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Southern Africa – Towards Inclusive Economic Development

Tax-motivated transfer mispricing in South Africa

Direct evidence using transaction data

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The collaboration is between the United Nations University World Institute for Development Economics Research (UNU-WIDER), the National Treasury of South Africa, the International Food Policy Research Institute (IFPRI), the Department of Monitoring, Planning, and Evaluation, the Department of Trade and Industry, South African Revenue Services, Trade and Industrial Policy Strategies, and other universities and institutes. It is funded by the National Treasury of South Africa, the Department of Trade and Industry of South Africa, the Delegation of the European Union to South Africa,IFPRI, and UNU-WIDER through the Institute's contributions from Finland, Sweden, and the United Kingdom to its research programme.

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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 is 0.5 per cent 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.

Keywords: tax, international taxation, profit shifting, multinational firms, developing countries
JEL classification: H25, H26, H87, O23

The underlying data used in the author's literature review can be found in the online appendix accessible here (https://www.wider.unu.edu/publication/tax-motivated-transfer-mispricing-south-africa).

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1 Introduction

Multinational enterprises (MNEs) can lower their global tax bill by shifting their earnings from affiliates in high-tax countries to those in low-tax countries—a phenomenon known as 'profit shifting'. In a remarkable consensus, international organizations agree that profit shifting is a particular problem in developing countries, which lack institutional capacity and rely heavily on corporate tax revenue.[1] However, credible profit-shifting estimates for developing countries are in short supply, leaving room for much speculation.[2]

Globally, policy makers are ready to act. Following a G20-mandated report by the OECD, more than 110 jurisdictions have embraced the OECD's recommended 'action points' on how to curb profit shifting. While popular among governments, critics maintain that these action points are insufficient and particularly insufficient in developing country settings.[3] In this paper, I contribute to the existing body of knowledge in two ways. First, I provide direct systematic evidence of profit shifting in a developing country. Second, I evaluate the effect of an OECD-recommended reform in a developing country.

One 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 per cent

[1] See e.g. UNCTAD (2015) and IMF (2015).

[2] This lack of evidence has led to concerns among some economists who fear that the relevance of profit shifting in the development agenda may be overrated (Forstater 2015; Johannesen and Pirttilä 2016).

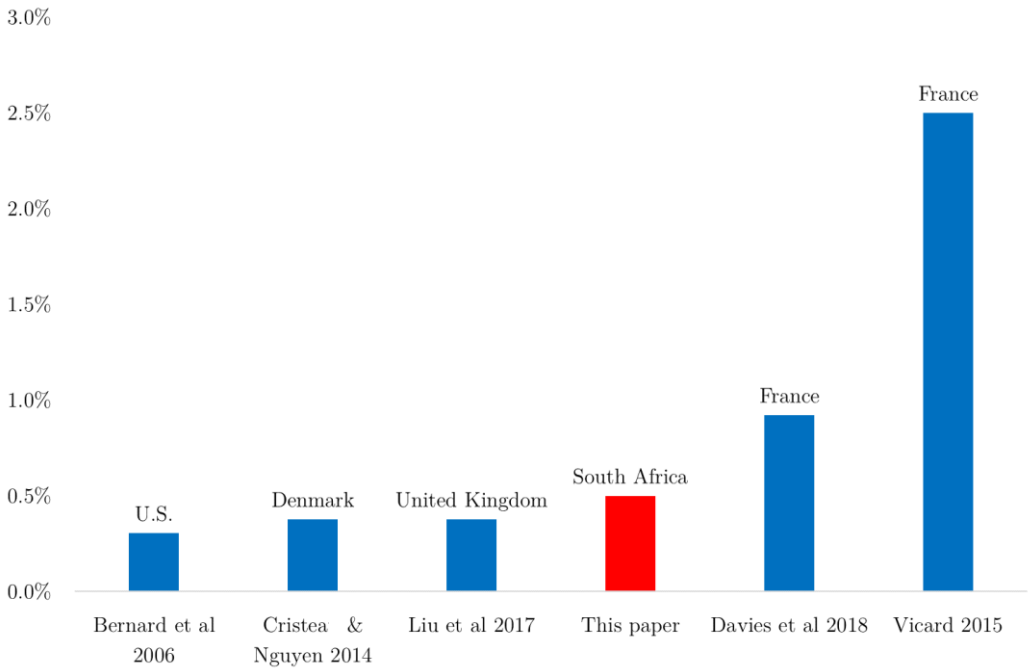
[3] See e.g. The Independent Commission for the Reform of International Corporate Taxation (ICRICT): 'by avoiding any rethinking of the separate entity system and creating even more complexity within the current faulty framework, the BEPS [Base Erosion and Profit Shifting] initiative has amounted to pouring new wine into old wineskins' (ICRICT 2015: 10)

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 per cent if the tax differential to the partner country increases by 1 percentage point. The resulting tax loss as a share of total corporate tax revenue is 0.5 per cent.

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. Pomeranz 2015 for a similar discussion on VAT).

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 2014; Davies et al. 2018); the United States (Clausing 2003; Bernard et al. 2006; Flaaen 2017) and the United Kingdom (Liu et al. 2017). 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 Figure 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 per cent and the median tax loss is 0.4 per cent, 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.

Figure 1: Estimated tax loss of 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).

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.[4] 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. However, 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 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.

[4] It took two weeks for me to set this up in South Africa.

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.[5] 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.[6] 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.[7] 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)[8] 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 (2014), Cristea and Nguyen (2016) and Liu et al. (2017) 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.

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[5] 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).

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

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

[8] Later replicated by Flaaen (2017).

3 South African context

3.1 Economy

South Africa is an upper-middle-income emerging economy with a gross domestic product (GDP) per capita of US$5,692 in 2015.[9] 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 per cent (National Treasury 2016).[10] The corporate income tax constituted a significant share of 19 per cent 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 per cent in 2014 (UNCTAD 2015). The South African statutory tax rate on business income is 28 per cent, which places it slightly above the world average of 24 per cent and far above nearby tax havens such as Mauritius and the Seychelles (see KPMG (n.d.). 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.

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 fraught 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 is 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 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:[11]

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[9] World Bank (2016) data.

[10] OECD (2016b) data.

[11] SARS (2014) Directive 2, Customs External Directive Method 1 Valuation of Imports

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.[12] 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: [13]

- 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.

[12] 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.

[13] 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.

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.[14]

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 Π_H-pq while the taxable profits in the low-tax country will be Π_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. Efficiency costs may also occur; Nielsen and Raimondos-Moller (2008) describe how transfer mispricing strategies may lead to inefficiencies within the MNE. 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. An increase in β will, for a given arm's-length price deviation, increase the costs of transfer mispricing and hence reflects institutional factors such as the likelihood of audits and the fines related to transfer mispricing. The MNE seeks to maximize the sum of after-tax profits across the two countries minus the costs of transfer price deviation, which implies that the optimization problem becomes:

$$\max_{\text{wrt p}}:(\Pi_H-pq)\tau_H+(\Pi_L+pq)\tau_L-\frac{\beta}{2}[(p-p_a)q]^2$$

In an internal optimum, the MNE will choose a transfer price that satisfies the condition:

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

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: 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

[14] More elaborate theoretical discussions can be found in Riedel et al. (2015), Cristea and Nguyen (2016), Davies et al. (2018), and Liu et al. (2017).

price deviations will be larger in a developing country. The hypothesis of transfer mispricing being a larger issue in developing countries is what I test 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. 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:**[15]
>
> *'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'*

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. 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 per cent. This share is markedly lower than what has been observed across French firms (9.2 per cent, Davies et al. 2018) and US firms (roughly 30 per cent, 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 per cent. I replicate all results censoring 2013. This does not impact the results quantitatively nor qualitatively.

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

Table 1: Imports to South Africa by year and partner relation

Year	Unrelated imports (Bn. Rnd.)	Related imports (Bn. Rnd.)	Related imports (Share)
2011	1,005.8	7.2	0.70%
2012	1,169.6	26.4	2.30%
2013	238.6	7.5	3.20%
2014	1,432.1	39.5	2.80%
2015	1,199.5	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.

Source: Author's calculations using SARS (n.d.) data.

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 (n.d.) Corporate Tax Table and the World Development Indicators (World Bank n.d.).

Figure 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 per cent, and there is substantial variation on both sides of the marker for both related and unrelated imports. Table 2 reports the summary statistics, while Appendix Table A1 lists the top 40 import partner countries.

Figure 2: Distribution of import partner corporate tax rate

Figure 2a: Related imports

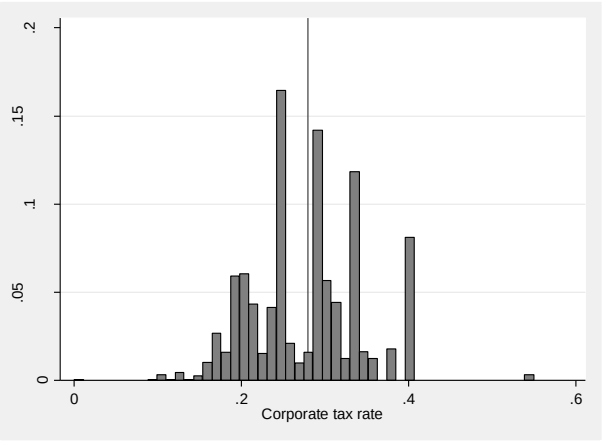
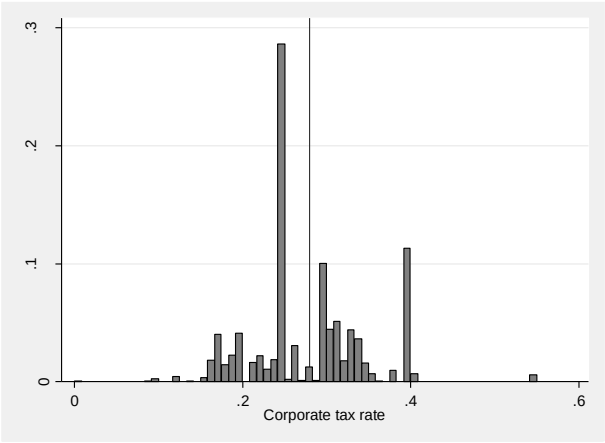


Figure 2b: Unrelated Imports



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 KPMG (n.d.) and SARS (n.d.).

Table 2: Descriptive statistics

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 (1,000 Rnd.)	120,301	7.2	176.0	0.0	29,700.0	4,914,602	20.2	4,577.0	0.0	6,190,000.0
Customs value (1,000 Rnd.)	120,301	993.1	20,400.0	0.0	3,700,000.0	4,914,603	1,026.6	51,600.0	0.0	27,700,000.0
Statistical quantity (1,000 Units)	120,301	79.5	10,800.0	0.0	2,530,000.0	4,914,604	55.3	5,281.2	0.0	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	-2,230.0	13,900.0	4,234,602	130.0	831.0	-1,7500.0	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 quintuble. 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 per cent. 'Corporate tax' is the corporate statutory tax rate of the import country. 'Haven' is a dummy indicating whether the the import origin country is a tax haven following the definition used in Hines (2010)

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

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. Table 3 illustrates this approach. Here, I report the aggregate averages of (log) unit prices by partner relation and tax level. Column 1 shows that the average unit price of related imports is roughly on par (4 per cent higher) with the unit price on external imports when imports originate from a high-tax country (defined as a tax rate above the

South African tax of 28 per cent). Contrary to this, column 2 shows that the unit price on related imports is 57 per cent 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 per cent minus 4 per cent = 53 per cent. 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.

Of course, I am, quite literally, comparing apples and oranges in this simple example. This concern can be mitigated by looking at the same difference-in-difference estimate within product groups. In Figure 2, I therefore calculate the difference-in-difference estimate within the ten largest product groups. That is, the bottom dot in Figure 3 corresponds to the overall difference-in-difference estimate of 54 per cent, 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 per cent. At the very high end, 'static converters' imported from related affiliates in low-tax countries are 'overpriced' by more than 80 per cent.

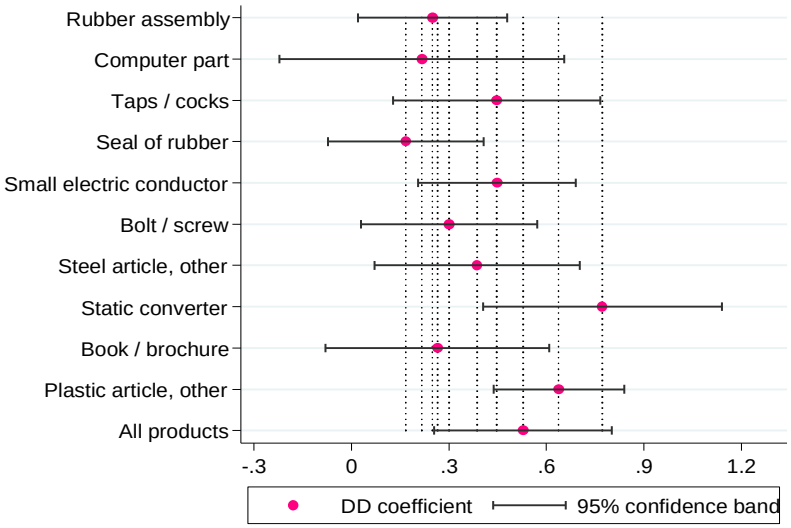
Table 3: Related and unrelated average import prices across high- and low-tax partners

	Average log (unit price)		
	High-tax partner (1)	Low-tax partner (2)	Difference: (1)-(2)
Unrelated partner	5.95***	5.26***	0.69***
	(0.17)	(0.33)	(0.18)
Related partner	5.99***	5.83***	0.16**
	(0.09)	(0.84)	(0.08)
Difference: related minus unrelated	0.04	0,57***	0,53***
	(0.04)	(0.13)	(0.14)

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 per cent. 'Related partner' 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 KPMG (n.d.) and SARS (n.d.).

Figure 3: '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 KPMG (n.d.) and SARS (n.d.).

Whereas Figure 3 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:

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

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

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 per cent 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 equation (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 equation (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. 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.

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.

5.3 Basic results

In Figure 1a and Table 4, Panel A, I report the estimated β_1 coefficient from equation (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 per cent. This estimate remains fairly stable when including product fixed effects and product–year fixed effects but drops significantly to 10 per cent 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 per cent.

In Figure 4b and Table 4, Panel B, I report the β_1 coefficients obtained from estimating equation (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 per cent. 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 A2a. 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 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.

I do a series of robustness checks of these results. First, using the re-weighting 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 A2c). 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 A2d).

Table 4: Basic results

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 per cent. The tax differential (τ-τ_{it}) is the difference between the South African corporate tax rate and the partner country tax rate. 'Related partner' 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, * p<0.1. Standard errors clustered at the country–year level.

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

Figure 4: The impact of tax incentives on deviations from arm's-length pricing

Figure 4a: % difference to arm's-length price when importing from a low-tax partner

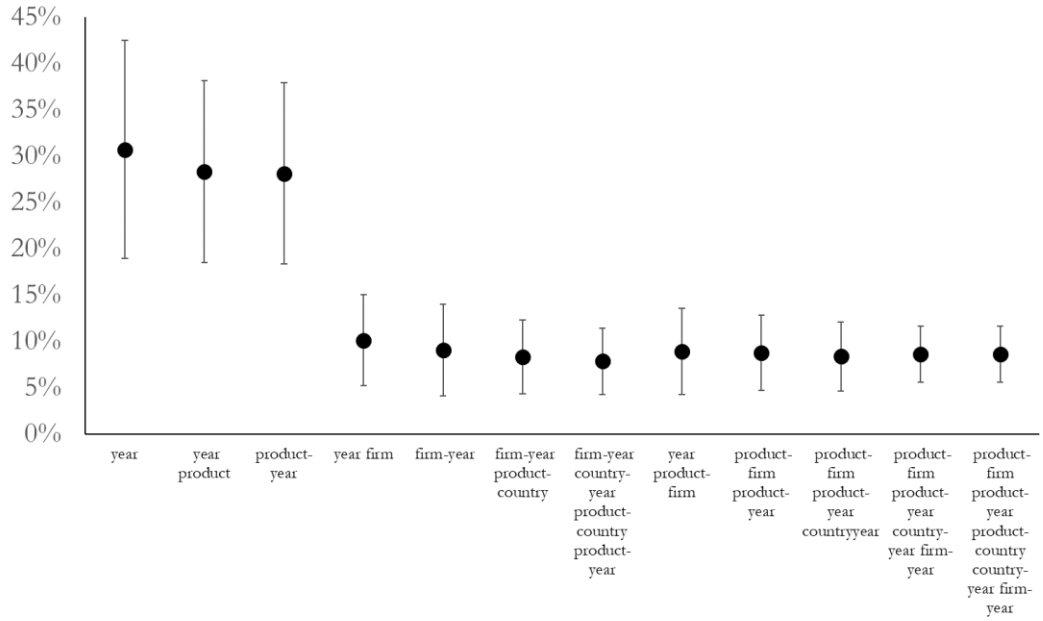
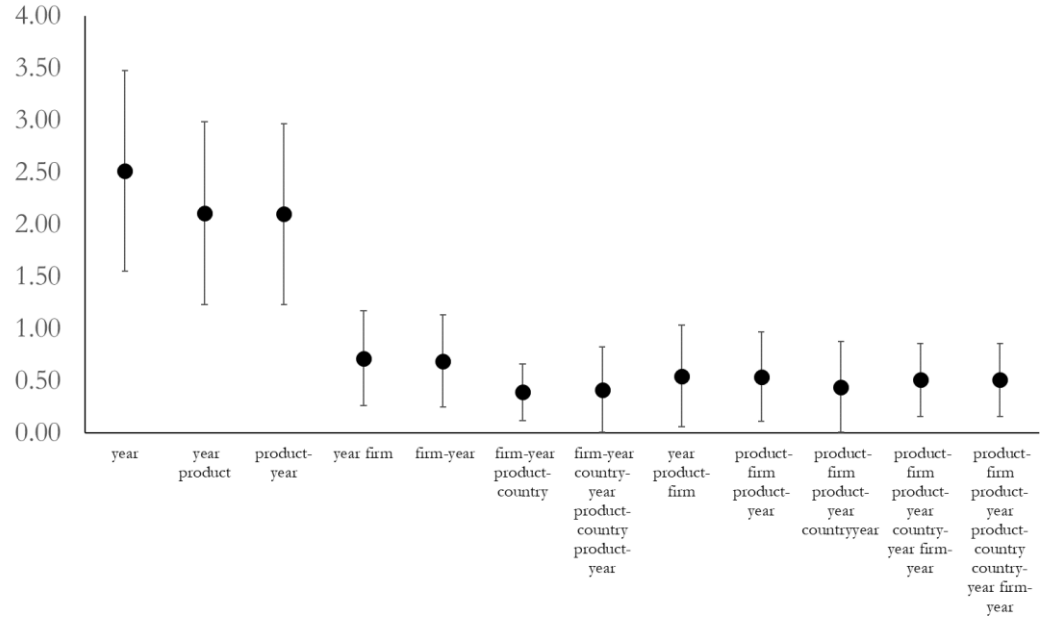


Figure 4b: Impact of tax differential to partner on % difference to arm's-length price



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. Figure 4a plots the β_1 coefficient estimate from equation (1) reported as *'low-tax partner x related'* in Table 4 Panel A. Figure 4b plots the β_1 coefficient estimate from equation (2) reported as *'Tax differential x 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 A2a/b for full regression results.

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

Drivers of transfer mispricing responses

In Table 5, I investigate whether specific subsamples of South African subsidiaries are more responsive to tax incentives. In column 1, the baseline specification using the full sample is reported, in which the estimated semi-elasticity with respect to the partner tax rate was -0.51. In column 2, the sample is restricted to firms with sales above the South African median—this does not impact the semi-elasticity estimates. Column 3 shows that profitable subsidiaries respond more to tax incentives, which is intuitive, as they have profits to shift. Differentiated goods may be easier to manipulate transfer price as there are less clear comparable prices. In column 4, I restrict the sample to differentiated goods using the 'naïve' classification from Bernard et al. (2006). Consistent with theory, I observe an increase in the estimated tax response. Finally, high leverage may be an indication of subsidiaries engaging in debt shifting, which could impact their transfer mispricing. The results reported in column 5, where the sample is restricted to firms with leverage in the top median, do not seem to support this.

Table 5: Drivers of transfer price manipulation

Dependent variable: ln (unit price)					
	(1)	(3)	(4)	(5)	(6)
	Full sample	Big firms	Profitable	Differentiated	High leverage
Related partner × (τ-τ_{it})	0.510***	0.526***	0.654***	0.751***	0.518**
	(0.178)	(0.181)	(0.215)	(0.217)	(0.204)
Observations	3,184,633	2,616,580	2,463,077	1,675,410	1,868,665
R-squared	0.825	0.815	0.823	0.797	0.798

Note: This table replicates the prefered estimate in Table 4, Panel B, column 12 across different samples to identify the drivers of profit shifting. Column 1 uses the full sample. Column 2 restricts the sample to imports originating from countries with a corporate tax rate below 28 per cent. Column 3 restricts the sample to firms with above median sales. Column 4 restricts the sample to profitable firms. Column 5 restricts the sample to differentiated imports defined using the Bernard et al. (2006) naïve classification. Column 6 restricts the sample to firms with above median sales.*** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered at the country–year level.

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

Other tax incentives for transfer mispricing

There might be tax benefits other than a low statutory tax rate in tax havens. Davies et al. (2018) find that the bulk of transfer mispricing occurs through tax havens. 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 (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 per cent 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 zero per cent 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 insignificant.

Table 6: Other tax incentives for transfer price manipulation

	Dependent variable: ln (unit price)		
	(1)	(2)	(3)
Related partner × haven partner	0.00765	0.0249	
	(0.0504)	(0.0517)	
Related partner × (τ-τ_{it})		0.546***	
		(0.183)	
Related partner × loss-making			0.0296
			(0.0220)
Observations	3,242,222	3,195,595	2,960,756
R-squared	0.825	0.825	0.820

Note: This table explores whether tax incentives other than the tax differential to the partner country may drive arm's-length deviations. This is done by re-estimating Table 4, Panel A, column 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 (2010). 2) 'Loss-making'; a dummy variable taking the value one whenever the import firm is loss-making. *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered at the country–year level.

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

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 equation 1 to all transactions with countries that have a tax rate lower than that of South Africa (i.e. lower than 28 per cent). 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 per cent. In Table 7, columns 2–4, I compute the resulting tax loss: using my preferred estimate in row 1, the tax loss is less than 2 per cent of foreign-owned firms' tax payments, 0.5 per cent of corporate tax receipts, and 0.1 per cent of total tax receipts. This tax loss is, by my account, negligible. 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 per cent (column1, Table 4, Panel A), the tax loss is still negligible.

Table 7: Tax loss of transfer mispricing

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.

Source: Author's calculations based on KPMG (n.d.), SARS (n.d.), and National Treasury (2018).

6 Consequences of an OECD-recommended reform

On 1 April 2012, South Africa revised their transfer pricing legislation to follow the standards of the OECD and WTO. The practical consequences of this revision were uncertain at first (International Tax Review 2012). The formal change in the legislation related largely to a change of wording of a single paragraph:

- Prior to 1 April 2012:[16] '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:[17] '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.[18]

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 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 reached the 2011 level but it was actually slightly above the initial level with a semi-elasticity of 0.85. This suggests 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

[16] SAICA (2010).

[17] OECD (2013).

[18] 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'.

resources and capabilities (see e.g. Pomeranz 2015). As I will discuss in Section 8, data analytics may solve the problem 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.

Table 8: Evaluation of a transfer pricing reform in April 2012

	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 occuring 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.

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

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.[19] In Figure 5a, 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. (2017). 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 Figure 5b, 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 Figures 5a and 5b 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 9, 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. (2017) with a preferred estimate of 2.7. Despite the large semi-elasticity, Liu et al. (2018) still find that tax losses are small. In fact, all papers but Vicard (2015) find that transfer mispricing of goods results in a tax loss of less than 1 per cent of corporate tax receipts. This supports the argument in Tørsløv et al. (2018) that the main vehicle of profit shifting is service transactions.

[19] 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 $\epsilon \cdot \frac{1}{\tau}$

It follows from Figure 5 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.

Figure 5: Reported semi-elasticities in prior research

Figure 5a: All semi-elasticities

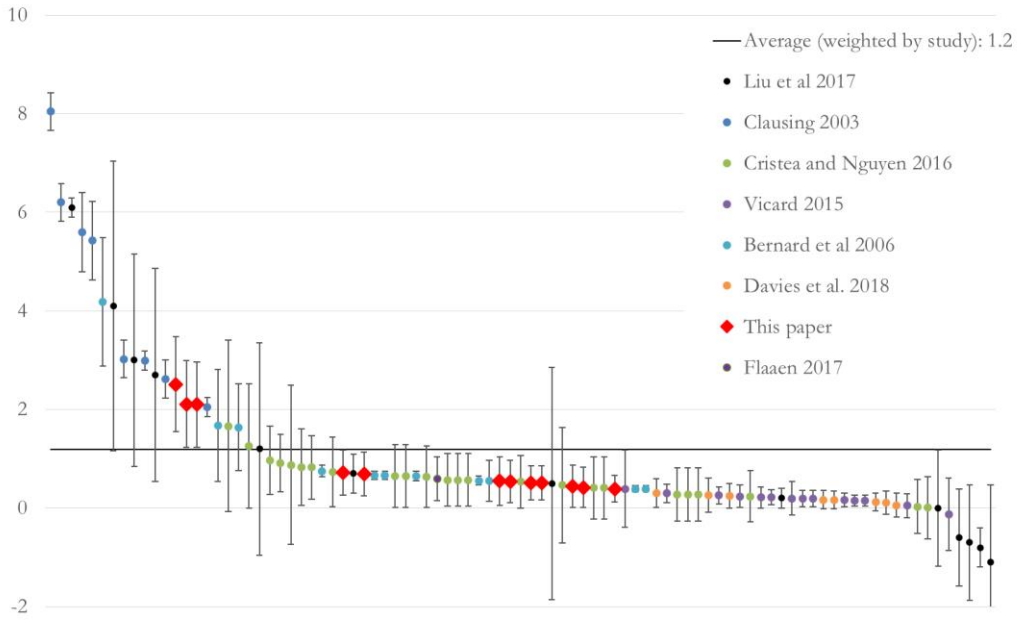
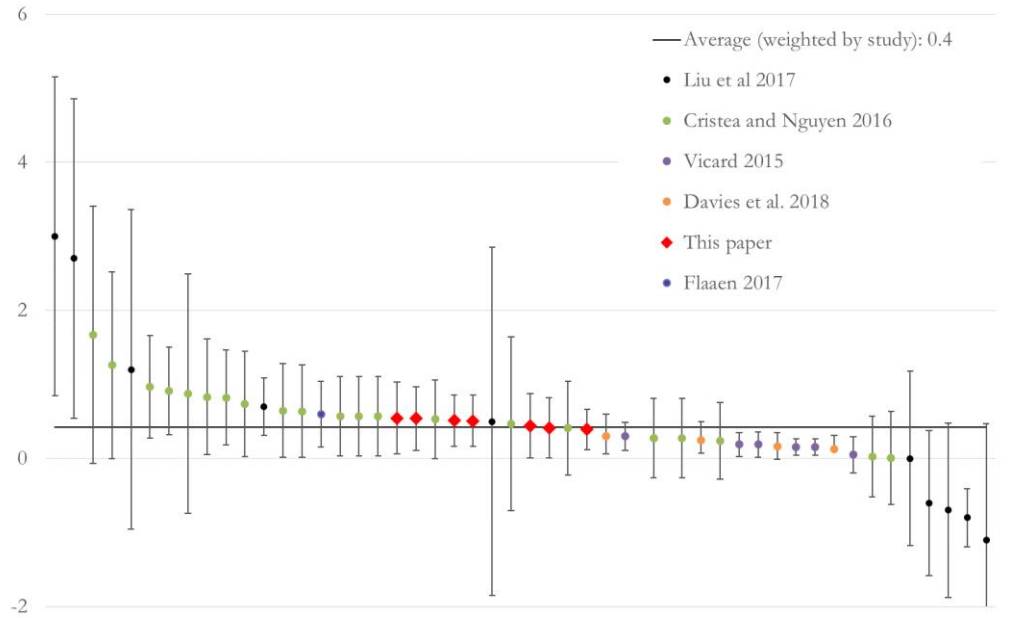


Figure 5b: Semi-elasticities in studies with firm and product fixed effects



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

	(1) Bernard et al. (2006)	(2) Cristea & Nguyen (2016)	(3) Davies et al. (2018)	(4) Flaaen (2017)	(5) Liu et al. (2017)	(6) Vicard (2015)	(7) Vicard (2015)	(8) All prior papers	**(9) 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' prefered 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	1,546	1,250		**78**
Corporate income tax revenue in million Euro	218,487	8,344	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 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).

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, 2015a) 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 should this not lead to an automatic audit? Or, as a minimum, should a flag not be 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 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.[20] 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 (2016) 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.

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

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Appendix tables

Appendix Table A1: Imports by country

	Related imports			Unrelated imports	
Country	Corp. tax rate	Freq.	Country	Corp. tax rate	Freq.
Germany	0.30	16795	China	0.25	1054653
China	0.25	11274	United States	0.40	551591
United States	0.40	9138	Germany	0.30	487778
France	0.33	6457	United Kingdom	0.23	308830
United Kingdom	0.23	5942	Italy	0.31	248051
Japan	0.36	5725	India	0.33	169529
Italy	0.31	5275	Taiwan	0.17	161703
India	0.34	4903	France	0.33	145291
Korea Rep.	0.24	3749	Japan	0.37	142708
Spain	0.29	3454	Netherlands	0.25	97658
Thailand	0.21	3013	Thailand	0.23	77554
Sweden	0.24	2701	Spain	0.30	73837
Czech Republic	0.19	2698	Hong Kong	0.17	72342
Poland	0.19	2347	Korea Rep.	0.24	72071
Austria	0.25	2313	Switzerland	0.18	66111
Brazil	0.34	2167	Turkey	0.20	62949
Turkey	0.20	2117	Belgium	0.34	62172
Taiwan	0.17	2017	Australia	0.30	53087
Switzerland	0.18	1768	Sweden	0.24	50868
Mexico	0.30	1718	Canada	0.27	48484
Netherlands	0.25	1713	Austria	0.25	47200
Hungary	0.19	1687	Namibia	0.33	47138
Belgium	0.34	1594	Botswana	0.22	43945
Australia	0.30	1529	Czech Republic	0.19	41414
Finland	0.21	1235	Mexico	0.30	41313
Romania	0.16	1235	Brazil	0.34	40388
Canada	0.27	1206	Malaysia	0.25	39115
Indonesia	0.25	1129	Denmark	0.25	36996
Portugal	0.23	1085	Poland	0.19	36934
Denmark	0.24	1048	Singapore	0.17	29200
Slovakia	0.21	1036	UAE	0.55	28870
Malaysia	0.25	1035	Indonesia	0.25	27217
Vietnam	0.23	685	Hungary	0.19	24405
Singapore	0.17	619	Israel	0.25	22478
Ireland	0.13	518	Pakistan	0.34	21834
United Arab Emirates	0.55	401	Portugal	0.24	21390
Israel	0.26	393	Vietnam	0.23	20983
Philippines	0.30	385	Finland	0.23	20786
Hong Kong SAR China	0.17	339	Ireland	0.13	18943
Slovenia	0.17	335	Romania	0.16	15854

Note: The table shows the distribution of South African imports of goods by origin countries for the years 2011-2015. Related denotes a transaction that is intra-firm (controlled), i.e. trade between affiliates of the same MNE. Corp. tax rate denotes the average statutory corporate tax rate.

Source: Author's calculations using SARS (n.d), KPMG (n.d.) and World Bank (n.d.)

Table A2a: Basic results (full regression results)

Dependent variable: Log (Unit Price)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
						Tax incentives in related transactions						
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)
						Pricing to market controls						
Related partner × ln (Population)	0.240***	0.152***	0.151***	0.0599**	0.0644**	0.0239	0.0567***	0.0146	0.0156	0.0481***	0.0538***	0.0538***
	(0.0569)	(0.0441)	(0.0441)	(0.0273)	(0.0260)	(0.0183)	(0.0169)	(0.0218)	(0.0193)	(0.0178)	(0.0136)	(0.0136)
Related partner × ln (Ex. Rate)	0.0201	0.00790	0.00816	0.0135	0.0110	0.00215	-0.00812*	0.00525	0.00522	-0.00545	-0.00886**	-0.00886**
	(0.0201)	(0.0159)	(0.0160)	(0.00875)	(0.00826)	(0.00542)	(0.00452)	(0.00663)	(0.00586)	(0.00482)	(0.00365)	(0.00365)
Related partner × ln (GDP per capita)	-0.176***	-0.0931*	-0.0921*	-0.0569*	-0.0627**	-0.0163	-0.0430**	-0.00519	-0.00727	-0.0333	-0.0400**	-0.0400**
	(0.0658)	(0.0493)	(0.0491)	(0.0328)	(0.0309)	(0.0205)	(0.0194)	(0.0247)	(0.0218)	(0.0205)	(0.0160)	(0.0160)
Related partner × ln (Distance)	0.178	-0.0399	-0.0441	0.0954	0.0925	-0.0297	-0.00601	-0.0187	-0.0195	0.00365	-0.0137	-0.0137
	(0.135)	(0.105)	(0.106)	(0.0869)	(0.0845)	(0.0510)	(0.0514)	(0.0628)	(0.0556)	(0.0547)	(0.0411)	(0.0411)
						Macro economic controls						
Low tax partner (τ-τ_{it}>0)	-0.431***	-0.402***	-0.403***	-0.162***	-0.160***	-0.135***	41.01	-0.136***	-0.136***			
	(0.0636)	(0.0549)	(0.0548)	(0.0290)	(0.0293)	(0.0217)	(530,812)	(0.0246)	(0.0217)			
Log (GDP per capita)	0.415***	0.271***	0.271***	0.200***	0.201***	0.112***	23.13	0.111***	0.112***			
	(0.0554)	(0.0386)	(0.0387)	(0.0249)	(0.0242)	(0.0154)	(191,559)	(0.0180)	(0.0159)			
Log (Population)	-0.519***	-0.377***	-0.377***	-0.234***	-0.234***	-0.158***	-2.929	-0.157***	-0.158***			
	(0.0486)	(0.0391)	(0.0390)	(0.0221)	(0.0214)	(0.0153)	(143,162)	(0.0179)	(0.0158)			
Log (Exchange rate)	-0.0466***	-0.0576***	-0.0574***	-0.0293***	-0.0278***	-0.0211***	-7.617	-0.0216***	-0.0216***			
	(0.0169)	(0.0138)	(0.0138)	(0.00827)	(0.00816)	(0.00559)	(79,868)	(0.00639)	(0.00566)			
Log (Distance)	0.245***	0.285***	0.283***	0.158***	0.146***	0.165***	-163.0	0.166***	0.165***			
	(0.0648)	(0.0451)	(0.0449)	(0.0362)	(0.0361)	(0.0250)	(607,844)	(0.0289)	(0.0253)			
						Firm controls						
Log (Sales)	-0.140***	-0.0680***	-0.0682***	0.0195*				0.0170*	0.0177**	0.0159**		
	(0.00780)	(0.00582)	(0.00584)	(0.0112)				(0.00941)	(0.00809)	(0.00765)		
Log (Wage bill)	0.207***	0.121***	0.121***	-0.000382				-0.00297	-0.00210	-0.00206		
	(0.0109)	(0.00912)	(0.00918)	(0.00668)				(0.00636)	(0.00565)	(0.00559)		

Fixed effects												
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
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

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 per cent. 'Related partner' 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 KPMG (n.d.), SARS (n.d.), and World Bank (n.d.).

Table A2b: Basic results (full regression results)

Dependent variable: Log(Unit Price)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
						Tax incentives in related transactions						
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)
						Pricing to market controls						
Related partner × ln (Population)	0.255***	0.167***	0.165***	0.0666**	0.0705***	0.0511**	0.0593***	0.0198	0.0206	0.0514**	0.0572***	0.0572***
	(0.056)	(0.0476)	(0.0476)	(0.0286)	(0.0268)	(0.0245)	(0.0193)	(0.0231)	(0.0203)	(0.02)	(0.016)	(0.016)
Related partner × ln (Ex. Rate)	0.0156	0.00805	0.0082	0.0115	0.00867	-0.0002	-0.0078	0.00517	0.00507	-0.00509	-0.00959**	-0.00959**
	(-0.0187)	(-0.0152)	(-0.0153)	(-0.00877)	(-0.00825)	(-0.00664)	(-0.00478)	(-0.00648)	(-0.00573)	(-0.00506)	(-0.00409)	(-0.00409)
Related partner × ln (GDP per capita)	-0.165**	-0.0818	-0.0806	-0.0553	-0.0599*	-0.0647***	-0.0478**	-0.0049	-0.0068	-0.0391*	-0.0444**	-0.0444**
	(0.0674)	(0.0562)	(0.0562)	(0.0353)	(0.0328)	(0.025)	(0.0227)	(0.027)	(0.0239)	(0.0237)	(0.0194)	(0.0194)
Related partner × ln (Distance)	0.296*	0.0488	0.0494	0.153	0.154*	0.0289	0.055	0.00823	0.00794	0.0718	0.0587	0.0587
	(0.158)	(0.132)	(0.131)	(0.0936)	(0.0846)	(0.0573)	(0.0644)	(0.073)	(0.0647)	(0.0673)	(0.0547)	(0.0547)
						Macro economic controls						
Tax differential (τ -τ_{it})	-3.103***	-2.847***	-2.852***	-1.098***	-1.076***			-1.047***	-1.049***			
	(0.579)	(0.505)	(0.505)	(0.274)	(0.275)			(0.224)	(0.198)			
Log (GDP per capita)	0.404***	0.260***	0.260***	0.204***	0.206***	0.156***	14	0.100***	0.100***			
	(0.0609)	(0.0497)	(0.0497)	(0.0289)	(0.0281)	(0.0226)	(72236)	(0.0215)	(0.019)			
Log (Population)	-0.533***	-0.395***	-0.395***	-0.246***	-0.246***	-0.184***	-4.914	-0.159***	-0.159***			
	(0.0509)	(0.0462)	(0.0461)	(0.0242)	(0.0236)	(0.0238)	(71291)	(0.0196)	(0.0173)			
Log (Exchange rate)	-0.0467***	-0.0639***	-0.0638***	-0.0299***	-0.0283***	-0.0211***	-4.628	-0.0235***	-0.0235***			
	(0.0146)	(0.0124)	(0.0124)	(0.0078)	(0.00771)	(0.00676)	(62606)	(0.00585)	(0.00518)			
Log (Distance)	0.191***	0.257***	0.255***	0.132***	0.119***	0.122***	-190.7	0.168***	0.167***			
	(0.065)	(0.0537)	(0.0537)	(0.0349)	(0.0343)	(0.027)	(283208)	(0.0307)	(0.0269)			
						Firm controls						
Log (Sales)	-0.134***	-0.0676***	-0.0678***	0.0189*				0.0164*	0.0175**	0.0160**		
	(-0.00749)	(-0.00567)	(-0.00569)	(-0.0113)				(-0.0095)	(-0.00814)	(-0.00768)		
Log (Wage bill)	0.197***	0.121***	0.121***	4.3E-05				-0.0018	-0.00086	-0.00119		
	(-0.0112)	(-0.00928)	(-0.00933)	(-0.00681)			(-0.00652)	(-0.0058)	(-0.00562)			
						Fixed effects						
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
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

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 per cent. 'Related partner' 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 KPMG (n.d.), SARS (n.d.), and World Bank (n.d.).

Table A2c: Basic results with matching using the customs value

Dependent variable: Log (Unit Price)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Tax incentives in related transactions												
Related partner × low tax partner	0.259***	0.247***	0.241***	0.108***	0.0987	0.0753***	0.0746***	0.0785**	0.0794***	0.0787***	0.0764***	0.0764***
	0.0775	0.0616	0.0589	0.032	0	0.0261	0.0239	0.032	0.0271	0.0252	0.0222	0.0222
Related partner	-0.39	0.863	0.896	0.316	0.343	0.658	0.804	0.575	0.554	0.723	0.661	0.661
	1.346	1.092	1.057	0.647	0	0.547	0.536	0.686	0.583	0.579	0.461	0.461
Pricing to market controls												
Related partner × ln (Population)	0.229***	0.171***	0.172***	0.0856***	0.0886	0.0421*	0.0794***	0.0378	0.0377	0.0744***	0.0742***	0.0742***
	0.0625	0.0473	0.0465	0.0319	0	0.0238	0.0216	0.029	0.0245	0.0226	0.0189	0.0189
Related partner × ln (Ex. Rate)	0.00762	-0.0002	0.00048	0.0107	0.00976	0.00234	-0.0054	0.00304	0.0036	-0.00424	-0.00597	-0.00597
	0.0193	0.015	0.0147	0.0094	0	0.00618	0.00516	0.00763	0.0066	0.00553	0.0047	0.0047
Related partner × ln (GDP per capita)	-0.190***	-0.141***	-0.140***	-0.0732*	-0.0764	-0.0284	-0.0571**	-0.0245	-0.0243	-0.0519**	-0.0544**	-0.0544**
	0.0735	0.0541	0.0524	0.0374	0	0.0253	0.0234	0.0303	0.0258	0.024	0.0214	0.0214
Related partner × ln (Distance)	0.22	0.0346	0.0283	0.0235	0.0226	-0.056	-0.0424	-0.0497	-0.0479	-0.0383	-0.0289	-0.0289
	0.158	0.126	0.122	0.0818	0	0.0621	0.0614	0.076	0.0652	0.0649	0.0552	0.0552
Macro economic controls												
Low tax partner	-0.353***	-0.331***	-0.330***	-0.162***	-0.16	-0.124***	-4.764	-0.124***	-0.124***			
	0.06	0.0512	0.051	0.0314	0	0.0226	88386	0.0251	0.0223			
Log (GDP pr. cap.)	0.345***	0.242***	0.241***	0.205***	0.203	0.111***	-19.87	0.112***	0.112***			
	0.0559	0.0406	0.0403	0.0298	0	0.0189	47059	0.0218	0.0192			
Log (Population)	-0.431***	-0.328***	-0.327***	-0.237***	-0.234	-0.157***	7.776	-0.158***	-0.158***			
	0.0488	0.0391	0.0389	0.0264	0	0.0177	53487	0.0203	0.0179			
Log (Exchange rate)	-0.0365**	-0.0481***	-0.0478***	-0.0229**	-0.0221	-0.0174***	-0.996	-0.0177**	-0.0176***			
	0.0145	0.0119	0.0118	0.00887	0	0.00614	18595	0.00712	0.00626			
Log (Distance)	0.243***	0.268***	0.267***	0.153***	0.149	0.161***	37.02	0.158***	0.159***			
	0.0618	0.0428	0.0422	0.0352	0	0.0247	67000	0.029	0.0252			

Firm controls												
Log (Sales)	-0.175***	-0.0991***	-0.101***	0.0212	-0.0065			0.0440***	0.0459***	0.0415***		
	0.0141	0.00994	0.00963	0.0224	0			0.0145	0.0121	0.0116		
Log (Wage bill)	0.253***	0.155***	0.157***	-0.0462**	-0.006			-0.0831***	-0.0761***	-0.0769***		
	0.0178	0.0126	0.0122	0.0192	0			0.0207	0.0171	0.0167		
Fixed effects												
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
Observations	2,420,470	2,385,387	2,385,387	2,385,387	2,385,387	1,835,213	1,831,631	2,385,387	1,843,038	1,842,993	3,210,254	3,210,254
R-squared	0.058	0.463	0.476	0.255	0.267	0.776	0.782	0.815	0.776	0.779	0.804	0.804

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 per cent. '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 KPMG (n.d.), SARS (n.d.), and World Bank (n.d.).

Table A2d: Basic results with MNEs only & control for whether subsidiary is in country

Dependent variable: Log (Unit Price)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
						Tax incentives in related transactions						
Related partner × low tax partner	0.287***	0.171***	0.167***	0.0232	0.013	0.0215	0.0722***	0.0707***	0.0685***	0.0757***	0.0814***	0.0814***
	0.0466	0.0395	0.0396	0.0255	0.0251	0.0173	0.0178	0.0244	0.0232	0.0207	0.0149	0.0149
Related partner	-0.337	0.0283	0.131	-0.468	-0.354	0.376	0.225	0.0953	0.184	0.0868	0.294	0.294
	1.111	0.835	0.845	0.605	0.592	0.356	0.385	0.439	0.419	0.419	0.287	0.287
						Pricing to market controls						
Related partner × ln (Population)	0.239***	0.0624*	0.0631*	0.0465*	0.0496**	0.014	0.0304*	0.00285	0.00491	0.0222	0.0238*	0.0238*
	0.0566	0.0342	0.0341	0.0253	0.0243	0.0192	0.0161	0.0202	0.0191	0.0174	0.0128	0.0128
Related partner × ln (Ex. Rate)	0.0202	0.00402	0.0043	0.00398	0.00178	0.00436	-0.00157	0.00518	0.00512	0.00134	-0.00253	-0.00253
	0.0201	0.0107	0.0106	0.00731	0.00672	0.0053	0.00447	0.00588	0.00551	0.00475	0.0035	0.0035
Related partner × ln (GDP per capita)	-0.172***	-0.0449	-0.0461	-0.0529*	-0.0564**	-0.0155	-0.0241	0.00359	0.000631	-0.015	-0.0144	-0.0144
	0.0646	0.0406	0.0404	0.0301	0.0282	0.0209	0.019	0.0234	0.0219	0.0204	0.0157	0.0157
Related partner × ln (Distance)	0.173	0.0468	0.0377	0.0978	0.0868	-0.00894	0.00174	-0.0118	-0.0177	0.00728	-0.0194	-0.0194
	0.134	0.0985	0.0993	0.0813	0.0788	0.0437	0.0479	0.0523	0.0495	0.0501	0.0383	0.0383
Non-related partner but subsidiary in country	-0.0000907	0.0000147	-0.000000861	-0.000181***	-0.000177***							
	0.0000832	0.000105	0.000105	0.0000638	0.0000539							
Subsidiary in country x low tax partner	0.0000911	-0.000490***	-0.000475***	0.000118	0.000123	-0.000292***	-0.000211***	-0.000197**	-0.000195**	-0.000205***	-0.000178***	-0.000178***
	0.000206	0.000146	0.000147	0.000112	0.0000949	0.000073	0.0000572	0.0000971	0.000092	0.0000758	0.0000477	0.0000477
						Macro economic controls						
Low tax partner	-0.433***	-0.189***	-0.190***	-0.105***	-0.105***			-0.0701***	-0.0705***			
	0.0649	0.0421	0.0423	0.0287	0.0285			0.0197	0.0187			
Log (GDP per capita)	0.416***	0.257***	0.257***	0.210***	0.208***	0.131***	97.36	0.116***	0.115***			
	0.0554	0.0275	0.0275	0.0217	0.0211	0.0163	464468	0.016	0.0149			
Log (Population)	-0.520***	-0.314***	-0.315***	-0.226***	-0.224***	-0.158***	-50.76	-0.152***	-0.153***			
	0.0486	0.0284	0.0284	0.0197	0.0191	0.0166	444072	0.0151	0.0142			
Log (Exchange rate)	-0.0465***	-0.0397***	-0.0392***	-0.0169**	-0.0164**	-0.0171***	66.62	-0.0167***	-0.0166***			
	0.0169	0.01	0.0101	0.00762	0.00736	0.0053	456588	0.00555	0.00526			
Log (Distance)	0.245***	0.194***	0.190***	0.135***	0.135***	0.139***	552.2	0.153***	0.153***			
	0.0648	0.0278	0.0277	0.0276	0.0271	0.017	1860000	0.0187	0.0174			

Firm controls												
Log (Sales)	-0.140***	-0.0564***	-0.0580***	0.0261				0.0261*	0.0285*	0.0196		
	0.0078	0.00805	0.00808	0.0263				0.0154	0.0154	0.0133		
Log (Wage bill)	0.207***	0.101***	0.103***	0.0113				-0.00507	0.000344	0.0000289		
	0.0109	0.00739	0.00736	0.0202				0.0168	0.0172	0.0172		
Fixed effects												
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
Observations	2,445,511	631,291	631,291	631,291	631,291	564,400	560,334	631,291	560,527	560,451	819,905	819,905
R-squared	0.083	0.438	0.453	0.214	0.225	0.735	0.742	0.77	0.734	0.737	0.746	0.746

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 per cent. 'Related partner' 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.

Author's calculations based on KPMG (n.d.), SARS (n.d.), and World Bank (n.d.).