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Financial Development and Tax Revenue in Developing Countries: Investigating the International Trade and Economic Growth Channels

Sèna Kimm GNANGNON[1]

Abstract

This study examines the effect of financial development on non-resource tax revenue performance in developing countries, including through the international trade and economic growth channels. Using a sample of 104 developing countries over the period 1980-2014, the empirical analysis shows that financial development exerts a positive effect on non-resource tax revenue performance. Interestingly, this positive effect takes place through higher trade openness, greater export product diversification, higher share of manufactured exports in total export products, and higher economic growth rate.

Keywords: Non-resource tax revenue; financial development; trade openness; export product diversification; manufacturing exports; economic growth.
Jel Classification: F14; G20; H20.

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1. Introduction

It is well established that developing countries face large trade costs (see for example, Anderson and van Wincoop, 2004). According to UNCTAD (2005, 2007), the eventual lack of trade financing coupled with the limited level of financial systems in these countries lead to the rise in the transaction costs as a trade barrier. Recognizing this, developing countries have adopted policies to deepen their domestic financial markets (e.g., Demir and Dahi, 2011). Recent research has shown that one policy tool to reduce trade costs in developing countries, notably in the poorest ones is the development of domestic financial markets (e.g., Beck, 2003; Bellone et al., 2010; Berman and Hericourt, 2010; Manova, 2013; Sare et al., 2018; Minetti and Zhu, 2011; Suwantaradon, 2012).

The importance of financial development for economic growth and development has now been well emphasized in the literature[2]. In the meantime, there is a dearth of studies on the determinants of tax revenue performance[3]. However, the relationship between financial development and tax revenue has received little attention in the literature. Among the main studies on the matter are for example Taha et al. (2013) who have reported empirical evidence that the development of the financial system influences positively direct tax revenue in Malaysia. Ilievski (2015) has relied on a panel dataset comprising 96 countries over the period 1990-2008 and provided empirical evidence that the development of stock markets exerts a positive effect on tax revenue. Petrescu (2013) has used a sample of 72 countries during 1990-2003 to investigate the effect of the financial sector development on diverse taxes. The author has obtained empirical evidence that while financial sector development influences positively total income tax revenue, it exerts no significant effect on the sales taxes, property taxes and gift taxes. Other key studies that have not directly examined the effect of financial development on tax revenue, but rather the relationship between financial development and the informal sector, have concluded that financial sector development could increase tax collection levels, including by reducing the incentives to operate in the underground economy and hence the level of tax evasion[4] (e.g., Ahamed, 2016; Bittencourt et al., 2014; Blackburn et al., 2012; Capasso and Jappelli, 2013). For example, Capasso and Jappelli (2013) have reported that by reducing the credit costs, or by granting credit to previously constrained agents, financial development reduces the size of the shadow economy, which contributes to enhancing tax revenue collection. Other studies that are, to some extent, related to the issue concerning the relationship between financial development and tax revenue are those on the effect of financial inclusion[5] on tax revenue. To the best of our knowledge, the only existing published paper on the matter is Oz-Yalaman (2019) who has used a panel dataset containing 137 countries over the years 2011, 2014 and 2017, to provide empirical evidence that financial inclusion exerts a positive effect on several tax revenues variables, including total tax

[2] Studies include among others Amable and Chatelain (2001); Ang and McKibbin (2007); Arcand et al. (2015); Arestis and Demetriades (1997); Asteriou and Spanos (2019); Benhabib and Spiegel (2000); Calderón and Liu (2003); Christopoulos and Tsionas (2004); De Gregorio and Guidotti (1995); Levine (1993, 1997); Levine and Zervos (1998); Luintel et al. (2008); Odedokun (1996); Samargandi et al. (2015); Yang (2019); Zhang et al. (2012).

[3] See for example, Adam et al. (2001); Agbeyegbe et al. (2006); Baunsgaard and Keen (2010); Bird et al. (2008); Cagé and Gadenne (2018); Clist (2016); Clist and Morrissey (2011); Crivelli (2016); Crivelli and Gupta (2014); Gnangnon and Brun (2017, 2018, 2019); Hisali (2012); Khan and Hoshino (1992); Khattry and Rao (2002); Mosley (2015); Heller (1975); Mosley (2015); Ouattara (2006); and Yohou et al. (2016).

[4] Some other studies (e.g., Amaral and Quintin, 2006; Antunes and Cavalcanti, 2007; Massenot and Straub, 2016; Straub, 2005) have obtained a negative effect of financial development on the size of the informal economy as higher credit market imperfections in the formal sector inhibits the outside finance for entrepreneurial firms and thus, magnifies the size of the informal activity.

[5] There is no consensus on the definition of financial inclusion. For example, Sarma (2008) defines financial inclusion as the ease of access, availability and usage of the formal financial system by all members of the economy. IMF (2018) has defined financial inclusion as access to and use of formal financial services by households and firms, while Grohmann et al. (2018) have defined this concept as the access to and use of financial services, which could contribute, *inter alia*, to financial development.

revenue, tax revenue on income, profits and capital gains, individual income tax revenue and corporate income tax revenue.

None of the few existing studies on the effect of financial development on tax revenue has deeply examined the channels through which this effect takes place. The current paper aims to fill this gap in the literature by investigating the effect of financial development on public revenue performance, notably through two main channels, namely the international trade and economic growth channels. In that respect, the current analysis departs from previous scarce studies on the effect of financial development on tax revenue in two ways. First, it uses the ratio of non-resource tax revenue in Gross Domestic Product (GDP) as the measure of public revenue performance, in contrast with previous studies that rely on tax revenue-to GDP ratio or total revenue-to-GDP ratio as the measure of public revenue performance. Second, it deeply examines some key channels - including international trade and economic - through which financial development can affect non-resource tax revenue performance. Concerning the international trade channel, the analysis considers three variables, namely the degree of trade openness, the degree of export product diversification, and the share of manufacturing exports in total export products.

The analysis has been performed using an unbalanced panel dataset, which contains 104 developing countries over the period 1980-2014. Empirical results, based on the two-step system Generalized Methods of Moments, have shown that financial development exerts a positive effect on tax revenue over the full sample. Additionally, the magnitude of this effect increases as countries experience greater trade openness, a higher level of export product diversification, a rise in the share of manufacturing exports in total export products, or higher economic growth rate.

The remainder of the analysis proceeds as follows. Section 2 discusses how financial development can affect non-resource tax revenue, including through the international trade and economic growth channels. Section 3 presents the model specification that helps analyse the effect of financial development on tax revenue through the channels highlighted above, and discusses the appropriate empirical method for the analysis. Section 4 interprets empirical results, and Section 6 concludes.

2. Discussion on the effect of financial development on tax revenue, including through the international trade and growth channels

2.1 Financial development, manufacturing exports and tax revenue

Levin (2005) has provided the main channels through which financial systems can influence economic growth. These include (i) the production of ex-ante information about investment opportunities; (ii) the improvement of ex-post monitoring of investment and exerting corporate governance; (iii) the facilitation of risk management and diversification; (iv) the mobilization and pool of savings; and (v) the ease of the exchange of goods and services. Leibovici (2018: page 2) has summarized the channels through which financial frictions can reduce the aggregate trade share. First, financial frictions introduce higher distortions in the exporters' production decisions compared to those of non-exporters, and hence reduce their exports. In fact, the distortion effects take place through the adverse effects of financial frictions on firms' capital expenditures that can be financed externally. Second, financial frictions lead to a lower share of exporting firms that export because they distort export entry decisions. In the presence of financial frictions, firms delay their export entry decision until sufficient internal funds are available to undertake the export entry investment. Additionally, financial frictions further delay export entry investment (until internal funds are sufficiently high) because they reduce firms' returns to exporting.

The theoretical work between financial development and trade dates back to the analysis by Kletze and Bardhan (1987) who have used the Heckscher-Ohlin framework to show theoretically that the development of the financial sector favors industries that rely heavily on external finance.

However, Baldwin (1989) have argued that the risk diversification role of financial development makes countries incline to specialize in the production of risky goods that bear relatively lower risk premiums. Following Kletzer and Bardhan (1987), Beck (2002, 2003) have shown that a well-developed financial system contributes to improving countries' export share and trade balance for manufactured goods. Rajan and Zingales (1998) have argued that differences in the financial sector among countries represent independent sources of comparative advantage, and demonstrated empirically that for technological reasons, industrial sectors that are more dependent on external finance grow relatively more in countries with a larger financial sector. This highlights the relevance of financial systems for manufacturing exports. Other studies[6] have also underlined the importance of financial development for exports, including manufacturing exports. Matsuyama (2005) and Cezar (2014) have noted that the manner in which finance affects trade depends on the characteristics of each economic sector, even among manufacturing industries. Additionally, according to these authors, financial development provides a commercial advantage to sectors that are dependent on external finance, whereas countries that experience low financial endowment specialize in sectors with low agency problems (including manufacturing). In that respect, Cezar (2015) has contended that previous empirical analyses neither cover the totality of the economics sectors, nor all the manufacturing sectors – which may signify that a large financial endowment fosters advantage in some industries but not all manufacturing sectors. Against this background, the author has uncovered empirically that while financial development increases the proportion of exporters, its effect on export volumes remains undetermined. He has explained this finding by the fact that the decrease in exports in some sectors – due to changes in the trade patterns induced by financial development – might have offset the export growth driven by financial development in some other manufacturing sectors.

On the basis of this brief literature review, we could be tempted to argue for a positive effect of financial development on manufacturing exports, even though the issue remains an empirical matter. How could then financial development affect tax revenue through the manufactured exports channel? The bulk of the studies on the structural determinants of public revenue performance (see studies cited above) have shown a positive effect of the share of value added in the manufactured sector in total output on public revenue performance, including tax revenue performance. This is particularly because of the substantial dynamic productivity gains, economies of scale, learning effects, and externalities among firms and industries in the manufacturing sector (e.g., Hirschman, 1958; Matsuyama, 1992). Therefore, we can expect that higher manufacturing exports performance (i.e., a rise in the share of manufacturing exports in total export products) would be positively associated with tax revenue performance, in particular as exporting firms are likely to experience higher income than domestic firms. This would directly influence tax revenue performance through higher corporate tax revenue as well as the eventual domestic consumption and investments, as well as imports of exporting firms. It could also affect tax revenue through its eventual positive effect on trading firms employees' income that would be associated with higher personal income tax revenue, but also higher indirect tax revenue and trade tax revenue if such income increase translates into higher domestic consumption and imports. Moreover, manufactured exports could promote tax revenue through their strong positive effect on economic growth (e.g., Fosu, 1990; Jones and Olken, 2008; Rodrik, 2007, 2013; Sachs and Warner, 1995). Overall, we could anticipate that financial development would further enhance tax revenue performance as countries enjoy a rise in manufacturing export performance.

[6] See for example, Amiti and Weinstein (2011); Demirguc-Kunt and Maksimovic (1998); Hur, Raj and Riyanto (2006); Huang and Temple (2005); Ju and Wei (2011); Manova (2008; 2013); Muûls (2008); Svaleryd and Valchos (2005); Wamboye and Mookerjee (2014a, 2014b) and Wynne (2005). Contessi and De Nicola (2013) and Foley and Manova (2015) have provided a good literature survey on the role of finance in international trade.

2.2. Financial development, export product diversification and tax revenue

Many studies have reported that liquidity constraints can constrain firms' export decisions of entry into international markets, and eventually adversely affect their export volumes[7] (e.g., Alvarez and Lopez, 2014; Beck et al. 2008; Berman and Hericourt, 2010; Bellone et al. 2010; Caggese and Cuñat, 2013; Chaney, 2005; Fauceglia, 2015; Feng and Lin, 2013; Goksel, 2012; Kumarasamy and Singh, 2018; Manova, 2008; 2013; Minetti and Zhu, 2011; Muûls, 2008; Nagaraj, 2014;). Following Agosin et al. (2011), the negative effect of liquidity constraints on firms' entry into international trade markets may suggest that by reducing liquidity constraints, countries could experience a higher number of exporters, which could facilitate export product diversification. However, it is unclear whether the possible adverse effects of firms' liquidity constraints on export volumes would result in lower export volumes at the intensive margins (i.e., whether it prevents the expansion of existing export products) and/or lower export volumes at the extensive margins (i.e., whether it prevents exporting firms from creating new export products). For example, as noted above, Cezar (2015) has obtained that while financial development increases the proportion of exporters, its effect on export volumes is not clear-cut (i.e., the effect could be negative, positive or statistically null, depending on the specification tested). Similarly, Regis (2018) has relied on a dataset of over 86,000 firms from 179 surveys in developing and emerging countries to provide, among others, empirical evidence that better access to credit increases the likelihood of firms' entry into the international markets, but does not induce higher export volume. Manova (2008, 2013) has developed on a multisector model where industries have different financing needs, and demonstrate that the positive effect of financial development is larger in sectors with greater requirements for outside finance or fewer collaterisable assets. Based on the findings of Manova (2008), Agosin et al. (2012) have postulated that if financing-dependent industries produce more differentiated products, then financial development may induce export product diversification. In contrast, if in a well-developed financial system, investors are risk-averse particularly on untried ventures, and rather decide to concentrate financial resources in existing activities where the economy is already competitive, then greater financial development would result in higher export product concentration. Agosin et al. (2012) have reported empirical evidence that financial development tends to be associated with higher export product concentration. On another note, Nagaraj (2014) has found for India that while firms entering the export market are financially healthier than non-exporting firms, it is financial health that causes exports, and not the other way around. Additionally, while firms' financial health does not influence the intensive margin of exports (i.e., an increase in exports of continuing exporters), reducing the financial constraints faced by firms could help increase the extensive margin of exports (i.e., a rise in exports due to new exporters). Cho et al. (2019) have introduced the concept of financial choice into a modern model of trade in a small open economy, where there exists more than one source of financing for capital investment (e.g., choice between bank and bond financing), with each source of financing carrying different levels of transaction costs. They have shown that policies that promote bank credit induce some potential bond issuers to switch to using bank loans, and allow new firms to enter at the bottom end of the efficiency continuum. These policies, therefore, lead to a reallocation of output and profit toward firms with higher marginal costs, and result, *inter alia*, in an appreciation of the real exchange rate and an increase in the extensive margin of trade and aggregate exports, given that some incumbent bank borrowers find that lower interest rates allow them to start exporting profitably or to expand their volume of exports. On the basis of this

[7] Other studies have found that the causal direction in the relationship between finance and firm exports runs from exports to finance (e.g., Bridges and Guariglia, 2008; Feenstra et al. 2014; Greenaway et al. 2007). However, Stiebale (2011) have pointed out that financial constraints and firm exports are not correlated.

literature review, we could not conclude whether financial development would consistently result in a greater export product diversification or a higher level of export product concentration in developing countries. At the same time, Gnangnon and Brun (2017) have shown that export upgrading, including export product diversification induces higher non-resource tax revenue in developing countries (i.e., non-High-income countries), including through its positive effects on the income of trading firms and employees, as well as their eventual subsequent domestic consumption and higher imports. Thus, if financial development leads to greater export product diversification in developing countries, then it would be positively associated with tax revenue as countries enjoy a higher level of export product diversification. In contrast, if financial development is associated with a higher degree of export product concentration in developing countries, then it would result in lower non-resource tax revenue as the level of export product concentration increases. Meanwhile, it is also possible that export product diversification would be positively associated with economic growth (e.g., Al-Marhubi, 2000; Herzer and Nowak-Lehnmann, 2007; Mania and Rieber, 2019). In such a case, as higher economic growth leads to higher tax revenue performance through the expansion of the tax base elements, we could expect greater positive effect of financial development on tax revenue as the level of export product diversification increases.

2.3. Financial development, trade openness and tax revenue

Feeney and Hillman (2004) have shown theoretically that asset market incompleteness can lead to trade liberalization, i.e., financial development could promote trade liberalization. They have developed a model where the protectionist lobbying effort conducted by owners of sector-specific capital is determined by the degree of portfolio diversification. Thus, in a context of full diversification of risks, special interest groups will have no incentive to lobby for protection. As a consequence, greater development of the financial sector that eliminates asymmetric information and rigidities could potentially lead to higher trade flows between and among countries. On another note, Svaleryd and Vlachos (2002) have noted that if trade induces higher aggregate risk - in the sense of Rodrik (1998) – then, such risk could not be covered only in the domestic financial markets. This means that the amount of international risk sharing should also have a positive impact on openness to trade. Nevertheless, the literature on international risk sharing has indicated that this effect is likely to be small (e.g., Lewis, 1995). Furthermore, Feeney and Hillman (2001) have noted that as internationally open financial markets eliminate or reduce the interest in strategic trade policy, they promote greater trade openness. Svaleryd and Vlachos (2002) have provided empirical support to their hypothesis that financial development could result in greater trade openness/trade liberalization. Rajan and Zingales (2003) have suggested theoretically that vested interest groups (incumbents) who feel to be adversely affected by the opening up of the financial system will be strongly incentivized to resist entry into the financial system and oppose the development of the financial system. Hence, greater openness to international trade and to capital flows would benefit to the country, including by potentially enhancing competition in the domestic market, and threatening the incumbents' vested interest. In this light, Rajan and Zingales (2003) have conjectured that the concomitant openness of the country to international trade and capital flows would likely wane the incumbents' powers to obstruct financial development, and might even create sufficient new profits that outweigh the adverse effects of increased competition on incumbents, thereby potentially reducing opposition to financial reform. Other works such as Do and Levchenko (2007) and Sare et al. (2018) have shown empirically that financial systems strongly influence international trade: as greater participation to international trade exposes countries to the vagaries of the international market, well-developed domestic financial systems provides with a powerful insurance instrument that reduces barriers to trade, and hence help promote international trade. Kim et al. (2010) have obtained empirically - using an heterogenous sample of Member-countries of the Organization for Economic Cooperation (OECD) and non-

OECD countries - that there is a positive long-run relationship between financial development and international trade, but a negative short-run relationship between these two variables. However, the analysis over OECD countries versus non-OECD countries has shown that the previous findings apply only to non-OECD countries, as for OECD countries, financial development exerts negligible effects on trade. Furthermore, the authors have reported that long-run responses of trade decrease with higher depth of financial development. Finally, they have found that negative trade effects of financial fragility coexist with positive trade impacts of financial depth. Kim et al. (2012) have found that financial development stimulates trade openness both in poorer countries and richer countries.

Overall, the literature tends to show that financial development influences positively trade openness. However, the direction and the extent to which the effect of financial development on tax revenue would depend on the level of trade openness depends ultimately on how trade openness itself affects tax revenue. The literature has postulated that the effect of trade openness[8] on tax revenue depends, *inter alia*, on the extent to which quantitative restrictions have been replaced with tariffs, how tariff reductions affect imports, the extent of price elasticity of demand for imports, the price elasticity of supply of import substitutes and, how exports respond to the trade liberalization measures (e.g., Agbeyegbe et al. 2006; Blejer and Cheasty, 1988; Tanzi, 1989). Meanwhile, as trade openness enhances productivity and induces economic growth (e.g., Coe and Helpman, 1995; Edwards 1998; Schiff and Wang, 2008; Yanikkaya, 2003; Falvey et al., 2012; Huchet-Bourdon et al. 2017), it would be associated with higher tax revenue performance. The empirical literature on the effect of trade openness on public revenue performance, including tax revenue performance has been inconclusive. In fact, some studies have shown that trade liberalization influences positively tax revenue (e.g., Ebrill et al., 1999; Adam et al., 2001), while others have found evidence of a timid effect of trade liberalization on trade tax revenue (e.g., Agbeyegbe et al., 2006). In contrast, some other works have uncovered a negative effect of trade openness (or trade liberalization) on tax revenue (e.g., Cagé and Gadenne, 2018; Hisali, 2012; Khattry and Rao, 2002; Gnangnon and Brun, 2019). Against this background, we could not argue a priori for a positive or a negative effect of financial development on tax revenue as policymakers further open-up their economies to international trade. Therefore, this issue is an empirical matter.

2.4. Financial development, economic growth and tax revenue

There is an extensive literature on the relationship between financial development and economic growth (see for example, Arcand et al. 2015 or Samargandi et al., 2015 for a literature review). Bagehot (1873) and Schumpeter (1911) were the first to have proposed the idea that a well-functioning financial system promotes economic growth. On the empirical side, Goldsmith (1969) was the first to outline the existence of a positive correlation between the size of the financial system and long-run economic growth. He has argued that this positive correlation occurs through the greater efficiency associated with financial intermediation rather than through the rise in the volume of investment, argument supported later by Grenwood and Jovanovich (1990) and Bencivenga and Smith (1991). Schumpeter and Opie (1934) have also suggested that finance positively affects economic growth, as financial institutions help in funding productive investments and encouraging innovation, both of which are conducive to economic growth. The ideas of 'supply-leading' and 'demand-following' aspects of financial development have been developed by Patrick (1966). The supply-leading role of financial institutions provides that these institutions act as productive inputs in the production process, and to facilitate the transfer of resources from traditional to modern sectors. This view aligns with that of Gurley and Shaw (1955), Goldsmith

[8] It is important to note that the concept of trade openness encompasses that of trade liberalization, as the latter reflect trade policy measures adopted by policymakers to liberalize their trade sector so as to make it internationally competitive, while trade openness is affected not only by many economic policy measures, of which trade liberalization, but also other factors such geographical and cultural factors.

(1969) and Xu (2000), who have argued that the development of financial markets helps to mobilize savings to finance the most productive investments, which in turn, promotes economic growth. As for the demand-aspect of financial development, it is the real side of the economy that generates economic growth, which in turn, leads to a rise in the demand for financial services. Therefore, financial institutions and instruments follow the lead taken by the real sector[9]. This view also aligns with that of Robinson (1952) and Kuznets (1955), and has recently been supported, for example, by Al-Yousif (2002) and Ang and McKibbin (2007). Given the nature of the current study, we focus on the supply-leading role of financial institutions in promoting economic growth. Authors such as Lucas (1988) have contended that the financial sector does not influence at all economic growth. In their more rigorous theoretical works, McKinnon (1973) and Shaw (1973) have underlined that in developing countries, pervasive financial regulations that entail interest rate ceilings and reserve requirements have adverse effects on saving-investment decisions. Therefore, they have concluded that financial liberalization via a deregulation of interest rates would lead to an increase in loanable funds as well as to a more efficient allocation of funds. According to the endogenous growth theory (e.g., Lucas, 1988; Romer, 1986; Bencivenga and Smith, 1991; Greenwood and Jovanovic, 1990; King and Levine, 1993a), the development of the financial sector is positively associated with economic growth. The argument underlying this positive effect is that the development of financial systems helps to mobilize savings, allocate resources to the most productive investments, reduce information, transaction and monitoring costs, diversify risks, and facilitate the exchange of goods and services. These are conducive to an efficient allocation of resources, a faster accumulation of physical and human capital, and the promotion of technological progress. As noted above, Rajan and Zingales (1998) have demonstrated empirically that for technological reasons, industrial sectors that are more dependent on external finance grow relatively more in countries with a larger financial sector. This, therefore highlights a strong channel through which finance could affect growth (see also Arcand et al., 2015). Numerous other studies[10] have provided evidence that financial development promotes economic growth, although studies such as Ang and McKibbin (2007), Calderón and Liu (2003), Luintel and Khan (1999) and Demetriades and Hussein (1996) have noted that the relationship between finance and growth runs in the two directions[11]. Some other empirical works have reported (various) thresholds above which financial development could hurt economic growth (e.g., Cecchetti and Kharroubi, 2012; Law and Singh, 2014; Arcand et al., 2015; Samargandi et al., 2015). Nevertheless, these findings have been nuanced by Botev et al. (2019). In examining the relationship between financial development and economic growth in a large sample of developing, emerging and advanced economies, Botev et al. (2019) have not been able to identify a threshold of financial development depth beyond which financial development influences negatively

[9] The demand-following role of the financial sector has also been emphasized by Robinson (1952) and Kuznets (1955). This view has been endorsed by the empirical studies of Al-Yousif (2002) and Ang and McKibbin (2007), while Xu (2000) rejects this hypothesis.

[10] These include for example Amable and Chatelain (2001); Ang and McKibbin (2007); Arestis and Demetriades (1997); Asteriou and Spanos (2019); Beck, et al. (2014); Benhabib and Spiegel (2000); Calderón and Liu (2003); Christopoulos and Tsionas (2004); Deidda and Fattouh (2002); De Gregorio and Guidotti (1995); Levine (1993); Levine and Zervos (1998); Loayza and Ranciere (2006); Luintel et al. (2008); Odedokun (1996); Owen and Temesvary (2014); Yang (2019) and Zhang et al. (2012).

[11] Similarly, other studies such as Gries et al. (2009) have reported for Sub-Saharan African economies that financial deepening has not contributed to economic development. This seems to be line with Deidda and Fattouh (2002) who have found that financial development promotes growth only in high-income countries, but not in low-income countries. Similarly, Rioja and Valev (2004a, 2004b) have reported that financial development spurs economic growth in high- and intermediate-income levels countries, but not in low-income countries. In contrast, focusing on Sub-Saharan African countries, Ibrahim and Alagidede (2018) have obtained evidence that the effect of financial development on economic growth depends crucially on the simultaneous growth of real and financial sectors. This aligns with the findings of Huang and Lin (2009) that financial development promotes economic growth in low-income countries.

economic development. In other words, they have not confirmed the too-much-finance-is-bad hypothesis. Rather, they have obtained, inter alia, that positive effect of bank credit on growth is larger in stock markets that are deeper. Overall, we could not ascertain that financial development always promotes economic growth, and as noted by authors such as King and Levine (1993b) and Levine (2005), the strength of the finance-growth relationship is ultimately an empirical matter. One conclusion that emerges from this literature is that tends to suggest at least that financial development cod positively with economic growth. As higher economic growth helps expand the tax base elements and hence contributes to higher non-resource tax revenue, we could expect that financial development would induce greater non-resource tax revenue as countries' economic growth increases, in particular if financial development itself enhances economic growth.

3. Model specification and econometric approach

In this section, we first present the model specification that helps investigate the effect of financial development on non-resource tax revenue performance in developing countries (sub-section 3.1) and then discuss the econometric approach used to estimate this model (sub-section 3.2).

3.1. Model specification

We explore the effect of financial development on non-resource tax revenue performance in developing countries by considering a baseline dynamic model specification which links financial development to non-resource tax revenue along with a number of control variables. The latter are indeed structural factors that influence public revenue performance in developing countries and that appear virtually in all relevant studies on the determinants of public revenue performance (e.g., Agbeyegbe et al. 2006; Baunsgaard and Keen, 2010; Crivelli, 2016; Crivelli and Gupta, 2014; Ghura, 1998; Gnangnon and Brun, 2017, 2018, 2019; Heller, 1975; Hisali, 2012; Khattry and Rao (2002); Mosley, 2015; Yohou et al. 2016; Bird et al. 2008). These control variables include the real per capita income, denoted "GDPC", which acts as a measure of countries' development level; the share (%) of the value added in the agricultural sector in the total output, denoted "SHAGRI"; the inflation rate, which after transformation is denoted "INFL" (see Appendix 1); a proxy for the prevailing institutional quality, denoted "POLITY2"; the terms of trade, denoted "TERMS", and the population size, denoted "POP". It is important to underline that trade openness, which also appears in models on the determinants of public revenue performance, has not been included in the baseline specification because it is one channel (that we test later) through which financial development could influence non-resource tax revenue performance in developing countries.

Against this background, we postulate the following baseline dynamic model:

$$NRTAX_{it} = \alpha_0 + \alpha_1 \mathrm{NRTAX}_{it-1} + \alpha_2\, \mathrm{FINDEV}_{it} + \alpha_3 \mathrm{Log(GDPC)}_{it} + \alpha_4\, \mathrm{SHAGRI}_{it} + \alpha_5 \mathrm{INFL}_{it} + \alpha_6 \mathrm{POLITY2}_{it} + \alpha_7 \mathrm{TERMS}_{it} + \alpha_8 \mathrm{Log(POP)}_{it} + \mu_i + \omega_{it} \qquad (1)$$

where the subscripts i and t represent respectively a country and the time-period. The panel dataset used in the analysis contains 104 developing countries, over the period 1980-2014. This dataset has been chosen based on data availability. The analysis has considered as developing countries, countries that are not included in the category of High-Income countries by the World Bank. Following the practice in the empirical literature, data has been averaged over non-overlapping sub-periods of 5-year so as to smooth out the effect of business cycles on variables. There are indeed 7 non-overlapping sub-periods: 1980-1984; 1985-1989; 1990-1994; 1995-1999; 2000-2004; 2005-2009 and 2010-2014. α_0 to α_8 are parameters to be estimated. μ_i are countries' fixed effects; ω_{it} is a well-behaving error term. It is worth noting that time dummies were included in the regressions, but did not appear to be not statistically significant at the conventional levels.

The dependent variable "NRTAX" represents the share of a country's total non-resource tax revenue in percentage of GDP. It represents the difference between the total tax revenue excluding grants and social contributions (in % GDP) and the resource tax revenue (in % GDP), the latter being the tax revenue collected on natural resources. The choice to use non-resource tax revenue share of GDP rather than total tax revenue to-GDP-ratio draws from Brun et al. (2015) and Gnangnon and Brun (2017, 2018) who have argued that public resource revenue is largely outside the reach of economic policy. Additionally, reliance on non-resource tax revenue as a dependent variable achieves much greater homogeneity across countries in the sample than total tax revenue or total public revenue (i.e., including both tax and non-tax revenue.

The dependent variable "FINDEV" is the indicator of financial development, and represents our key variable of interest. To measure the overall development in the financial sector, denoted "FINDEV", we follow several previous studies (e.g., Huang, 2010; Samargandi et al., 2015; Ang and McKibbin, 2007; Gries et al., 2009; Campos and Kinoshita, 2010) and use a single indicator of financial development obtained by combining several existing financial development indicators using the principal components analysis (PCA) (see for example, Samargandi et al. (2015, page 70) for the advantages of proceeding in that way). The current analysis uses 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). As we will see later, in addition to performing the regression using the indicator "FINDEV", we also present estimations' results based on each of the above-mentioned four financial development indicators. We present in Table 1 an overview of the outcomes of the principal component analysis. It could be noted that the first component represents the only one with an eigenvalue (far) greater than 1, i.e., the only one to show to show fitting characteristics: it explains about 90% of the variation of the dependent variable. The second, third and fourth principal component account respectively for 8.3%, 1.5%, and 0.02% of the variation. Overall, we can conclude that the first principal component has the maximum explanatory power as it provides sufficient information on the depth of financial development. Consequently, we can safely use the indicator "FINDEV" in the empirical analysis.

All other variables (control variables) included in model (1) are described in Appendix 1. Appendix 2 shows the standard descriptive statistics on all variables used in the analysis. Appendix 3 reports the list of developing countries used in the analysis.

In terms of theoretical expectation of control variables, Crivelli and Gupta (2014) have argued that a rise in the development level reflects a higher degree of economic and institutional sophistication, and a rise in the demand for public services. As a result, higher development level may be positively associated with tax revenue. We also expect a negative effect of the share of value added in the agriculture sector in total output on non-resource tax revenue in light of the difficulties of taxing the agricultural sector (e.g., Balh, 2003) and given that for political reasons, governments exempt a large share of agricultural activities from taxes (e.g., Bird et al. 2008). Likewise, in an inflationary environment, lags in tax payments reduce the real amount of tax collected by the inflation rate (this effect is further enhanced if the tax system is not protected from inflation) (e.g., Tanzi, 1977). According to Ghura (1998), high inflation rates reduce the tax base because economic agents will adjust their portfolio in favour of assets that typically escape taxes, with the objective of protecting the real value of their wealth. As for the effect of the population size, we argue, following Bahl (2003), that tax systems in countries experiencing faster growing populations, may lag behind in the ability to capture new taxpayers. This, therefore, suggests that the rise in the population size may be negatively associated with tax revenue. Improvement in institutional quality helps governments better mobilize tax revenue (e.g., Ghura, 1998; Bird et al. 2008). Finally, we expect that improvements in terms of trade would positively influence tax revenue performance as such improvements would be associated with higher profitability for export industries and hence generate higher income tax revenue, higher trading

corporate tax revenue, and possibly higher trade tax revenue (when applied to imported inputs) (see Agbeyegbe et al., 2006). At the same time, terms of trade improvements might be negatively associated with tax revenue performance if governments do not endeavour to efficiently collect tax revenue, including non-resource tax revenue during periods of such improvements in the terms of trade.

We provide a first insight into the relationship between financial development and non-resource tax revenue by plotting in Figure 1, the scatter plot between the variables "FINDEV" and "NRTAX" over the full sample as well as over the sub-samples of LDCs[12] (Least developed countries) and NonLDCs (countries in the full sample that are not classified as LDCs). We observe across the three graphs in Figure 1 that financial development tends to be positively correlated with non-resource tax revenue share of GDP. Meanwhile the graph concerning the full sample tends to show the existence of some outlier-countries. In particular, there are four outlier-countries, including Albania, Bulgaria, Lesotho and Mongolia, which have exhibited a share of non-resource tax revenue (% GDP) higher than 30%. In the empirical analysis, we check whether these outlier-countries genuinely influence the estimations' outcomes.

3.2 Econometric approach

Following many studies on the determinants of public revenue performance, including in developing countries (e.g., Agbeyegbe et al. 2006; Baunsgaard and Keen, 2010; Crivelli and Gupta, 2014; Crivelli, 2016; Gnangnon and Brun, 2017, 2018, 2019; Mosley, 2015), we estimate the dynamic model (1) using the two-step system Generalized Methods of Moments (GMM) approach proposed by Arellano and Bover (1995) and Blundell and Bond (1998). This estimator allows to handle endogeneity concerns, in particular related to simultaneity, omitted variable biases, and potential biases associated with the correlation between the lagged dependent variable and countries' time-invariant specific effects. For example, while financial development is expected to 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 (e.g., Colombo and Caldeira, 2018; Schandlbauer, 2017). The same reasoning could apply to several variables used in the analysis. For example, while the real per capita income could be expected to affect the level of a country's tax performance, tax revenue performance could also influence the real per capita income as countries with lower tax revenue performance are, for example, likely to experience lower public investment and possibly lower real per capita income. Likewise, countries where higher trade openness results in lower tax revenue may be willing to adopt restrictive trade measures so as to collect higher tax revenue at the border (i.e., higher tariff revenue or higher export tax revenue). The two-step system GMM estimator is particularly suitable for dynamic panel dataset with large numbers of countries (N) relative to the time period (T) (e.g., Roodman, 2006). While this estimator has usually been used to perform micro panel-based analyses (Eberhardt, 2012), it is also widely used in empirical macroeconomic analyses such as those concerning the determinants of public revenue performance. This estimator combines the first-difference equations with suitably lagged levels as instruments and levels equations with suitably lagged first-differences as instruments. In particular, in the equations in first differences, the two-step system GMM approach makes use of lagged levels of the series as instruments for the pre-determined and endogenous variables, and for equations in levels, it relies on lagged differences of the dependent variable as instruments. This estimator has been found to be more efficient than the first-

[12] It is worth noting that we focus on LDCs versus NonLDCs because LDCs are considered by the United Nations as the poorest and most vulnerable countries in the world to external and environmental shocks. The choice of LDCs as a sub-sample in the analysis is particularly relevant because these countries exhibit a lower level of financial development compared to other countries in the sample. This category of countries is also recognized as a special group of countries that deserve special treatment by Members of the World Trade Organization (WTO). Further information on LDCs, including the list of these countries could be found online at: http://unohrlls.org/about-ldcs/

differenced GMM estimator of Arellano and Bond (1991) in the presence of persistent data and weak instruments for first differences. Furthermore, it is recommended when the panel dataset is unbalanced, as the difference GMM estimator has a weakness of magnifying gaps (Roodman, 2009). The consistency of this GMM estimator hinges on three diagnostic tests. These include the Arellano-Bond (AB) test of presence of first-order serial correlation in the error term (denoted AR(1)) and no second-order autocorrelation in the residuals (denoted AR(2)), and the Sargan-Hansen test of over-identifying restrictions (OID). Thus, failure to reject the null hypotheses of these tests would give support to the consistency of the two-step system GMM estimator. In addition, while the GMM approach allows researchers to have some freedom in specifying the lag structure for the instruments, that is, in using the second (or third) lag of the instrumented variables up to the nth lag ($n \geq 2$), we ensure that the rule of thumb whereby the number of instruments should not exceed he number of countries in the regressions, is met. In fact, when the number of instruments is higher than the number of countries, instrument overfit and estimations' results tend to be biased towards outcomes based on the ordinary least squares estimations (Roodman, 2009). In such a situation, the diagnostic tests may lose power (e.g., Ziliak, 1997; Bowsher, 2002; Roodman, 2009). The regressions have used at maximum 4 lags of the dependent variable as instruments and 3 lags of the endogenous variables as instruments, and the Windmeijer (2005) corrected standard errors.

The estimations based on the two-step system GMM approach proceed as follows. First, we estimate model (1) as it stands, results of which are reported in column [1] of Table 1. Second, as noted above, we check whether the outlier-countries identified in Figure 1 influence the estimation's outcomes reported in column [1] of Table 2. To do so, we create a dummy variable, denoted "DUMOUTL", which takes the value "1" for outliers, and 0, otherwise. Then, we include this dummy variable as well as its interaction with the indicator "FINDEV" in model (1). If these variables lead to a significant change in the coefficient of "FINDEV" obtained in column [1], then, we could conclude that these outliers definitely influence the outcomes of the baseline regression. In such a case, all other estimations would be based on the specification of model (1), which includes the dummy outlier and its interaction with the "FINDEV" indicator. If in contrast, the coefficient of "FINDEV" does not significantly change after the introduction in model (1) of the dummy-outlier and its interaction with "FINDEV", then we could conclude that the outliers do not affect significantly the baseline model's estimation outcomes. Thus, this baseline model could be used for the rest of the analysis. Column [2] of Table 2 reports the empirical outcome of the estimation of the model (1) specification that takes into account outliers. It could be observed in this Table that the coefficient of "FINDEV" in columns [1] and [2] are identical, which lead us to conclude that the suspected outliers in Figure 1 do not in reality influence the estimation outcomes. As a result, the other model specifications described below would definitely rely on model (1) that does not include the dummy-outlier and its interaction with "FINDEV". In Table 3, we report the estimations' results of different specifications of model (1) in which the composite indictor "FINDEV" is replaced with each of its components, denoted respectively "LLGDP" for the share (%) of liquid liabilities, in percentage of GDP; "PCRDBOFGDP" for the share (%) of the private credit by deposit money banks and other financial institutions in GDP; "BDGDP" for the ratio (%) of Bank deposits to GDP; and "FDGDP" for the share of the financial system deposit, in percentage of GDP. Results in column [1] of Table 4 allow calculating the net effect of financial development on non-resource tax revenue performance in LDCs versus NonLDCs, while results in column [2] of the same Table aim to help analyse more generally how the effect of financial development on non-resource tax revenue performance varies across countries in the full sample. Results reported in column [1] of Table 4 are obtained by estimating a specification of model (1), which contains a dummy variable representing LDCs in the full sample (this dummy denoted "LDC" takes the value 1 for LDCs, and 0, otherwise) and the interaction of this dummy with "FINDEV". Similarly, results in column [2] of Table 4 are obtained by estimating another

specification of model (1) that includes the interaction between the variables "GDPC" and "FINDEV". The estimates displayed in Table 5 arise from the estimation of different specifications of model (1) in which we introduce only once each of the variables capturing the channels through which financial development can affect non-resource tax revenue. To recall, these channels include the international trade channels, which comprise the level of trade openness, denoted "OPEN"; the share of manufactured exports in total export products, denoted "SHMANEXP"; the degree of export product concentration ("ECI") – for which higher values reflect greater export product concentration, while declining values indicate higher degree of exports product diversification; and the economic growth channel ("GROWTH" is the measure of economic growth rate). All these channel-variables are described in Appendix 1. The purpose of introducing each variable (only once) in the model (1) is to check whether they influence the effect of financial development on non-resource tax revenue performance. If for example, after introducing a channel-variable, the coefficient of "FINDEV" becomes statistically non-significant, then this may indicate that the effect of financial development on non-resource tax revenue performance translates through this variable. If in contrast, the coefficient of "FINDEV" remains statistically significant (but maintains its sign), then we could conclude that in addition to the new channel-variable added to the model, financial development influences non-resource tax revenue through other channels, such as the size of the informal sector (as explained in the introduction and that we do not investigate in the present analysis). Finally, Table 6 displayed outcomes of the estimations of different variants of model (1) in which we introduce (only once) each channel-variable along with its interaction with "FINDEV". The purpose of doing so is to examine the extent to which the effect of financial development on non-resource tax revenue depends on each of the channels highlighted above.

4. Analysis of empirical results

At the bottom of all columns of Tables 2 to 6, we provide the outcomes of the diagnostic tests that help assess the consistency of the two-step system GMM approach. We can observe that all regressions accept the null hypothesis of presence of first-order serial correlation in the error term (denoted AR(1)) and no second-order autocorrelation in the residuals (denoted AR(2)), as well as the hypothesis of the joint validity of instruments used in the regressions. Furthermore, the number of instruments is consistently lower than the number of countries across all columns of the six Tables. Incidentally, the coefficient of the lag of the dependent variable (see also the bottom of all columns of the six Tables) is positive and statistically significant at the 1% level, which confirms the findings of previous studies (cited above) that public revenue performance, including non-resource tax revenue performance exhibits a state-dependence path. This definitely shows the relevance of considering the dynamic specification of model (1) in the analysis. Overall, these outcomes indicate the appropriateness of using the two-step system GMM approach to address empirically the issue at hand.

We now turn to the estimates reported in Tables 2 to 6. For the sake of simplicity, we henceforth refer the share of non-resource tax revenue in GDP to "non-resource tax revenue". Let us now start with the results presented in Table 2. As already noted, the coefficient of the variable "FINDEV" is the same in the two columns of this Table, thereby suggesting that outliers do not influence the estimations' results reported in column [1]. In particular, we obtain that the effect of financial development on non-resource tax revenue is positive and statistically significant at the 1% level. Focusing on estimates in column [1] of Table 2, we find that a 1-point increase in the index of financial development is associated with a 0.012 percentage point rise in non-resource tax revenue. To provide an economic significance of this effect, we combine this estimate with the standard deviation of the variable "FINDEV", which amounts to 36.239. Hence, an increase in the index of financial development by a one-standard deviation is associated with a rise in non-resource tax revenue by 4.17 (= 0.115*36.239) percentage points. Concerning control variables,

we find (from column [1]) that a rise in real per capita income is negatively and significantly associated with non-resource tax revenue, thereby indicating that less advanced countries among developing countries tend to experience a higher non-resource tax revenue than relatively advanced countries among developing countries. This may suggest that less advanced economies make higher effort to collect tax revenue (expressed in share of their GDP) compared to relatively advanced developing countries. As expected, a rise in the share of the value added in the agricultural sector (in percentage of total output) influences negatively and significantly non-resource tax revenue. Likewise, lower inflation rates and a rise in the population size are negatively and significantly associated with non-resource tax revenue. Surprisingly, terms of trade improvements lead to lower non-resource tax revenue, which may signify that when countries experience an improvement in their terms of trade, they tend to reduce their effort of non-resource revenue mobilization. At this stage of the analysis, it is important to note that results obtained over control variables in all columns of Tables 4 to 6 are consistent with those in column [1] of Table 2.

Turning now to results in Table 3, we obtain across the four columns of this Table that all four indicators of financial development are positively and significantly (at the 1% level) associated with non-resource tax revenue. Interestingly, the indicators "LLGDP", "BDGDP" and "FDGDP" exhibit almost the same magnitude of the coefficient, while the coefficient of the indicator "PCRDBOFGDP" almost doubles the coefficients of the other three indicators. Overall, these results confirm our previous findings in Table 2 that financial development influences positively and significantly non-resource tax revenue.

Results in Table 4 suggest that the interaction term (of the variable "FINDEV*LDC") is yet positive, but statistically significant only at the 10% level. This indicates that it is only at the 10% level that a higher depth of financial development exerts a higher positive effect on non-resource tax revenue in LDCs than in NonLDCs. Thus, at the 5% level, financial development influences positively and significantly non-resource tax revenue in LDCs and NonLDCs alike, with a similar magnitude of this positive effect. Specifically, an increase in the index of financial development by a one-standard deviation is associated with a rise in non-resource tax share by 0.3 (= 0.00817*36.239) percentage points in both LDCs and NonLDCs. As these effects represent 'average' effects over the full sample (for results in column [1]) or over LDCs and NonLDCs (for results in Table 4), we find useful to explore how financial development influences non-resource tax revenue across countries in the full sample. Results in column [2] of Table 4 allow to perform this analysis. Here, we are interested in both the coefficient of "FINDEV" and the interaction term related to the variable "FINDEV*[Log(GDPC)]". We note that the former is positive and statistically significant at the 1% level, while the latter is negative, but statistically significant only at the 10% level. Taking together, these two results suggest that at the 5% level, financial development always influences positively and significantly non-resource tax revenue, regardless of countries' level of real per capita income. To get a better picture on this impact, we display in Figure 2, at the 95 per cent confidence intervals, the development of the marginal impact of financial development on non-resource tax revenue for varying countries' levels of development (proxied by their real per capita income). It is worth noting that the statistically significant marginal impacts at the 95 per cent confidence intervals are those encompassing only the upper and lower bounds of the confidence interval that are either above or below the zero line in Figure 2. We observe in this Figure that the marginal effect of financial development on non-resource tax revenue is always positive, but declines as countries experience a rise in the real per capita income. However, this marginal effect is not always statistically significant (at the 5% level). Specifically, it is non-statistically significant for countries whose real per capita income exceed US$ 11324.5 [=

exponential (9.334727[13])] (according to statistics reported in Appendix 2, values of the real per capita income variable range between US$ 153.9 and US$ 18257.4). Hence, countries with a real per capita income lower than US$ 11324.5 experience a positive impact of financial development on non-resource tax revenue, and the lower countries' real per capita income, the greater is the magnitude of the positive impact of financial development on non-resource tax revenue. In contrast, countries whose real per capita income exceeds this threshold experience no significant effect of financial development on non-resource tax revenue. Overall, the key message conveyed by Figure 2 is that less advanced developing economies experience a higher positive effect of financial development on non-resource tax revenue than relatively advanced developing countries.

As for results in Table 5, we note from column [1] that trade openness exerts a positive effect on non-resource tax revenue, which is statistically significant only at the 10% level. At the same time, the coefficient of the indicator "FINDEV" is statistically significant at the 1% level, and exhibits a magnitude similar to the one observed in Table 2. This signifies that at the 5% level, trade openness does not significantly affect non-resource tax revenue in a model specification that includes financial development as explanatory variable. This outcome contrasts with the findings of many previous studies that have either reported a positive or a negative effect of trade openness on public revenue, including non-resource tax revenue (for the latter see for example, Gnangnon and Brun, 2017). Thus, we may be tempted to conclude that, at the 5% level, the effect of trade openness on non-resource tax revenue may have been absorbed by that of financial development. Results in column [2] of Table 5 suggest that the increase in the share of manufactured exports in total export products exerts a positive and significant effect on non-resource tax revenue: a 1 percentage point increase in this share induces a 0.07 percentage point increase in the non-resource tax revenue. Similarly, we obtain from column [3] that export product concentration influences negatively and significantly (at the 1% level) non-resource tax revenue. In terms of the magnitude of this impact, a rise in the index of export product concentration by a one standard deviation (which amounts to 1.112 - see Appendix 2) is associated with a 0.64 [= (1.112*0.579)] percentage point decrease in non-resource tax revenue. Finally, estimates in column [4] indicate that higher economic growth influences positively and significantly (at the 1% level) non-resource tax revenue: a 1-point increase in the economic growth rate generates a 0.16-point increase in non-resource tax revenue.

Turning now to results in Table 6, the key coefficients of interest for the analysis include the coefficient of "FINDEV" and the interaction term associated with the interaction variable contained in each column of the Table. Results in column [1] of this Table suggest a non-statistically significant coefficient of "FINDEV" (at the conventional levels), but a positive and statistically significant interaction term associated with the variable ["FINDEV*OPEN"]. The combination of these two results, therefore, suggests that the effect of financial development on non-resource tax revenue depends on the level of trade openness, and indeed, increases as countries further open-up their economies to international trade. Figure 3 provides, at the 95 per cent confidence intervals, the development of the marginal impact of financial development on non-resource tax revenue for varying countries' levels of trade openness. The Figure indicates that this marginal impact is always positive and increases as countries experience a higher degree of trade openness, but it is not always statistically significant. In fact, it is statistically significant for levels of trade openness strictly higher than 32.3% (note that as per Appendix 2, values of trade openness range between 0.22% and 229.64%). Therefore, we conclude that countries whose trade openness levels exceed 32.3% experience a positive effect of financial development on non-resource tax revenue, and for these countries, the greater the degree of trade openness, the higher is the magnitude of the positive impact of financial development on non-resource tax revenue. For

[13] This number is obtained from the graph (in Figure 1) generated by the Stata software used to compute the development of the marginal impact of financial development on non-resource tax revenue for varying countries' levels of development.

the other countries (i.e., those with a level of trade openness lower than 32.3%), financial development exerts no significant impact on non-resource tax revenue. Summing up, the key message from Figure 3 is that greater trade openness (especially if it exceeds the threshold 32.3%) enhances the positive effect of financial development on non-resource tax revenue.

Results in column [2] of Table 6 indicate that both the coefficient of "FINDEV" and the interaction term related to the variable ["FINDEV*SHMANEXP"] are positive and statistically significant at the 5% level, thereby suggesting that financial development consistently induces higher non-resource tax revenue regardless of the value of countries' share of manufactured exports in total export products. Interestingly, the magnitude of the positive effect of financial development on non-resource tax revenue consistently increases as countries experience a higher share of manufactured exports in total export products. Figure 4 better illustrates this impact by showing at the 95 per cent confidence intervals, how the marginal impact of financial development on non-resource tax revenue evolves for varying countries' shares of manufactured exports in total export products. The graph in this Figure clearly confirms that the effect of financial development on non-resource tax revenue is always positive, regardless of the value of countries' share of manufactured exports in total export products, and additionally increases as this share rises. These findings appear to be confirmed by results in column [3] of Table 6, which allow to analyse how financial development influences non-resource tax revenue for varying levels of export product concentration (or diversification). Estimates presented in column [3] of Table 6 show a positive coefficient of "FINDEV" and a negative interaction term (of the variable "FINDEV*ECI") that are statistically significant respectively at the 1% level and the 5% level. Taking together, these two results suggest that there is a threshold of "ECI" above which the total effect of financial development on non-resource tax revenue becomes negative. This threshold is given by the value 8.45 (= 0.0196/0.00232). As values of the "ECI" variable range between 1.009 and 6.269 (see Appendix 2), and given that the threshold 8.45 is not contained in this interval, we definitely conclude that regardless of the countries' level of export product concentration, financial development always exerts a positive effect on non-resource tax revenue. However, the magnitude of this positive effect decreases as countries' level of export product concentration increases. This finding raises the question as to whether the magnitude of the positive effect of financial development on non-resource tax revenue also decreases as countries experience a higher level of export concentration on manufactured products. We will investigate this issue later. But for the time being, results in column [3] of Table do suggest that financial development always exerts a positive effect on non-resource tax revenue (irrespective of the level of export product concentration or diversification), but the magnitude of this positive effect rises as countries enjoy greater export product diversification. This finding is confirmed in Figure 5, which displays how the marginal impact of financial development on non-resource tax revenue evolves for varying countries' levels of export product concentration. It could be observed in this Figure that this marginal impact is always positive and statistically significant, but decreases as the level of export product concentration increases. In other words, financial development is always associated with higher non-resource tax revenue, with the magnitude of this positive effect rising as countries enjoy a higher degree of export product diversification.

Turning now to results in column [4] of Table 6, we find that a negative and statistically significant (at the 5% level) coefficient of "FINDEV", but a positive and statistically significant (at the 1% level) of the interaction term related to the variable ["FINDEV*GROWTH"]. These mean that the total effect financial development on non-resource tax revenue is positive only when the economic growth rate reaches a minimum threshold, which amounts to 1.22% (= 0.00450/0.00370). Hence, on average, countries with an economic growth rate lower than 1.22% experience a negative effect of financial development on non-resource tax revenue. However, countries with an economic growth rate higher than 1.22% enjoy a positive effect of financial development on non-resource tax revenue, and for this group of countries, higher economic

growth induces a greater positive effect of financial development on non-resource tax revenue. These findings are well reflected in Figure 6, which shows at the 95 per cent confidence intervals, the development of the marginal impact of financial development on non-resource tax revenue for varying countries' economic growth rates. It clearly appears that this marginal impact could take both negative and positive values, and increases as the economic growth rate rises. Specifically, for economic growth rates lower than 1.17% (number[14] that is closed to the one obtained above), financial development induces lower non-resource tax revenue, and for economic growth rates higher than 1.17%, financial development results in higher non-resource tax revenue. Overall, the key message from Figure 6 is that financial development generates higher non-resource tax revenue only when countries experience a rise in the economic growth rate, notably when the latter exceeds the threshold of 1.17%.

5. Further analysis

In the previous section, we have found that while financial development always exerts a positive effect on non-resource tax revenue, the magnitude of this positive effect decreases as countries' level of export product concentration increases. As noted, this raises the question as to whether the magnitude of the positive effect of financial development on non-resource tax revenue also decreases as countries experience a higher level of export concentration on manufactured products. This section tries to address this issue. To do so, we estimate a variant of model (1), which contains four interaction variables: the interaction between financial development and export product concentration; the interaction between financial development and the share of manufactured exports in total exports products; the interaction between the share of manufactured exports in total exports products and export product concentration; and the interaction between financial development, the share of manufactured exports in total exports products and export product concentration. The results of the estimation of this variant of model (1) using the two-step system GMM estimator are presented in Table 7. It could be noted from this Table that the regression has passed with success all diagnostic tests that help assess the consistency of the GMM approach (see the results at the bottom of Table 7). In addition, the coefficient of the one-period lag of dependent variable is positive and significant, thereby confirming the state-dependence nature of non-resource tax revenue, and hence once again, the relevance of considering a dynamic nature of this variant of model (1).

Turning to estimates provided in this Table, we note that those of control variables are to a large extent consistent with the ones observed in column [1] of Table 1. However, our main coefficients of interest here are the interaction terms associated respectively with the interaction variables ["FINDEV*SHMANEXP*ECI"]" and ["SHMANEXP*ECI"]. It is interesting to note that the coefficient of "[FINDEV*SHMANEXP*ECI]" is positive and statistically significant at the 1% level, thereby suggesting that financial development induces higher non-resource tax revenue in countries that concentrate their export on manufactured products. As in the meantime, the interaction term of ["SHMANEXP*ECI"] is negative and statistically significant also at the 1% level, we can infer that financial development is positively associated with non-resource tax revenue only when countries' export concentration on manufactured products reaches a certain threshold. This is clearly illustrated in Figure 7, which shows at the 95 per cent confidence intervals, how the marginal impact of financial development on non-resource tax revenue evolves for varying countries' levels of the combined index of export product concentration and the share of manufactured exports in total export products. The Figure indicates that only for very low levels of export concentration on manufactured products that financial development induces lower non-

[14] This number is obtained from the graph (in Figure 6) generated by the Stata software used to compute the development of the marginal impact of financial development on non-resource tax revenue for varying countries' economic growth rates.

resource tax revenue. In other words, financial development almost always generates higher non-resource tax revenue, as countries concentrate their export products on manufactured products.

6. Conclusion

This study contributes to two strands of the literature, namely the literature on the macroeconomic effects of financial development in developing countries, on the one hand, and the literature on the determinants of tax revenue in developing countries, on the other hand. It has examined the effect of financial development on non-resource tax revenue, including through the international trade and economic growth channels, using a dataset of 104 countries over the period 1980-2014. Empirical results have shown that financial development is positively associated with non-resource tax revenue. Furthermore, the magnitude of this positive effect increases as countries enjoy higher degrees of trade openness (at least when trade openness level reaches a minimum threshold), higher shares of manufactured exports in total export products, higher levels of export product diversification, or higher economic growth rates (at least from a minimum economic growth rate). Incidentally, the analysis has shown that developing countries that experience a rise in export concentration on manufacturing products consistently enjoy a positive effect of financial development on non-resource tax revenue, and the magnitude of this effect rises as countries experience a rise of the share of manufacturing share in total export products. From a policy perspective, this study has underlined the importance of deepening domestic financial markets for improving non-resource revenue performance in developing countries, including when these countries are able to promote their manufacturing export performance, export product diversification, trade openness and economic growth.

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Tables and Appendices

Table 1: Principal component analysis for financial development depth index

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	3.61	3.2739	0.902	0.902
Comp2	0.33	0.275	0.083	0.985
Comp3	0.058	0.057	0.015	0.9998
Comp4	0.000839	..	0.0002	1.0000

Table 2: Impact of financial development on non-resource tax revenue
Estimator: Two-step System GMM

Variables	**NRTAX**	**NRTAX**
	(1)	**(2)**
FINDEV	0.0115***	0.0115***
	(0.00281)	(0.00247)
DUMOUTL		1.605***
		(0.428)
FINDEV*DUMOUTL		-0.00229
		(0.00526)
Log(GDPC)	-0.834***	-1.338***
	(0.272)	(0.260)
SHAGRI	-0.136***	-0.169***
	(0.0163)	(0.0160)
INFL	-0.217***	-0.238***
	(0.0743)	(0.0636)
POLITY2	0.0696**	0.0296
	(0.0308)	(0.0288)
TERMS	-0.00404**	-0.00326*
	(0.00168)	(0.00172)
Log(POP)	-0.856***	-0.590***
	(0.199)	(0.199)
$NRTAX_{t-1}$	0.562***	0.578***
	(0.0237)	(0.0243)
Constant	28.98***	28.83***
	(3.996)	(3.892)
Observations - Countries	491 - 104	491 - 104
Number of Instruments	66	78
AR1 (P-Value)	0.0101	0.0094
AR2 (P-Value)	0.2018	0.1848
OID (P-Value)	0.2628	0.5029

*Note: *p-value<0.1; **p-value<0.05; ***p-value<0.01. Robust Standard Errors are in parenthesis. In the two-step system GMM estimations, the variables "FINDEV", "GDPC", "DUMOUTL", "POLITY2" and the interaction variable have been considered as endogenous. The other variables have been considered as exogenous.*

Table 3: Impact of components of financial development on non-resource tax revenue
Estimator: Two-step System GMM

Variables	NRTAX	NRTAX	NRTAX	NRTAX
	(1)	(2)	(3)	(4)
LLGDP	0.0110***			
	(0.00117)			
PCRDBOFGDP		0.0200***		
		(0.00174)		
BDGDP			0.0128***	
			(0.00123)	
FDGDP				0.0110***
				(0.00141)
Log(GDPC)	-0.995***	-0.896***	-0.928***	-0.821***
	(0.190)	(0.192)	(0.147)	(0.161)
SHAGRI	-0.190***	-0.121***	-0.176***	-0.167***
	(0.0170)	(0.0167)	(0.0165)	(0.0170)
INFL	-0.280***	-0.406***	-0.315***	-0.331***
	(0.0665)	(0.0637)	(0.0723)	(0.0717)
POLITY2	0.0474**	0.0516**	0.0563**	0.0574**
	(0.0234)	(0.0233)	(0.0252)	(0.0248)
TERMS	-0.00284	-0.00327*	-0.00480***	-0.00388**
	(0.00173)	(0.00169)	(0.00170)	(0.00180)
Log(POP)	-0.486*	-0.444**	-0.744***	-0.766***
	(0.281)	(0.225)	(0.250)	(0.250)
$NRTAX_{t-1}$	0.614***	0.584***	0.620***	0.620***
	(0.0274)	(0.0220)	(0.0295)	(0.0291)
Constant	24.84***	22.66***	28.49***	27.85***
	(5.382)	(4.284)	(4.652)	(4.658)
Observations - Countries	492 - 104	491 - 104	491 - 104	491 - 104
Number of Instruments	66	66	66	66
AR1 (P-Value)	0.0120	0.0102	0.0118	0.0115
AR2 (P-Value)	0.1754	0.1547	0.1789	0.1755
OID (P-Value)	0.1685	0.1965	0.1461	0.1906

*Note: *p-value<0.1; **p-value<0.05; ***p-value<0.01. Robust Standard Errors are in parenthesis. In the two-step system GMM estimations, the variables "FINDEV", "GDPC" and "POLITY2" have been considered as endogenous. The other variables have been considered as exogenous.*

Table 4: Impact of financial development on non-resource tax revenue in LDCs versus NonLDCs
Estimator: Two-step System GMM

Variables	NRTAX	NRTAX
	(1)	(2)
FINDEV	0.00817***	0.0344**
	(0.00229)	(0.0143)
FINDEV*LDC	0.00763*	
	(0.00402)	
FINDEV*[Log(GDPC)]		-0.00305*
		(0.00182)
LDC	-1.958***	
	(0.520)	
Log(GDPC)	-0.651**	-0.647***
	(0.314)	(0.179)
SHAGRI	-0.144***	-0.138***
	(0.0123)	(0.00808)
INFL	-0.228***	-0.226***
	(0.0686)	(0.0517)
POLITY2	0.0414**	0.0518***
	(0.0203)	(0.0190)
TERMS	-0.00267**	-0.00552***
	(0.00122)	(0.00132)
Log(POP)	-0.824***	-0.568***
	(0.161)	(0.115)
$NRTAX_{t-1}$	0.535***	0.554***
	(0.0217)	(0.0182)
Constant	28.38***	23.26***
	(3.817)	(2.417)
Observations - Countries	491 - 104	491 - 104
Number of Instruments	80	80
AR1 (P-Value)	0.0099	0.0115
AR2 (P-Value)	0.2001	0.2156
OID (P-Value)	0.2190	0.2155

*Note: *p-value<0.1; **p-value<0.05; ***p-value<0.01. Robust Standard Errors are in parenthesis. In the two-step system GMM estimations, the variables "FINDEV", "GDPC", "POLITY2" and the interaction variables have been considered as endogenous. The other variables have been considered as exogenous.*

Table 5: Introducing in the analysis the channels through which financial development can affect non-resource tax revenue
Estimator: Two-step System GMM

Variables	NRTAX	NRTAX	NRTAX	NRTAX
	(1)	(2)	(3)	(4)
FINDEV	0.0111***	0.00527***	0.0133***	0.0115***
	(0.00208)	(0.00138)	(0.00215)	(0.00222)
OPEN	0.00484*			
	(0.00260)			
SHMANEXP		0.0701***		
		(0.00720)		
ECI			-0.579***	
			(0.167)	
GROWTH				0.161***
				(0.0247)
Log(GDPC)	-0.819***	-0.0234	-1.105***	-0.546***
	(0.219)	(0.195)	(0.136)	(0.171)
SHAGRI	-0.120***	-0.130***	-0.134***	-0.120***
	(0.0126)	(0.0145)	(0.0119)	(0.0146)
INFL	-0.152***	-0.556***	-0.253***	-0.110*
	(0.0412)	(0.0653)	(0.0656)	(0.0617)
POLITY2	0.0334	-0.00663	0.0298	0.0283
	(0.0241)	(0.0210)	(0.0200)	(0.0192)
TERMS	-0.00256*	-0.0118***	-0.00200	-0.00425***
	(0.00133)	(0.00157)	(0.00130)	(0.00133)
Log(POP)	-0.166	-0.639***	-0.542***	-0.397***
	(0.130)	(0.184)	(0.179)	(0.111)
$NRTAX_{t-1}$	0.586***	0.506***	0.576***	0.603***
	(0.0184)	(0.0233)	(0.0252)	(0.0161)
Constant	16.50***	21.22***	27.71***	17.79***
	(2.801)	(3.665)	(3.896)	(2.536)
Observations - Countries	469 - 101	409 - 97	476 - 104	491 - 104
Number of Instruments	78	78	78	78
AR1 (P-Value)	0.0107	0.0343	0.0189	0.0095
AR2 (P-Value)	0.2064	0.1550	0.2480	0.2498
OID (P-Value)	0.4571	0.3936	0.1749	0.4890

*Note: *p-value<0.1; **p-value<0.05; ***p-value<0.01. Robust Standard Errors are in parenthesis. In the two-step system GMM estimations, the variables "FINDEV", "GDPC", "POLITY2", "OPEN", "SHMANEXP", "ECI", and "GROWTH" have been considered as endogenous. The other variables have been considered as exogenous.*

Table 6: Channels through which financial development could affect non-resource tax revenue
Estimator: Two-step System GMM

Variables	NRTAX	NRTAX	NRTAX	NRTAX
	(1)	(2)	(3)	(4)
FINDEV	0.000527	0.00305**	0.0196***	-0.00450**
	(0.00304)	(0.00143)	(0.00381)	(0.00202)
FINDEV*OPEN	0.000116***			
	(2.75e-05)			
FINDEV*SHMANEXP		0.000165**		
		(7.84e-05)		
FINDEV*ECI			-0.00232**	
			(0.000912)	
FINDEV*GROWTH				0.00370***
				(0.000407)
OPEN	0.00190			
	(0.00190)			
SHMANEXP		0.0467***		
		(0.00538)		
ECI			-0.760***	
			(0.111)	
GROWTH				0.0296*
				(0.0173)
Log(GDPC)	-0.561***	0.158	-1.006***	-0.489***
	(0.135)	(0.101)	(0.0991)	(0.122)
SHAGRI	-0.137***	-0.135***	-0.126***	-0.108***
	(0.00838)	(0.0108)	(0.00800)	(0.0110)
INFL	-0.143***	-0.421***	-0.324***	-0.151***
	(0.0258)	(0.0520)	(0.0498)	(0.0419)
POLITY2	0.0256**	-0.0269**	0.0158	0.0492***
	(0.0113)	(0.0120)	(0.0121)	(0.0171)
TERMS	-0.00487***	-0.00959***	-0.000632	-0.00549***
	(0.000827)	(0.000999)	(0.000927)	(0.00114)
Log(POP)	-0.592***	-0.854***	-0.511***	-0.503***
	(0.0754)	(0.0639)	(0.0880)	(0.0786)
$NRTAX_{t-1}$	0.607***	0.526***	0.570***	0.614***
	(0.0129)	(0.0150)	(0.0140)	(0.00882)
Constant	22.12***	22.98***	27.21***	19.32***
	(2.144)	(1.768)	(1.907)	(1.379)
Observations - Countries	469 - 101	409 - 97	476 - 104	491 - 104
Number of Instruments	92	89	92	92
AR1 (P-Value)	0.0118	0.0321	0.0186	0.0036
AR2 (P-Value)	0.2278	0.1754	0.2521	0.3442
OID (P-Value)	0.2550	0.3218	0.1918	0.4392

*Note: *p-value<0.1; **p-value<0.05; ***p-value<0.01. Robust Standard Errors are in parenthesis. In the two-step system GMM estimations, the variables "FINDEV", "GDPC", "POLITY2", "ECI", "SHMANEXP", "GROWTH" as well as the interaction variables have been considered as endogenous. The other variables have been considered as exogenous.*

Table 7: To what extent do the effect of financial development on non-resource tax revenue depend on the joint effect of both export product concentration and the share of manufactured exports in total export products?
Estimator: Two-step System GMM

Variables	**NRTAX**
	(1)
FINDEV	0.0303***
	(0.00771)
FINDEV*SHMANEXP*ECI	0.000503***
	(8.44e-05)
FINDEV*SHMANEXP	-0.00165***
	(0.000323)
FINDEV*ECI	-0.00647***
	(0.00183)
SHMANEXP*ECI	-0.0621***
	(0.00748)
SHMANEXP	0.255***
	(0.0280)
ECI	0.250**
	(0.126)
Log(GDPC)	0.0345
	(0.0990)
SHAGRI	-0.122***
	(0.0114)
INFL	-0.445***
	(0.0480)
POLITY2	-0.0201
	(0.0157)
TERMS	-0.00526***
	(0.000891)
Log(POP)	-0.725***
	(0.0891)
$NRTAX_{t-1}$	0.541***
	(0.0186)
Constant	19.89***
	(2.018)
Observations - Countries	405 - 97
Number of Instruments	91
AR1 (P-Value)	0.0380
AR2 (P-Value)	0.2336
Sargan (P-Value)	0.3135

*Note: *p-value<0.1; **p-value<0.05; ***p-value<0.01. Robust Standard Errors are in parenthesis. In the two-step system GMM estimations, the variables "FINDEV", "GDPC", "POLITY2", "OPEN", "SHMANEXP", "ECI", and the interaction variables been considered as endogenous. The other variables have been considered as exogenous.*

Figures

Figure 1: Correlation pattern between FINDEV and NRTAX

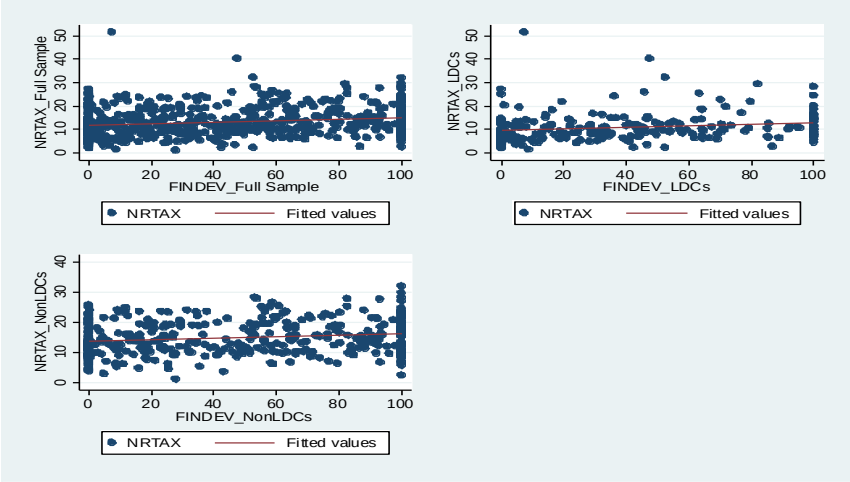


Figure 2: Marginal Impact of "FINDEV" on "NRTAX", for varying levels of per capita income

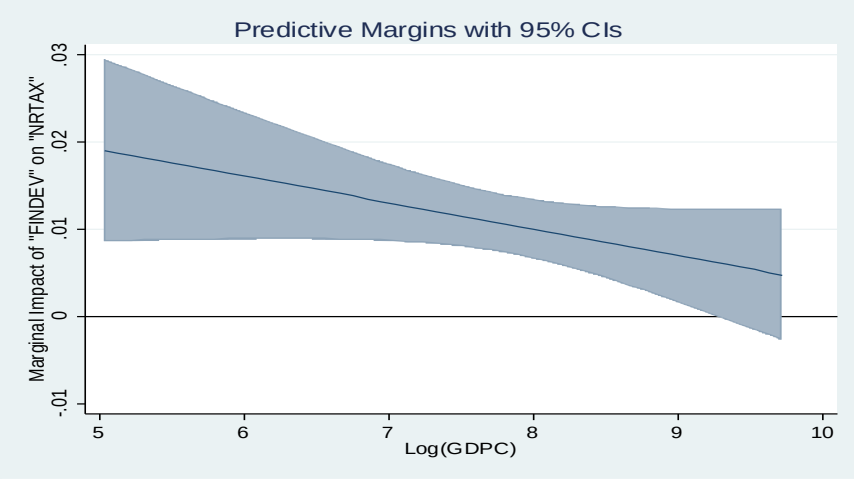


Figure 3: Marginal Impact of "FINDEV" on "NRTAX", for varying degrees of trade openness

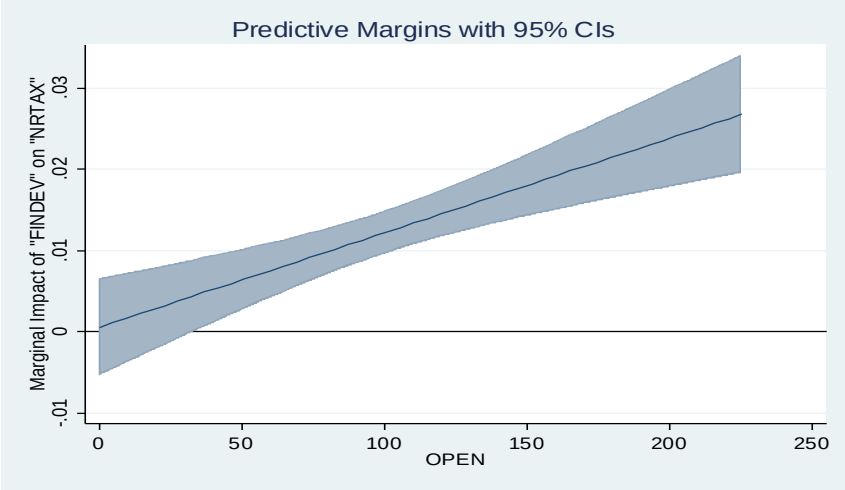
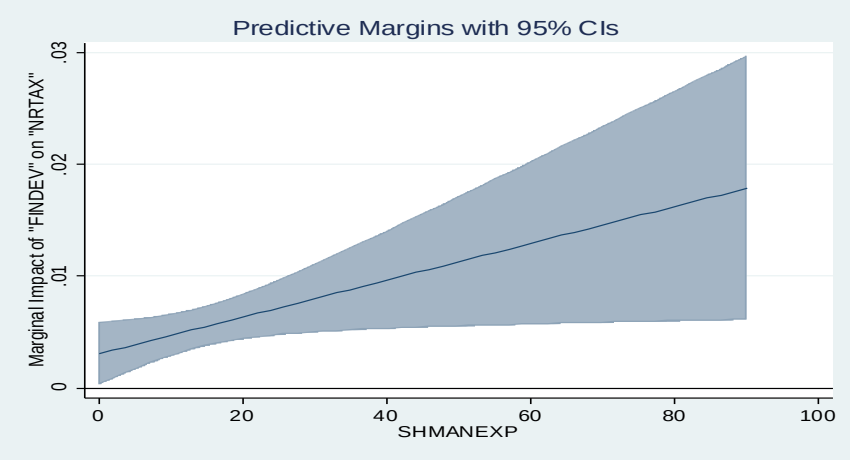


Figure 4: Marginal Impact of "FINDEV" on "NRTAX", for varying shares of manufactured exports in total export products



Source: Author

Figures (Continued)

Figure 5: Marginal Impact of "FINDEV" on "NRTAX", for varying degrees of overall export product concentration

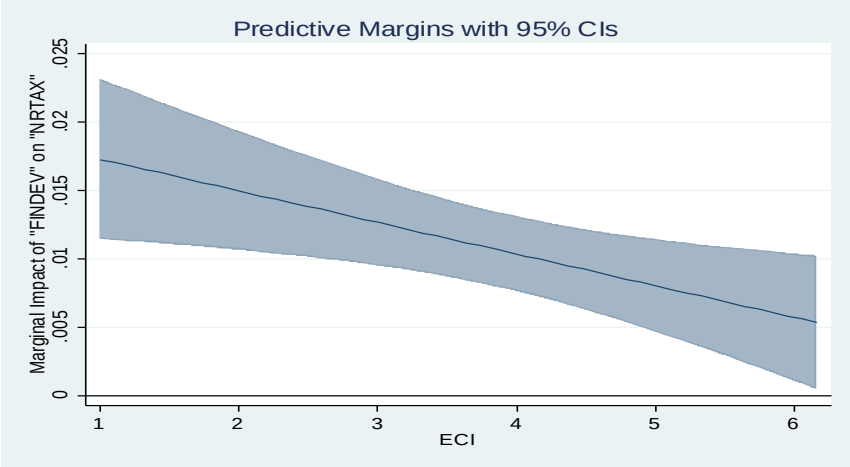


Figure 6: Marginal Impact of "FINDEV" on "NRTAX", for varying economic growth rates

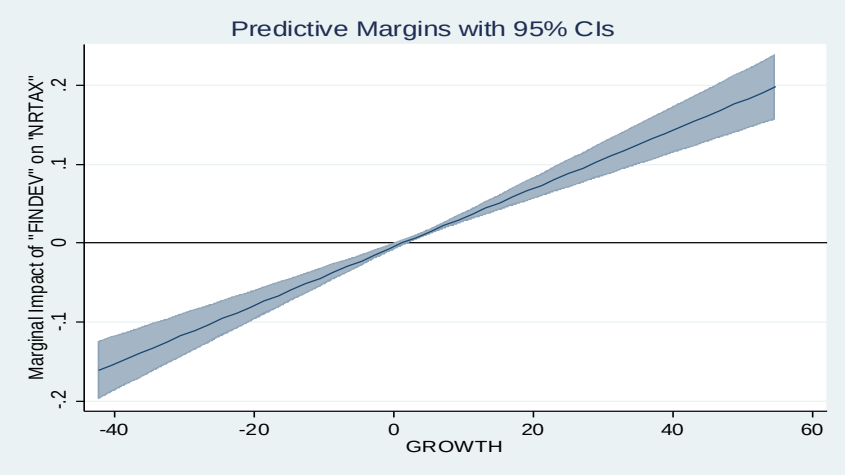
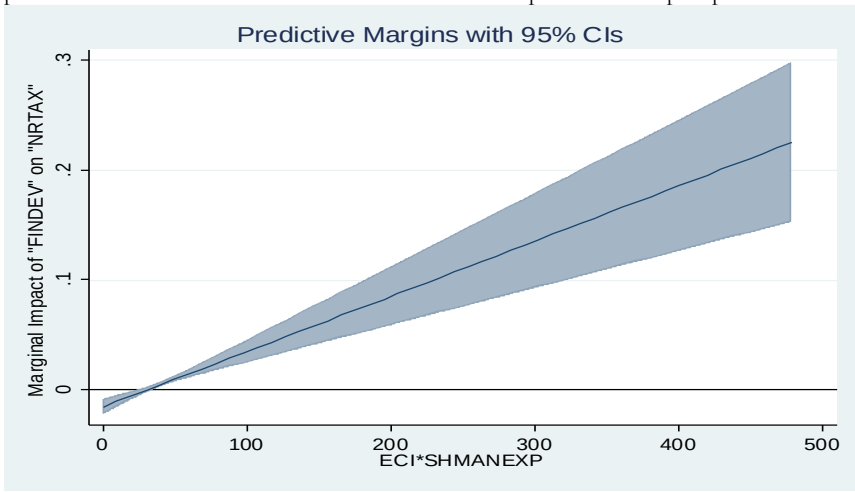


Figure 7: Marginal Impact of "FINDEV" on "NRTAX", for varying joint values of both export product concentration and the share of manufactured export in total export products



Source: Author

Appendix 1: Definition and Source of variables

Variables	Definition	Sources
NRTAX	This is the share of a country's total non-resource tax revenue in percentage of GDP, which represents the difference between the total tax revenue excluding grants and social contributions (in % GDP) and the resource tax revenue (in % GDP), the latter being the tax revenue collected on natural resources.	ICTD Public Revenue Dataset. See online: https://www.wider.unu.edu/project/government-revenue-dataset
FINDEV	This is the indicator of financial development. It is a composite index of 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). The "FINDEV" indicator has been computed by relying on the factor analysis approach, including the Principal Component Analysis that allows to extract a common factor from the above-mentioned four indicators of financial development. The computed index has been normalized so that its values range from 0 to 100. Higher values of "FINDEV" reflect higher depth of financial development, and lower values indicate lower level of financial development.	Author's calculation based on data on the four indicators extracted from the World Bank's Financial Structure dataset developed by Beck et al. (2000; 2009) and Čihák et al. (2012) and updated in July 2018 (see online at: https://www.worldbank.org/en/publication/gfdr/data/financial-structure-database)
LLGDP	Liquid liabilities, in percentage of GDP.	Data extracted from the World Bank's Financial Structure dataset developed by Beck et al. (2000; 2009) and Čihák et al. (2012) and updated in July 2018 (see online at: https://www.worldbank.org/en/publication/gfdr/data/financial-structure-database)
PCRDBOFGDP	Private credit by deposit money banks and other financial institutions, in percentage of GDP.	Data extracted from the World Bank's Financial Structure dataset developed by Beck et al. (2000; 2009) and Čihák et al. (2012) and updated in July 2018 (see online at: https://www.worldbank.org/en/publication/gfdr/data/financial-structure-database)
BDGDP	Bank deposits, in percentage of GDP.	Data extracted from the World Bank's Financial Structure dataset developed by Beck et al. (2000; 2009) and Čihák et al. (2012) and updated in July 2018 (see online at:

		https://www.worldbank.org/en/publication/gfdr/data/financial-structure-database)
FDGDP	Financial system deposit, in percentage of GDP.	Data extracted from the World Bank's Financial Structure dataset developed by Beck et al. (2000; 2009) and Čihák et al. (2012) and updated in July 2018 (see online at: https://www.worldbank.org/en/publication/gfdr/data/financial-structure-database)
OPEN	This is the measure of trade openness (i.e., de facto trade openness). It is calculated as the sum of exports and imports, in % GDP	WDI
SHMANEXP	Share (%) of manufactured exports in total export products	Author's calculation based on data from the UN COMTRADE database.
ECI	This is the first variable capturing export product upgrading. This is the index of overall export product concentration. It is calculated using the Theil Index and following the definitions and methods used in Cadot et al. (2011). The Theil index of export product concentration has been computed using a classification of products into "Traditional", "New", or "Non-Traded" products categories. A rise in the values of "ECI" index signifies an increase in the degree of overall export product concentration, while a decrease in the values of the index indicates a rise in the degree of overall export product concentration (that is, greater export product diversification).	Details on the calculation of this Index could be found online: International Monetary Fund's Diversification Toolkit – See data online at: https://data.imf.org/?sk=3567E911-4282-4427-98F9-2B8A6F83C3B6
GROWTH	Annual GDP growth (%)	Data extracted from the World Development Indicators (WDI) of the World Bank
TERMS	This is the measure of terms of trade. Terms of trade represent the ratio of the export price index to import price index.	Authors' calculation based on data from WDI.
GDPC	GDP per capita (constant 2010 US$)	WDI
SHAGRI	Share of value added in the agriculture sector in percentage of total output value.	WDI
INFL	The variable "INFL" has been calculated using the following formula (e.g., Yeyati et al. 2007): INFL $= sign(INFLATION) * \log(1 + \lvert INFLATION \rvert)$ (2), where $\lvert INFLATION \rvert$ refers to the	Authors' calculation based on data from the WDI.

	absolute value of the annual inflation rate (%), denoted "INFLATION". The annual inflation rate (%) is based on Consumer Price Index -CPI- (annual %) where missing values has been replaced with values of the GDP Deflator (annual %).	
Proxy for the Institutional Quality (POLITY2)	This variable is an index extracted from Polity IV Database (Marshall et al., 2018). It represents the degree of democracy based on competitiveness of political participation, the openness and competitiveness of executive recruitment and constraints on the chief executive. Its values range between -10 and +10, with lower values reflecting autocratic regimes, and greater values indicating democratic regimes. Specifically, the value +10 for this index represents a strong democratic regime, while the value -10 stands for strong autocratic regime.	Polity IV Database (Marshall et al., 2018)
POP	Total Population	WDI

Appendix 2: Standard Descriptive statistics on the variables used in the analysis

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
NRTAX	642	13.248	6.313	1.010	51.633
FINDEV	666	45.310	36.239	0	100
LLGDP	667	37.362	44.363	0.032	528.465
PCRDBOFGDP	667	25.487	30.215	0.009	441.340
BDGDP	667	29.486	36.237	0.017	411.734
FDGDP	667	29.704	36.402	0.030	411.734
OPEN	637	70.549	35.253	0.218	229.638
ECI	682	3.759	1.112	1.009	6.269
SHMANEXP	543	13.887	14.917	0.000	91.896
GROWTH	682	3.620	5.035	-42.451	56.696
POLITY2	700	0.930	6.173	-10	10
GDPC	686	2798.016	2867.621	153.903	18257.430
INFLATION	694	66.594	384.293	-5.903	6424.987
SHAGRI	646	20.412	13.026	1.131	73.788
POP	726	3.28e+07	1.04e+08	246533.6	1.27e+09
TERMS	678	104.556	66.916	10.919	813.973

Appendix 3: List of countries of the full sample

Full Sample			**LDCs**
Albania	Guinea	Paraguay	Angola
Algeria	Guinea-Bissau	Peru	Bangladesh
Angola	Guyana	Philippines	Benin
Argentina	Haiti	Romania	Bhutan
Armenia	Honduras	Russian Federation	Burkina Faso
Azerbaijan	India	Rwanda	Burundi
Bangladesh	Indonesia	Senegal	Cambodia
Benin	Iran, Islamic Rep.	Serbia	Central African Republic
Bhutan	Jamaica	Sierra Leone	Chad
Bolivia	Jordan	Solomon Islands	Comoros
Botswana	Kazakhstan	South Africa	Congo, Dem. Rep.
Brazil	Kenya	Sri Lanka	Djibouti
Bulgaria	Kyrgyz Republic	Sudan	Equatorial Guinea
Burkina Faso	Lao PDR	Suriname	Ethiopia
Burundi	Lebanon	Eswatini	Gambia, The
Cabo Verde	Lesotho	Tajikistan	Guinea
Cambodia	Liberia	Tanzania	Guinea-Bissau
Cameroon	Libya	Thailand	Haiti
Central African Republic	North Macedonia	Togo	Lao PDR
Chad	Madagascar	Tunisia	Lesotho
Colombia	Malawi	Turkey	Liberia
Comoros	Malaysia	Uganda	Madagascar
Congo, Dem. Rep.	Mauritania	Ukraine	Malawi
Congo, Rep.	Mauritius	Venezuela, RB	Mauritania
Costa Rica	Mexico	Vietnam	Mozambique
Cote d'Ivoire	Moldova	Yemen, Rep.	Myanmar
Djibouti	Mongolia	Zambia	Nepal
Dominican Republic	Morocco	Zimbabwe	Niger
Ecuador	Mozambique		Rwanda
Egypt, Arab Rep.	Myanmar		Senegal
El Salvador	Namibia		Sierra Leone
Equatorial Guinea	Nepal		Solomon Islands
Ethiopia	Nicaragua		Sudan

Fiji	Niger		Tanzania
Gabon	Nigeria		Togo
Gambia, The	Pakistan		Uganda
Georgia	Panama		Yemen, Rep.
Guatemala	Papua New Guinea		Zambia