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WIDER Working Paper 2022/36

Profit shifting by multinational corporations

Evidence from transaction-level data in Nigeria

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Abstract: Research on profit shifting by multinational corporations in developing countries is limited due to a lack of data. In this paper we use, for the first time, novel administrative data on the transactions of multinational corporations operating in Nigeria vis-à-vis related parties in other jurisdictions. The data provides a breakdown of these intra-group transactions into seven categories: (1) tangible goods, (2) services and fees, (3) royalties, (4) interest, (5) dividends, (6) reimbursements, and (7) other. We develop a methodology that uses this data to identify which transactions are most often used by multinationals to shift profits out of Nigeria and estimate their relative importance. We find that profits reported in Nigeria are highly sensitive to the hypothetical tax that would be paid on a transaction's value in the partner jurisdiction: a 1 per cent increase in the hypothetical tax on outgoing transactions is associated with a 0.28 per cent increase in reported profits in Nigeria. Payments for services and fees, royalties, and interest going from Nigerian companies to affiliates in low-tax countries are the most important channels of profit shifting in Nigeria. We argue that our approach can be used to inform low-cost policy interventions and increase audit efficiency with potentially strong effects on corporate income tax collection.

Key words: tax havens, multinational corporations, profit shifting

JEL classification: F36, G28, H26, H87

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1 Introduction

Multinational corporations (MNCs) engage in illicit financial flows through profit shifting to tax havens, exploiting the existing regulatory arbitrage opportunities. The channels that are used by MNCs to lower their global effective tax rates are now relatively well understood. There is compelling, firm-level empirical evidence on MNCs' strategic location of related companies (Clifford 2017; Huizinga and Voget 2009; Reurink and Garcia-Bernardo 2020; Voget 2011), assets (Dischinger and Riedel 2011; Karkinsky and Riedel 2012), liabilities (Buettner and Wamser 2013; Desai et al. 2004; Huizinga and Laeven 2008; Ruf and Weichenrieder 2012), and risk (Becker et al. 2020) in low-tax jurisdictions, as well as on the strategic mispricing of goods (Cristea and Nguyen 2016; Davies et al. 2018; Wier 2020) and services (Hebous and Johannesen 2015) transferred between related parties that face different tax rates. This literature, most of which builds in its empirical strategy on the seminal contribution by Hines and Rice (1994), suggests that reported profits are highly sensitive to differences in tax rates; a meta-analysis by Heckemeyer and Overesch (2017), as well as a review by Dharmapala (2014), report a consensus of the existing evidence on tax semi-elasticity of subsidiary pre-tax profits of about 0.8.

The overall scale of profit shifting and the resulting tax revenue losses is economically significant; a range of recent studies, despite using different data sources and methodologies, estimates annual global tax revenue losses of around US\$200 billion (Garcia-Bernardo and Janský 2021; Janský and Palanský 2019; Tax Justice Network 2020b; Tørsløv et al. 2020). At this scale, profit shifting has an important negative effect on economic growth, and it undermines countries' capacities to mobilize their revenue resources (Reuters 2018). Some recent evidence also suggests that low-income countries are likely to be affected more, which is a result of their lower capacity to protect their tax base (Besley and Persson 2013; Johannesen et al. 2020).

These recent advances in our understanding of profit shifting by MNCs have been made possible by improved data sources at both the macro- and micro-level. However, these data sources, and thus also our understanding of the issue, still suffer from low and, importantly, selective coverage. Most micro-level studies rely on Orbis, a private company-level database of financial results, whose low coverage of companies in low-income countries and in tax havens has been highlighted by many researchers (Garcia-Bernardo et al. 2020; Tørsløv et al. 2020). Macro-level data has relatively better coverage and enables comprehensive global estimates of the scale of profit shifting, but the aggregate nature of the data does not provide an opportunity for understanding the specific behaviour of individual firms.

In this paper we propose a new source of administrative data: transfer pricing disclosure forms (TPDFs), which we obtain in anonymized form for research purposes from tax authorities in several developing countries. We use the TPDFs to estimate the relative importance (with respect to profit shifting) of seven transaction categories: (1) tangible goods, (2) services and fees, (3) royalties, (4) interest, (5) dividends, (6) reimbursements, and (7) other. For each transaction, we calculate the hypothetical tax payment had that transaction not been made and instead were reported as profit in the country where it originated. We use a variation of the approach pioneered by Hines and Rice (1994), in which we use the hypothetical tax payments as explanatory variables in a regression designed to explain profits reported by the affiliates in Nigeria.

We find that profit shifting can indeed be observed in the transaction-level data focusing on Nigerian companies. Our results suggest that the hypothetical tax payments on outgoing transactions are strong predictors of reported profits, controlling for the value of the transactions and the companies' revenues. Payments for services and fees, royalties, and interest going from Nigerian companies to affiliates in low-tax jurisdictions emerge as the most important channels of profit shifting, which is consistent with the main channels of profit shifting identified in prior literature: strategic location of intangibles (services and fees, royalties) and debt shifting (interest payments). We propose a simple back-of-the-envelope cal-

ulation of the overall scale of profit shifting based on this transaction-level data, leading to an estimate of US\$163 million lost in tax revenue from the 64 companies in our sample alone.

The approach used in this paper allows identifying companies with a high risk of corporate profit shifting. We argue that this approach may have significant positive effects on corporate tax revenue collection as compared to the current mechanism of auditing, which has very limited capacity in developing countries. At the same time, the methodology would also allow identifying confidently the causal relationship between each transaction category and reported profits.

The remainder of this paper is structured as follows. Section 2 describes the institutional background in Nigeria and the context of the study. Section 3 presents the data sources. In Section 4 we describe how we employ the transaction-level data from TPDFs to analyse the profit shifting behaviour of MNCs. Section 5 presents the results and Section 6 concludes.

2 Institutional background

Nigeria is a middle-income country situated on the western coast of Africa. It is the largest economy in Africa, with a population of over 200 million people and GDP amounting to US\$432.3 billion in 2020 (PricewaterhouseCoopers 2022; World Bank 2021). As the country with the largest oil reserves in Africa, its economy is dependent on oil, which contributes 80 per cent to export earnings and more than 50 per cent to government revenues (World Bank 2021). The country's vast natural resources have over the years attracted a considerable number of MNCs which dominate primarily the oil and other extractive sectors. Similar to other developing economies, corporate tax revenues in Nigeria contribute significantly to government revenues: the OECD (2014b) highlights that tax from MNCs accounts for 88 per cent of all corporate income tax revenue.

Despite countries around the world competing to attract foreign direct investment by lowering corporate income tax rates, Nigeria has not changed its corporate income tax rate of 30 per cent for the past decade (KPMG 2022). This tax rate applies to large companies and MNCs with a turnover exceeding 100 million Nigerian naira (around US\$240,000). The rate of 30 per cent is slightly higher than in other large developing countries in Africa, such as Ghana (25 per cent) and South Africa (28 per cent). The high corporate income tax rate incentivizes MNCs operating in Nigeria to shift their profits to low-tax countries in order to reduce their global tax obligations.

The tax revenue losses that result from profit shifting by MNCs are likely to be economically significant: based on country-by-country reporting data from 2017, the Tax Justice Network (2021a) estimates that Nigeria loses US\$1.77 billion in tax revenue annually due to profit shifting by large MNCs alone. Total collected corporate income tax revenue amounted to US\$7.05 billion in 2017 (OECD 2021a).

Even though Nigeria's economy is relatively strong and is among the fastest-growing economies in the region, it faces numerous challenges including high unemployment and poverty rates and corruption. Nigeria is one of the countries with the highest corruption ranking (placed at 154 out of 180 countries by Transparency International (2021)). While such survey-based measures of corruption do not represent estimates of profit shifting, they generally serve as a good indicator of the tendency of the economy to engage in more illicit practices such as tax evasion by citizens and MNCs through profit shifting. Butnaru (2018) argues that when the corporate income tax rate is higher the effect of corruption becomes large if the profit shifting activities are factored in: when corruption levels are high, MNCs are more likely to engage in aggressive tax planning and profit shifting.

Similar to other developing countries, Nigeria has a relatively low administrative capacity of tax authorities and also loopholes in the tax system which make it susceptible to the risk of base erosion in the

form of transfer mispricing and debt shifting (OECD 2014a; Tax Justice Network 2020a). In a quest to enhance transparency in the tax system and to reduce tax avoidance by MNCs, the OECD in 2013 launched the BEPS (base erosion and profit shifting) project. This project ensures that profits generated from economic activities carried out by MNCs are taxed. Since then, the OECD has been extending membership to include as many countries as possible; as of November 2021, the OECD has collaborated with 141 countries to implement policies across 15 areas of the G20–OECD Inclusive Framework on BEPS (OECD 2021b).

Nigeria became one of the OECD BEPS signatories in 2017, committing to the implementation of the action plans (OECD 2017). KPMG (2020) reports that Nigeria focuses on implementing eight action plans from within BEPS, namely: addressing the tax challenges of the digital economy (Action 1); limiting base erosion involving interest deductions and other financial payments (Action 4); preventing allowance for treaty abuse (Action 6); aligning transfer pricing outcomes to value creation (Actions 8–10); evaluation of transfer pricing and country-by-country reporting (Action 13); and making dispute resolutions more effective (Action 14). It has reached significant milestones in terms of implementing these actions, particularly Actions 1, 8, 9, 10, and 13. Under Action 1, the 2019 Finance Act introduced the Significant Economic Presence (SEP), targeting MNCs in the digital space who derive income of up to 25 million Nigerian naira in Nigeria. For Actions 8–10, transfer pricing regulation was introduced in 2012 and subsequently revised in 2018 to align it with the outcome of the BEPS projects.

Importantly for the purposes of this paper, under Action 13 of the BEPS programme the Federal Inland Revenue Service (FIRS) of Nigeria began in 2019 the collection of data on intra-group transactions by MNCs operating in Nigeria. In the following section we describe how we collected and digitalized this data and how we analyse its features, before using it in the empirical part of the paper to improve our understanding of the behaviour of MNCs operating in Nigeria.

3 Data

The data used in this paper comes from TPDFs, reports on intra-group transactions that are submitted by all MNCs active in Nigeria to the FIRS. The TPDFs contain data on intra-group controlled transactions—transactions between the company operating in Nigeria and other companies sharing the same parent company. The TPDFs contain information on the financial results of companies, the values of each intra-group transaction, the direction and subject of the transaction, and the country in which the partner affiliate is located. For example, one observation could be an incoming transaction of US\$5 million from the sale of tangible goods to affiliate *A* located in Singapore, or US\$2 million of royalty expenses to affiliate *B* located in the Netherlands.

We divide the observed transactions into the following seven categories: (1) tangible goods, (2) services and fees, (3) royalties, (4) interest, (5) dividends, (6) reimbursements, and (7) other. Income and costs are reported separately for each of the seven transaction categories. The TPDFs also provide the company’s basic financial information (assets, revenues, profits, etc.) and information on the location of all parent, sister, and subsidiary companies. To the best of the authors’ knowledge, this data has not been used in academic research before and provides unprecedented detail and coverage for low-income countries.

As part of a collaboration between FIRS and the Tax Justice Network which started in 2019, we have obtained a sample of the TPDFs submitted in 2019 as anonymized scanned documents, which we digitalized by hand. In total, we obtained data on 302 transactions worth US\$3.7 billion made by 64 individual companies operating in Nigeria. For each transaction we have information on the value and currency, the jurisdiction of the partner affiliated company, and the category of the transaction as described above.

Table 1 shows descriptive statistics of the data at the transaction level. Table 1 also includes summary statistics on the hypothetical taxes paid on these transactions, a key variable in our analysis whose construction we describe in the following section.

Table 1: Summary statistics of transaction-level data from a sample of Nigerian MNCs, in million US\$

	<i>N</i>	Mean	SD	Min.	Max.
Value of income transactions	114	13.19	87.09	0	915
Hypothetical tax (ETR) on income transactions	112	2.52	11.04	0	82
Hypothetical tax (LACIT) on income transactions	112	1.52	6.73	0	46
Value of cost transactions	188	13.04	90.54	0	1,196
Hypothetical tax (ETR) on cost transactions	183	1.99	10.18	0	111
Hypothetical tax (LACIT) on cost transactions	183	1.35	6.63	0	60

Note: ETR, effective tax rate; LACIT, lowest available corporate income tax rate.

Source: authors' calculations based on FIRS data.

3.1 Incentives for profit shifting

To understand the motivation of MNCs to shift profits to other jurisdictions, we combine transaction-level and firm-level data from the TPDFs with country-level data in three areas: corporate income tax rates, withholding tax rates, and tax rates obtainable via tax treaties. First, for corporate income tax rates, we source data on effective tax rates (of foreign operations of MNCs) from the OECD country-by-country dataset. This data is the most relevant source of information on the activities of large MNCs. We use the adjustments for double counting of reported profits developed by Garcia-Bernardo and Janský (2021) and calculate effective corporate income tax rates as the ratio of actual taxes paid to reported profit. In addition to effective rates, we collect data on the lowest available corporate income tax (LACIT) rates and baseline statutory corporate income tax rates and use them in auxiliary specifications, hypothesizing that the effective rates are those that are relevant predictors of the profit shifting behaviour of MNCs, rather than statutory rates. We source the data on LACIT rates from the Corporate Tax Haven Index (Tax Justice Network 2021a) and on statutory rates from KPMG (2022).

Second, we use data on applicable withholding tax rates for transactions with third countries, as collected by the International Center for Tax and Development (ICTD). This data contains information on the withholding tax rates applicable on dividends, interest, royalties, and service and management fees. Transactions related to the sale of tangible goods and reimbursements are generally not subject to withholding tax.¹ Third, we adjust these withholding tax rates using information from double taxation agreements, which we source from the International Bureau of Fiscal Documentation and Treaties.

We define the total tax rate τ for transaction x to country c as:

$$\tau_{x,c} = 1 - (1 - ETR_c) \cdot (1 - WHT_{x,c}) \quad (1)$$

where ETR is the effective tax rate and WHT the withholding tax rate. As described above, we run an alternative specification that uses, instead of ETRs, the forward-looking LACIT rates complemented by statutory corporate income tax rates where LACIT rates are not available. The tax rate $\tau_{x,c}$ thus represents a measure of the motivation of companies to use transactions of category x vis-à-vis partner jurisdiction c . This distinction of tax rates applicable to different categories of transactions allows us to assess the motivation for profit shifting for each category separately.

¹ Although, in relatively rare cases, they may be subject to additional tariffs.

4 Empirical strategy

Our empirical strategy to using transaction-level data to estimate the relative importance of individual profit shifting channels consists of two steps. First, for each category x of transactions (e.g. royalty fees) between affiliates of company i we calculate the hypothetical total tax paid on the transaction's value, $T_{i,x}$, defined as the sum across x and c of the products of the applicable tax rate on the particular transaction category, $\tau_{x,c}$, and the value of the transactions in that category, $X_{i,x,c}$:

$$T_{i,x} = \sum_{x,c} \tau_{x,c} \cdot X_{i,x,c} \quad (2)$$

The hypothetical tax thus represents the value of tax that would have been paid had the transaction not taken place and so the full amount of that transaction would be reported as profit in the origin country of that transaction. By design, this approach thus assumes that the full sum of the transaction constitutes profit shifting.

In reality, there are two general channels that companies can use to shift profit, and this distinction impacts the interpretation of the effects of the hypothetical tax paid on reported profits. First, companies may carry out transactions that, had it not been for the difference in tax rates, would not have been carried out. As an example, a Nigerian affiliate may take out an unnecessary loan from its sister company located in a low-tax jurisdiction and pay interest on that loan, effectively shifting profit out of Nigeria equal to the value of that transaction. Second, the company may artificially inflate or deflate the prices of transactions that are taking place for legitimate purposes, with the aim to lower the profit reported in Nigeria, increasing the profit reported in the partner jurisdiction. As an example, a Nigerian affiliate may pay a higher interest rate on a loan than would be the market, arm's-length rate.

As a consequence, the motivation represented by the hypothetical tax maps onto the decision-making process of the affiliate as follows. For outgoing transactions (i.e. costs) both channels work in the same direction: following the example with an intra-company loan, a lower hypothetical tax in a low-tax jurisdiction would increase both the motivation to implement unnecessary loans and the motivation to inflate the interest rates on existing legitimate loans. Therefore, the effect of these motivations on the outgoing transactions is unambiguously positive—a lower hypothetical tax on cost transactions motivates companies to shift more profit to the partner jurisdiction, lowering the reported profit in the home country.

For incoming transactions (i.e. income), the situation is more complicated and differs across categories of transactions. For the first channel, if a company aims to shift profit out of Nigeria, for example, it might decide to implement an unnecessary loan, receiving interest (even though the interest rate is likely to be set relatively low because of the second channel being employed simultaneously, the effect should still be positive, albeit small). Within the second channel, we might expect at least some categories of incoming transactions to be positively correlated with the hypothetical tax, increasing the profits reported in the home country. As an example, a transaction involving the sale of tangible goods might have deflated prices, decreasing Nigerian affiliates' income and thereby the MNCs profit reported in Nigeria. Overall, in practice, the mechanism for an association between incoming transactions and the hypothetical tax paid on these transactions can be considered relatively weak, and we thus do not expect a strong effect of the hypothetical tax on incoming transactions on reported profits.

In the second step of our approach, to test for which of these effects prevail, we move from transaction-level data to the affiliate level, and we use $T_{i,x}$ in a variation of the standard Hines–Rice model of profits of affiliate i reported in its home country as:

$$\log(\pi_i) = \beta_0 + \beta_x \cdot \log(\mathbf{T}_{i,x}) + \gamma_x \cdot \log(\mathbf{V}_{i,x}) + \delta_\chi \cdot \chi_i + \varepsilon \quad (3)$$

where $\mathbf{T}_{i,x}$ is a vector of hypothetical taxes applicable to transaction x ; $\mathbf{V}_{i,x}$ is the value of transaction x ; χ_i is the logarithm of a company's revenue; and ε is the error term.

The coefficients of interest, $\beta_x, x \in (1, \dots, 10)$, express the increase of profits booked in the country as the total tax cost increases, while controlling for the actual value of the transaction, $V_{i,x}$, which is not adjusted by the tax rate of the partner country, and the company's revenue. We hypothesize that β_x will be positive and statistically significant for cost transaction categories x that most often facilitate corporate profit shifting, and that β_x will be negative and statistically significant for such income transactions.

Identifying which transaction categories are associated with lower reported profits (and how important they are relative to each other) is one of the key contributions of this paper. Lastly, we use the coefficients obtained from these regression models to estimate the scale of corporate profit shifting and the resulting tax losses by calculating the hypothetical profits in the case that all transactions were carried out with jurisdictions with tax rates similar to the domestic ones.

5 Results

Our baseline hypothesis in this paper is that profits reported by MNC affiliates that operate in Nigeria are sensitive to the hypothetical tax paid on incoming and outgoing intra-group transactions. We test this hypothesis in two stages: for total incoming and outgoing transactions, and then for each transaction category individually.

In Table 2 we report the results of the estimation of the model specified in equation (3). In line with our expectations, for income transactions (i.e. models reported in columns (1) and (2)) the reported profits are not statistically significantly associated with the total value of income transactions or the hypothetical tax on income transactions. When using the LACIT rate, reported in Table A1 in Appendix A, we find a statistically significant effect of the hypothetical tax on incoming transactions, but not of the actual value of incoming transactions. We break this result down into transaction categories in Table 3 and find only one negative, statistically significant coefficient: for the tangible goods category. Arguably, that is the category in which it is the most difficult to implement unnecessary transactions, leaving space only for the second channel of profit shifting, that of deflated prices. We also find a positive, statistically significant coefficient for the non-classified transactions; however, the number of observations in that category is relatively small and they are not representative of a specific trend in the behaviour of MNCs. We find a similar result in a robustness check using the LACIT rate, as reported in Table A2.

For outgoing transactions (i.e. costs), where the mechanism for profit shifting is much more straightforward, based on the reasoning in Section 4 we expect the effect to be unambiguously positive. Our findings are in line with this expectation. In columns (3) and (4) in Table 2, we find that hypothetical taxes on costs are positively associated with reported profits, and the effect is also economically significant: a 1 per cent increase in the hypothetical tax on outgoing transactions (i.e. costs) is associated with a 0.28 per cent increase in reported profits in Nigeria. In Table 4 we assess the individual transaction categories and we find statistically significant effects for the categories of services and fees, royalties, and interest. These three categories of transactions are consistent with the profit shifting channels that are recognized in the literature, mainly those of strategic location of intangible assets (for services and fees and royalties) and debt shifting (for interest). We do not find statistically significant results when using the LACIT rate instead of the effective tax rate (see Tables A1 and A3), suggesting that only effective rates represent a good predictor of profit shifting behaviour, while statutory rates do not.

Table 2: Results of the regression of transactions and the hypothetical tax on these transactions on reported profits

	(1)	(2)	(3)	(4)
Log of total income	0.195 (0.153)	-0.043 (0.281)		
Log of hypothetical tax on income		0.256 (0.246)		
Log of total costs			0.118** (0.053)	-0.178 (0.109)
Log of hypothetical tax on costs				0.281*** (0.083)
Log of revenue	1.827*** (0.244)	1.818*** (0.240)	1.685*** (0.158)	1.686*** (0.154)
Constant	-21.467*** (2.626)	-21.131*** (2.519)	-18.464*** (1.683)	-17.677*** (1.686)
Observations	43	43	53	51
R^2	0.715	0.726	0.802	0.818

Note: robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. The dependent variable is the log of reported profits in Nigeria.

Source: authors' calculations based on FIRS data.

Table 3: Results of the regression of transactions and the hypothetical tax on these transactions on reported profits, using effective corporate income tax rates, by type of income transaction

	(1)	(2)	(3)	(4)	(5)
Log of total income	1.508*** (0.214)	1.024** (0.384)	0.125 (0.231)	0.620** (0.234)	-0.018 (0.311)
Tangible goods	-0.953*** (0.213)				
Services and fees		0.121 (0.294)			
Interest			0.297 (0.249)		
Reimbursements				0.097 (0.277)	
Other					1.205*** (0.243)
Constant	-8.048*** (1.839)	-15.924*** (3.118)	-2.501 (1.844)	-9.212*** (2.874)	-11.559*** (1.964)
Observations	11	19	12	16	7
R^2	0.663	0.690	0.349	0.323	0.773

Note: robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. The dependent variable is the log of reported profits in Nigeria.

Source: authors' calculations based on FIRS data.

Table 4: Results of the regression of transactions and the hypothetical tax on these transactions on reported profits, types of cost transactions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log of total costs	0.250 (0.524)	0.706*** (0.146)	0.147 (0.240)	0.483* (0.242)	0.901 (.)	0.442*** (0.156)	0.500* (0.218)
Tangible goods	-0.004 (0.351)						
Services and fees		0.352** (0.140)					
Royalties			0.558* (0.233)				
Interest				0.346* (0.184)			
Dividends					0.151 (.)		
Reimbursements						-0.149 (0.201)	
Other							0.074 (0.304)
Constant	-1.979 (4.299)	-13.208*** (2.907)	-6.910** (2.487)	-9.017*** (2.313)	-15.241 (.)	-3.496* (1.723)	-6.271* (2.903)
Observations	22	17	7	15	3	24	9
R ²	0.082	0.613	0.793	0.660	1.000	0.358	0.393

Note: robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. The dependent variable is the log of reported profits in Nigeria.

Source: authors' calculations based on FIRS data.

These results suggest that profit shifting can indeed be observed in transaction-level data of MNCs, and that the semi-elasticity of their outgoing transactions to the tax rate of the partner jurisdiction is high. In a back-of-the-envelope estimation, we can use these results to derive the total amount of profit shifting out of Nigeria. The 64 Nigerian affiliates of MNCs in our sample reported a profit of US\$2.55 billion in 2019, with total outgoing transactions worth US\$2.33 billion, on which they (potentially) paid a weighted average of 15.1 per cent in corporate income tax in the partner jurisdictions. Assuming that the difference between the tax rate paid elsewhere and the tax rate hypothetically paid in Nigeria (considering the statutory corporate income tax rate of 30 per cent²) can be attributed to profit shifting, these estimates suggest that the profits reported in Nigeria, had it not been for profit shifting, would actually be $e^{0.281 \log(0.3/0.151)} = 1.213$ higher than the observed reported profits.

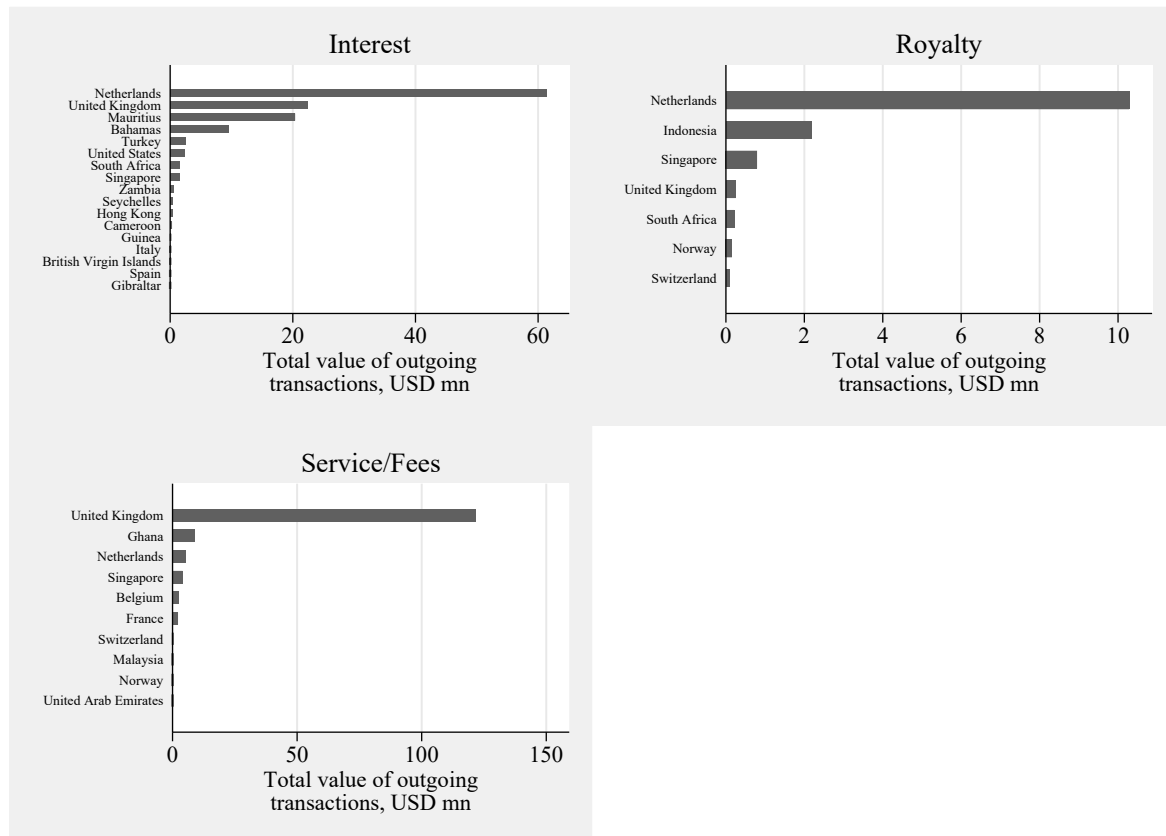
Therefore, the US\$2.55 billion reported in profits should actually be 1.213 higher if it were not for profit shifting, potentially yielding $2.55 \times 0.213 \times 0.3 = 0.163$ billion US dollars, or US\$163 million, in extra tax revenue. This estimate is significantly lower than the estimates of tax revenue losses due to all large MNCs as reported in the prior literature—the Tax Justice Network (2021b) estimates US\$1.77 billion; however, the US\$163 million applies to only the 64 companies in our sample. While the relatively small sample that we use in this paper is not well suited for estimates of the overall scale of profit shifting, it gives more insight than previously studied datasets because it provides a breakdown by transaction category, enabling a much more detailed study of the behaviour of MNCs than achieved previously.

For outgoing transactions classified as interest, royalties, and service and fees, whose hypothetical tax payments are positively associated with higher reported profits, we provide a breakdown of the partner countries in these transactions in Figure 1. Several prominent low-tax jurisdictions serve as top destinations of these categories of transactions, primarily the Netherlands, Mauritius, the Bahamas, and

² Estimated effective tax rates in Nigeria are even higher, at 57.83 per cent (Tax Justice Network 2020b), so using the statutory rate is a rather conservative approach.

Singapore. These countries serve as destinations of an outsized value of transactions of highly risky categories which are closely connected to some of the most commonly used profit shifting strategies. In Figure A1 we report the value of these transactions as a percentage share of the destination countries' GDP, highlighting how disproportionate these flows are. The finding that interest, royalties, and services and fees are the transaction categories most sensitive to hypothetical taxes paid coincides with previously documented patterns of profit shifting out of developing countries, in which intangible assets (royalty payments) and debt shifting plays an outsized role (Dischinger and Riedel 2008; Fuest et al. 2011; Huizinga and Laeven 2008; Reynolds and Wier 2019).

Figure 1: Destinations of Nigerian affiliates' outgoing transactions classified as interest, royalties, and services and fees



Source: authors' calculations based on FIRS data.

6 Conclusion

This paper uses, for the first time, novel administrative data on the transactions of MNCs in Nigeria to identify channels that they use to shift profits to tax havens; the paper also estimates the relative importance of these individual profit shifting channels. We have partnered with Nigeria's FIRS to digitalize data on 302 transactions worth US\$ 3.7 billion, made in 2019 by 64 individual companies operating in Nigeria.

We use the transaction-level data in an approach that estimates the semi-elasticity of reported profits to the hypothetical tax that would have been paid on the value of the transactions had they not been made. We find that the hypothetical tax on the outgoing transactions in the categories of interest, royalties, and services and costs is positively associated with reported profits in the home jurisdiction, suggesting the relative importance of the strategic location of intangible assets (for services and fees and royalty payments) and debt shifting (for interest) as channels of profit shifting of Nigerian MNCs. The jurisdictions

most prominently implicated in these transactions are the Netherlands, Mauritius, and the Bahamas, all countries that act as aggressive corporate tax havens. A simple back-of-the-envelope calculation of the overall scale of profit shifting based on this transaction-level data leads to an estimate of US\$163 million lost in tax revenue from the 64 companies in our sample alone.

When MNCs shift their profits to countries with low corporate income tax rates they deprive the countries in which the profit was generated of significant tax revenues. In the case of less developed countries, in which corporate income tax rates generally play a very important role, corporate profit shifting has significant negative impacts on economic development. In this paper we pioneer the use of administrative transaction-level data in academic research to analyse the relative importance of individual channels of profit shifting. We establish that profit shifting is detectable in transaction-level data, and this data can thus potentially be used by tax authorities to mitigate profit shifting. For example, we recommend that FIRS uses this methodology to identify companies with a high risk of profit shifting to tax havens and enhance their auditing capacity of MNCs' intra-group transactions. The econometric analysis carried out in this paper can assist tax authorities particularly in developing countries with limited resources to decrease profit shifting and increase domestic corporate tax revenue. Future studies can replicate this methodology and expand the sample to include several countries to draw more general conclusions about the profit shifting behaviour of MNCs in developing countries.

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Appendix A

Table A1: Results of the regression of transactions and the hypothetical tax on these transactions on reported profits, using the LACIT rate to calculate the hypothetical tax

	(1)	(2)	(3)	(4)
Log of total income	0.195 (0.153)	0.085 (0.151)		
Log of hypothetical tax on income		0.194** (0.072)		
Log of total costs			0.118** (0.053)	0.182** (0.078)
Log of hypothetical tax on costs				-0.073 (0.059)
Log of revenue	1.827*** (0.244)	1.657*** (0.218)	1.685*** (0.158)	1.639*** (0.160)
Constant	-21.467*** (2.626)	-20.339*** (2.515)	-18.464*** (1.683)	-17.931*** (1.737)
Observations	43	38	53	48
R^2	0.715	0.745	0.802	0.804

Note: robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. The dependent variable is the log of reported profits in Nigeria. The LACIT rate is sourced from the Corporate Tax Haven Index 2021 as published by the Tax Justice Network (2021a), and, when unavailable, we use the statutory corporate income tax rate.

Source: authors' calculations based on FIRS data.

Table A2: Results of the regression of transactions and the hypothetical tax on these transactions on reported profits, using the LACIT rate to calculate the hypothetical tax, by type of income transaction

	(1)	(2)	(3)	(4)	(5)
Log of total income	1.828*** (0.275)	1.114*** (0.327)	0.063 (0.259)	0.499** (0.162)	0.487 (0.251)
Tangible goods	-1.305*** (0.288)				
Services and fees		0.041 (0.276)			
Interest			0.435 (0.254)		
Reimbursements				0.542*** (0.111)	
Other					0.496** (0.119)
Constant	-8.606*** (1.742)	-16.197*** (2.920)	-3.434 (2.531)	-12.153*** (2.293)	-10.556* (4.090)
Observations	11	16	10	14	7
R^2	0.639	0.721	0.459	0.610	0.739

Note: robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. The dependent variable is the log of reported profits in Nigeria.

Source: authors' calculations based on FIRS data.

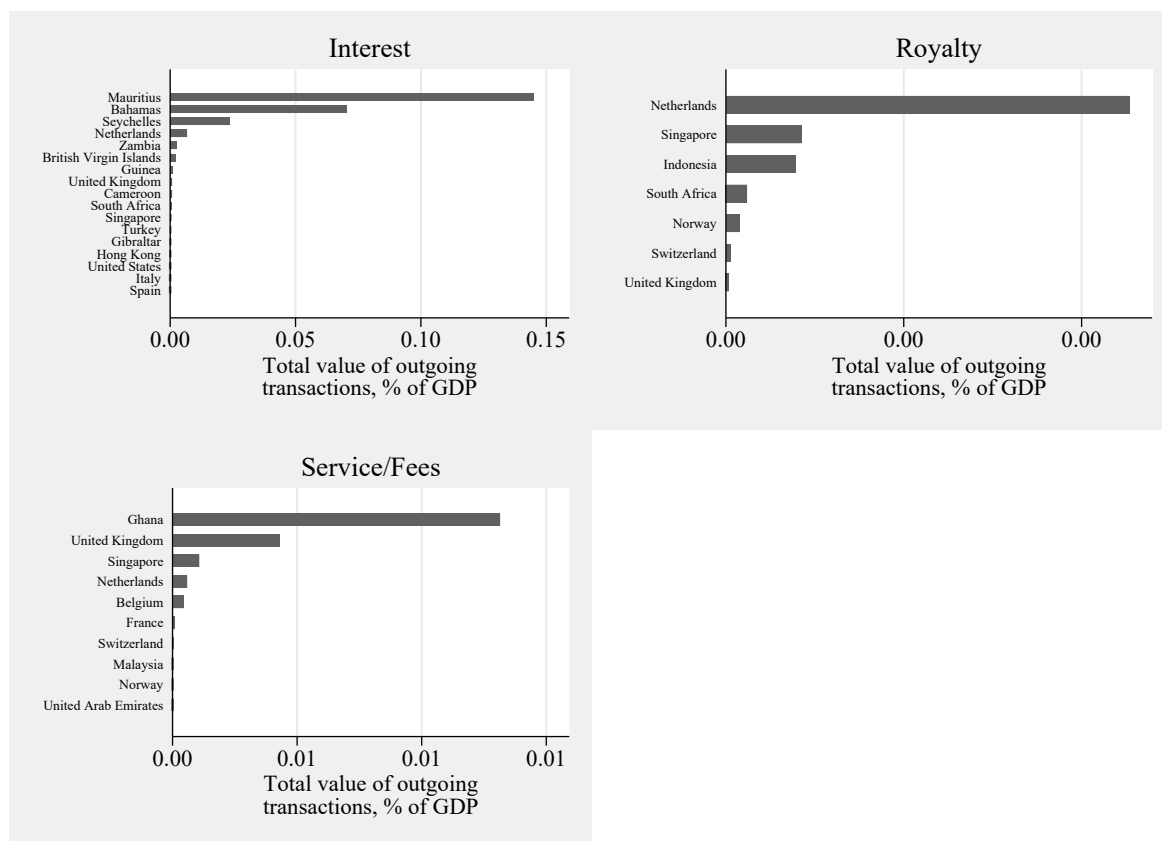
Table A3: Results of the regression of transactions and the hypothetical tax on these transactions on reported profits, using the LACIT rate to calculate the hypothetical tax, by type of cost transaction

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log of total costs	0.401 (0.340)	0.769*** (0.148)	0.281 (0.216)	0.444* (0.237)	0.000 (.)	0.612*** (0.171)	0.484* (0.218)
Tangible goods	-0.072 (0.216)						
Services and fees		0.247* (0.134)					
Royalties			0.365 (0.155)				
Interest				0.441 (0.247)			
Dividends					0.989 (.)		
Reimbursements						-0.408 (0.259)	
Other							0.105 (0.277)
Constant	-3.365 (3.481)	-12.915*** (2.929)	-6.917* (2.687)	-10.009*** (2.671)	-11.357 (.)	-2.991* (1.431)	-6.348* (2.727)
Observations	16	15	6	12	2	22	9
R ²	0.169	0.622	0.774	0.610	1.000	0.464	0.403

Note: robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. The dependent variable is the log of reported profits in Nigeria.

Source: authors' calculations based on FIRS data.

Figure A1: Destinations of Nigerian affiliates' outgoing transactions classified as interest, royalties, and services and fees, as percentage of GDP



Source: authors' calculations based on FIRS data.