finances publiques et les défis économiques mondiaux plus larges décrits dans le contexte. Elle invite à une enquête approfondie sur l'impact du développement financier sur la résilience fiscale et les mesures politiques stratégiques nécessaires pour optimiser cet impact afin d'atteindre les objectifs de développement et la stabilité fiscale dans un environnement économique dynamique et incertain. La relation entre les finances publiques et le financement du développement constitue un point critique dans le contexte économique actuel, caractérisé par sa complexité et son interconnexion. Les finances publiques, souvent considérées comme le cœur financier d'une nation, constituent l'élément central permettant la fourniture de biens publics, de services sociaux et d'infrastructures. Parallèlement, l'évolution et l'expansion du secteur financier jouent un rôle déterminant dans la configuration du paysage économique d'une nation, influençant sa trajectoire de croissance et son bien-être global. La synergie complexe entre ces deux forces dynamiques est cruciale pour comprendre le potentiel transformateur du développement financier dans le contexte

des finances publiques et du financement du développement. Cette thèse explore le rôle multifacette du développement financier dans la transformation des finances publiques et, par extension, dans la réalisation des objectifs de développement. Les finances publiques gravitent autour des responsabilités du gouvernement en matière de génération de revenus, d'allocation des ressources et de gestion des dépenses publiques. Une gestion efficace des finances publiques est primordiale pour maintenir la discipline budgétaire, assurer la fourniture de biens et services publics, et atteindre des objectifs économiques et sociaux plus larges. Un système de finances publiques bien fonctionnel peut contribuer à la stabilité économique, faciliter la redistribution des revenus et améliorer le bien-être social. Cependant, une gestion inadéquate des finances publiques peut entraîner des déficits budgétaires, une accumulation de la dette et une instabilité macroéconomique.

Afin d'établir le cadre de cette thèse, cette introduction générale est structurée en deux sections principales. D'une part, elle définit et présente la littérature sur les déterminants du développement financier et discute des limites des mesures de développement financier. D'autre part, elle analyse l'impact macroéconomique du développement financier.

1 La littérature sur le développement financier

La littérature consacrée au développement financier est en constante évolution, caractérisée par l'émergence de nouvelles définitions, déterminants, et procédures de mesure. Les éléments favorisant, restreignant, voire inversant le développement financier sont consignés dans les travaux de Huang (2010, 2011); Girma et Shortland (2008); Herger, Hodler et Lobsiger (2008); Yang (2011); Roe et Siegel (2011). Ces paramètres englobent la qualité institutionnelle, les politiques macroéconomiques, ainsi que les caractéristiques géographiques et culturelles. La mesure du développement financier demeure un enjeu essentiel pour les études empiriques. En effet, différents auteurs ont recours à diverses sources et méthodologies analytiques pour estimer la valeur du développement financier dans les pays en développement (IMF; World bank; European Statistics; Levine et Zervos, 1998; Levine, 2005; Svirydzenka, 2016).

1.1 Définition du concept de développement financier

Le concept de développement financier trouve ses origines dans les travaux pionniers de Schumpeter (1961); McKinnon (1973) et Shaw (1973). La définition de ce concept a connu une évolution significative au fil du temps. À titre d'exemple, Shaw (1973) a défini le développement financier de manière générale comme "*l'accumulation d'actifs financiers à un rythme plus rapide que l'accumulation d'actifs non financiers*". Par la suite, Levine (2005) élargit cette définition en indiquant que: " *le développement financier est atteint lorsque les instruments financiers, les marchés et les intermédiaires financiers réduisent, sans nécessairement les éliminer, les coûts liés à l'obtention d'informations, à l'application de contrats et aux transactions, permettant ainsi une meilleure réalisation des cinq fonctions financières* ". Ces cinq fonctions principales selon Levine, qui requièrent le développement financier, sont : *(i) la production d'informations ex-ante sur les projets et la promotion de l'allocation optimale des ressources, (ii) la surveillance des investissements et le contrôle des entreprises, (iii) la facilitation des transactions financières, la couverture des risques, la diversification des actifs et le partage des risques, (iv) l'assurance de la mobilisation de l'épargne, et (v) la facilitation de l'échange de biens et services*. Dans le cadre de cette thèse, pour un aperçu des différentes définitions, nous définissons notre développement financier en suivant les lignes directrices de la Banque mondiale (Washington, 2020). Le développement financier est ainsi défini comme : « *l'ensemble des institutions, instruments, marchés, ainsi que le cadre légal et réglementaire qui permettent des transactions en étendant le crédit. Fondamentalement, le développement du secteur financier vise à surmonter les "coûts" engagés dans le système financier. Ce processus de réduction des coûts liés à l'acquisition d'informations, à l'application de contrats et à la réalisation de transactions a conduit à l'émergence de contrats financiers, de marchés et d'intermédiaires. Différents types et combinaisons de coûts d'information, d'application et de transactions, associés à des systèmes juridiques, réglementaires et fiscaux différents, ont motivé l'émergence de contrats financiers, de marchés et d'intermédiaires distincts d'un pays à l'autre et tout au long de l'histoire. Le développement du secteur financier se produit donc lorsque les instruments financiers, les marchés et les intermédiaires atténuent les effets des coûts d'information, d'application et de transactions, et font donc un travail*

correspondant mieux à la fourniture des fonctions clés du secteur financier dans l'économie ».

1.2 Nouvel indice global de développement financier

D'un point de vue théorique, en s'appuyant sur les analyses de Levine (1997, 2005) et Beck (2013), le développement financier caractérise un processus dans lequel différentes composantes d'un système financier, principalement les banques et les marchés financiers, contribuent à la réduction des coûts d'information et de transaction associés aux opérations financières. Quantitativement, cela se traduit par une augmentation de l'offre de fonds prêtables pour financer les dépenses de consommation et d'investissement des agents économiques. Qualitativement, cela se traduit par une allocation et une utilisation plus efficace des ressources disponibles, ainsi qu'une amélioration de la gestion des risques et de la diversification. Bien que cette définition constitue une base nécessaire pour une approche théorique initiale du concept de développement financier, elle présente deux limites. Tout d'abord, elle ne produit pas d'indicateurs spécifiques permettant de mesurer le niveau de développement financier dans un pays donné. Deuxièmement, elle ne souligne pas explicitement la nature structurellement multidimensionnelle du développement financier. Depuis les années 1970, la majorité des études empiriques ont évalué le développement financier à travers le prisme de deux mesures de la profondeur financière : le ratio crédit privé/PIB et, dans une moindre mesure, la capitalisation boursière, également exprimée en ratio par rapport au PIB. Par exemple, dans une analyse cruciale au niveau de l'industrie, Rajan et Zingales (1996) ont utilisé ces deux métriques pour démontrer l'impact positif développement financier accru sur la croissance économique. Plus récemment, Arcand, Berkes et Panizza (2015) ont utilisé le ratio crédit/PIB pour délimiter un seuil au-delà duquel un développement financier supplémentaire cesse d'exercer une influence positive sur la croissance économique. En termes de stabilité macroéconomique, Dabla-Norris et Srivisal (2013) ont découvert que le développement financier, tel que quantifié par le ratio crédit privé/PIB des banques et autres institutions financières, atténue significativement la volatilité de la croissance de la production, de la consommation et de l'investissement, bien que jusqu'à un certain point. Dans ce domaine, la majorité des chercheurs utilisent des variations de ces deux mesures pour

examiner le rôle du système financier dans le développement économique.[48] Cependant, le développement financier est un processus complexe et multifacette. Au fil du temps, les secteurs financiers ont évolué à l'échelle mondiale, conduisant à la diversité des systèmes financiers modernes. Alors que les banques restent généralement les acteurs les plus importants et les plus influents, les banques d'investissement, les compagnies d'assurance, les fonds communs de placement, les fonds de pension, les sociétés de capital-risque et diverses autres institutions financières non bancaires exercent désormais une influence significative. De même, les marchés financiers se sont développés pour permettre aux particuliers et aux entreprises de diversifier leurs économies. Les entreprises peuvent désormais se procurer des fonds par le biais d'actions, d'obligations et de marchés monétaires de gros, contournant ainsi les prêts bancaires traditionnels. Ce paysage diversifié des institutions financières et des marchés facilite la fourniture de services financiers. De plus, l'accessibilité et l'efficacité sont des caractéristiques essentielles des systèmes financiers. Les grands systèmes financiers ne servent à rien s'ils ne sont pas accessibles à une large partie de la population et aux entreprises. Bien que les systèmes financiers soient indispensables et aient une portée étendue, leur contribution au développement économique dépend de leur efficacité et de l'évitement du gaspillage. Cet aspect est également exploré dans des travaux tels que Čihák *et al.* (2012) et Aizenman, Jinjarak et Park (2015). Compte tenu de la diversité des systèmes financiers entre les pays, l'examen de plusieurs indicateurs est essentiel pour évaluer le développement financier.

Confrontés à la nature intrinsèquement multidimensionnelle du développement financier, une question cruciale émerge naturellement : Quel indicateur singulier de développement financier revêt une importance primordiale dans notre étude ? Lequel offre des perspectives les plus significatives pour l'analyse de l'impact du développement financier sur les finances publiques ? Pour remédier aux limitations des indicateurs uniques en tant que mesures du développement financier, nous utilisons dans cette thèse un ensemble d'indices qui regroupant le niveau de développement des

[48] En effet, ces articles se heurtent à plusieurs limitations dans leur portée. En premier lieu, différentes mesures du développement financier sont généralement fortement corrélées et fréquemment sujettes à des erreurs de mesure. Deuxièmement, les études antérieures ont tendance à examiner un seul indicateur, tel que le crédit bancaire ou la capitalisation boursière, comme une approximation du développement financier, ce qui conduit à l'incapacité de saisir la nature complexe et multidimensionnelle du processus de développement financier.

institutions financières et des marchés financiers en termes de profondeur, d'accessibilité et d'efficacité, aboutissant à l'indice final de développement financier (voir *Figure 1.1*). Initialement développés dans le cadre d'une note de discussion du FMI intitulée "Repenser l'approfondissement financier : stabilité et croissance dans les marchés émergents" (Sahay *et al.*, 2015), ces indices offrent une nouvelle perspective sur le développement financier. Ils ont été méticuleusement conçus pour révéler les subtilités de la profondeur du marché, de l'accessibilité aux services financiers et de l'efficacité des institutions. Ces indices tiennent compte d'une large gamme d'acteurs financiers, des banques aux compagnies d'assurance, en passant par les fonds communs de placement et les fonds de pension. Les marchés financiers, qu'il s'agisse des marchés boursiers ou obligataires, sont également examinés avec une grande précision. Le développement financier, tel que nous le définissons, repose sur un subtil mélange de profondeur du marché, d'accessibilité aux services financiers et d'efficacité institutionnelle. Il résulte d'une réflexion multidimensionnelle, s'inscrivant dans la matrice des caractéristiques du système financier développée par Čihák *et al.* (2012). Le travail de Čihák *et al.* (2012) représente une avancée significative à cet égard, car il propose une définition plus précise du développement financier, opérationnelle et qui tient compte de la nature multidimensionnelle de ce concept. La typologie du développement financier proposée par ces auteurs, appelée la 'matrice 4x2', repose sur une double distinction.

D'un côté, elle distingue les quatre dimensions de la taille, de l'accès, de l'efficacité et de la stabilité associées au processus de développement financier. D'un autre côté, elle différencie les deux composantes d'un système financier, à savoir les institutions financières (banques et investisseurs institutionnels) et les marchés financiers (marchés boursiers et marchés monétaires). En parcourant les différentes lignes et colonnes de cette matrice 4x2, une typologie claire et facilement quantifiable des différentes dimensions du développement financier émerge. Par exemple, on peut évaluer la taille du secteur bancaire dans l'économie, l'étendue de l'accès que la population a aux services financiers fournis par les banques, l'efficacité avec laquelle les intermédiaires financiers gèrent leurs opérations financières, et la stabilité de leurs activités, y compris des facteurs tels que les avoirs en capital, la qualité des actifs et la dette présente dans leurs bilans. En raison de ces nombreux avantages, la définition du développement

financier par Čihák *et al.* (2012) est non seulement celle actuellement adoptée par la Banque mondiale, mais aussi largement acceptée au sein de la littérature académique.

Figure 1.1. Pyramide de l'indice de développement financier

Source: IMF staff, based on Čihák *et al.* (2012)

1.3 Qu'est-ce qui détermine le développement financier ?

Les questions liées aux déterminants du développement financier ont fait l'objet de plusieurs recherches. Par exemple, Huang (2005, 2010) suggère que le niveau de développement financier est déterminé par des facteurs institutionnels (environnement juridique et réglementaire, démocratie, corruption, instabilité politique), des facteurs macroéconomiques (inflation, niveau de revenu, taux d'épargne), des facteurs structurels (ouverture commerciale et financière), géographiques et culturels (latitude, accès à la mer, distance par rapport aux grands marchés, colonisation, niveau de population, caractéristiques religieuses, linguistiques et ethniques). Divers chercheurs ont examiné les relations entre le développement financier et les facteurs institutionnels, mais pas dans une seule étude. Par exemple, Girma and Shortland (2008) et Huang (2010) étudient les effets des institutions politiques sur le développement financier et la structure financière, et constatent des effets positifs des institutions politiques sur le développement financier. Bhattacharyya (2013) analyse l'impact de la démocratisation sur la structure financière dans un échantillon de 96 pays couvrant la période de 1970 à 2005. Il conclut que la démocratisation conduit à un système financier davantage basé sur le marché. La Porta *et al.* (1997) établissent empiriquement le lien entre l'environnement juridique et les marchés financiers dans

49 pays et constatent que les pays avec un niveau inférieur de protection des investisseurs, mesuré par la nature des règles juridiques et la qualité de l'application de la loi, ont des marchés de capitaux, d'actions et de dettes plus petits et plus étroits. De même, La Porta *et al.* (1998) examinent les règles juridiques couvrant la protection des actionnaires et des créanciers, l'origine de ces règles et la qualité de leur application. Ils affirment que l'origine juridique nationale affecte fortement l'environnement juridique et réglementaire des transactions financières et explique les différences de développement financier entre les pays. Ils montrent que les pays de droit civil français ont généralement les protections légales des investisseurs les plus faibles, et les pays de common law les plus fortes, avec les pays de droit civil allemand et scandinave situés au milieu. Acemoglu, Johnson et Robinson (2001) et Beck, Demirgüç-Kunt et Levine (2003) attribuent les différences dans le développement financier des pays aux stratégies coloniales. Ils concluent que les différences dans la mortalité des premiers colons peuvent expliquer les variations inter-pays dans le développement financier parmi les anciennes colonies. Rajan et Zingales (2003) étudient le rôle de la politique des groupes d'intérêts dans le développement financier et constatent que la politique des groupes d'intérêts est un facteur important dans le développement financier entre les pays. Ils soutiennent que les groupes d'intérêts, et notamment l'opposition des entreprises industrielles en place et du secteur financier domestique, seront plus faibles dans un pays qui autorise à la fois l'ouverture commerciale et les flux de capitaux. Les conditions macroéconomiques pourraient affecter le développement du système financier. Selon Huybens et Smith (1999), l'inflation est l'une de ces variables macroéconomiques, nuisant à la performance financière. En effet, une augmentation du taux d'inflation réduit le rendement réel de l'argent et des actifs, entraînant un rationnement du crédit. Le secteur financier accorderait alors moins de prêts, l'allocation des ressources deviendrait moins efficace, et l'activité des intermédiaires diminuerait, avec des conséquences négatives pour l'investissement en capital (Gultekin, 1983; Boudoukh and Richardson, 1993; Boyd, Levine and Smith, 1996, 2001; Ely and Robinson, 1997; Barnes, Boyd and Smith, 1999; Huybens and Smith, 1999; Schotman and Schweitzer, 2000). Certaines études ont également examiné l'impact des facteurs structurels sur le développement financier. Par exemple, Ibrahim et Sare (2018) examinent les déterminants du développement du secteur financier en Afrique, en se basant sur des données de 46 pays couvrant la période 1980-2015. Ils

montrent que, bien que le capital humain influence de manière robuste le développement financier, l'ouverture commerciale a une influence plus robuste sur le crédit privé que sur le crédit intérieur. Ils ont constaté que l'ouverture commerciale et le capital humain sont des substituts et jouent un rôle influent dans le développement financier en Afrique. Le rôle des banques étrangères dans la promotion du développement financier dans les pays en développement est souligné dans la littérature. Ainsi, Levine (1996) postule que les banques étrangères favorisent directement le développement financier en fournissant des services bancaires de haute qualité et indirectement en incitant les banques nationales à améliorer la qualité et à réduire les coûts ; en stimulant la croissance du cadre de supervision et légal bancaire ; et en intensifiant les pressions sur les gouvernements pour améliorer les systèmes juridiques, réglementaires et de supervision. Claessens, Demirgüç-Kunt et Huizinga, (2001) examinent l'étendue et l'effet de la présence étrangère sur les marchés bancaires nationaux et constatent que les banques étrangères ont des profits plus élevés que les banques nationales dans les pays en développement. Une analyse de Stulz et Williamson (2003) sur l'impact des différences culturelles, représentées par des différences religieuses et linguistiques, présente deux éléments de preuve sur le processus de développement financier. Premièrement, la culture prédit des variations inter-pays dans la protection et l'application des droits des investisseurs, en particulier pour les droits des créanciers. Deuxièmement, l'influence de la culture sur la protection des droits des créanciers est atténuée par l'introduction de l'ouverture commerciale. L'analyse montre également que les principales religions monothéistes, telles que le catholicisme, l'islam et le protestantisme, sont systématiquement liées à l'établissement et à l'application des droits des créanciers et influent sur l'efficacité du système financier. Des études ont analysé comment les ressources naturelles influencent le développement financier. Par exemple, Beck (2011) montre que les économies basées sur les ressources ont des systèmes financiers moins développés. Leurs banques sont plus liquides, mieux capitalisées et plus rentables, mais accordent moins de prêts aux entreprises. Les entreprises dans les économies basées sur les ressources utilisent moins de financement externe, et une plus petite proportion d'entre elles utilise des prêts bancaires, bien qu'il y ait le même niveau de demande que dans d'autres pays, ce qui indique des contraintes d'approvisionnement. Dans l'ensemble, il y a des indications d'une malédiction des ressources naturelles dans le développement financier, qui pèse

davantage sur les entreprises que sur les ménages. Zaidi *et al.*, (2019) explorent l'influence de la mondialisation, des ressources naturelles et du capital humain sur le développement financier dans un panel de trente-et-un pays de l'OCDE et constatent que les ressources naturelles ont une causalité de Granger et des effets positifs sur le développement financier. Gokmenoglu et Rustamov (2019) étudient le rôle du financement de la Banque mondiale et de l'abondance des ressources naturelles sur le développement financier dans le cas de quatre pays en développement riches en ressources naturelles : le Kazakhstan, l'Azerbaïdjan, la Russie et le Turkménistan (KART) sur la période de 1992 à 2017, et concluent qu'à long terme, le financement de la Banque mondiale et l'abondance des ressources naturelles influent positivement sur le développement financier. En revanche, Bhattacharyya et Hodler, (2014) étudient si les revenus des ressources naturelles entravent le développement financier et quel rôle jouent les institutions politiques dans ce processus dans 133 pays sur la période de 1970 à 2005. Les résultats montrent que les rentes des ressources sont négativement associées au développement financier dans les pays avec des institutions politiques faibles. Cependant, cet effet négatif diminue en valeur absolue et finit par disparaître à mesure que la qualité des institutions politiques s'améliore. Phuc Canh et Trung Thong (2020) constatent que la rente des ressources naturelles a un effet négatif sur les institutions financières.

2 Quels sont les effets macroéconomiques du développement financier ?

Les effets économiques du développement financier sont multiples. Ils influent sur l'épargne, l'investissement, la croissance économique, l'inflation, l'ouverture commerciale, la volatilité du cycle économique, la pauvreté et l'inégalité, etc. La recherche sur les effets économiques du développement financier tire des conclusions différentes.

Plusieurs études comme Robert G King et Levine (1993), Levine, Loayza et Beck (2000), Ang et McKibbin (2007), Greenwood, Sanchez et Wang (2013), révèlent un effet positif du développement financier sur la croissance. Par exemple , McKinnon (1973) et Shaw (1973) soulignent l'importance du système financier dans la promotion de la croissance économique. Dans la même veine, Levine (1991) montre que les marchés boursiers accélèrent la croissance en facilitant la propriété de l'entreprise sans

perturber les processus de production au sein des entreprises et en permettant aux agents de diversifier les portefeuilles. Robert G King et Levine (1993) constatent que le développement financier est fortement associé à la croissance économique. Levine et Zervos (1998) établissent un lien fort et positif entre le développement financier et la croissance économique. Levine (2005) soutient que les systèmes financiers peuvent influencer les taux d'épargne, les décisions d'investissement, l'innovation technologique et les taux de croissance à long terme. Cependant, l'effet positif du développement financier sur la croissance économique doit être interprété avec prudence, car il pourrait refléter l'impact des variables omises, des effets spécifiques aux pays non observés et du problème de simultanéité (Levine, Loayza and Beck, 2000a). Bien que les travaux antérieurs montrent que le niveau de développement financier est une bonne prédiction de la croissance économique, ces résultats ne se contentent pas de la causalité. L'importance du développement financier pour la croissance économique est encore discutable (Robinson, 1952; McKinnon, 1973; Lucas Jr, 1988; Levine, 2001). Par exemple, Lucas Jr (1988) affirme que les économistes "stressent beaucoup trop" le rôle des facteurs financiers dans l'économie. En revanche, McKinnon (1973; 1989) déclare que le développement financier peut être une source importante de croissance économique. De plus, McKinnon (1973; 1989) laisse entendre que la question de savoir si le développement financier est un moteur efficace de la croissance économique subséquente dépend de l'efficacité des institutions financières et d'autres conditions économiques connexes.

De nombreux travaux empiriques fournissent des preuves qui démontrent la nature changeante du lien entre la finance et la croissance. Par exemple, Rousseau et Wachtel (2011) fournissent la preuve que l'un ou l'autre des effets positifs disparaissent. En parallèle, Benczúr, Karagiannis et Kvedaras (2019), Arcand, Berkes et Panizza (2015), Samargandi, Fidrmuc et Ghosh (2015), Cournède et Denk (2015), Sahay *et al.*(2015), Law et Singh (2014), Cecchetti et Kharroubi (2012) fournissent la preuve d'un potentiel non-linéaire (souvent en forme de U inversée). Demetriades et Rousseau (2016) soutiennent que certaines réformes financières ont des effets de croissance importants, positifs ou négatifs, selon la réglementation bancaire et la qualité de la supervision. Concernant les effets sur la volatilité de la croissance, Ferreira da Silva (2002) montre qu'après avoir pris en compte d'autres facteurs susceptibles d'affecter les fluctuations de l'activité économique, les pays dont les systèmes financiers sont les

plus développés présentent des cycles économiques moins volatils. Un système financier bien développé selon Ahamada et Coulibalyb (2011) empêche les envois de fonds de créer une volatilité significative de la croissance du PIB. Les marchés financiers peuvent canaliser les envois de fonds vers les agents de réception des non-engagements ayant des besoins d'investissement et leur permettre de lisser leurs investissements, entraînant une diminution de la volatilité totale de la production. Moradbeigi et Law (2016) fournissent des preuves qui appuient l'effet modérateur du développement financier sur la propagation de la volatilité des termes de l'échange du pétrole. Plus précisément, un système financier bien développé peut compenser certains des effets négatifs de la volatilité du pétrole sur la volatilité de la croissance.

Certaines études ont examiné la relation entre le développement financier et la politique commerciale avec diverses conclusions, en particulier sur l'impact du développement financier sur la libéralisation du commerce (Beck, 2002; Svaleryd and Vlachos, 2002; Do and Levchenko, 2007; Kim, Lin and Suen, 2010; Yakubu *et al.*, 2018; Sare, Aboagye and Mensah, 2019; Sare, 2021). Premièrement, Beck (2002) explore un lien entre le développement financier et la structure de la balance commerciale. Il constate que le niveau de développement financier a un impact à la fois sur les exportations et sur la balance commerciale des produits manufacturés. Dans le même ordre d'idées, Svaleryd et Vlachos (2002) constatent également une relation positive et économiquement significative entre la politique commerciale et les marchés financiers, avec une causalité dans les deux sens. Ensuite, Kim, Lin et Suen (2010) étudient les relations à court et à long terme entre le développement financier et l'ouverture commerciale et montrent que la complémentarité à long terme entre le développement financier et l'ouverture commerciale coexiste avec la substituabilité à court terme entre les deux variables politiques. En effet, Kim, Lin et Suen (2012) ont montré que le développement financier a un impact positif sur le commerce et un effet négatif sur le développement financier dans les pays les plus pauvres. Dans les pays riches, le développement financier stimule l'ouverture des échanges alors que le commerce a un impact ambigu sur le développement financier. En utilisant les données de 46 pays africains sur la période 1980-2015,Yakubu *et al.* (2018) révèlent les effets différentiels de la finance sur le commerce. Les auteurs fournissent des preuves que le crédit privé ne favorise pas le commerce alors que le crédit intérieur affecte positivement le commerce, et Sare, Aboagye et Mensah, (2019) ont étudié l'impact de la finance sur le

commerce ainsi que les canaux sectoriels par lesquels la finance influence le commerce international dans 46 pays d'Afrique entre 1980 et 2016, et ont constaté que le développement du secteur financier n'a pas d'effet significatif sur le commerce international. Sare (2021) cherche à quantifier le seuil au-delà duquel le développement du secteur financier n'a plus d'effet positif sur le commerce international. Pour ce faire, il utilise des données sur 46 pays d'Afrique entre 1980 et 2016 et passe par une approche de fractionnement de l'échantillon et d'estimation des seuils. L'auteur trouve des preuves des effets de seuil pour certains pays.

Plusieurs articles ont examiné l'impact du développement financier sur la pauvreté et les inégalités (Jalilian and Kirkpatrick, 2005; Clarke, Xu and Zou, 2006; Beck, Demirgüç-Kunt and Levine, 2007; Huang, 2010). D'une part, Jalilian et Kirkpatrick (2005) examinent la contribution du développement financier à la réduction de la pauvreté dans les pays en développement. Ils montrent que, jusqu'à un seuil de développement économique, la croissance du secteur financier contribue à la réduction de la pauvreté et à l'effet de croissance. Cependant, Clarke, Xu et Zou (2006) examinent la relation entre le développement financier et le niveau du coefficient de Gini. Ils rejettent l'hypothèse selon laquelle le développement financier ne profite qu'aux riches et soutiennent que l'inégalité est moindre lorsque le développement financier est plus important à long terme. D'autre part, Ang (2010) examine comment la finance impacte l'inégalité des revenus en Inde en utilisant des données annuelles en séries temporelles sur plus d'un demi-siècle et constate que le développement financier réduit l'inégalité des revenus. Enfin, Beck, Demirgüç-Kunt et Levine (2007) constatent que le développement financier réduit l'inégalité des revenus, exerce un impact positif disproportionné sur les plus pauvres et est fortement associé à l'allègement de la pauvreté. Sanfilippo-Azofra *et al.* (2018) ont examiné l'influence du développement financier sur le canal de prêt bancaire. Ils ont observé que dans les pays dotés de systèmes financiers moins développés, les changements de politique monétaire n'affectent pas significativement l'offre de prêts des banques. Cependant, dans les pays disposant de systèmes financiers plus avancés, le canal de prêt bancaire devient efficace, notamment après les crises financières. Dans de tels environnements, les banques disposent de divers instruments financiers pour atténuer les risques et accéder à diverses sources de financement, réduisant ainsi l'impact des changements de

politique monétaire sur l'offre de prêts. En revanche, dans les pays moins développés financièrement, où les marchés financiers sont limités et le financement bancaire repose fortement sur les dépôts, le canal de prêt bancaire tend à avoir un impact plus significatif. Malgré les recherches antérieures sur la relation entre le développement financier et la politique monétaire, l'effet spécifique du développement financier sur l'offre de prêts des banques reste largement inexploré.

3 Fondements théoriques

Les fondements théoriques de cette thèse sont multiples. Tout d'abord, nous nous appuyons sur la théorie de l'économie publique (Musgrave, 1959; Jackson et McLeod, 1982; Jackson, 2011; Pollitt et Bouckaert, 2011; M. Lewis, 2015; Desmarais-Tremblay, 2021; De Waele *et al.*, 2021; Hallaert et Primus, 2022), pour analyser les mécanismes d'allocation des ressources publiques et évaluer l'efficacité des politiques publiques. Cette théorie est complétée par des contributions en économie du bien-être (Arrow et Kurz, 1969; Lindbeck, 1985; Aschauer, 1989; Barro, 1990; Ravallion, 1997; Baffes et Shah, 1998; Cornia et Reddy, 1999; Jung et Thorbecke, 2003; Wilhelm et Fiestas, 2005; Carboni et Medda, 2011; Chauvet et Ferry, 2021), qui éclairent l'impact des politiques publiques sur le bien-être social et l'optimisation des choix collectifs. D'autres contributions évaluent l'efficacité locale (par exemple, voir Eeckaut, Tulkens et Jamar, 1993; Worthington, 2000; Afonso et Fernandes, 2008). Deuxièmement, nous nous appuyons sur les théories financières classiques telles que la théorie de l'intermédiation financière (Bohn, 1990; De Gregorio et Guidotti, 1995; Khan Mohsin et Senhadji Abdelhak, 2000; Demirgüç-Kunt et Huizinga, 2001; Tavares et Valkanov, 2001; Levine, 2005; Gordon et Li, 2009; Gilbert et Ilievski, 2016), ainsi que la théorie de l'efficience des marchés financiers (Levine, 1997; Ardagna, 2009; Mu, Stotsky et Phelps, 2013; Harford et Uysal, 2014). Certains chercheurs notent que le développement financier est une source potentielle de mobilisation fiscale pour les pays en développement (Bohn, 1990; Gordon et Li, 2009). Ces théories fournissent un cadre pour comprendre comment le développement financier influence l'allocation des ressources et l'efficacité des investissements publics. Troisièmement, la thèse repose également sur la théorie de la fiscalité et du développement (Tanzi *et al.*, 1981; Tanzi, 1992a; Burgess et Stern, 1993; Andreoni, Erard et Feinstein, 1998; Ghura, 1998; Emran et Stiglitz, 2005; Bird, Martinez-Vazquez et Torgler, 2008; Mahdavi, 2008; Besley et

Persson, 2009, 2010, 2013; Baunsgaard et Keen, 2010; Crivelli et Gupta, 2014). Cette théorie se concentre sur diverses questions fiscales dans les pays en développement, telles que le niveau et la structure de la fiscalité, l'évasion fiscale, la fiscalité du capital et du revenu, les distorsions fiscales et les réformes fiscales, et leur impact sur la mobilisation des recettes fiscales. Enfin, nous nous appuyons sur des théories macroéconomiques telles que la théorie des cycles économiques (Schumpeter, 1961; Rodrik, 1989; Stiglitz, 2000; Broz, 2002; Dye, 2004; Dye et Merriman, 2004; Talvi et Vegh, 2005; Vaaler, Schrage and Block, 2006; Afonso, Agnello et Furceri, 2010; Agnello et Sousa, 2014; Amin *et al.*, 2014; Ma et Lv, 2023). Cette théorie fournit des informations sur les fluctuations économiques et leur impact sur la stabilité des recettes fiscales.

4 Valeur ajoutée de la thèse (contribution)

En résumé, cette thèse contribue de manière significative à notre compréhension du paysage économique complexe de l'ère post-pandémique. Dans leur ensemble, ces contributions établissent une base solide pour une recherche exhaustive sur l'interaction profonde entre le développement financier et les finances publiques, abordant les défis économiques mondiaux pressants et les dynamiques complexes au sein du domaine financier. Bien que la littérature étendue traite des avantages et des éventuelles conséquences néfastes du développement financier, mon intérêt est de contribuer au discours en cours et de mener une enquête plus approfondie sur les effets du développement financier. Cela implique d'examiner son influence sur deux aspects cruciaux : i) les dépenses publiques et leurs implications pour l'efficience du secteur public, et ii) les recettes publiques, englobant leur impact sur la mobilisation des recettes fiscales et la stabilité des revenus. De plus, cette thèse vise à formuler des recommandations politiques visant à aider les pays à optimiser leur allocation et utilisation des ressources. La thèse apporte une valeur substantielle en proposant une analyse détaillée et complète des relations entre le développement financier, la mobilisation des recettes fiscales et l'efficience du secteur public. Ses conclusions solides, son approche orientée politique et sa rigueur méthodologique en font une ressource inestimable pour les décideurs politiques cherchant à améliorer les performances du secteur public, à stabiliser les recettes fiscales et à garantir une allocation efficace des ressources dans les pays en développement. La capacité de la

thèse à découvrir des déterminants importants, à identifier les canaux de transmission et à explorer les hétérogénéités et les non-linéarités ajoute de la profondeur et de la pertinence pratique à l'ensemble des connaissances existantes.

5 Outline and Main results :

Cette thèse présente les résultats de recherche, organisés en deux parties principales comprenant quatre chapitres. La première section, couvrant deux chapitres, se plonge dans un examen dual. Tout d'abord, elle scrute les facteurs influençant l'efficience du secteur public, puis explore l'impact du développement financier sur l'efficience du secteur public. Dans le chapitre 1, nous fournissons un ensemble de données important sur l'efficience du secteur public en utilisant une approche paramétrique, couvrant 158 pays de tous les niveaux de revenus sur la période 1990–2017. L'analyse inclut quatre secteurs : l'éducation, la santé, l'infrastructure et l'administration publique. Nous considérons en outre trois indicateurs d'efficacité liés aux tâches gouvernementales de type 'Musgravien' : l'allocation, la distribution et la stabilisation. Après avoir calculé les scores d'efficience pour nos pays échantillonnés, nous examinons leurs déterminants en utilisant une large gamme de facteurs économiques et institutionnels. Nos principales conclusions indiquent que la mondialisation des échanges, la productivité des facteurs et la qualité institutionnelle semblent être des déterminants importants de l'efficience des dépenses totales du secteur public. Les résultats restent robustes à des spécifications et méthodes alternatives. Enfin, nous fournissons des preuves supplémentaires en explorant la sensibilité des principaux déterminants à différents groupes de pays, en tenant compte du niveau de développement économique, des régions géographiques et des États fragiles. Ensuite, le chapitre 2 évalue dans quelle mesure le développement du secteur financier peut accroître l'efficience du secteur public. Nous tirons parti des nouveaux scores mondiaux d'efficience du secteur public pour les pays en développement et développés pour aborder cette question. Ensuite, nous nous appuyons notamment sur une méthodologie de panel pour estimer l'effet du développement financier sur les changements des scores d'efficience. Pour un échantillon de 158 pays en développement et développés sur la période 1990–2017, nous constatons que le développement financier conduit à une augmentation significative de l'efficience des dépenses, avec des effets économiquement significatifs.

La robustesse a été vérifiée de plusieurs manières, notamment en considérant des échantillons alternatifs, en utilisant des mesures alternatives, des contrôles supplémentaires et des stratégies d'estimation alternatives, en particulier la régression des moindres carrés ordinaires (OLS), la méthode des moments généralisés (GMM) et une approche des variables instrumentales (IV). Nous, analysons également trois canaux de transmission par lesquels le développement financier pourrait influencer l'efficience des dépenses. Nous démontrons que l'amélioration de la performance fiscale par une mobilisation accrue des recettes, un PIB par habitant plus élevé et une meilleure qualité institutionnelle (notamment le contrôle de la corruption) sont des canaux par lesquels le développement financier affecte positivement l'efficience des dépenses. Enfin, nous approfondissons l'analyse en explorant plusieurs hétérogénéités potentielles dans l'effet du développement financier, en fonction d'une gamme de facteurs macroéconomiques et institutionnels. La deuxième partie étudie la relation entre le développement financier et les recettes fiscales. Nous examinons dans le chapitre 3 l'effet du développement financier sur la mobilisation des recettes fiscales dans les pays en développement. Notre analyse empirique utilise l'indice financier agrégé qui englobe la profondeur (taille et activité) du système bancaire, l'accès et l'efficacité des institutions financières et des marchés financiers. Utilisant des données de panel provenant de pays en développement sur la période 1995-2017, nos résultats suggèrent que des secteurs financiers plus développés influent de manière positive et significative sur la capacité du gouvernement à lever des recettes fiscales. Plus intéressant encore, nous constatons que cet effet favorable est sensible aux caractéristiques des pays en développement, notamment le niveau de développement économique, le degré d'ouverture financière et l'orientation des politiques fiscales. Lorsque nous examinons de manière plus précise les effets des composants du développement financier sur la mobilisation des recettes fiscales, nous constatons que les coefficients estimés sur les sous-composantes du développement financier sont statistiquement significatifs, à l'exception de l'efficacité du marché financier. Les résultats indiquent que les recettes fiscales dans les pays en développement dépendent des institutions financières et des marchés financiers. De plus, nous étudions dans le chapitre 4 si l'accès au marché financier influence la stabilité des recettes fiscales d'un pays en développement, en utilisant des données de panel approfondies provenant de 30 pays sur la période 1996-2020. Nous utilisons une méthode appropriée, à savoir

l'estimateur de système GMM. Nous constatons un effet de causalité entre l'instabilité des recettes fiscales, définie comme l'écart type du ratio des recettes fiscales sur une fenêtre mobile de cinq ans, comme dans Bekaert, Harvey et Lundblad (2006) et les faibles écarts de rendement des obligations et les notes souveraines élevées. Un classement plus élevé de la dette souveraine réduit significativement l'instabilité des recettes fiscales, tandis qu'une augmentation des écarts de rendement l'augmente. Ce résultat est robuste à divers tests, y compris des spécifications alternatives et des mesures alternatives de l'instabilité des recettes fiscales. Nos résultats révèlent que l'accès au marché financier diminue fortement et de manière robuste l'instabilité des recettes fiscales, même après avoir contrôlé pour l'effet des crises bancaires. L'analyse des canaux de transmission indique que les IDE et la croissance économique alimentent l'effet stabilisateur de l'accès au marché financier. Cependant, les résultats révèlent une certaine hétérogénéité selon des facteurs structurels tels que les conditions fiscales, le niveau du PIB, l'ouverture financière et la qualité des institutions. Dans les chapitres qui suivent, nous nous engageons dans une exploration approfondie de nos conclusions, de la méthodologie à notre disposition, des données que nous avons exploitées, et des recommandations politiques primordiales. Notre objectif est de fournir aux décideurs des informations précieuses pour améliorer la performance de leur secteur public, renforcer les recettes fiscales et garantir leur allocation effective.

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