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Tax-motivated transfer mispricing in South Africa: Direct evidence using transaction data

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ABSTRACT

This paper provides the first direct systematic evidence of profit shifting through transfer mispricing in a developing country. Using South African transaction-level customs data, I directly test for transfer price deviations from arm's-length pricing. I find that multinational firms in South Africa manipulate transfer prices in order to shift taxable profits to low-tax countries. The estimated tax loss relating to imported goods alone is 0.5% of corporate tax payments. My estimates do not support the common belief that transfer mispricing in South Africa is more severe than in advanced economies. I find that an OECD-recommended reform had no long-term impact on transfer mispricing but argue that the method used in this paper provides a cost-efficient way to curb transfer mispricing.

1. Introduction

There is a close link between the economic development of a country and its capacity to collect tax revenue. Tax administrations in developing countries often face a shortage of resources and a large informal sector that limits the possibility of enforcing a broad tax base. In this context, the taxation of large formal firms has been of major historical importance. By focusing their efforts on a few sizable taxpayers, the tax authority in a developing country could collect substantial tax revenue with few audit costs.[1] However, this source of revenue is now at risk. Across the world, multinational enterprises (MNEs) are shifting their earnings from affiliates in high-tax countries to those in low-tax countries—a phenomenon known as 'profit shifting'. This behaviour is well documented in high-income countries, but state-of-the-art econometric evidence is still largely absent in developing countries. Policy papers reporting astounding tax losses in low- and middle-income countries have gained large attention, but these reports continue to face substantial methodological criticism (Forstater, 2015; Johannesen and Pirttilä, 2016).

Despite the lack of empirical evidence, leading international organizations jointly express concern that profit shifting disproportionally affects developing countries and that failing to tackle this issue will jeopardize achieving the Sustainable Development Goals.[2] The OECD concludes in their G20 mandated report that 'developing countries face difficulties in building the capacity needed to implement highly complex rules and to challenge well-advised and experienced MNEs' (OECD, 2014: 4). There is further criticism that the G20 and OECD led reforms of international tax practises are not benefitting poorer countries (ICRICT, 2019). United Kingdom's Independent Commission for Aid Impact concluded in their 2014 report: 'DfiD [Department for International Development] has failed in its efforts to fully include developing countries so that they benefit from OECD and G20 reforms on international tax.' The commission further questioned the impact of OECD led anti-profit-shifting assistance in developing countries: 'the benefits … of implementing the new standards may have been oversold' (economia 2016).

In this paper, I contribute to the existing body of knowledge in two ways. First, I provide the first direct systematic evidence of profit

[1] Corporate tax revenue constitutes twice the share of total tax revenue in developing countries as compared to their developed counterparts (UNCTAD, 2015). See e.g., Besley and Persson (2013), Kleven et al. (2016), and Mascagni et al. (2014) for a discussion of tax collection constraints in developing countries.

[2] This widespread agreement has led to the establishment of the "Platform for Collaboration on Tax" – a joint effort by the World Bank, IMF, OECD and UN to assist developing countries in curbing profit shifting https://www.worldbank.org/en/programs/platform-for-tax-collaboration#1.

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shifting in a developing country. Second, I evaluate the effect of an OECD-recommended reform in a developing country. This paper hence aims to help inform the current discussion on the importance of profit shifting outside high-income countries and the efficacy of current reforms.

One important channel of profit shifting is transfer mispricing. That is, firms can reduce their tax bill by applying a high price on items flowing from affiliates in low-tax countries to affiliates in high-tax countries, and vice versa. This erodes the profits in the high-tax affiliate, which is paying the high price, but equally increases the profits in the low-tax affiliate, which is receiving the high price. Legally firms are supposed to use 'arm's-length pricing' when transacting internally. That is, firms should set prices internally 'as if' they were trading with an external party. However, following the standard Allingham-Sandmo model (1972), firms may choose to deviate from arm's-length pricing absent frequent audits. Furthermore, even when audited, the OECD admits that 'transfer pricing is not an exact science' (OECD, 2010: 2) and this uncertainty leaves room for firms to produce convincing arm's-length price benchmarks in their favour. All in all, the actual enforcement of arm's-length pricing requires substantial administrative resources and a common hypothesis is that tax authorities in developing countries do not have these resources. The main contribution of this paper is to test this hypothesis by providing direct systematic evidence of transfer mispricing in a developing country. This has not previously been possible due to data constraints.

Using transactional data, I can directly test for transfer mispricing. I obtain access to a newly constructed, confidential, administrative-level, customs data-set covering all imports of goods to South Africa in the period from 2011 to 2015. The data is disaggregated at the country-firm-relationship-product-year level, which allows me to precisely estimate the arm's-length price of each transaction. I then compare the unit price on related (intra-firm) transactions to the estimated arm's-length price. I find that the estimated deviation from arm's-length pricing systematically moves in accordance with the tax incentives to manipulate transfer prices. This is interpreted as strong evidence of firms engaging in tax-motivated transfer mispricing. Across all specifications, I find evidence that related imports from low-tax countries are overpriced by at least 8% compared to the estimated arm's-length price. This translates into a semi-elasticity with respect to the tax differential of 0.5, implying that the price wedge to the arm's-length price increases by 0.5% if the tax differential to the partner country increases by 1 percentage point. The response to tax rate differentials is highly heterogeneous. Firstly, I find that the entire response to tax rates is driven by mispricing of goods imported from very low-tax countries (profit shifting out of South Africa), while there is no incremental effect of differences in partner tax rates higher or close to the South African tax rate. This implies that, similar to what has been observed in developed countries, South Africa only lose taxable income due to tax-motivated transfer mispricing and does not seem to attract any inward profit shifting in return. Secondly, I find that profit shifting is more pervasive for R&D intensive firms and highly leveraged firms. Finally, I find that higher withholding tax rates on royalty payments incentivize profit shifting through transfer mispricing of goods.

Using the same methodology, I then move on to investigate the effects of an OECD-recommended transfer-price reform. In April 2012, South Africa introduced a number of measures aimed at limiting transfer mispricing through increased documentational requirements and audit discretion. These legislative changes were based on OECD recommendations. I find that this reform did seem to limit transfer mispricing in 2012–14 but that transfer price manipulation returned to its original level in 2015. One possible explanation of this pattern is that the immediate effect of the reform was primarily an (unjustified) expectation of highly increased audit capabilities in the tax administration. As firms experienced no actual change in enforcement efforts, the transfer mispricing returned to its initial level. This conclusion is not surprising: granting more information and discretion to the tax authority will not result in higher tax compliance if there is no increase in tax enforcement resources and capabilities (see e.g. Casey and Castro (2015) and Pomeranz (2015) for a similar discussion).

Contrary to common belief, I do not find that firms in South Africa are more aggressive in their transfer mispricing compared to firms operating in developed countries. I do a systematic review of the seven prior studies of transfer mispricing in Denmark (Cristea and Nguyen, 2016); France (Vicard, 2015; Davies et al., 2018); the United States (Clausing, 2003; Bernard et al., 2006; Flaaen, 2017) and the United Kingdom (Liu et al. forthcoming). I find that the estimated semi-elasticity of transfer mispricing with respect to the tax differential varies significantly across and even within studies. The mean estimated semi-elasticity across studies is 1.3 but drops to 0.4 when restricting the sample of estimates to those accounting for firm and product fixed effects. The estimated semi-elasticity in South Africa is hence completely on par with what has been observed in advanced economies. In Fig. 1, I plot the estimated tax loss of (one directional) transfer mispricing of goods in prior studies. The average estimated tax loss is just below 1% and the median tax loss is 0.4%, which is completely on par with the estimated tax loss in South Africa. I conclude that transfer mispricing of goods in South Africa is not different from transfer mispricing in developed countries, both in terms of the responsiveness to tax incentives and the resulting tax loss.

Tax authorities can use the econometric method applied in this paper as an automated digital flagging system. Such a system would alert tax authorities when firms are systematically divergent in their external and internal price-setting behaviour. For many governments, the data is already there and used when firms are audited. The next natural development is to use the full data source in an automated flagging model to guide the selection of firms for audits. This would be a feasible, low-cost, and easily implemented digital intervention. The cost of doing this is in the thousands of dollars while the potential tax gain is in the tens of millions of dollars. Such an intervention is an example of the potential for digital tax enforcement, which the OECD (2016a) and the IMF (2017) are promoting. To my knowledge, no tax authority has yet implemented such a system. The fact that I (and others) find systematic mispricing using this methodology implies that there should be some scope to pursue this further.

The paper will proceed as follows. In Section 2, I give an overview of the previous literature. In Section 3, I describe the South African context and transfer pricing legislation. Section 4 gives a brief theoretical

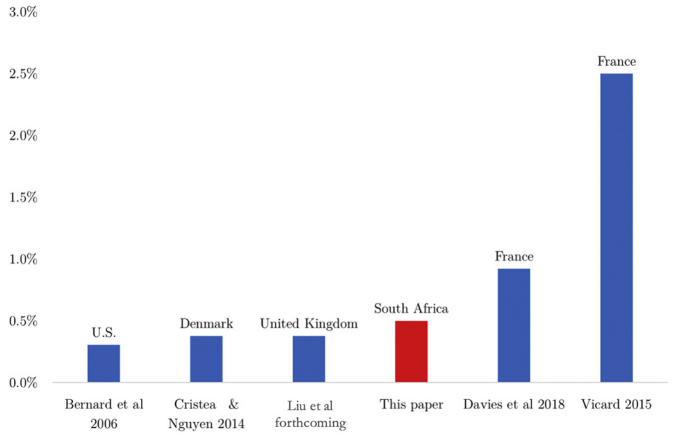

Fig. 1. Estimated tax loss of one-directional transfer mispricing of goods (% of corporate tax receipts). Note: the graph shows the estimated tax loss caused by transfer mispricing of goods in prior studies as a share of total corporate tax receipts. The tax loss is based on one direction of trade (imports or exports) in all studies but Vicard (2015) where the average across imports and exports is used. See Section 7 for a full description.
Source: Author's own literature review, see Online Appendix.

motivation. Section 5 presents the data used, the identification strategy, and the main empirical results. Section 6 evaluates the transfer pricing reform that took place in 2012. Section 7 presents a systematic review of prior transfer mispricing estimates and compares these estimates to the South African case. Finally, I conclude and discuss the findings in Section 7.

2. Related literature on profit shifting

Most profit-shifting studies rely on so-called 'indirect evidence', which relates the taxable profits of each subsidiary to its inputs of labour and capital and the tax incentive to shift profits.[3] This method is, however, also the subject of much criticism. The main criticism is that when simply investigating patterns in profitability, one might be capturing other 'real' responses to tax incentives or tax avoidance not related to profit shifting.[4] In a broader sense, the indirect evidence approach can be unsatisfactory, as the method does not identify specific profit-shifting channels. This study addresses such critique by directly comparing the prices that multinationals apply to internal and external transactions.

A further critique of past profit-shifting studies—especially relevant in developing country settings—is the common use of low-coverage proprietary databases. In their G20-mandated report on profit-shifting measurement, the OECD criticizes the use of proprietary databases where data quality and coverage are often poor, particularly outside of the EU and in developing countries (OECD, 2015). The OECD thus advocates the use of tax-administrative micro-data in profit-shifting studies, which has previously not been possible in developing countries. Unlike previous work, this study follows the OECD recommendation by using tax-administrative data.

This paper contributes to the scarce literature on 'direct' evidence of transfer mispricing.[5] In fact, this is the first study applying this direct identification strategy outside the context of the US, UK, France, and Denmark. Swenson (2001) and Clausing (2003) introduced the method by estimating the impact of corporate tax rates on US trade price indices aggregated at the industry and country level. They both find very large estimates of transfer mispricing, but there is a concern that product and firm compositional effects may drive the result. Bernard et al. (2006)[6] address this issue by using customs data at the firm and product level, allowing them to accurately estimate arm's-length price deviations. Instead of exploiting the full sample of product prices at a country-by-country level, Bernard et al. (2006) calculate price wedges between related and unrelated transactions for each product group within each MNE. This makes their estimates less comparable to mine. Most recently, Davies et al. (2018) investigate transfer mispricing in France using a method directly comparable to the one used in this paper, which makes their results a good point of reference for this study. Also relying on transaction-level customs data, Vicard (2015), Cristea and Nguyen (2016) and Liu et al. (forthcoming) find strong evidence of transfer mispricing in France, Denmark, and the UK. They do not, however, observe whether transactions are in fact related but instead approximate this using firm ownership data. In Section 7, I systematically compare the estimates of my study to prior research. I find that transfer mispricing in South Africa is on par with what has been observed in prior studies.

To my knowledge, this is the first paper that uses transaction data to directly test for transfer mispricing in a developing country.

[3] Hines and Rice (1994) introduced this methodology and it has since been applied in a wealth of papers. See Dharmapala and Riedel (2013) or Heckemeyer and Overesch (2013) for an overview of the literature. A handful of studies have applied this technique in a developing-country setting, see e.g. Crivelli et al. (2015), UNCTAD (2015), Reynolds and Wier (2016), Johannesen et al. (2017), and Tørsløv et al. (2018).

[4] See Hines Jr (2014) for a discussion of this.

[5] The notion of 'direct' evidence was first coined by Clausing (2003).

[6] Later replicated by Flaaen (2017).

3. South African context

3.1. Economy and corporate tax regime

South Africa is an upper-middle-income emerging economy with a gross domestic product (GDP) per capita of US$5692 in 2015.[7] As a BRICS member with a population of 56 million and Africa's second largest economy, South Africa is seen by many as the most influential economy in Africa. Nonetheless, South Africa struggles with issues common to many developing countries in the form of rampant inequality (Greenwood, 2018), slow growth (Roux, 2017), and corruption (Gebrekidan and Onishi, 2018).

As is the case with most developing countries, South Africa is fiscally constrained and relies heavily on corporate tax receipts. Total tax revenue constituted 25.5 of GDP in 2014–15, which is substantially beneath the OECD average of 34% (National Treasury, 2016).[8] The corporate income tax constituted a significant share of 19% of total taxes in 2014/2015, which places South Africa on par with the developing country average (UNCTAD, 2015; National Treasury, 2016). In comparison, developed countries' corporate income tax share of total taxes was only 11% in 2014 (UNCTAD, 2015). The South African statutory tax rate on business income is 28%, which is on par with the African average rate but slightly above the world average of 24% and far above nearby tax havens such as Mauritius and the Seychelles (see KPMG n.d.). Throughout the time period of this study (2011–2015), there was a moderate global decline in corporate tax rates from 25% to 24%, but no change in the South African rate. The combination of low overall tax receipts, high reliance on corporate tax revenue, and a moderately high corporate tax rate warrants extra attention to the issue of profit shifting in South Africa, throughout the observed period 2011–2015. South Africa has CFC rules in place, that implies South African head quartered firms will be taxed on their foreign passive earnings in a foreign entity (i.e. earnings from financial/intangible assets) if there is no real/active business activity in the foreign affiliate and if the corporate tax rate facing the foreign entity is below 21%. The CFC rules are less relevant regarding transactions of tangible goods (the scope of this paper), as these transactions are usually not passive i.e. require active business presence in the country of the foreign affiliate. Foreign affiliates in South Africa are taxed according to the territorial system.

3.2. Transfer price legislation

Transfer price legislation was first enacted in South Africa in 1995 and requires that tax payers follow the arm's-length principle in their transactions with affiliated foreign parties. This means that firms operating in South Africa should set their transfer prices on internal transactions *as if* they were transacting with an external party. Enforcing this principle is fought with difficulty. Some economists have argued that the very idea of one true arm's-length price is flawed (see e.g. Devereux and Vella, 2014 or Zucman, 2014). The critique of the 'arm's-length' price, however, mostly refers to service transactions (such as management fees), where comparable transactions are hard to find. In the case of goods transactions, which are the focus of this paper, we actually have well-defined product categories (such as 'bolts' or 'carrots') and we have objective quantities that allow us to compute unit prices (which is not the case when transacting in services). The arm's-length principle should hence be easier to enforce in the case of goods transactions, where we can actually compare the unit price that firms apply to external and internal transactions.

How is arm's-length pricing enforced in practice? Following the WTO's stance on transfer pricing, South African tax authorities may

[7] World Bank (2016) data.

[8] OECD (2016b) data.

require the importer to explain a chosen transfer price whenever the importer and exporter are 'related' (e.g. through common ownership) and this relation is suspected to have impacted the transaction value. In order to avoid a transfer price correction, the importer must demonstrate that the chosen transfer price can be justified according to one of the following methods[9]:

1) The transfer price corresponds to the price observed in external comparable unrelated transactions (according to articles 2, 3, or 4 of the Method of the WTO Valuation Agreement).
2) The transfer price is calculated by estimating the opportunity costs and gains to each party in the transaction. This can be done through methods such as cost-plus pricing, profit split, or most commonly the transactional net margin method (according to article 5 of the Method of the WTO Valuation Agreement).

It is clear that the multitude of valuation methods gives the importer a negotiable room of acceptable transfer prices—leaving room for tax avoidance. In the case of comparable unrelated transactions, the firm can selectively choose which products to include in the comparison. In the case of cost-plus pricing both costs and required profit margin can be manipulated by the firm.[10] Finally, the firm might choose to do outright tax evasion and deviate from arm's-length pricing without having any documentation to support the deviation. As described in Allingham and Sandmo (1972), a firm's willingness to engage in tax evasion is a function of the likelihood of audits and the penalties involved, both of which are small in the case of transfer pricing.

If a firm deviates from the 'objective' arm's-length price to ensure a minimal tax bill, this is known as 'tax-motivated transfer mispricing'. Tax-motivated transfer mispricing is the focus of this paper and must not be confused with 'trade misinvoicing'. Trade misinvoicing refers to situations where firms commit fraud and falsify information given to the tax authority. In such a case there may not be a transfer price, as the firms simply hide all or some of the transaction. As this study exploits the information given to tax authorities, for obvious reasons it does not attempt to estimate misinvoicing. The following list clarifies the terminology[11]:

- Trade misinvoicing: false documentation on actual price and/or affiliation of transacting parties and/or quantities and/or product;
- Arm's length price deviation: deviation from arm's-length pricing, but correct documentation supplied on price, affiliation, quantities, and product;
- Tax-motivated transfer mispricing: intentional deviation from arm's-length pricing that is motivated by tax savings (scope of this study).

In this paper, I use the terms tax-motivated transfer mispricing and transfer mispricing interchangeably.

4. Theoretical motivation

Following the broad literature of theoretical models describing the optimal price strategy within intra-firm trade, I present an illustrative example that can produce the main predictions related to tax-motivated transfer mispricing and tax enforcement.[12]

Consider a MNE consisting of two affiliates located in a high-tax country denoted H with tax rate τ_H and a low-tax country denoted L with a lower tax rate τ_L. Further assume that the low-tax affiliate sells q units of goods to the high-tax affiliate at price p. Let Π_H and Π_L denote the exogenous taxable income in countries H and L prior to paying the transfer price. The taxable profits in the high-tax country will in this case be $\Pi_H - pq$ while the taxable profits in the low-tax country will be $\Pi_L + pq$. Any transfer price increase will reduce the taxable profits in the high-tax subsidiary but correspondingly increase the taxable profits of the subsidiary in the low-tax country. As the after-tax value of profits is higher in the low-tax country, the MNE would absent any additional constraints always choose the transfer price $p = \frac{\Pi_H}{q}$, such that all profits would be shifted from the high-tax subsidiary to the low-tax subsidiary. However, the MNE is by law required to price the internal sale at the 'true' arm's-length price p_a, and any deviation from this is assumed to come at a cost. Costs may come in the form of additional documentational requirements, potential legal costs, worsened public relations, etc. For simplicity, I assume that these costs can be approximated by the functional form $\frac{\beta}{2}[(p-p_a)q]^2$, such that the marginal cost of deviating from the arm's-length price is increasing in the size of the deviation, the quantity sold, and a parameter β. In an internal optimum, the profit maximizing MNE will choose a transfer price that satisfies the condition[13]:

$$\frac{\tau_H - \tau_L}{\beta} = (p - p_a)q$$

As $\tau_H > \tau_L$ the firm will always choose to price the item flowing from the low-tax affiliate to the high-tax affiliate above the arm's-length price $p > p_a$. Intuitively, the transfer mispricing $(p - p_a)$ is furthermore increasing in the size of the tax differential $(\tau_H - \tau_L)$, which is the tax saving per dollar shifted, and decreasing in the parameter β, which is proportional to the marginal cost of shifting one extra dollar. It is important to note that the cost parameter β is endogenous to the policies in place in both countries and the resources made available to the tax authority: e.g. strict documentational requirements, advanced audit strategies, or a high risk of audit will increase the cost of deviating from the arm's-length price. The common hypothesis is that β is low in a developing country, such that for a given tax incentive arm's-length price deviations will be larger in a developing country (OECD, 2014; UNCTAD, 2015). The hypothesis of transfer mispricing being a larger issue in developing countries is what I test in this paper.

An extension of the model first suggested by Davies et al. (2018) is the existence of fixed costs in profit shifting. If this is the case transfer mispricing will be a discontinuous function of the tax differential – such that transfer mispricing only occurs when the tax differential is sufficiently large. Finally, as discussed by Liu et al. (forthcoming), CFC rules may limit the incentive of multinational firms headquartered in South Africa to shift profits to low-tax places. These hypotheses are further tested in this paper.

5. Empirical analysis

5.1. Data

Confidential customs data on imported goods is obtained from the South African Revenue Service (SARS) and covers the period from 2011 to 2015. The unit of observation is at the firm-product-relation-country-year level, such that each observation includes a firm identifier, product code, a dummy indicating whether the transaction is intra-firm, the country of origin, and the year. The data also includes information on the customs value and the number of units, which allows me to calculate the unit price. To remove outliers, I censor observations with unit prices in the top 99 percentile within each year; this does not, however, impact the results quantitatively nor qualitatively.

[9] SARS (2014) Directive 2, Customs External Directive Method 1 valuation of imports.
[10] Some economists have argued that the very idea of one true arm's-length price is flawed (see e.g. Zucman, 2014). Becker and Davies (2014) argue that transfer mispricing should instead be seen as a bargaining game between the tax authority and the firm.
[11] Forstater (2018) discusses the conceptual differences in detail. She also discusses the empirical evidence and finds that estimates of trade misinvoicing are generally much larger than transfer mispricing, but that the estimates are also less credibly identified.
[12] More elaborate theoretical discussions can be found in Riedel et al. (2015), Cristea and Nguyen (2016), Davies et al. (2018), and Liu et al. (forthcoming).
[13] This follows from the solving $\max_{wrt\ p} : (\Pi_H - pq)\tau_H + (\Pi_L + pq)\tau_L - \frac{\beta}{2}[(p-p_a)q]^2$.

Product categories are defined according to the Harmonized System (HS) at the 8-digit level. The fact that the code is eight digits allows for incredible precision in the product description. One of the most traded product categories is for example:

Product category 4016.95.20[a]
'Inflatable article of rubberised fabric, with hermetically sealed ends, for use as moulds in the manufacture, construction or maintenance of concrete pipes, voided (cavity) blocks, beams, slabs and structures'

[a] Full product codes can be found in SARS (2018).

The large number of transactions occurring in the time period 2011–2015 (~5 million) allows for comparison of related and unrelated prices across virtually all product categories. That is: 98% of all unrelated transactions have a comparable unrelated transaction within the same 8-digit product category, year and country; 99% have comparable unrelated transactions within the same 8-digit product category and country; the remaining 1% all have comparable transactions within the same product category but not in the same country.

Table 1 shows the aggregate value of imports across years and partner relation. Two immediate concerns come to mind when looking at these aggregate values. First, the share of related (intra-firm) imports is always below 4%. This share is markedly lower than what has been observed across French firms (9.2%, Davies et al., 2018) and US firms (roughly 30%, Bernard et al., 2006). This raises the concern of whether related imports are correctly registered. Each firm is required by law to denote whether the import is coming from a related party, but whether firms are actually filling out the forms correctly is, of course, a question of enforcement. I discussed this with tax officials working in the transfer-pricing unit at SARS—they did not think that misfiling of information was widespread. As discussed in Section 3.2, misclassification of firm relations in internal transactions relates to trade misinvoicing and is therefore outside the scope of transfer mispricing. The second concern Table 1 invokes is that of overall coverage. Whereas the aggregate value of imports in the years 2011, 2012, 2014, and 2015 matches the aggregate customs statistics, coverage in 2013 is only 25%. This is due to a coding error, which occurred when SARS handed over the data to the UNU-WIDER (the data I use). I replicate all results excluding 2013. This does not impact the results quantitatively nor qualitatively.

The customs data is merged with firm financials obtained from corporate tax returns, which are also obtained from SARS. Finally, information on global statutory corporate tax rates and macro-economic variables is obtained from the KPMG Corporate Tax Tables (KPMG n.d.) and the World Development Indicators (World Bank n.d.).

Table 1
Imports to South Africa by year and partner relation.
Source: Author's calculations using SARS (n.d.) data.

Year	Unrelated imports (Bn. Rnd.)	Related imports (Bn. Rnd.)	Related imports (share)
2011	1005.8	7.2	0.70%
2012	1169.6	26.4	2.30%
2013	238.6	7.5	3.20%
2014	1432.1	39.5	2.80%
2015	1199.5	38.8	3.20%

Note: the table shows the distribution of South African imports of goods. 'Related' denotes a transaction that is intra-firm (controlled), i.e. trade between affiliates of the same MNE.

Fig. 1 shows the distribution of partner country corporate tax rates in the customs data. The vertical line marks the South African tax rate of 28%, and there is substantial variation on both sides of the marker for both related and unrelated imports. Table 2 reports the summary statistics, while the Appendix Table A1 lists the top 40 import partner countries. In Appendix Table A1b, I further investigate the relationship between related imports and FDI positions. There is a clear relationship between the share of related imports and the size of bilateral and immediate inward and outward FDI positions. While the immediate outward and inward FDI stocks are of similar size, the bulk (75%) of South African outward FDI has an ultimate owner outside of South Africa (using Damgaard and Elkjaer (2017) estimates of ultimate ownership).

5.2. Identification of transfer mispricing

The great detail in the customs data allows for a direct comparison of the unit price of related and unrelated imports. This in turn allows me to estimate the arm's-length prices and the resulting transfer price deviations. If the estimated arm's-length price deviations systematically move in accordance with the tax incentives to manipulate transfer prices, this is taken as evidence of firms engaging in strategic transfer mispricing.

To explain this approach it can be useful to start with an example. I therefore begin by computing the average price wedge as the log difference between all related and unrelated unit prices. To establish whether the price wedge is impacted by tax incentives, I compute this price wedge separately for transactions with high-tax countries (defined as countries with a tax rate above the South African) and low-tax countries. Please note that this exercise is purely illustrative, as I am quite literally comparing apple and oranges when simply averaging across all transactions. With this caveat in mind, I report the results in Fig. 3. The first bar shows that average unit price of related imports is roughly on par with the unit price on external imports when imports originate from a high-tax country. Contrary to this, column 2 shows that the unit price on related imports is 57% higher when the import origin is a low-tax country. Based on these aggregate numbers, the most plausible estimate of transfer mispricing is the 'difference-in-difference' estimate, i.e. 57% minus 4% = 53%. This is a first indication that related imports from low-tax countries may be overpriced (and by a lot), which is consistent with firms manipulating transfer prices (a lot) in order to shift profits to low-tax countries.

I can move beyond these aggregate numbers by exploiting the rich South African data. By using the 8-digit product, codes I can compute the difference-in-difference estimate within product groups. In Fig. 2, I therefore calculate the difference-in-difference estimate within the ten largest product groups. That is, the bottom dot in Fig. 3 corresponds to the overall difference-in-difference estimate of 53%, the dot above replicates this estimate but with a sample only consisting of plastic articles, and so on. Albeit there is substantial variation in the estimates across different product categories, seven out of ten products show significant estimates and all point estimates are above 20%. At the very high end, 'static converters' imported from related affiliates in low-tax countries are 'overpriced' by >80%.

Whereas Fig. 4 supports the notion of strategic transfer mispricing, several concerns still exist. First, country-specific quality of goods may confound the results. Second, different firms may demand different qualities and, even within firms, products may be imported at different levels of quality. To ensure that compositional effects are not driving the results, I move on to estimate an ordinary least squares (OLS) regression of the form:

$$\log(\text{unit price}_{it}) = \beta_1 \cdot \text{related import} \cdot I(\tau - \tau_{it}) + \beta_2 \cdot I(\tau - \tau_{it} > 0) + \beta_3 \cdot \text{related import}_{it} + X_{it}'B + \epsilon_{it} \quad (1)$$

$$\log(\text{unit price}_{it}) = \beta_1 \cdot \text{related import} \cdot (\tau - \tau_{it}) + \beta_2 \cdot (\tau - \tau_{it}) + \beta_3 \cdot \text{related import}_{it} + X_{it}'B + \epsilon_{it} \quad (2)$$

Table 2
Descriptive statistics.
Source: Author's calculations based on SARS (n.d.), WDI (n.d.) and KPMG (n.d.)

Variable	Related imports					All imports				
	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
Panel A: customs										
Log (unit price)	120,301	5.9	1.7	−6.8	17.2	4,914,601	5.6	2.3	−12.1	22.5
Unit price (1000 Rnd.)	120,301	7.2	176.0	1.17E−06	29,700.0	4,914,602	20.2	4577.0	0.00E+00	6,190,000.0
Customs value (1000 Rnd.)	120,301	993.1	20,400.0	1.00E−03	3,700,000.0	4,914,603	1026.6	51,600.0	0.00E+00	27,700,000.0
Statistical quantity (1000 Units)	120,301	79.5	10,800.0	1.00E−05	2,530,000.0	4,914,604	55.3	5281.2	1.00E−05	2,930,000.0
Related party dummy	120,301	1.0	0.0	1.0	1.0	4,914,603	0.0	0.2	0.0	1.0
Panel B: financials – SA importer										
Log (sales)	71,507	20.6	2.0	10.2	25.8	2,459,574	18.5	2.4	6.4	25.8
Log (wage)	71,690	17.9	1.8	9.4	22.3	2,477,314	16.3	2.3	0.0	24.0
Leverage	22,075	0.2	0.3	0.0	4.6	1,334,794	0.2	0.5	0.0	18.5
Loss making	106,504	0.2	0.4	0.0	1.0	4,234,601	0.1	0.3	0.0	1.0
Taxable income (Mill. Rand)	72,998	182.0	748.0	−2230.0	13,900.0	4,234,602	130.0	831.0	−17,500.0	31,500.0
Panel C: macro data – partner country										
Low tax	120,301	0.5	0.5	0.0	1.0	4,914,603	0.5	0.5	0.0	1.0
Corporate tax	117,729	0.3	0.1	0.0	0.6	4,800,978	0.3	0.1	0.0	0.6
Log (GDP pr. cap.)	119,077	14.5	1.4	5.6	16.7	4,886,696	14.7	1.8	4.4	16.7
Log (exchange rate)	105,890	1.6	2.3	−1.0	10.3	4,530,318	1.4	2.0	−1.3	10.3
Log (distance)	119,280	9.1	0.3	5.5	9.6	4,827,748	9.1	0.6	5.5	9.7
Log (population)	119,077	4.3	1.6	−2.9	7.2	4,886,696	4.7	1.9	−5.3	7.2
EU dummy	119,211	0.5	0.5	0.0	1.0	4,890,506	0.3	0.5	0.0	1.0
OECD dummy	119,211	0.7	0.5	0.0	1.0	4,890,506	0.5	0.5	0.0	1.0
Haven dummy	119,211	0.0	0.2	0.0	1.0	4,890,506	0.0	0.2	0.0	1.0

Note: the table shows descriptive statistics of the gross sample. The sample period is 2011 to 2015. All observations are imports going to South Africa from a foreign country. The table is split across related imports (between affiliates) and unrelated. A unit of observation is a firm–relation–origin–product–time quintuple. Unit prices are calculated as the transaction value divided by the statistical quantity. Observations with unit prices in the 99th percentile are dropped from the sample. Panel A describes the customs data. 'Customs value' denotes the registered value of the transaction in the customs data. 'Statistical quantity' denotes the number of units. 'Related party' is a dummy variable indicating an internal (controlled) trade between affiliates of the same MNE. Panel B describes the financials of the importing firm in South Africa obtained from the South African Corporate Income Tax database (SARS, n.d.). 'Sales' denotes turnover, 'Wage' denotes the labour costs, 'Leverage' is measured as total long-term debt over assets, and 'Loss making' is a dummy variable indicating whether the firm incurred a loss in the period in scope. Panel C describes the macro data on the import country of origin. 'Low tax' is a dummy variable indicating whether the trading partner (import origin) country's corporate tax rate is below the South African corporate tax rate of 28%. 'Corporate tax' is the corporate statutory tax rate of the import country. 'Haven' is a dummy indicating whether the import origin country is a tax haven following the definition used in Hines Jr (2010).

The unit of observation is at the firm-product-relation-country-year level. Standard errors are clustered at the country–year level. $\mathbf{X_{it}}$ is a vector of firm and country variables. $related_{it}$ is a dummy indicator taking the value one whenever the import partner is a related subsidiary and accounts for any level differences in the price level of related and unrelated imports. The tax differential between the South African tax rate τ (28% throughout the sample period) and the partner tax rate τ_{it} approximates the incentive to shift profits. If firms shift profits through transfer mispricing the price wedge between related and unrelated imports will increase as the tax rate of the partner country decreases, implying that $\beta_1 > 0$. In Eq. (1), I estimate β_1 as a dummy coefficient, which can be interpreted as the average percentage deviation from the arm's-length price when importing goods from affiliates in low-tax countries (where $\tau > \tau_{it}$). In Eq. (2), I estimate β_1 as a semi-elasticity, such that β_1 is the average percentage change in the deviation from the arm's-length price when the tax differential increases by 1 percentage point.

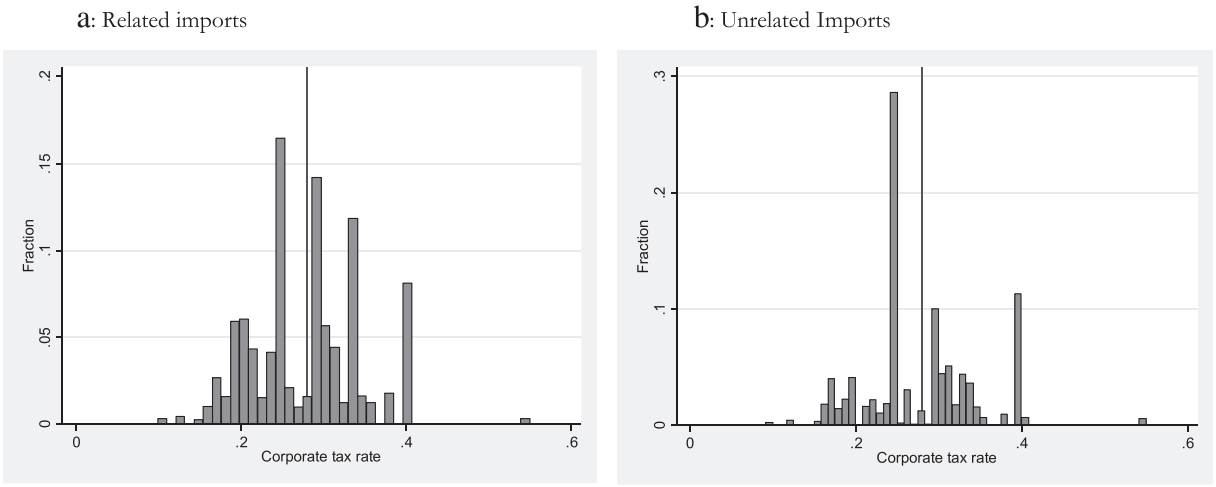

Fig. 2. Distribution of import partner corporate tax rate. Note: the figures show the distribution of import partner corporate tax rates. 'Related' denotes a transaction that is intra-firm (controlled), i.e. trade between affiliates of the same MNE. The sample period is 2011 to 2015.
Source: Author's calculations based on SARS (n.d.) and KPMG (n.d.)

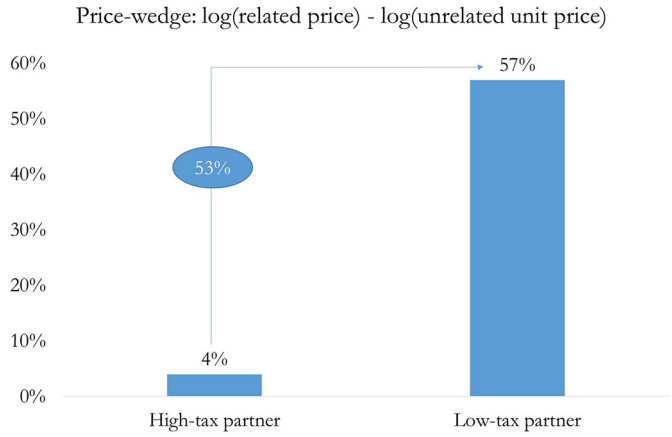

Fig. 3. Related and unrelated price wedge across high- and low-tax partners (no controls). Note: the figure explores the effect of the trading partner (import origin) country's corporate tax rate on the import price in related trades (between affiliates) relative to the effect on domestic and unaffiliated firms. The sample period is 2011 to 2015. A unit of observation is a firm–relation–origin–product–time quintuble. The dependent variable is the Log (Unit Value). The product is defined by HS8 codes. 'Low-tax partner' is a dummy variable indicating whether the trading partner (import origin) country's corporate tax rate is below the South African corporate tax rate of 28%.'Related party' is a dummy variable indicating an internal (controlled) trade between affiliates of the same MNE. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. Standard errors clustered at the country–year level.
Source: Author's calculations based on SARS (n.d.) and KPMG (n.d.)

The rich detail of the data allows me to move further and include a series of fixed effects. In the highest dimensional model this includes product–firm, firm–year, product–year, country–product, and country–year fixed effects. In this case, country and firm variables are absorbed by the fixed effects and only the interaction terms remain.

Following Davies et al. (2018), I further include a full set of macro-control and related dummy interactions. This is to ensure that omitted variables correlated with the corporate tax rate are not driving the results. As a robustness check I omit the macro-control and related dummy interactions, this does not impact the results quantitatively nor qualitatively.

What is the appropriate dimension of fixed effects? While there is often an inclination to assume that more fixed effects is better, there is in fact a trade-off. On one hand we want to avoid omitted variable bias. In particular, it seems crucial to account for firm, product, year, and country specific effects, as different products come at different prices and product quality will differ dramatically across firms, years, and countries. On the other hand, we might have concerns about overfitting, attenuation bias, and suppressing valuable information. In particular, firms may be sufficiently perceptive to not openly provoke tax authorities and avoid pricing the same good differently in related and unrelated transactions. Instead, firms may focus their mispricing on goods that they only transact internally. This implies that including firm–product fixed effects might lead to a downward bias in the estimate of transfer mispricing. In practice, after controlling for firm fixed effects, I find a very stable estimate of transfer mispricing for a wide range of additional fixed effects. This implies that, after controlling for firm specificity, the exact level of fixed effects is unimportant for the quantitative findings.

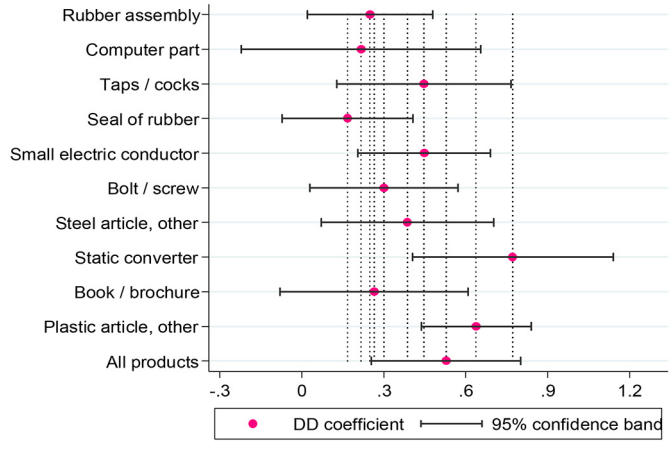

Fig. 4. 'Overpricing' of related low-tax imports within 10 largest product groups. Note: the figure explores the effect of the trading partner (import origin) country's corporate tax rate on the import price in related trades (between affiliates) relative to the effect on domestic and unaffiliated firms within the 10 largest product groups. The pink dots reflect the coefficient value β1 obtained from estimating the regression: $\text{Log(Unit price}_{it}) = \beta_1 * \text{Related}_{it} * \text{Low tax}_{it} + \beta_2 \text{ Low tax}_{it} + \beta_3 * \text{Related}_{it} + \epsilon_{it}$. The product category names are simplified descriptions of the longer detailed HS8 code descriptions. The corresponding HS8 codes are: 'rubber assembly' 40169390, 'Computer part' 84818090, 'Taps/cocks' 'Seal of rubber' 40169310, 'Small electric conductor' 85444290, 'Bolt/screw' 73181590, 'Steel article, other' 73269090, 'Static converter' 85044000, 'Book/brochure' 49019900, 'Plastic article, other' 39269090.
Source: Author's calculations based on SARS (n.d.) and KPMG (n.d.)

5.3. Basic results

In Fig. 1a and Table 4, Panel A I report the estimated β_1 coefficient from Eq. (1)—that is, the average percentage deviation from the arm's-length price deviation when importing goods from affiliated firms in low-tax countries (where $\tau > \tau_{it}$). Throughout all specifications, the interaction term between the related import dummy and the low-tax dummy is positive and highly significant. This implies that transfer prices systematically deviate from the estimated arm's-length price in accordance with the tax incentive to do so. In column 1 of Table 4, the most basic results are reported using just a set of control variables and yearly fixed effects. The estimated average excess price on related imports from low-tax countries is 31%. This estimate remains fairly stable when including product fixed effects and product–year fixed effects but drops significantly to 10% when firm fixed effects are included. This indeed indicates that firm compositional effects may drive up the estimated magnitude of transfer mispricing when failing to account for firm-specific characteristics. However, as seen in columns 4 to 12, after controlling for firm fixed effects the estimated transfer mispricing does not change drastically when more fixed effects are added to the model. In the most demanding model, which includes product–firm, firm–year, product–year, country–product, and country–year fixed effects, the estimated excess price on related imports from low-tax countries is 8.6%.

In Fig. 5b and Table 4, Panel B, I report the β_1 coefficients obtained from estimating Eq. (2)—that is, the estimated semi-elasticity of the arm's-length price deviation with respect to the tax differential. Throughout all specifications, the interaction term between the related import dummy and the low-tax dummy is positive and highly significant. In column 1 of Table 4 the most basic results are reported using just a set of control variables and yearly fixed effects. The estimated semi-elasticity is 2.5—implying that a 1 percentage point increase in the tax differential increases the estimated deviation from the arm's-length price by 2.5%. Once again, this estimate drops significantly to around 0.5 when firm fixed effects are included. After controlling for firm fixed effects, the estimate does not change drastically when firm–product, country, and further fixed effects are included. In the most demanding model, which includes product–firm, firm–year, product–year, country–product, and country–year fixed effects, the estimated semi-elasticity is 0.51.

I report the full regression results in Appendix Table A1a. I find, unsurprisingly, that country characteristics influence unit prices. For example, GDP per capita of the country of origin correlates positively with unit prices. This seems intuitive, as goods originating from high-income countries are plausibly of higher quality. Furthermore, the unit price is generally higher in high-tax countries. This suggests that, absent

Table 4
Basic results.
Source: Author's calculations based on SARS (n.d.), KPMG (n.d.) and World Bank (n.d.)

Dependent variable: Log (Unit Price)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A: Impact of transacting with related low-tax partner on deviation from arm's-length price												
Related partner × low-tax partner	0.307***	0.283***	0.281***	0.101***	0.0905***	0.0829***	0.0785***	0.0887***	0.0877***	0.0836***	0.0859***	0.0859***
	(0.0600)	(0.0502)	(0.0499)	(0.0251)	(0.0253)	(0.0203)	(0.0182)	(0.0237)	(0.0207)	(0.0189)	(0.0155)	(0.0155)
Related partner	-0.337	0.886	0.919	-0.473	-0.401	0.318	0.361	0.108	0.142	0.183	0.403	0.403
	(1.111)	(0.893)	(0.895)	(0.633)	(0.621)	(0.408)	(0.403)	(0.497)	(0.441)	(0.430)	(0.308)	(0.308)
Observations	2,445,511	2,410,173	2,410,173	2,410,173	2,410,173	1,859,084	1,855,497	2,410,173	1,867,562	1,867,517	3,230,145	3,230,145
R-squared	0.083	0.477	0.482	0.338	0.361	0.804	0.807	0.853	0.800	0.802	0.825	0.825
Panel B: Impact of transacting with related low-tax partner on deviation from arm's-length price												
Related partner × (τ-τ_{it})	2.512***	2.110***	2.099***	0.717***	0.690***	0.393***	0.416**	0.546**	0.540**	0.441**	0.510***	0.510***
	(0.491)	(0.447)	(0.442)	(0.231)	(0.225)	(0.139)	(0.208)	(0.248)	(0.218)	(0.222)	(0.178)	(0.178)
Related partner	-0.749	0.579	0.561	-0.802	-0.792	0.297	0.0135	0.0308	0.0563	-0.208	-0.0261	-0.0261
	(1.372)	(1.161)	(1.153)	(0.726)	(0.662)	(0.446)	(0.497)	(0.591)	(0.523)	(0.522)	(0.399)	(0.399)
Observations	2,386,350	2,386,350	2,386,350	2,386,350	2,386,350	1,841,887	1,838,348	2,386,350	1,850,237	1,850,214	3,184,633	3,184,633
R-squared	0.082	0.475	0.48	0.338	0.361	0.803	0.807	0.853	0.8	0.802	0.825	0.825
Pricing to market controls												
Macro controls in partner country	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	(absorbed)	(absorbed)	(absorbed)
Related partner x market conditions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls (Sales, wage bill)	Yes	Yes	Yes	Yes	(absorbed)	(absorbed)	(absorbed)	Yes	Yes	Yes	(absorbed)	(absorbed)
Fixed effects												
Year	Yes			Yes				Yes				
Product		Yes										
Product#Year			Yes				Yes		Yes	Yes	Yes	Yes
Firm				Yes								
Firm#Year					Yes	Yes	Yes				Yes	Yes
Product#Country						Yes	Yes					Yes
Country#Year							Yes			Yes	Yes	Yes
Firm#Product								Yes	Yes	Yes	Yes	Yes

Note: the table explores the effect of the trading partner (import origin) country's corporate tax rate on the import price in related trades (between affiliates) relative to the effect on domestic and unaffiliated firms. The sample period is 2011 to 2015. A unit of observation is a firm–relation–origin–product–time quintuble. The dependent variable is the Log(Unit Value). The product is defined by HS8 codes. 'low-tax partner' is a dummy variable indicating whether the trading partner (import origin) country's corporate tax rate is below the South African corporate tax rate of 28%. The tax differential (τ-τit) is the difference between the South African corporate tax rate and the partner country tax rate. 'Related party' is a dummy variable indicating an internal (controlled) trade between affiliates of the same MNE. 'Macro controls in partner country'/'Market conditions' include GDP per capita, population, exchange rate and distance to partner. ***$p < 0.01$, **$p < 0.05$, * < 0.1. Standard errors clustered at the country–year level.

any partner relation, firms shift part of the tax burden of corporate taxation towards consumers. All these effects are, of course, absorbed when using country–year fixed effects. I do not find a robust relationship between firm characteristics and import unit prices and, again, whatever the relationship may be, this is absorbed by the firm–year fixed effects. Finally, across all specifications the macro-variable and related dummy interactions remain highly significant, supporting the notion that market conditions influence unit prices on related imports differently than unrelated imports (discussed in Davies et al., 2018).

I do a series of robustness checks of these results. First, using the reweighting procedure by DiNardo et al. (1996) and Boserup et al. (2016), I match observations based on transaction size and then estimate the model on the matched sample. This does not change the results (see Appendix Table A4c). Finally, I confine the sample to MNE transactions only and control for whether a subsidiary is located in the country (following Cristea and Nguyen, 2016). This does not change the results (see Appendix Table A4d).

5.3.1. Heterogeneity in transfer mispricing responses

Prior research from high-income countries show large heterogeneities in profit shifting across firm characteristics. In Table 5 I investigate the heterogeneity of transfer mispricing across different firm and transaction characteristics. In column 1 I report the baseline specification using the full sample in which the estimated semi-elasticity with respect to the partner tax rate was −0.51.

Johansson et al. (2017) find that lossmaking firms respond less to profit shifting incentives. In column 2 I include an additional interaction term between my main effect and a dummy for whether the firm is making a loss. I do find that lossmaking firms have a smaller response to tax incentives, but this effect is not statistically significant. This may be explained by the fact that South Africa has indefinite loss-carry forward rules, why even lossmaking firms may benefit from profit shifting in future years.

Bernard et al. (2006) argues that it may be easier to misprice certain "differentiated" goods than products that are traded on standardized markets (such as commodities). In column 3 I include an interaction term for whether the good being transacted is "differentiated" according to the 'naïve' classification from Bernard et al. (2006). Consistent with theory, I observe an increase in the estimated tax response, but this difference is not significant.

There might be additional scope for R&D intensive firms to misprice their internal transactions as they can allocate higher costs to products using cost plus pricing or net profit split methods. In column 4 I indeed find that firms with above median royalty expenditures do respond more to tax incentives and significantly so. This is aligned with the finding from Liu et al. (forthcoming) on UK based multinationals.

High leverage may be an indication of subsidiaries engaging in debt shifting, which could impact their transfer mispricing. In particular, one plausible hypothesis would be that firms substitute between debt shifting and transfer mispricing. In column 5 I find that firms with above median leverage respond more to tax incentives in their transfer mispricing than firms with lower leverage. This suggests that firms do not substitute between debt shifting and transfer mispricing.

An additional test of whether transfer mispricing is more prevalent in transactions with developing countries is to condition on the development level of the counterpart. In column 6 I find that transfer mispricing is not affected by whether the counterpart is an OECD country. This further supports the finding that developing countries are not more at risk of tax-motivated transfer mispricing of goods.

Dischinger et al. (2013) argues that firms are particularly inclined to shift profits to the parent – this may be explained by a "home" bias or simply the increased tax planning capacity of the parent. In column 7 I

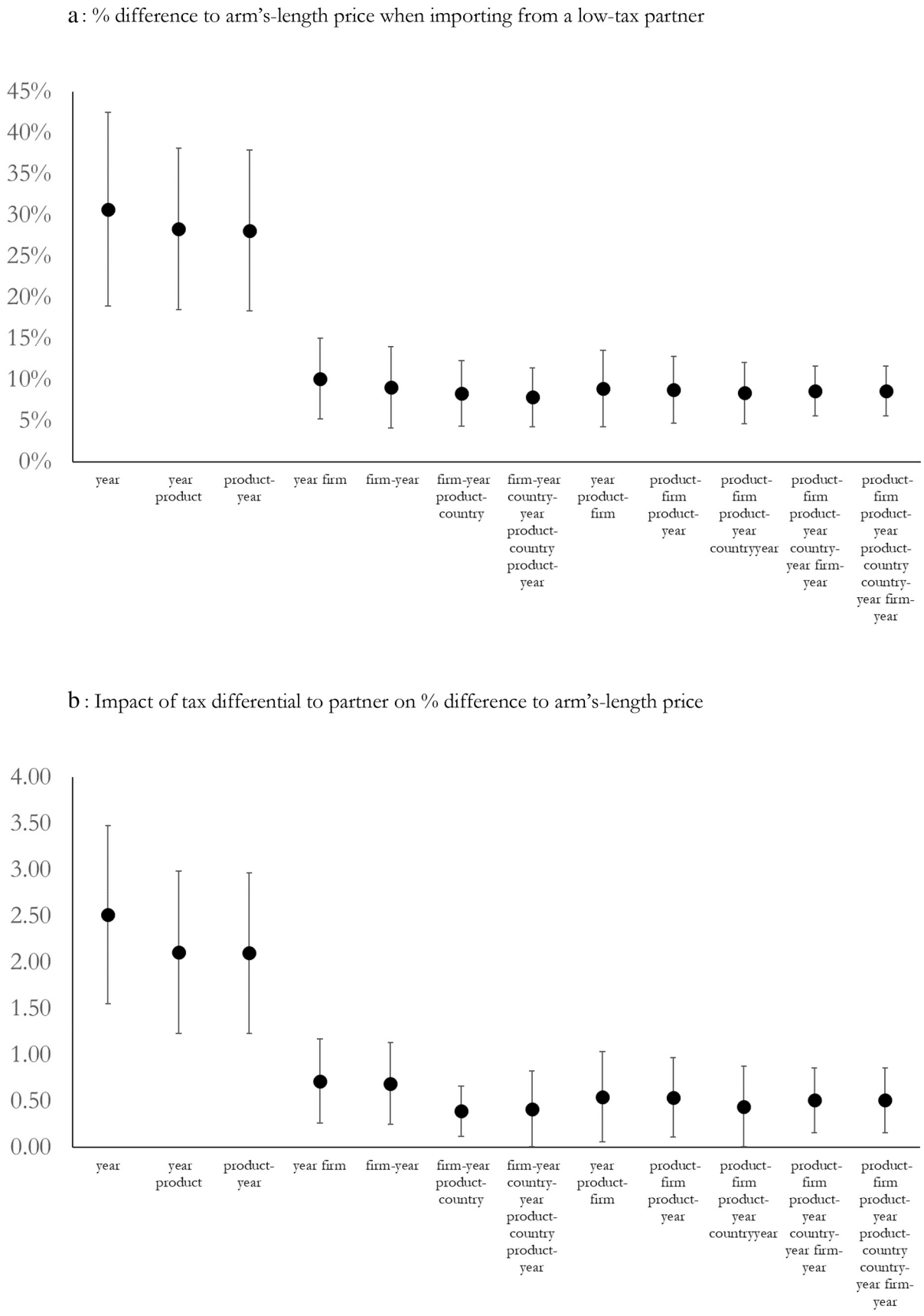

Fig. 5. The impact of tax incentives on deviations from arm's-length pricing. Note: the figure explores the effect of the trading partner (import origin) country's corporate tax rate on the import price in related trades (between affiliates) relative to the effect on unaffiliated transactions. Panel a plots the β_1 coefficient estimate from Eq. (1) reported as 'low-tax partner x related' in Table 4 Panel A. Panel b plots the β_1 coefficient estimate from Eq. (2) reported as 'Tax differential × related' in Table 4 Panel B. The horizontal axis indicates the fixed-effect dimensions of the estimated model. All regressions control for firm and country characteristics. See appendix Table A4a/b for full regression results.
Source: Author's calculations based on SARS (n.d.), KPMG (n.d.) and World Bank (n.d.)

Table 5
Drivers of transfer price manipulation.
Source: SARS, KPMG, WDI and author calculations.

Dependent variable: ln(unit price)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Related partner × (τ-τ_{it})	0.510***	0.571***	0.479***	0.317	0.455***	0.863***	0.790***
	(0.178)	(0.186)	(0.177)	(0.240)	(0.176)	(0.310)	(0.228)
Related partner × (τ-τ_{it}) × lossmaking		−0.115					
		(0.0828)					
Related partner × (τ-τ_{it}) × differentiated good			0.0515				
			(0.0398)				
Related partner × (τ-τ_{it}) ×high leverage				0.209*			
				(0.125)			
Related partner × (τ-τ_{it}) × high R&D					0.278***		
					(0.0967)		
Related partner × (τ-τ_{it}) × OECD partner country						0.00848	
						(0.168)	
Related partner × (τ-τ_{it}) × trading with parent country							−0.382
							(0.260)
Observations	3,184,633	2,923,433	3,184,633	888,254	3,184,633	2,473,505	3,184,633
R-squared	0.825	0.820	0.825	0.828	0.825	0.843	0.825

Note: this table investigates heterogeneities in transfer mispricing by interacting the main effect from Table 4a column 12 with different dummy variables. Column 1 reports the baseline result with no interactive terms. Column 2 interacts the main effect with a dummy variable taking the value one if the firm is reporting a loss and zero otherwise. Column 3 interacts the main effect with a dummy variable taking the value one if the good is classified as differentiated (using Bernard et al. (2006) naïve classification) and zero otherwise. Column 4 interacts the main effect with a dummy variable taking the value one if the importing firm has above median leverage and zero otherwise. Column 5 interacts the main effect with a dummy variable taking the value one if the importing firms royalty expenditures are above median and zero otherwise Column 6 interacts the main effect with a dummy variable taking the value one if the partner country is an OECD country and zero otherwise. Column 7 interacts the main effect with a dummy variable taking the value one if the parent country of the importing firm and zero otherwise. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. Standard errors clustered at the country-year level.

find that the semi-elasticity wrt, the tax differential is smaller in transactions where the partner country is home to the parent firm, but not significantly so.

5.3.2. Other tax incentives for transfer mispricing

There might be tax benefits other than a low statutory tax rate in tax havens such as secrecy and lenient enforcement, which could lead companies to favour these countries in their transfer mispricing beyond what the tax rate warrants. Consistent with this notion, Davies et al. (2018) find that the bulk of transfer mispricing occurs through tax havens and that this cannot simply be explained by the tax differential to these countries. Contrary, Liu et al. (forthcoming) does not find more transfer mispricing in transactions with tax havens than what can be explained by the low tax differential. In columns 1 and 2 of Table 6 the related dummy is interacted with a dummy variable taking the value one whenever the country of origin is a tax haven. I use the tax haven definition from Hines Jr (2010). Contrary to Davies et al. (2018), the results do not seem to support the view that tax havens are driving the semi-elasticity from previous specifications. To some extent, this is not surprising, as only 4% of related imports to South Africa originate from tax havens.

Hopland et al. (2018) hypothesize that loss-making subsidiaries may receive profits from foreign affiliates, the reasoning being that the loss-making subsidiaries are effectively paying 0% tax on additional earnings. Loss-carry-forward rules complicate this reasoning as present losses can be converted into future tax savings (Dharmapala and Riedel, 2013). I test the hypothesis of Hopland et al. (2018) by interacting a loss dummy with the related dummy. If foreign affiliates are shifting profits to South African subsidiaries, we would expect this interaction to be negative, as related imports to loss-making subsidiaries would be under-priced. The results are reported in column 3 of Table 6. There seems to be little support for the view that South African loss-making subsidiaries are receiving foreign profits, as the interaction term is highly insignificant.

Withholding tax rates may impact the decision to shift profits as they raise the cost of transferring income through dividends, royalties

Table 6
Other tax incentives for transfer price manipulation.
Source: SARS, KPMG, WDI and author calculations.

Dependent variable: ln(unit price)						
	(1)	(2)	(3)	(6)	(7)	(8)
Related partner × haven partner	0.00765	0.0249				
	(0.0504)	(0.0517)				
Related partner × (τ-τ_{it})		0.546***		0.694***	0.713***	0.701***
		(0.183)		(0.176)	(0.165)	(0.165)
Related partner × lossmaking			0.0296			
			(0.0220)			
Related partner × wht dividends				−0.611		
				(0.00532)		
Related partner × wht interests					0.126	
					(0.00204)	
Related partner × wht royalties						0.637***
						(0.00238)
Observations	3,242,222	3,195,595	2,960,756	2,447,185	2,453,526	2,453,526
R-squared	0.825	0.825	0.820	0.825	0.825	0.825

Note: this table explores whether other tax incentives than the tax differential to the partner country may drive arm's-length deviations. This is done by re-estimating Table 4a col. 12 but replacing the tax incentive by 1) "haven partner"; a dummy variable taking the value 1 whenever the partner country is listed as a tax haven in Hines Jr (2010). 2) "Lossmaking"; a dummy variable taking the value one whenever the import firm is lossmaking. Finally, in column (3)–(6), I test the impact of the withholding tax rate of the immediate counterpart by interacting the related partner dummy with the respective rat. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. Standard errors clustered at the country-year level.

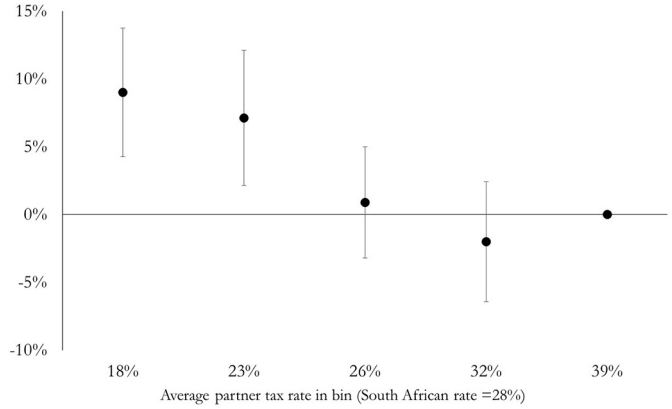

Fig. 6. %-difference to arm's-length price across partner tax-rates (baseline tax = 39%). Note: this figure shows the non-parametrically fitted transfer mispricing curve across different partner tax rates. Partner countries were divided into six equally sized bins (average tax rate of each bin reported as 2nd axis). Each dot reports the interaction term between the sextile and the related transaction dummy. Additional controls follow the specification in Table 4, column 12. The reference group is the top sextile (mean tax rate of 39%). 90% confidence bands reported using robust standard errors clustered at the firm-level.
Source: Author's calculations based on SARS (n.d.), KPMG (n.d.) and World Bank (n.d.)

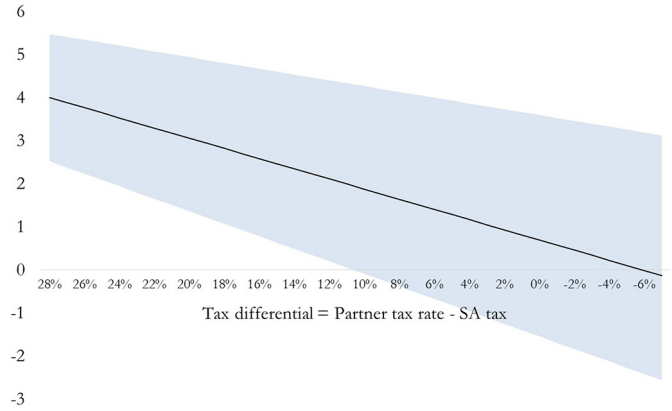

Fig. 7. Semi-elasticity across tax differentials (polynomic fit). Note: this figure shows the quadratically fitted semi-elasticity of transfer mispricing across tax-differentials. Additional controls follow the specification in Table 4, column 12. 90% confidence bands reported using robust standard errors clustered at the firm-level.
Source: Author's calculations based on SARS (n.d.), KPMG (n.d.) and World Bank (n.d.)

and interest payments. Theoretically withholding tax rates hence incentivizes transfer mispricing via interest payments. This effect might be mitigated through treaty shopping. E.g., in the case of South Africa, there is a zero withholding tax rate on royalty payments to Switzerland, why firms may want to route a royalty payments through Switzerland instead of paying the general 15% withholding tax rate of royalty payments. In column 6 to 8, I examine the impact of withholding taxes on transfer mispricing by interacting the related partner dummy with the withholding tax rates. I find no significant impact of dividend or withholding tax rates on transfer mispricing (col. 6–7). I do, however, find a significant impact of royalty withholding tax rates on transfer mispricing of goods in column 8, which is comparable to the impact of the corporate tax differential: a 1 percentage point increase in the royalty withholding tax rate increases the price wedge to estimate the arm's-length price by 0.6 percentage points. Interestingly, this suggests that firms substitute from royalty payments to transfer mispricing of goods when withholding tax rates increase.

5.3.3. Non-linear response to tax differentials

Recent studies from France (Davies et al., 2018), Denmark (Cristea and Nguyen, 2016) and the UK (Liu et al. forthcoming) find asymmetrical transfer mispricing responses to tax differentials. In particular, the studies only find evidence of outward profit shifting (no inward shifting) and Davies et al. (2018) only find evidence of transfer mispricing in transactions with very low-tax countries (no transfer mispricing when the tax differential is small). This pattern is consistent with fixed costs of profit shifting, such that firms only chose to shift profits when the tax differential is sufficiently large.

I investigate the functional form of the response function to tax differentials through two specifications. First, I conduct a non-parametric test by simply dividing the tax differential into six equally sized bins and interacting each bin with a dummy indicating whether the transaction is internal. I omit the top tax bracket (average tax rate of 39%) as the reference group. The results are reported in Fig. 6. Consistent with the findings from developed countries, I only find evidence of outward transfer mispricing and only in the case of tax differentials smaller than −5 percentage points. Second, I allow for a second degree polynomic fit for the tax differential response function. The marginal elasticity estimates are reported in Fig. 7. The polynomic response function suggests a non-linear relationship between tax differentials and transfer mispricing, which is insignificant for tax differentials close to or above zero and very large for tax differentials smaller than −10 percentage points. I hence find clear evidence of asymmetrical responses to tax differentials, consistent with previous findings from high-income countries. These findings may be explained by the existence of fixed costs of profit shifting, making it only worthwhile when the tax differential is sufficiently large.

This all adds up to one thing: Similar to what has been observed in developed countries, South Africa only lose taxable income due to tax-motivated transfer mispricing and does not seem to attract any inward profit shifting in return.

The South African CFC rules could impact the functional form of the response function to transfer mispricing incentives for multinational entities headquartered in South Africa. The aim of these rules is to limit the incentive for South African head quartered firms to shift profits to low-tax countries. In particular, the South African CFC rules are only pertinent to partner countries with a corporate tax rate lower than 21%. However, as the CFC rules only apply to passive (intangible/financial) income, these rules does not directly impact firms trading in tangible goods. In Appendix Fig. 5a, I re-estimate the non-parametric transfer mispricing curve form Fig. 6, but limiting the sample to South African headquartered firms. The figure suggest that South African head

Table 7
Tax loss of transfer mispricing of imported goods.
Source: Author's calculations based on SARS (n.d.), KPMG (n.d.) and National Treasury (2016).

Transfer mispricing estimate	Share of tax base: Foreign- owned firms	All corporations	Total tax revenue
(1)	(2)	(3)	(4)
8.6%	1.7%	0.5%	0.10%
10.0%	2.0%	0.6%	0.1%
20.0%	4.0%	1.2%	0.2%
30.0%	6.0%	1.8%	0.3%
40.0%	8.0%	2.4%	0.5%
50.0%	10.0%	3.0%	0.6%
60.0%	12.0%	3.6%	0.7%
70.0%	14.0%	4.2%	0.8%

Note: the transfer mispricing estimate is the average tax induced difference to the arm's-length price. This estimate is multiplied by the customs value of related goods imports from low-tax countries to compute the tax loss. The first row uses the preferred estimate from column 11 in Table 4. The subsequent rows show the robustness of the results.

Table 8
Evaluation of a transfer pricing reform in April 2012.
Source: Author's calculations based on SARS (n.d.), KPMG (n.d.) and World Bank (n.d.)

Dependent variable: ln (unit price)					
	(1)	(2)	(3)	(4)	(5)
Year	2011	2012	2013	2014	2015
Related partner × (τ-τ_{it})	0.721***	0.452	0.28	0.343	0.847***
	(0.217)	(0.369)	(0.444)	(0.391)	(0.262)
Observations	475,611	520,669	177,803	545,567	295,619
R-squared	0.810	0.805	0.812	0.799	0.811

Note: the table explores the effect of a transfer pricing reform occurring in April 2012. This is done by re-estimating column 12 in Table 4, Panel B on a year-to-year basis. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. Standard errors clustered at the country-year level.

quartered firms are more (not less) aggressive in their profit shifting to very low-tax countries, but not significantly so.

5.4. Quantifying the tax loss

In this section, I estimate the tax loss of tax-motivated transfer mispricing using the empirical results in Section 5.3. I simply estimate the total tax loss by applying the estimated arm's-length price deviation from Eq. (1) to all transactions with countries that have a tax rate lower than that of South Africa (i.e. lower than 28%). Following previous literature, this estimate assumes that transactions would still occur in the situation where no tax incentives were present, but that systematic tax-motivated transfer mispricing would cease to exist. I use my preferred estimate in column 12 in Table 4, Panel A, which is an average tax-motivated arm's-length price deviation of 8.59%. In Table 7, columns 2–4, I compute the resulting tax loss: using my preferred estimate in row 1, the tax loss is <2% of foreign-owned firms' tax payments, 0.5% of corporate tax receipts, and 0.1% of total tax receipts (note that this tax loss in only pertinent to transfer mispricing of imported goods). This tax loss is, by my account, negligible. This estimate further declines to 0.3% of corporate tax receipts if we use the more detailed non-parametric estimates from Fig. 6. I do a sensitivity analysis of this estimate by increasing the arm's-length deviation and find that even using the largest estimated arm's-length deviation of 30% (column1, Table 4, Panel A), the tax loss is still negligible.

6. Consequences of an OECD-recommended reform

In their 2014 report, The United Kingdom's Independent Commission for Aid Impact questioned the impact of OECD led anti-profit-shifting assistance in developing countries: 'the benefits … of implementing the new standards may have been oversold' (economia 2016). This echoes the concerns voiced by many NGO's such as Action Aid International,[14] the Tax Justice Network[15] or ICRICT (2019). To shed light on the effect of implementing OECD standards, I study the impact of a South African reform. The reform was pursued in isolation with no other major changes to the corporate tax code[16] and hence serves as a useful natural experiment.

On 1 April 2012, South Africa revised their transfer pricing legislation to follow the standards of the OECD and WTO with the intent enacting best-practice legislation and limiting transfer mispricing.

The formal change in the legislation related largely to a change of wording of a single paragraph:

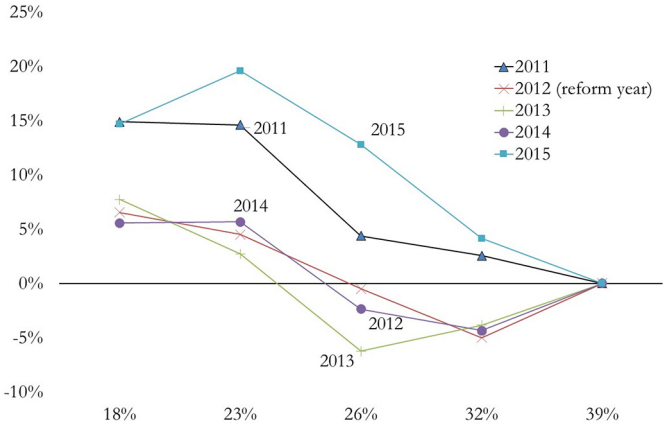

Fig. 8. %-difference to arm's-length price across partner tax-rates (baseline tax = 39%). Note: this figure shows the non-parametrically fitted transfer mispricing curve across different partner tax rates and years. Partner countries were divided into six equally sized bins (average tax rate of each bin reported as 2nd axis). Each dot reports the interaction term between the sextile and the related transaction dummy. The estimation procedure is reported across years to determine how a 2012 reform impacted the transfer mispricing of firms. Additional controls follow the specification in Table 4, column 12. The reference group is the top sextile (mean tax rate of 39%).
Source: Author's calculations based on SARS (n.d.), KPMG (n.d.) and World Bank (n.d.)

- Prior to 1 April 2012[17]: 'the *Commissioner may… adjust* the consideration in respect of the transaction to reflect the arm's length price for the goods or services';
- After 1 April 2012[18]: 'the *taxable income or tax payable by any person … must be calculated* as if that transaction, operation, scheme, agreement or understanding had been entered into on the terms and conditions that would have existed had those persons been independent persons dealing at arm's length'.

Firstly, as marked in *italic* letters, the previous legislation only gave the tax authority the *right* to intervene whenever they found that the arm's-length principle had been overstepped. However, under the new legislation the firm was now obligated to prove that internal relations were organized according to the arm's-length principle. This shifted the onus of proof from the tax authority to the tax payer. In practice, the meaning of this distinction was less clear, as the previous legislation had also required firms to present transfer pricing documentation in support of transfer pricing decisions. In the end, a practical consequence of this distinction was that the tax authority would now require the same documentation with shorter notice (PWC, 2013). Secondly, as underlined in the above paragraphs, previous legislation focused on specific transactions whereas the new legislation followed the OECD tax model by applying a more holistic view. This implied taking factors such as overall profitability into account when determining whether chosen transfer prices were acceptable. The actual consequences of this broader definition of audit strategy was at first unclear to firms but was widely regarded as an increase in audit risk.[19] Overall the a priori expectation of the reform was that it would lower transfer mispricing.

To test the impact of the legislation, I estimate the baseline specification on a year-by-year basis. The results are striking. Table 8 shows that the tax-motivated arm's-length price deviation fell dramatically from above 0.7 in 2011 to below 0.5 in 2012 and fell further to below 0.4 in 2013 and 2014. Furthermore, the tax-motivated deviation from the arm's-length price was not significant from 2012 to 2014. To be clear, none of these differences are statistically significant, but they suggest

[14] https://actionaid.org/publications/2015/patching-broken-tax-system-why-beps-not-solution-poor-countries-tax-problems.
[15] https://www.taxjustice.net/2017/09/11/new-un-tax-handbook-sets-lower-income-countries-oecd-beps/.
[16] Additional to the changes in transfer pricing legislation discussed here was a simplification of the CFC rules meant to strengthen the enforcement of these and a substitution of the special STC rate with the more common dividend tax. These initiatives should further limit the incentives to shift profits. (Government Gazette, 2012)
[17] SAICA (2010).
[18] OECD (2013).
[19] PWC (2013), for example, informs tax payers that they have 'seen increased audit activity by the specialist Transfer Pricing unit within SARS across all industries'.

that firms responded to the reform by closing the gap to estimated arm's-length pricing in the immediate aftermath of the reform. Interestingly, however, in 2015 the estimated semi-elasticity not only reversed to the 2011 level but it was actually slightly above the initial level with a semi-elasticity of 0.85.

Tørsløv et al. (2018) find empirical, theoretical and legislative support of asymmetrical transfer price enforcement, which implies that tax authorities focus on outward profit shifting and ignores inward. If this is the case, there is reason to believe that South African authorities implemented the reform with an asymmetric focus on outward profit shifting. This could imply a lasting effect of the reform that is not visible in the aggregate linear elasticity. To investigate this phenomenon further, I re-estimate the non-parametric response function from Fig. 6 at an annual basis. In Fig. 8 we see the entire response function shift downwards and flattens in the years 2012 to 2014, but then shift back to its original position in 2015. This again suggests that the reform did have an immediate effect on tax-motivated transfer mispricing but that this effect was short-lived.

One possible explanation for the observed pattern in Table 8 and Fig. 8 is that the immediate response to the transfer price legislation reform was based on an unfounded expectation of increased audit capacities and that firms returned to their original transfer price manipulation practice after they obtained certainty about the implication of the new policy. This conclusion is not surprising: granting more information and discretion to the tax authority will not result in higher tax compliance if there is no increase in tax enforcement resources and capabilities (see e.g. Casey and Castro, 2015). As I will discuss in Section 8, data analytics may help solve the problem

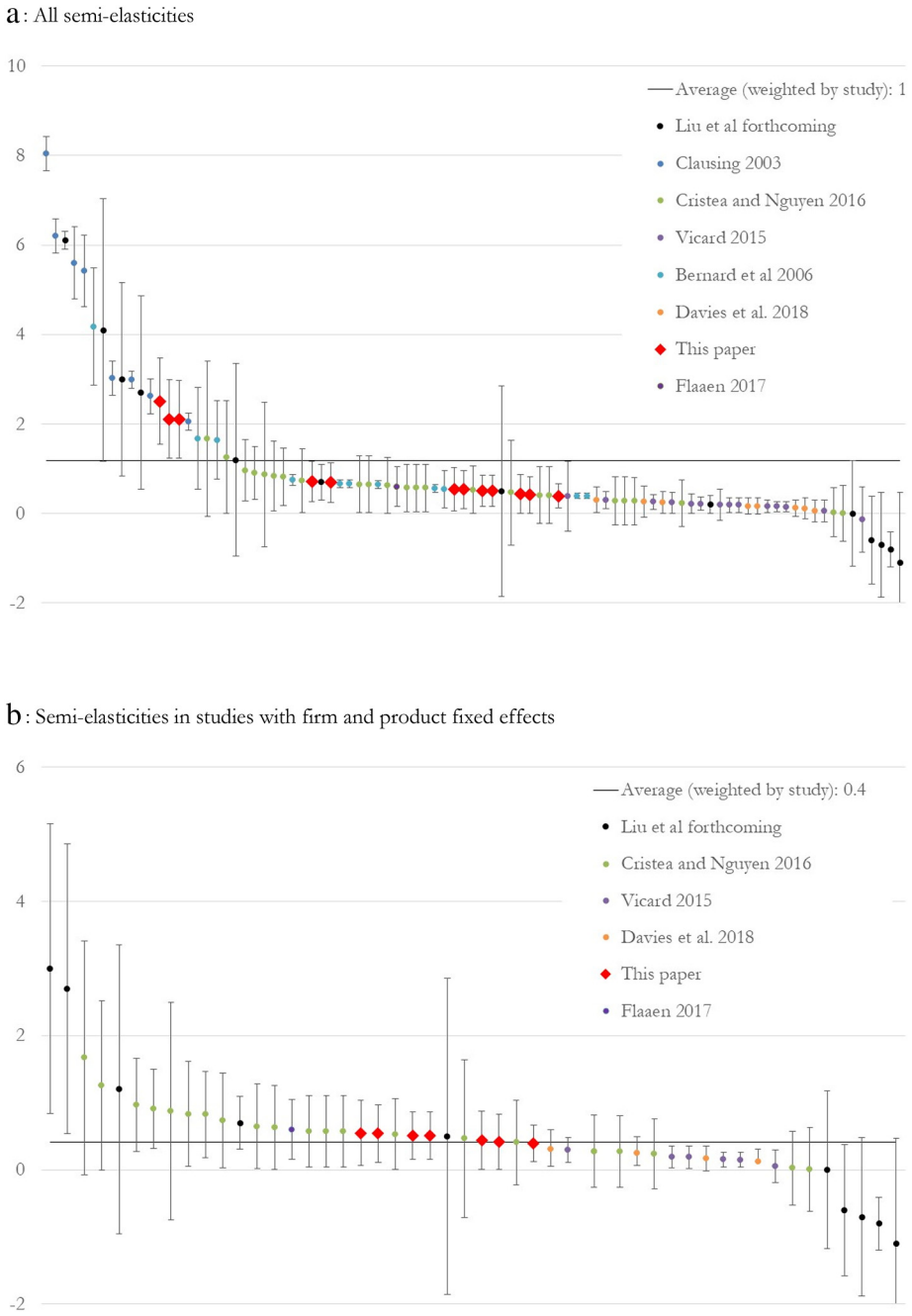

Fig. 9. Reported semi-elasticities in prior research. Note: this figure shows the reported semi-elasticities of prior studies on transfer mispricing of goods. The semi-elasticity is defined as the percentage change in the distance to the arm's-length price in response to a percentage point change in the tax differential between related transacting parties.
Source: Author's own literature review (see Online Appendix).

Table 9
Micro studies of transfer mispricing of goods.
Source: Author's own literature review (see Online Appendix).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Bernard et al. (2006)	Cristea and Nguyen (2016)	Davies et al. (2018)	Flaaen (2017)	Liu et al. (forthcoming)	Vicard (2015)	Vicard (2015)	All prior papers	This paper
Scope of study									
Year of estimate	2004	2006	1999	2000	2010	2008	2008	1999–2008	2014
Country	US	DK	FR	US	UK	FR	FR	High income	SA
Direction	Exports	Exports	Exports	Imports	Exports	Exports	Imports	Exp & Imp	Imports
Estimated semi-elasticity									
Authors' preferred semi-elasticity	0.65***	0.57**	0.26**	0.60***	2.7**	0.22**	0.240**	0.84	0.510**
	(0.05)	(0.272)	(0.13)	(0.226)	(1.1)	(0.08)	(0.12)		(0.27)
Overall mean point estimate	1.10	0.61	0.18	0.60	1.18	0.15	0.21	0.64	0.96
Mean point estimate with firm and product FE	N/A	0.62	0.21	0.60	0.49	0.15	0.21	0.42	0.48
Maximum point estimate	4.18	1.67	0.31	0.60	4.1	0.3	0.39	4.18	2.51
Minimum point estimate	0.39	0.01	0.06	0.60	−1.1	−0.13	0.05	−1.1	0.39
Estimated tax loss (according to study)									
Tax loss in million Euro	666	32	340	N/A	196	1546	1250		78
Corporate income tax revenue in million Euro	218,487	8344	36,872	N/A	50,984	56,670	56,670		15,696
Tax loss in percentage of CIT	0.3%	0.4%	0.9%	N/A	0.4%	2.7%	2.2%	0.9%	0.5%

Note: this figure shows the reported semi-elasticities and estimated tax loss of prior studies on transfer mispricing of goods. The tax loss is based on one direction of trade (imports or exports) in all studies but Vicard (2015) where the average across imports and exports is used. The semi-elasticity is defined as the percentage change in the distance to the arm's-length price in response to a percentage point change in the tax differential between related transacting parties.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

of how to process the abundance of information available to the tax authority and hence credibly increase the audit risk of firms that engage in transfer mispricing.

7. Transfer mispricing in South Africa vs. developed countries

To understand how transfer mispricing in South Africa compares to that of other countries, I collected all the semi-elasticities reported in prior studies. I normalize the coefficients such that the coefficient is positive when it confirms profit-shifting behaviour. Clausing (2003) and Davies et al. (2018) report elasticities (not semi-elasticities); their estimates are transformed to semi-elasticities using the average tax differential of the papers.[20] In Fig. 8a, I report the basic results; the full review is available in the Online Appendix. What is most striking is the enormous variation in point estimates across studies from 8.0 in Clausing (2003) to −1.1 in Liu et al. (forthcoming). The overall average estimate (weighted by study) is 1.3, which is twice as large as the preferred estimate in this paper of 0.51. In Fig. 8b, I limit the sample of estimates to studies using firm and product fixed effects. Clausing (2003) does not use firm fixed effects and is therefore not included in this graph. Limiting the sample to estimates using firm and product fixed effects lowers the average (study weighted) estimated semi-elasticity to 0.37, which is slightly lower than my preferred estimate. Without exception, the estimated semi-elasticity falls within studies when moving from no fixed effects to firm and product fixed effects. This suggests that failing to account for firm and product fixed effects will upwardly bias the results.

The conclusion from Fig. 9a and b is primarily that the accuracy of point estimates is not overwhelming. However, in bundling all estimates, I disregard that some estimates are regarded as less valid by the authors themselves. In Table 8, I report the preferred estimate of each paper and the resulting estimated tax loss. Strikingly, five out of six papers find that the preferred estimate of the semi-elasticity is between 0.2 and 0.7—the exception being Liu et al. (forthcoming) with a preferred estimate of 2.7. Despite the large semi-elasticity, Liu et al. (forthcoming) still find that tax losses are small. In fact, all papers but Vicard (2014) find that transfer mispricing of goods results in a tax loss of <1% of corporate tax receipts. This supports the argument in Tørsløv et al. (2018) that the main vehicle of profit shifting is service transactions.

It follows from Fig. 9 and Table 9 that the estimated transfer mispricing in South Africa is neither systematically higher nor lower than what is observed in previous studies from Denmark, the UK, France, and the US.

8. Conclusion and implications for digital tax enforcement

This paper provides the first direct evidence of transfer mispricing in a developing country. Using highly detailed firm-level customs data, I found that deviations from estimated arm's-length prices correlate with the tax incentive to shift profits, which is interpreted as strong evidence of tax-motivated transfer mispricing of goods.

I evaluated a recent OECD-recommended reform that increased the documentational requirements and audit discretion of the tax authority. I found that transfer mispricing fell in the immediate aftermath of the reform but later returned to its initial level. I argued that an unjustified fear of higher audit risk led to the initial response of firms. As soon as it became clear that the tax authority did not increase its enforcement efforts, the effect of the reform disappeared.

I carried out a systematic review of previous literature on transfer mispricing in advanced economies. Contrary to the common perception, I found that transfer mispricing of goods in South Africa is on par with transfer mispricing of goods in developed countries. Furthermore, across these countries and South Africa, the tax losses were negligible as a share of total corporate taxes paid. This suggests (perhaps unsurprisingly) that transfer mispricing of goods is not the most important channel of profit shifting. Indeed, the OECD (2014, 2015) and Tørsløv et al. (2018) argue that service transactions and shifting of intellectual property rights are the main drivers of profit shifting.

There might be a very cost-effective way to curb transfer mispricing of goods. Tax authorities around the world find themselves in a situation where information is in abundance but not efficiently exploited. When a firm prices a product differently in related and unrelated transactions this must lead to an automatic audit? Or, as a minimum, a flag gets raised and an email sent to the firm cautioning them to stop this behaviour? Academics and senior officials have asked me these questions on numerous occasions. The short answer is no. To my knowledge, no tax authority has set up an automated flagging system that tests for deviations in the pricing of related and unrelated transactions. This seems to

[20] I do this using the identity that the elasticity with respect to the tax differential $\frac{\Delta p}{p} \cdot \frac{\tau}{\Delta \tau}$ can be rewritten as $\epsilon \cdot \frac{1}{\tau}$.

be a very low-hanging fruit for tax authorities globally to pursue. In many cases, the data is already there, stored in a raw format on a server and used in the calculation of import statistics. Tax authorities in some countries will exploit this data source after they have decided to audit a firm—*after* being the key word here. It took me two weeks to set up the data in South Africa such that it could automatically flag companies with systematic deviations from estimated arm's-length pricing.[21] The costs of doing this is in the thousands of dollars while the potential tax gain is in the tens of millions of dollars; that is, despite the tax loss being negligible compared to total tax revenue, the tax loss is enormous compared to the cost of this digital intervention. Such an intervention is an example of the potential for digital tax enforcement, which the OECD (2016a) and the IMF (2017) is promoting. The fact that I (and others) find systematic mispricing using this methodology implies that there should be some scope to pursue this further.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jpubeco.2020.104153.

References

Allingham, M.G., Sandmo, A., 1972. Income tax evasion: a theoretical analysis. J. Public Econ. 1, 323–338.
Becker, J., Davies, R., 2014. A Negotiation-Based Model of Tax-Induced Transfer Pricing.
Bernard, A.B., Jensen, J.B., Schott, P.K., 2006. Transfer pricing by U.S.-based multinational firms. NBER Working Paper 12493. National Bureau of Economic Research, Cambridge, MA.
Besley, T., Persson, T., 2013. Taxation and Development'. In: Auerbach, A.J., Chetty, R., Feldstein, M., Saez, E. (Eds.), Handbook of Public Economics, volume 5, Amsterdam: Elsevier.
Boserup, S.H., Kopczuk, W., Kreiner, C.T., 2016. The role of bequests in shaping wealth inequality: evidence from Danish wealth records. Am. Econ. Rev. Pap. Proc. 106 (5), 656–661.
Casey, P., Castro, P., 2015. Electronic fiscal devices (EFDs): an empirical study of their impact on taxpayer compliance and administrative. IMF Working Paper 15/73. IMF, Washington, DC.
Clausing, K.A., 2003. Tax-motivated transfer pricing and US intrafirm trade prices. J. Public Econ. 87 (9), 2207–2223.
Cristea, A., Nguyen, D., 2016. Transfer pricing by multinational firms: new evidence from foreign firm ownerships. Am. Econ. J. Econ. Pol. 8 (3), 170–202.
Crivelli, E., de Mooij, R., Keen, M., 2015. Base Erosion, profit shifting and developing countries. IMF Working Paper 15/118. IMF, Washington, DC.
Damgaard, J., Elkjaer, T., 2017. The global FDI network: searching for ultimate investors. International Monetary Fund.
Davies, R.B., Martin, J., Parenti, M., Toubal, F., 2018. Knocking on tax Haven's door: multinational firms and transfer pricing. Rev. Econ. Stat. 100 (1), 120–134.
Devereux, M.P., Vella, J., 2014. Are we heading towards a corporate tax system fit for the 21st century? Fisc. Stud. 35 (4), 449–475.
Dharmapala, D., Riedel, N., 2013. Earnings shocks and tax-motivated income-shifting: evidence from European multinationals. J. Public Econ. 97 (1), 95–107.
DiNardo, J., Fortin, N., Lemieux, T., 1996. Labor market institutions and the distribution of wages, 1973–1992: a semiparametric approach. Econometrica 64 (5), 1001–1044.
Dischinger, M., Knoll, B., Riedel, N., 2013. 'The Role of Headquarters in Multinational Profit Shifting Strategies'. International Tax and Public Finance 21 (2), 248–271.
economia, 2016. "UK aid programme "failing to tackle tax avoidance and evasion" 27 September. Available at. http://economia.icaew.com/news/september-2016/uk-aid-programme-failingto-tackle-tax-avoidance-and-evasion, Accessed date: 21 November 2016.
Flaaen, A., 2017. The role of transfer prices in profit-shifting by U.S. multinational firms: evidence from the 2004 Homeland Investment Act. Finance and Economics Discussion Series 2017-055. Board of Governors of the Federal Reserve System, Washington, DC https://doi.org/10.17016/FEDS.2017.055.
Forstater, M., 2015. Can stopping "tax dodging" by multinational enterprises close the gap in development finance? CGD Policy Paper 069. Center for Global Development, Washington, DC
Forstater, M., 2018. Illicit financial flows, trade misinvoicing, and multinational tax avoidance: the same or different? CGD Policy Paper 123. Center for Global Development, Washington, DC
Gebrekidan, S., Onishi, N., 2018. Corruption gutted South Africa's tax agency. Now the nation is paying the price. The New York Times 10 June. Available at:. https://www.nytimes.com/2018/06/10/world/africa/south-africa-corruption-taxes.html (accessed on 1/1/2018).
Government Gazette, 2012. No. 24 of 2011: Taxation Laws Amendment Act, 2011. Accessible at. https://www.sars.gov.za/AllDocs/LegalDoclib/AmendActs/LAPD-LPrim-AA-2011-02%20-%20Taxation%20Laws%20Amendment%20Act%202011.pdf.
Greenwood, X. (2018). 'South Africa is the Most Unequal Country in the World and its Poverty is the "Enduring Legacy of Apartheid", says World Bank'. Independent, 4 April. Available at: https://www.independent.co.uk/news/world/africa/south-africa-unequal-country-poverty-legacy-apartheid-world-bank-a8288986.html (1/1/2018).
Heckemayer, J., Overesch, M., 2013. Multinationals' profit response to tax differentials: effect size and shifting channels. ZEW Working Paper 13-045. Center for European Economic Research, Mannheim.
Hines Jr., J.R., 2010. Treasure Islands. J. Econ. Perspect. 24 (4), 103–126.
Hines Jr., J.R., 2014. How serious a problem is base erosion and profit shifting? Canadian Tax Journal 62 (2), 443–453.
Hines, J., Rice, E., 1994. Foreign tax havens and American business. Q. J. Econ. 109 (1), 149–182.
Hopland, A.O., Lisowsky, P., Mardan, M., Schindler, D., 2018. Flexibility in income shifting under losses. Account. Rev. 93 (3), 163–183.
ICRICT (Independent Commission for the Reform of International Corporate Taxation), 2019. A time for developing countries to speak up.Available at:. https://www.icrict.com/icrict-in-thenews/2019/10/18/a-time-for-developing-nations-to-speak-up (accessed on 1/12/2019).
IMF, 2017. Digital revolutions in public finance. Available at:. https://www.imf.org/en/News/Articles/2017/09/07/sp090817-digital-revolutions-in-public-finance-vision-aries-plumbers-architects.
Johannesen, N., Pirttilä, J., 2016. Capital flight and development. WIDER Working Paper 2016/95. UNU-WIDER, Helsinki.
Johannesen, N., Tørsløv, T., Wier, L., 2017. Are less developed countries more exposed to multinational tax avoidance? Method and evidence from micro-data. WIDER Working Paper 2016/10. UNU-WIDER, Helsinki.
Johansson, Å., Skeie, Ø.B., Sorbe, S., Menon, C., 2017. 'Tax Planning by Multinational Firms: Firm-level Evidence from a Cross-country Database'. OECD Economics Department Working Papers 1355, Paris: OECD.
KPMG (n.d.). 'Corporate tax rates table'. Available at: https://home.kpmg.com/xx/en/home/services/tax/tax-tools-and-resources/tax-rates-online/corporate-tax-rates-table.html (accessed on 1/1/2018).
Kleven, H.J., Thustrup Kreiner, C., Saez, E., 2016. Why Can Modern Governments Tax so Much? An Agency Model of Firms as Fiscal Intermediaries'. Economica 88, 219–246.
Liu, L., Schmidt-Eisenlohr, T., Guo, D., 2017. International Transfer Pricing and Tax Avoidance: Evidence from the Linked Tax-Trade Statistics in the UK.
Mascagni, G., Moore, M., McCluskey, R., 2014. Tax Revenue Mobilisation in Developing Countries: Issues and Challenges. Policy Department study, Brussels: European Parliament.
National Treasury, 2016. Budget Review.Available at:. www.treasury.gov.za/documents/national%20budget/2016/review/chapter%204.pdf (accessed on 1 October 2016).
OECD, 2010. OECD Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations.
OECD, 2013. Transfer pricing country profile: South Africa. Available at:. http://www.oecd.org/ctp/transfer-pricing/SouthAfrica_TPCountryProfile_Jan2013.pdf.
OECD, 2014. Two-Part Report to G20 Development Working Group on the Impact of BEPS in Low Income Countries. OECD Publishing, Paris.
OECD, 2015. Measuring and Monitoring BEPS, Action 11: 2015 Final Report. OECD Publishing, Paris.
OECD, 2016a. Advanced Analytics for Better Tax Administration: Putting Data to Work. OECD Publishing, Paris https://doi.org/10.1787/9789264256453-en.
OECD, 2016b. Tax revenue. Available at:. https://data.oecd.org/tax/tax-revenue.htm.
Pomeranz, D., 2015. No taxation without information: deterrence and self-enforcement in the value added tax. Am. Econ. Rev. 105 (8), 2539–2569.
PWC, 2013. International transfer pricing 2013/14. Available at:. https://www.pwc.com/gx/en/international-transfer-pricing/assets/itp-2013-final.pdf.
Reynolds, H., Wier, L., 2016. Estimating profit shifting in South Africa using firm-level tax returns. WIDER Working Paper 2016/128. UNU-WIDER, Helsinki.
Riedel, N., Zinn, T., Hofmann, P., 2015. Do transfer pricing Laws limit international income shifting? Evidence from Europe'. Working paper. Available at:. https://www.wiwi.

[21] Friedrich Kreuser also deserves credit for the entire process of obtaining the data from SARS.

ruhr-uni-bochum.de/fiwipo/mam/content/do_transfer_pricing_laws_limit_international_income_shifting_evidence_from_europe.pdf.
Roux, A., 2017. Economic growth in SA: what has gone wrong?: how the Country's growth rate is Dteering it away from economic success'. Business day, 23 October. Available at:. https://www.businesslive.co.za/bd/opinion/2017-10-23-economic-growth-in-sa-what-has-gone-wrong/.
SAICA (South African Institute of Chartered Accountants), 2010. Current south African transfer pricing rules. Available at:. https://www.saica.co.za/integritax/2010/1901._Transfer_pricing.htm.
SARS (South African Revenue Service) (2014). Customs external directive: method 1 valuation of imports. Available at: http://www.sars.gov.za/AllDocs/OpsDocs/Policies/SC-CR-A-05%20-%20Method%201%20Valuation%20of%20Imports%20-%20External%20Directive.pdf (accessed on 1/1/2018). SARS (South African Revenue Service) (2018). 'Customs & Excise Tariff'. Available at: http://www.sars.gov.za/AllDocs/LegalDoclib/SCEA1964/LAPD-LPrim-Tariff-2012-04%20-%20Schedule%20No%201%20Part%201%20Chapters%201%20to%2099.pdf (accessed on 1 January 2018).
SARS (South African Revenue Service) (n.d.). 'Corporate Tax Data Base'. Confidential (accessed on 1 January 2018).
Swenson, D.L., 2001. Tax reforms and evidence of transfer pricing. Natl. Tax J. (1), 7–25 LIV.
Tørsløv, T.R., Wier, L.S., Zucman, G., 2018. The Missing Profits of Nations (No. w24701). National Bureau of Economic Research.
UNCTAD, 2015. World Investment Report 2015. UNCTAD, Geneva.
Vicard, V., 2015. Transfer Pricing of Multinational Companies and Aggregate Trade.
World Bank, 2016. GDP per capita (current US$). Available at:. http://data.worldbank.org/indicator/NY.GDP.PCAP.CD.
World Bank (n.d.). 'World Bank development indicators'. Available at: https://data.worldbank.org/products/wdi (accessed on 1 January 2018).
Zucman, G., 2014. Taxing across borders: tracking personal wealth and corporate profits. J. Econ. Perspect. 28 (4), 121–148.