NATURAL RESOURCES AND CAPITAL FLIGHT:
A ROLE FOR POLICY?[*]

Rabah Arezki, Gregoire Rota-Graziosi, and Lemma W. Senbet [†]

September 2014

Abstract

This paper investigates the relationship between natural resources and capital flight in the form of tax avoidance from multinational corporations. In particular, it focuses on the spillover effects in terms of tax revenue mobilization and stock market development from the thin capitalization rule, a policy instrument aimed at limiting firm tax avoidance through setting limits on a firm's foreign indebtedness. We exploit the plausibly exogenous within-country variations of data on oil discoveries for a panel of 117 countries during the period 1970–2012. We find evidence that oil discoveries significantly enhance both tax revenue mobilization and stock market development, but only when a thin capitalization rule is in place. We argue that these findings can be explained through the limiting role of a thin capitalization rule in multinational companies' use of financial transactions among their affiliates or tax havens to transfer part of the profit. The thin capitalization rule may thus not only help limit the erosion of the domestic tax base but may also entice multinational corporations to resort to using and developing the domestic financial system.

Key Words: Capital flight; illicit financial flows; thin capitalization; safe havens; Africa; transfer pricing; financial development.

JEL Classifications: G11; O16; O55; F38

"When **foreign investors make extensive use of offshore companies, shell companies, and tax havens, they weaken disclosure standards** and undermine the efforts of reformers in Africa to promote transparency. Such practices also facilitate **tax evasion** and, in some countries, corruption, draining Africa of revenues that should be deployed against poverty and vulnerability."

"It is unconscionable that **some companies**, often supported by dishonest officials, are **using unethical tax avoidance, transfer pricing, and anonymous company ownership to maximize their profits**, while millions of Africans go without adequate nutrition, health, and education."

<div align="right">Kofi Annan (African Progress Report 2013)</div>

1.   Introduction

While democratization and improvement in governance throughout the developing world suggest that governments may be facing more constraints, the globalization of trade and offshore finance has made multinational corporations more powerful, leaving some critics to argue that they have unfettered access to capital, labor, and natural resources, sometimes at the expense of the citizenry. In contrast to illicit financial flows instigated by political elites, the form of capital flight brought on by multinational corporations that manipulate prices and take advantage of loopholes in tax codes has received less attention. Some argue that the latter is surely on the rise (although it is hard to obtain systematic evidence), with far-reaching consequences for developing countries, especially resource-rich ones whose wealth is concentrated in one sector. The above quotes from Kofi Annan illustrate the importance of shedding light on the risks faced by resource-rich countries (Africa Progress Report, 2013). In the paper, we focus on the

macro implications of specific policy responses from resource-rich countries attempting to limit profit-shifting practices on the part of multinational corporations.

The Group of Twenty advanced and emerging economies (the G20) has put the issue of tax avoidance and profit shifting in general at the top of its agenda. In July 2013, the group adopted an action plan to rein in tax avoidance by multinational corporations, drawing from recommendations in a report by the Organisation for Economic Co-operation and Development (2013). Because multinational corporations operate in different countries and sometimes on different continents, they can readily take advantage of variations in regulations and tax laws across countries to avoid paying taxes both in the countries where they extract the wealth and where their headquarters are located. Specifically, some multinational corporations practice what is known as "transfer pricing" or "profit shifting," which involves attributing a corporation's net profit or loss before tax to opaque jurisdictions where taxes are low—the so-called tax havens. Tax havens serve as domiciles for more than two million companies and thousands of banks. Some analysts estimate the wealth in those tax havens to be on the order of $20 trillion (*The Economist*, 2013), but this is hard to know with certainty, given the secrecy prevailing in tax havens. Multinational corporations can shift profits in a variety of ways. One of the most widely used methods is through "thin capitalization," when a company chooses to be more indebted than similar independent entities. Indeed, companies are typically financed (or capitalized) through a mixture of borrowing (debt) and stock issuance (equity). The way a company structures its capital will often significantly lower the amount of profit it reports for tax purposes, because tax rules typically allow a deduction of interest paid, while the remuneration of equity (dividends) is not tax

deductible. This debt bias is exploited by multinational corporations, which are able to structure their financing arrangements in such a way that their affiliates in high-tax countries pay deductible interest to their affiliates in low-tax countries, or tax havens, thereby minimizing their global tax burden. Tax avoidance by multinational corporations is a serious problem for many developing countries, especially those rich in natural resources. For example, the Zambian government estimates that it loses $2 billion a year—15 percent of GDP—to tax avoidance by multinational corporations operating copper mines within the country.

The resource sector is the main game in town in many developing countries. Governments should try to collect as much revenue as they possibly can from the hefty profits generated while remaining attractive to investment. But striking the right balance to generate the most economic gains is often fraught with peril. First, the exploitation of natural resources, particularly minerals, [1] requires much technical expertise, which multinational corporations are not keen on sharing. Second, multinational corporations sometimes take advantage of different legal and institutional environments, which enables them to shift profits across countries. Finally, resource sectors have limited linkages with the rest of the economy. Therefore, governments in resource-rich developing countries need to do more to develop those linkages to diversify their economies and avoid economic growth supported only by non-renewable natural resources. Profit shifting by multinational corporations erodes the tax base in the countries where they operate but also in the countries where they are headquartered. This

---

[1] We focus on minerals and not oil and gas because the numerous oil and gas fields in resource-rich countries are operated by national oil/gas companies sometimes with production sharing agreements with multinational corporations. We leave the study of public vs. private ownership in the resource sector for further research.

may also lead to excessive foreign indebtedness, increasing the exposure of the country to a crisis in the event that one of those corporations is unable to meet its obligations.

An important aspect of profit shifting is the loss of positive spillovers that natural resource exploitation can bring to the country, including through the development of the domestic financial system. Preventing capital flight that stems from multinational corporations operating in the resource sector would help the development of a domestic financial system, particularly an equity market with its attendant benefits in risk sharing and liquidity provision. This in turn would aid in the financing and development of the non-resource sector.

The historical development of South Africa's stock market illustrates the potential benefits stemming from discoveries of natural resources. In 1886, the discovery of gold was rapidly followed by the establishment of the Johannesburg Stock Exchange. The stock exchange helped raise money for the then-booming mining and financial industry. Today, the Johannesburg Stock Exchange has a capitalization of more than $800 billion and 411 listed companies, including an overwhelming majority in the non-resource sector. According to a recent study by Revenue Watch (2012), the extractive sector company securities in stock exchanges represent a market capitalization of $7.7 trillion. Of that $7.7 trillion, the companies listed on the major American stock exchanges represent nearly $4.4 trillion. Companies publicly listed on a U.S. exchange cover 57 percent of the global market capitalization in Revenue Watch's data set. On U.S. exchanges, company listings in the extractive sector represent 36 percent of global sector value. Figure 1 shows shares of global sector value by exchange, based on the value of

companies whose primary listing is on that exchange. Figure 1 clearly shows that the valorization of natural resources is not happening in countries that are predominantly resource abundant, such as African countries, but in advanced economies where multinational corporations operating in that sector are located. Figure 2 shows that there is a negative relationship between a measure of mineral resource windfalls (which is defined in the empirical section) and stock market capitalization. Resource-rich countries will certainly gain from having more of their natural wealth valorized in their own countries. The finance literature also suggests that having a domestic financial sector allows countries to gain expert knowledge about the domestic economy and thus would help promote better allocation of capital and better price discovery.

[Figure 1 here]

In this paper, we explore the effect of the so-called thin capitalization rule (TCR), an instrument aimed at unilaterally limiting profit shifting of subsidiaries of multinational corporations, on tax revenue mobilization and financial development in resource-rich countries. First adopted in Canada in 1972,[2] the TCR is used in 60 countries as of January 2013. Colombia, Sierra Leone, Uganda, and Liberia are the countries that have adopted it more recently. The sharp increase in the adoption of the TCR around the world, but especially in resource-rich African countries, points to the importance of investigating the impact of TCR on tax revenue mobilization and other country features. To do so, we use panel data techniques to investigate the effects of the TCR. We find evidence that the TCR enhance tax revenue mobilization following resource windfalls. We also find

---

[2] In 1965, the IRS obtained the power (IRC section 385) to determine if intercompany loans are equity or not. In the former case, interest payments are then deemed as dividends distributions, which are taxable.

evidence for a statistically and economically significant effect on stock market development following a giant mineral discovery, but only for countries that have adopted TCR. These results are robust to a wide array of statistical checks. Our findings suggest that, despite recent improvements in state capacity and government accountability in most developing countries, the latter need to equip themselves with new policy tools to face up to mounting challenges associated with the ever increasing sophistication of profit shifting practices of multinational corporations aided by offshore finance.

[Figure 2 here]

This paper relates to several strands of the economics and finance literature. It is closely related to the literature on tax revenue mobilization in developing countries. For instance, Keen and Simone (2004) and Keen and Mansour (2010a, 2010b) discuss the challenges faced by developing countries in terms of tax revenue mobilization in a context where globalization leads to fierce corporate tax competition and trade liberalization. We contribute to this literature by considering an additional source of challenge that is profit shifting by multinational corporations and the effectiveness of the policy response. The paper also relates to the literature on capital flight. For instance, Ndikumana and Boyce (2003, 2001) provide empirical evidence suggesting that to a large extent capital flight is debt-fueled. Their estimates suggest that sub-Saharan Africa is a 'net creditor' to the rest of the world. While the existing literature on capital flight has focused disproportionately on illicit flows, in this paper we broaden the definition of capital flight to include flight

originating from multinational corporations in the form of tax avoidance. Indeed, debt bias is used by foreign firms in resource-rich countries as a vehicle for tax evasion.

This paper is also closely related to the literature on corporate tax and capital structure. Specifically, it is related to policies to alter capital structure and their effect on multinational groups' capital structure (Desai et al., 2004). So far this literature has focused on corporations or multinational groups but paid little attention to macro implications for host countries. We remedy this by elaborating on the lesson from this literature in the next section.

The paper also relates to the literature on financial liberalization, which has emphasized the benefits in terms of lowering the cost of capital (Henry, 2007) and the risks associated with increased financial instability. Recently, a consensus has emerged in policy institutions around the need to add capital controls to the policy maker's toolbox to be used as macroeconomic prudential tools (Korinek, 2011). This literature has not, however, explored the spillover effects of those controls on financial development. This paper discusses the consequences of specific policies such as the thin capitalization rule on financial development. The literature on the so-called resource curse has predominantly focused on the spending channel, but rarely on the tax side and even less on the financial side except for Beck (2011).[3] This paper contributes to this literature by focusing on the consequences of tax evasion and avoidance on financial development in

---

[3] The experiences of resource-rich countries (especially those rich in hydrocarbon and minerals) indeed suggest that resource wealth is not always a blessing. It can, in fact, be a curse. There are several explanations as to why the exploitation of natural resources could have negative consequences on the economy (Frankel, 2012). Resource-rich countries do face a multifaceted set of challenges: (i) loss in price competitiveness, the so called "Dutch Disease"; (ii) "debt overhang" or excessive spending leading to unsustainable fiscal positions and heavy indebtedness; (iii) macroeconomic volatility, hampering agents' investment and consumption decisions ; (iv) corruption by political elites and bureaucrats ; and (v) internal and external conflicts.

resource-rich countries. Finally, this paper also relates to the literature on financial development. The latter emphasizes the role of broadly defined institutions (La Porta et al., 1998). In this paper, we focus on the effect of a specific policy − the thin capitalization rule −on financial development.

2. Data, Empirical Strategy, and Results

2.1 Data

To test the effect of the TCR we resort to two empirical models. The two models explore what we refer to as intensive and extensive margins. The intensive margin relates to the effect of resource windfalls on tax revenue mobilization. The extensive margin is in reference to the development of the stock market. In practice, mineral windfalls will help capture the intensive margin while giant mineral discoveries will help capture the extensive margin.

Mineral Windfalls: To capture revenue windfalls from international mineral price booms, we construct a country-specific international commodity export price index:

$$ComPI_{i,t} = \prod_{c \in C} ComPrice_{c,t}^{\theta_{i,c}}$$

where $ComPrice_{c,t}$ is the international price of commodity c in year t, and θ_{ic} is the average (time-invariant) share of exports of commodity c in the GDP of country i. The data on annual international commodity prices are for the 1970–2007 period from UNCTAD Commodity Statistics. Data on the value of commodity exports are from the NBER-United Nations Trade Database. The commodities included in the commodity

8

export price index are mineral products. In cases where there were multiple prices listed for the same commodity a simple average of all the relevant prices is used.

Mineral Discoveries: To capture the effect of a resource endowment shock, we exploit data from MinEX consulting, a private consulting firm. The discovery event data consist of large (i.e. > 1 mt Cu-equiv, > 100kt Ni, > 1 Moz Au, >10 m carats, >25 kt U3O8) non-ferrous metals, precious metals, diamonds, uranium, and others. Discovery data consist of 1390 major deposits found around the world since 1950. The timing of giant mineral discoveries constitutes a unique source of within-country variation in mineral wealth that can be used to precisely test whether resource shocks may affect financial development in the context where the TCR is or is not in place. Discovery events are widely spread over time and space. This allows us to adopt panel data estimation techniques that control for country and year fixed effects.

2.2   Empirical strategy

A. Tax revenue mobilization

We now present the methodology used to estimate the effect of mineral windfall on resource tax revenues. Specifically, we estimate the following model:

$$\Delta \text{Resource Tax Revenue}_{it} = \mu_i + \alpha \text{ComPI}_{it} + \gamma_t + \beta \text{TCR}_{it} + \lambda \text{Interaction}_{it} + u_{it} \qquad (1)$$

where μ_i are country fixed effects that capture unobservable time-invariant country characteristics, and γ_t are year fixed effects that capture shocks common to all countries. The parameter estimate β reflects the marginal effect of mineral windfalls on logarithm

9

changes in resource tax revenues. The parameter estimate λ captures the marginal effect of the interaction between mineral windfall and a dummy for the TCR which takes a value of 1 if the country has adopted the TCR and 0 otherwise.[4] We also controlled for lagged resource tax revenue, which captures convergence effects in the level of resource tax revenue. We present the results from least squares estimation with fixed effects and time effects. The error term u_{it} is clustered at the country level and may be arbitrarily serially correlated within countries.

B. Stock market capitalization

To test the potential spillover effects of the TCR on financial development, we conduct an event analysis using cross-country variation in the timing of giant mineral discoveries for more than a hundred countries during 1970–2012. Our empirical framework controls for time-invariant factors, including geography, that can play an important role in the development (or the lack thereof) of a stock market. We adopt the panel model with distributed lag of giant mineral discoveries, as follows:

$$\text{Capitalization}_{it} = A(L)\text{Disc}_{it} + \alpha_i + \gamma'_0\, dt + \gamma'_1\, Z_{it} + \varepsilon_{it} \qquad (2)$$

where capitalization$_{it}$ is the stock market capitalization as percentage of GDP for country i in year t obtained from Beck (2011) and Demirguc-Kunt and Levine (2013) α_i controls for country fixed effects which capture unobserved time invariant characteristics such as geographic features; dt is the yearly effect controlling for common shocks; Z_{it} are other control variables; ε_{it} is the disturbance; $Disc_{it}$ is the giant mineral discovery event which

---

[4] The inclusion of fixed effects implicitly controls for time invariant factors such as geography and deeply rooted institutions.

takes a value of 1 if a discovery was made and 0 otherwise; and *A(L)* is the *p* order lag operator with *p* equal to 15 years. Thus, the dynamic effect of giant mineral discoveries is captured by the set of 15 coefficients associated with the lagged value of the discovery event. Given the large number of coefficients, we report the results in graphical form that includes the value of the coefficients and confidence bands.

Note that to test the effect of the TCR, we split the sample into a subsample that includes the country-year observations where the TCR was not adopted and another subsample with country-year observations where the TCR was in place.

2.3   Main results

A. Tax revenue mobilization

Table 1 summarizes our estimation results for the link between within-country variation in mineral windfall and within-country variation in resource tax revenue. Column (1) shows the least squares estimates where control variables are lagged dependent variable in level and country fixed effects as well as year fixed effects (both jointly significant at the 1% level). From column (1) the point estimate on our mineral windfall measure is 0.399, which is, however, not statistically significant at conventional levels. The point estimate in column (1) implies that a one standard deviation increase in the mineral windfall increases resource tax revenue by about 0.1 percent. In column (2) we show that this positive link between mineral windfall and tax resource revenue remains insignificant when controlling for TCR but the magnitude is virtually unchanged. The coefficient associated with the TCR is positive but not significant, which is inconsistent

11

with the view that individually the TCR may reduce the tax base and in turn resource tax revenue. Column (3), our preferred regression result, documents that the estimates of the interaction between mineral windfall and the TCR on resource tax revenue is statistically and economically significant. While the individual coefficient associated with the TCR is negative, the combined estimates suggest that in the face of a mineral windfall the presence of the TCR significantly improves the tax revenue mobilization compared to the case where the TCR is not in place. Quantitatively, the estimates suggest that in the presence of a TCR, a one standard deviation increase in mineral windfall leads to an extra 0.35 percent increase in resource tax revenue compared to the case where TCR is not in place.

Overall, our findings suggest that adopting the TCR allows governments in resource-rich countries to mobilize more effectively resource tax revenues following a mineral windfall. As discussed in the previous section, adopting the TCR allows avoiding profit shifting practices by multinational corporations and thus can limit the erosion of the tax base.

[Table 1 here]

B. Stock market capitalization

Figure 3 presents our results for the dynamic impact of the giant mineral discovery events on the stock market capitalization for all country-year observations. It shows the marginal effect based on the estimates of the panel distributed lag fixed effects model. We find evidence that the announcement of a giant mineral discovery (production typically starts

12

4–5 years after discovery) is followed by a decrease in stock market capitalization compared to countries where no such discoveries were made. The effect is statistically and economically significant. At its peak, a discovery leads to a lower stock market capitalization by 5 percent of GDP.

Figure 4 presents the results of our estimation using solely country-year observations for which TCR was adopted. The estimates show that stock market capitalization does increase following a giant mineral discovery. The effect is statistically and economically significant. Figure 4 shows that, at its peak, a giant mineral discovery leads to a 10 percent increase in stock market capitalization. In the absence of the TCR, a giant mineral discovery is followed by a decrease in stock market capitalization. Indeed, Figure 5 shows that at its peak the effect of a giant mineral discovery could lead to a decrease in stock market capitalization by about 5 percent of GDP.

Overall, our results suggest that following a resource discovery, stock market capitalization decreases. This result is consistent with the work of Beck (2011), who found evidence that resource-rich countries tend to have less-developed financial systems. However, in contrast, our findings show that the presence of a thin capitalization rule allows countries to reverse the negative effect on capitalization of the resource discoveries. That effect is large in terms of its impact on the economy.

[Figure 3 here]

[Figure 4 here]

[Figure 5 here]

3. Conclusion

This paper has explored the effects of the TCR on tax revenue mobilization and financial development in resource-rich countries. We found evidence that the TCR enhances tax revenue mobilization following resource windfalls. We also found evidence for a statistically and economically significant effect on stock market development following a giant mineral discovery, but only for countries that have adopted the TCR. The thin capitalization rule is a unilateral response to one of the main practices in aggressive tax optimization behavior by multinational corporations and appears to be the most viable option right now. It not only protects the tax base of resource-rich countries, but also helps link financial development in these countries with the exploitation of their resources. Our findings suggest that, despite improvements in state capacity and government accountability in the developing world, the latter needs to equip itself with new policy tools to face up to mounting challenges, considering the ever-increasing sophistication of profit-shifting practices of multinational corporations aided by offshore finance.

Yet other alternatives have been floated. Based on the U.S. experience, Nobel Laureate Joseph Stiglitz recently proposed taxing the global profits of multinational groups and redistributing a proportion of those tax receipts to the country in which the value is actually created. This would be analogous to converging to a source-based tax system, which many multinational corporations are vehemently lobbying against. Its alternative, the residence principle, allows multinationals to locate their headquarters in low tax rate jurisdictions. While Stiglitz's proposal is conceptually appealing, it might be impractical

given the limited level of disclosure now required of multinational corporations, not to mention the difficulty in coordinating all the actors involved, including tax havens.

Transparency in the extractive sector can also help limit capital flight and illicit flows in the form of tax evasion. Most prominently, the Extractive Industry Transparency Initiative, a global standard that promotes revenue transparency and accountability in the extractive sector and is governed by a board representing supporting countries, civil society organizations, industry, and investment companies, continues to push for further transparency in the oil, gas, and mining industries. The initiative asks governments and companies operating in participating countries to declare the amount of money received from oil exports. Critics say that the initiative doesn't go far enough, because so much can happen throughout the value chain.

More recently, the 2010 Dodd-Frank Act in the United States requires public disclosure to the Security and Exchange Commission of payments made to the U.S. and foreign governments relating to the commercial development of oil, natural gas, and minerals. In October 2011, the European Commission adopted a legislative proposal that would require EU-based companies to disclose their payments to governments for oil, gas, minerals, and logging on a country-by-country and per-project basis.

The increase in the level of disclosure of multinational corporations operating in the resource sector is certainly a very important step in the right direction. It will help make multinational groups more accountable to tax authorities in the countries where they operate. However, increasing transparency is only a first step toward tax base protection and does not deter tax avoidance through such tax optimization methods as thin

capitalization.

Overall, the concern over massive capital flight from developing economies, particularly those rich in resources, should go well beyond illicit financial flows and consider the seemingly legitimate behavior of corporations across countries consisting of shifting profits to minimize their tax liabilities. Thus, effective mechanisms, such as a thin capitalization rule, should be in place to deter massive outflows stemming from tax avoidance schemes.

References

Africa Progress Report. (2013). Equity in Extractives: Stewarding Africa's Natural Resources for All. Geneva: Africa Progress Panel.

Beck, T. (2011). Finance and Oil: Is There a Resource Curse? In R. Arezki, T. Gylfason, and A. Sy (Eds.), *Beyond the Curse: Policies to Harness the Power of Natural Resources*. Washington: International Monetary Fund.

Desai, M.A., Foley, C. F. and Hines, J. (2004). The Costs of Shared Ownership: Evidence from International Joint Ventures. *Journal of Financial Economics*, *73*(2), 323–74.

Frankel, J. (2012). The Natural Resource Curse: A Survey of Diagnoses and Some Prescriptions. In R. Arezki, C. Pattillo, M. Quintyn, and M. Zhu (Eds.), *Commodity Price Volatility and Inclusive Growth in Low-Income Countries*. Washington: International Monetary Fund.

Henry, P.B. (2007). Capital Account Liberalization: Theory, Evidence, and Speculation. *Journal of Economic Literature*, *45*(4), 887–935.

Keen, M., and Mansour, M. (2010a). Revenue Mobilization in sub-Saharan Africa:

Challenges from Globalization I—Trade Reform. *Development Policy Review¸ 28*, 552–71.

Keen, M., and Mansour, M. (2010b). Revenue Mobilization in sub-Saharan Africa—

Challenges from Globalization II—Corporate Taxation. *Development Policy Review¸ 28*, 573–96.

Keen, M., and Simone, A. (2004). Tax Policy in Developing Countries: Some Lessons

from the 1990s, and Some Challenges Ahead. In S. Gupta, B. Clements, and G. Inchauste (Eds.), *Helping Countries Develop: The Role of Fiscal Policy (*pp. 302–52). Washington: International Monetary Fund.

Korinek, A. (2011). The New Economics of Prudential Capital Controls: A Research

Agenda. *IMF Economic Review*, *59*(3), 523–61.

Ndikumana, L. and Boyce, J.K. (2001). Is Africa a Net Creditor? New Estimates of

Capital Flight from Severely Indebted sub-Saharan African Countries, 1970–1996. *Journal of Development Studies, 38*(2), 27–56.

Ndikumana, L. and Boyce, J.K. (2003). Public debts and public assets: Explaining capital

flight from sub-Saharan African countries. *World Development,* 31(1), 107-130.

Organisation for Economic Co-operation and Development (2013). Addressing Base

Erosion and Profit Shifting. Paris.

The Economist. (2013). The Missing $20 Trillion. Feb 16.

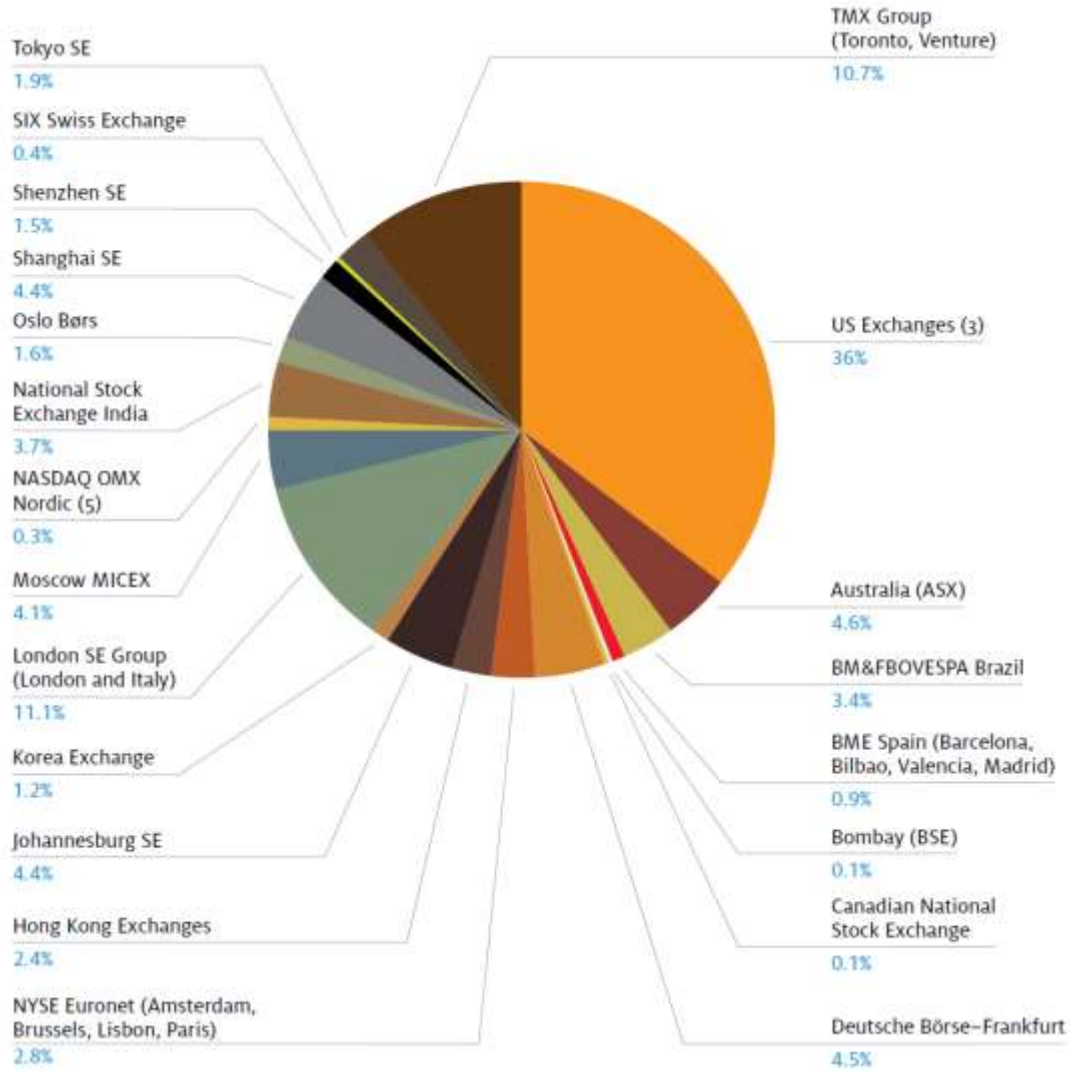**Table 1. Resource Revenue Mobilization and Thin Capitalization Rule**

	(1)	(2)	(3)
	Difference in Logarithm Resource Tax Revenue		
Lag Logarithm of Resource Tax Revenue	-0.578**	-0.580**	-0.593***
	(0.220)	(0.220)	(0.220)
Interaction Resource Windfall*TCR			1.178**
			(0.501)
Resource Windfall	0.399	0.404	0.346
	(0.246)	(0.246)	(0.233)
TCR		0.126	-5.436**
		(0.177)	(2.339)
Country fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes
Observations	415	415	415
R-squared	0.461	0.462	0.473
Number of countries	50	50	50

Robust standard errors in parentheses
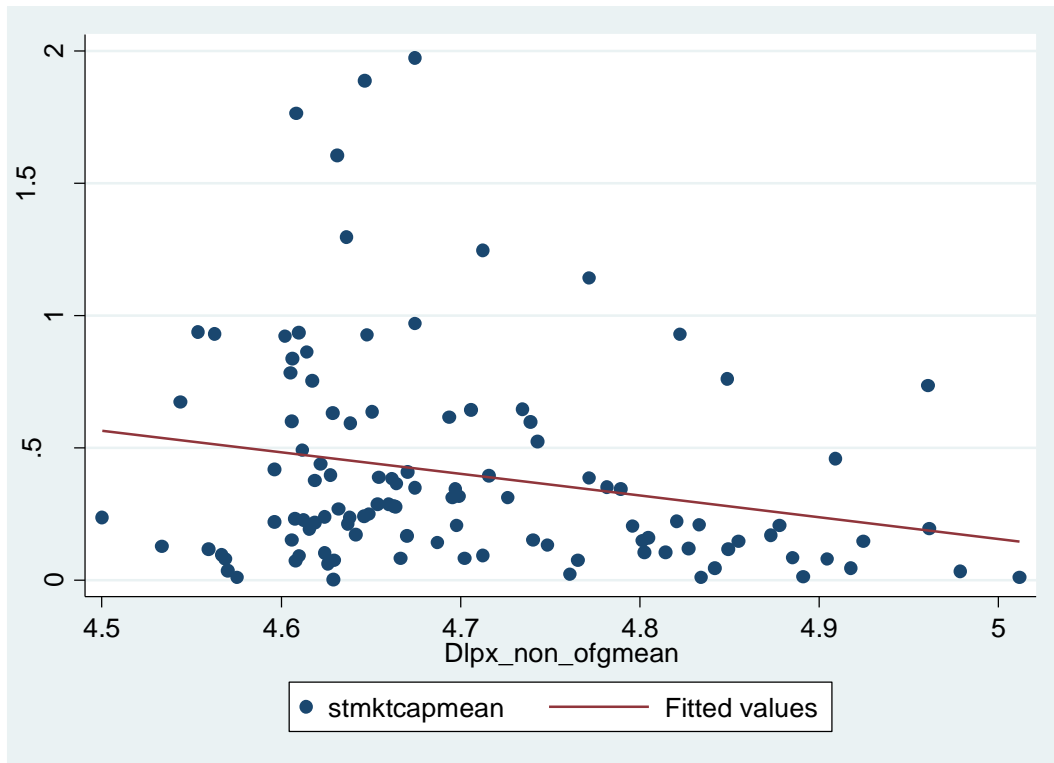*** p<0.01, ** p<0.05, * p<0.1

Note: The table shows the results of the estimation of fixed-effects estimation with tax revenue mobilization as a dependent variable and mineral discovery and its interaction with the thin capitalization rule as independent variables.

**Figure 1. Shares of Global Extractive Sector Value by Exchange**

Tokyo SE
1.9%

SIX Swiss Exchange
0.4%

Shenzhen SE
1.5%

Shanghai SE
4.4%

Oslo Børs
1.6%

National Stock
Exchange India
3.7%

NASDAQ OMX
Nordic (5)
0.3%

Moscow MICEX
4.1%

London SE Group
(London and Italy)
11.1%

Korea Exchange
1.2%

Johannesburg SE
4.4%

Hong Kong Exchanges
2.4%

NYSE Euronet (Amsterdam,
Brussels, Lisbon, Paris)
2.8%

TMX Group
(Toronto, Venture)
10.7%

US Exchanges (3)
36%

Australia (ASX)
4.6%

BM&FBOVESPA Brazil
3.4%

BME Spain (Barcelona,
Bilbao, Valencia, Madrid)
0.9%

Bombay (BSE)
0.1%

Canadian National
Stock Exchange
0.1%

Deutsche Börse–Frankfurt
4.5%

Source: Revenue Watch Institute

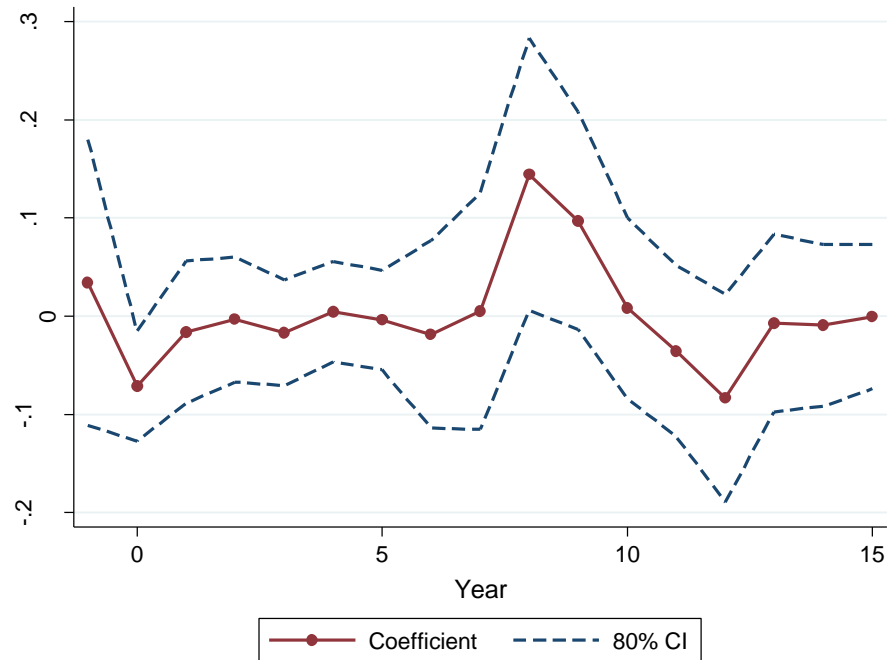**Figure 2. Stock Market Capitalization and Mineral Windfalls**

Source: Demirgunt et al. (2013) and UNCTAD (2012)

Figure 3. Dynamic Effect of Giant Mineral Discoveries on Stock Market Capitalization
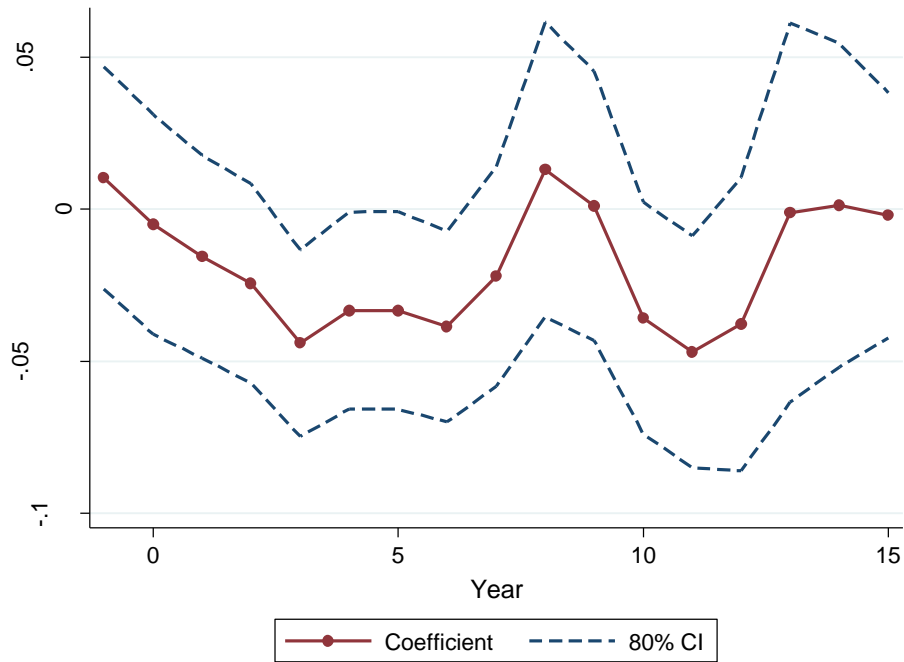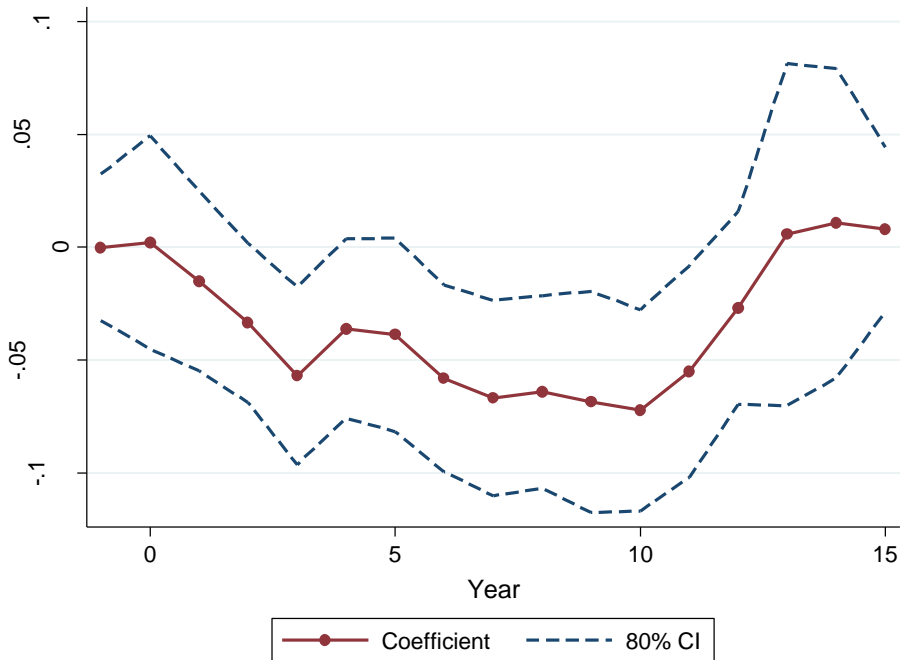

Note: The graph shows the results of the estimation of the distributed lagged model with stock market development as a dependent variable and mineral discovery as the independent variable. Specifically, it shows the values of the 15 coefficients and associated confidence bands. The sample includes over 117 countries covering the period 1970–2012.

Figure 4. Dynamic Effect of Giant Mineral Discoveries on Stock Market Capitalization for cases when Thin Capitalization Rule is in place

Note: The graph shows the results of the estimation of the distributed lagged model with stock market development as a dependent variable and mineral discovery and its interaction with the thin capitalization rule as independent variables. Specifically, it shows the values of the 15 coefficients and associated confidence bands for the observations corresponding to the year-country observation for which the thin capitalization rules were in place. The overall sample includes 117 countries covering the period 1970–2012.

Figure 5. Dynamic Effect of Giant Mineral Discoveries on Stock Market Capitalization for cases when Thin Capitalization Rule is not in place

Note: The graph shows the results of the estimation of the distributed lagged model with stock market development as a dependent variable and mineral discovery and its interaction with the thin capitalization rule as independent variables. Specifically, it shows the values of the 15 coefficients and associated confidence bands for the observations corresponding to the year-country observation for which the thin capitalization rules were not in place. The overall sample includes 117 countries covering the period 1970–2012.