Falling tariffs: Implications of globalization-induced tariff reductions on firms, workers, and tax revenue implications

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This draft: January 31, 2024

Abstract

Rising globalization has exerted a downward pressure on global tariffs, thereby eroding tariff revenues in developing nations. We analyze how gains from lowering import tariffs are distributed within the firm and the corresponding tax (base) implications. First, we study the effect of tariff changes on imports. Second, we estimate the firm-level semi-elasticities of profits, sales, capital, and wages with respect to import tariffs. Using linked employer-employee data and firm-product-level import data for South Africa we find that lowering tariffs, leads to higher imports and lower import prices, raises within firm wage inequality and favors capital owners, while overall government revenues decline. The latter is attributable to the insufficient expansion of alternative tax bases (profits, sales, and wages) after a tariff cut. This limits the government's capacity to mitigate the adverse distributive effects arising from tariff reductions.

Keywords: Globalization; Taxation; Tariffs; Inequality; Tax Revenue.

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Acknowledgements: We gratefully acknowledge the data and research support by the UNU-WIDER and National Treasury of South Africa team, Michael Kilumelume, Marlies Piek, Marvelous Kadzima, Raisibe Gololo, Noreen Kajugusi, and especially by Fadzayi Chingwere. We also thank Ron Davies, Carsten Eckel, Lisandra Flach, Antonia Hohmann, Martina Magli, Roxanne Raabe, Nadine Riedel, and Claudia Steinwender for discussion of the paper at various stages. We thank participants and attendees at the UNU-WIDER SA-TIED workshop in Johannesburg, the UCD School of Economics Brownbag Seminar, the LMU-ifo Munich Trade Retreat, and the FIW-Workshop: Firms, Workers, and Institutions in the Global Economy.

Funding: This work was financially supported by the UNU-WIDER project: Southern Africa - Towards Inclusive Economic Development (SA-TIED) as part of the Public Revenue Mobilization stream.

1. Introduction

Tax systems in developing countries have undergone substantial changes in recent decades due to globalization-induced pressure to cut tariffs, and the subsequent transition from tariff to tax-based revenue mobilization (see e.g. Besley and Persson, 2014). In gaining access to international markets, developing countries have lowered their tariffs substantially; however, the implications are far-reaching – from greater import competition on domestic firms and workers (see e.g. Autor et al., 2013) to greater pressure on domestic public finances (see e.g. Ganghof, 2005; Hines Jr. and Summers, 2009; Egger et al., 2019). With the the tariff revenues less reliable in the long run, the transition to a tax-based, and thus more stable, revenue system poses several challenges for developing countries. The new system must mobilize sufficient revenues and tackle the unequal distribution of gains from trade within society. Focusing on South Africa, Figure 1 highlights the overall response in revenue collection over time against the development of the relevant MFN (most favored nation) tariffs. As tariffs trend downwards, non-trade-related tax revenues are increasing over time. Thus, South Africa is increasing overall tax revenues from other tax bases, compensating potential revenue losses from tariffs.

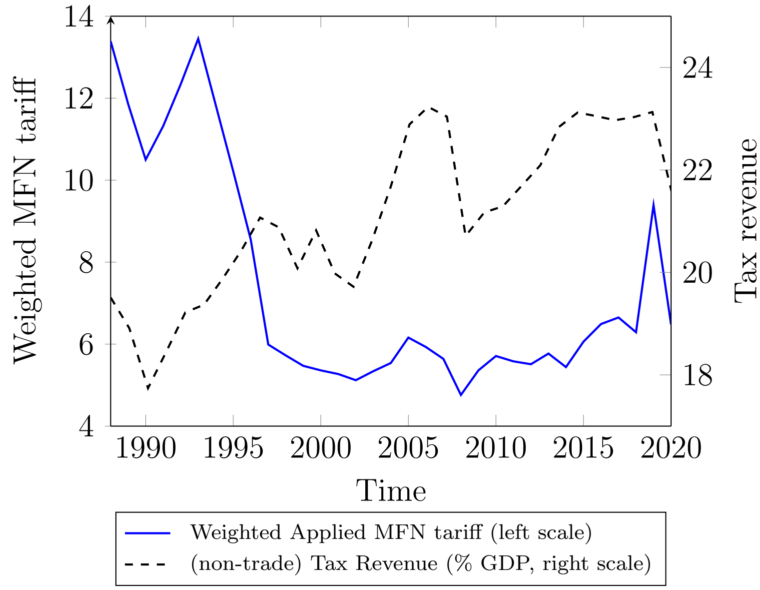

Figure 1: Revenue and Tariff Development in South Africa

Source: World Development Indicators (2023) and IMF Government Revenue Statistics (2023).

This paper addresses the question whether import tariff-reductions in South Africa were revenue neutral and analyzes their distributional consequences. The analysis builds on a large administrative data set from the South African Treasury comprising the universe of all tax returns and transaction-level customs forms. Our analysis proceeds in two steps. First, we identify the direct revenue implications from tariff changes through rate and base effects. In a second step, we analyze the indirect revenue implications of tariff reductions through their impact on firm profits, wages, and turnover and subsequently the VAT, personal and corporate income tax base. To appropriately identify the effects of tariff liberalizations on the South African economy it is essential to distinguish between input and final goods tariff liberalizations affecting either the production cost of South African firms or leading to increased import competition (see e.g. Shu and Steinwender, 2019).

The paper answers three research questions: Do falling import tariffs affect South African firms, labor markets, and/or tax revenues? Do import tariff reductions increase income inequality? Does the existing tax system mitigate rising inequality levels?

To answer these questions we use the universe of corporate and personal income tax returns as well as customs forms between 2009 and 2019. The data allows us to construct a linked employer-employee data set that also contains product-level customs information. The empirical strategy aims to identify the effects of effectively applied import tariff changes in South Africa on import values, quantities, prices, gross sales and profits, labor cost, wages, overall employment, intra-firm inequality, and tax revenues. To mitigate potential endogeneity concerns of tariff changes on firm outcomes, we aggregate tariffs to the sector level as well as high-dimensional fixed effects estimation. We find the expected results on trade, but observe the diverging nature of tariff reductions in inputs versus finals goods. While cost reductions from a reduction in tariffs on inputs have an overall positive effect on firm fundamentals, import competition in final goods trade (via lower tariffs on final goods) exerts negative pressure on firm fundamentals.

Empirically we find that reducing tariffs will increase import values and prices significantly. The impact at the firm level is more ambiguous. Gross profits of firms are not impacted by changing tariffs, however, gross sales are increasing. This indicates that firm expenditures need to adjust so that gross profits remain stable. We find that inventories raise when tariffs decline which increases costs of business for firms. Similarly, production becomes more capital-intensive and hence capital costs are increasing. In terms of labor costs, we observe the opposite, i.e., wages decline when import tariffs are lowered. This is particularly important in the case of workers in the lower wage deciles which indicates a greater inequality within firms. Our back-of-the-envelope estimations suggests that a broad 1 percentage point decrease in South African tariffs will reduce government revenues by ZAR 921 million or USD 89 million. It turns out that the loss of tariff revenues cannot be fully compensated by additional VAT or capital gains tax revenues from broadening tax bases.

The paper adds to the existing literature by providing a comprehensive analysis of the effects of import tariff liberalization on firms, employees, and public revenues in a trade-active developing country such as South Africa. In contrast to the literature we do not focus on classical tariff pass-through channels at the product level such as mark-ups (De Loecker et al., 2016) or quality of the product (Ludema and Yu, 2016). Our approach focuses on a detailed view on how gains from tariff reduction are distributed within the firm and hence allows for a more holistic view on tariff pass-through and its impact on firm behavior. Moreover, our paper answers pressing policy issues in many developing countries. The general decline of tariffs presented in Figure 1 is a development many low and middle income countries around the world are facing. For these countries the share of trade taxes compared to other taxes is much large than for high income countries (Besley and Persson, 2014). Thus, reducing tariffs can have a dramatic impact on government revenues and the capabilities to provide public goods and services. Understanding the individual channels through which changes in import tariffs impact various tax bases will help policy makers to create revenue neutral policies and mitigate potentially negative effects of trade liberalization.

Using the universe of South African tax returns and customs forms, we obtain product-country-of-origin-year specific tariff measures to estimate the effect of these applied tariffs on imports. We also aggregate the same tariffs to the firm's sectoral level to estimate tariff semi-elasticities for firm and labor market outcomes ranging from gross sales and profits, different firm-level expenditures, workforce, wages, as well as intra-firm inequality.

We do not focus on major tariff liberalization periods in South Africa but rather marginal trade policy reforms. By focusing on marginal tariff changes we are able to mitigate the risk of general equilibrium effects that could potentially contaminate our results. These results are particularly relevant, as most developing countries already experienced major liberalization episodes, while evidence on marginal liberalization and their efficiency and equity implications are lacking in the developing-country context.

The remainder of the paper is structured as follows. First, we provide a short review of the relevant literature in section 2. In Sections 3 and 4 we address the unique institutional setting of the South African administrative data and our methodological approaches. Sections 5 and 6 present the results of the results of our analysis and back-of-the-envelope type tax simulations. Section 7 concludes.

2. Literature

The paper adds to three strands of the literature. First, it contributes to the literature analyzing trade liberalization in developing countries. The canonical view on trade liberalization suggests a strong positive impact in terms of economic growth, see Dornbusch (1992). This is widely confirmed in empirical studies at the country level (Frankel and Romer, 1999; Weisbrot and Baker, 2003; Egger et al., 2020). The source of this increased growth is often attributed to productivity gains at the firm level.

Pavcnik (2002) analyzes the effects of trade liberalization on the productivity of Chilean manufacturing firms. Using semi-parametric estimations to correct for selection and simultaneity biases, they find that trade liberalization has led to productivity increases between 3% and 10% in import-competing sectors. Edwards and Lawrence (2008) finds similar developments in South Africa during a trade liberalization period in the 1990s. The productivity gains impact wages within firms, so that trade openness is often linked to higher wages within firms, see Egger et al. (2013) or Egger et al. (2023). For Indonesia Amiti and Davis (2012) investigate how input and output tariff changes affect wages manufacturing firms between 1991 to 2000. They find that changes in output tariffs lead to wage decreases in firms serving the domestic market, while exporting firms experience wage increases. Furthermore, importing firms exhibit substantial increases in wages when input tariffs are reduced. Overall, trade liberalization will impact firms in various dimensions. Edwards et al. (2018) show that not only wages and productivity are impacted by trade liberalization but also capital intensity in South Africa. This holds for importing and exporting firms alike.

However, wage gains from trade openness might not be equally distributed. Helpman et al. (2016) show that for Brazil trade openness increases the inequality across sectors. Yet, the relationship between inequality and trade openness in developing countries is complex. In a survey of the findings on the effects of trade on inequality in developing countries, Pavcnik (2017) highlights that while the impact of globalization depends a great deal on the channel through which it enters, its effects can lead to greater inequality. However, while trade contributes to adverse outcomes it is not its main driver. This is supported by Dorn et al. (2022) using panel data more than 100 countries over 40 years. All this highlights the importance of analyzing the effects that trade has on firms and how these effects are carried through to workers and government revenues.

Second, this paper contributes to the literature looking at tariff pass-through.[1] De Loecker et al. (2016) analyze import tariff liberalizations in India and find incomplete pass-through due to rising mark-ups after the liberalization. Thus, tariff liberalizations predominantly benefited producers rather than consumers. Similarly, Ludema and Yu (2016) analyze the effect of export tariff changes on US exporters. The authors also find incomplete pass-through due to quality upgrading and subsequent price increases which are particularly pronounced for high productivity firms. This is in line with Amiti and Konings (2007) who find that lower import tariffs are significantly increase the productivity of firms. Cavallo et al. (2021) analyze the effects of US trade policy on importers, exporters and consumers. They find asymmetric responses with Chinese exporters passing most of import tariff increases on to consumers while US exporters did not. Our paper adds to this strand of the literature by providing a comprehensive analysis of the efficiency and equity implications of import tariff liberalizations in a developing country context.

Third, this paper contributes to the literature focusing on the transition from a tariff to a broad-based tax system in developing countries. Baunsgaard and Keen (2010) analyze whether countries around the globe have been able to recover tariff revenue losses from trade liberalization through

[1] A related literature analyzes the pass-through of profit-shocks see Dix-Carneiro and Kovak (2019), Goldberg and Pavcnik (2003), Paz (2015), Keller and Olney (2021), or Almeida et al. (2022).

a broad-based tax system. They find that high and middle-income countries have been able to recover these losses, while low-income countries only show incomplete replacement. Besley and Persson (2014) provide an overview why low-income countries have been unable to collect larger mounts of tax revenue. Their results imply that not only economic, but also political, social and cultural factors impede revenue generation in developing countries. Cagé and Gadenne (2018) illustrate that developing countries have experienced larger and more persistent declines in tax revenues and subsequently public spending after trade liberalization episodes since the 1970s. Arezki et al. (2021) investigate the impact of trade liberalization on public revenues for a global panel. They find negative short-term and no medium-term revenue impacts of trade liberalizations. Furthermore, they find that VAT plays a relevant role in mitigating the adverse revenue effects from tariff liberalizations. In contrast to this literature, we employ micro-level administrative data to identify the trade-off between tariff and tax revenue and the respective effects of rate changes on the tax base.

3. Institutional Setting and Data

Our analysis focuses on South Africa which is the continent's third largest economy, as well as its most advanced and diversified.[2] Ranked an upper-middle-income economy, South Africa hosts 75% of multinational firms in Africa (see World Bank, 2023). However, the benefits of South Africa's trade and international standing are highly unequally distributed. Latest figures indicate that 20% of its nearly 60 million inhabitants are living below the poverty threshold, the unemployment rate is 29.8%, and its Gini coefficient of around 70 is the highest recorded in the world by 2017 (Solt, 2023).

Despite its highly unequal distribution of incomes and wealth, South Africa relies heavily on individual taxation and the taxation of goods with 37.7% and 34.4% of overall tax revenue in 2021, respectively, as shown in Figure 2.

For our analysis we rely on administrative data from the South African tax authority. The joint effort of the United Nations University-World Institute for Development Economics Research (UNU-WIDER), the British High Commission in Pretoria, the South African Revenue Service, and the National Treasury of South Africa made it possible to compile, clean, and anonymize the universe of corporate income tax (CIT) returns, the universe of personal income tax (PIT) returns, as well as the universe of customs records, which were submitted to the South African authorities between 2008 and 2021 – we focus on the years 2010 to 2019.[3] The CIT data contain detailed balance sheet information and income statements for each firm's financial year. We are particularly interested in the sales, different payroll expenditures, the asset and financing composition of the firm, other

[2] In 2023 the largest African economies are Egypt and Nigeria.
[3] This avoids the undersampled early years and the effect of the COVID-19 pandemic.

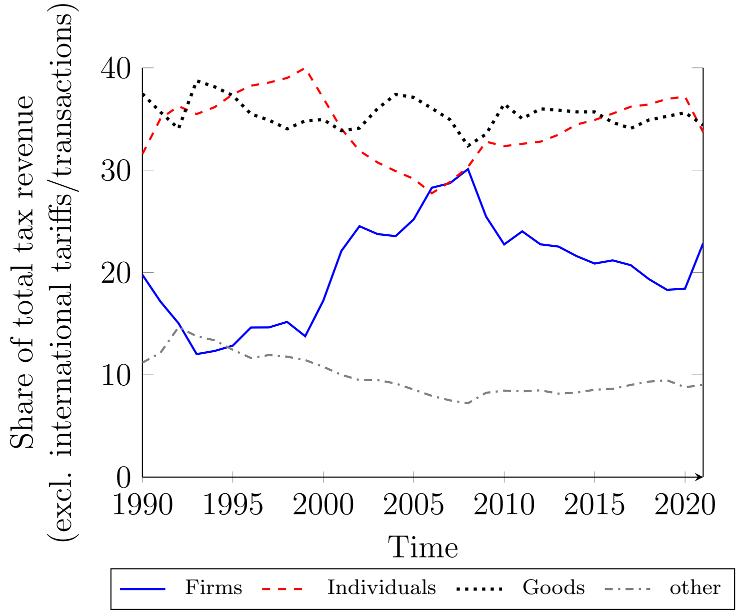

Figure 2: Revenue Composition in South Africa.

Source: Own calculations and IMF Government Revenue Statistics (2023).

operating costs, and a firm's income sources. Each firm is uniquely identified with a firm ID, which we will use to link firms to customs records and to uniquely identified individual workers. Workers employed in multiple establishments are linked to each employer. We link firms' CIT data to their customs data.

The customs data provide monthly product-level information on the values and quantities of a firm's imports and exports by country or origin and country of destination. Thus, we have firm-product-country-of-origin-year-specific customs and firm-year specific balance sheet information. All monetary values in the data are in South African Rand (ZAR).[4] The top half of Table 1 contains the descriptive statistics of the trade data (denoted in ZAR 1,000 for legibility) at the product-country-of-origin-year level.

In our analysis we employ the applied product-specific import tariffs of South Africa vis-à-vis its trading partners. This allows us to exploit variation in MFN tariffs as well as trade-agreement-specific tariff rates. Though not a member of many trade agreements, South Africa's imports and exports are strongly tied to its trade partnerships,[6] especially as host of the two largest African

[4]Between 2008 and 2018, the average exchange rate was ZAR 10.37 per US dollar, or ZAR 4.5 per USD in PPP terms. Throughout the paper we will always use this average historical exchange rate to convert South African Rand to US Dollars.

[5]Equal maximum values across bottom five deciles result of very small firm with very high salaries.

[6]South Africa is a member the Southern African Customs Union (SACU) with Botswana, Eswatini, Lesotho, and Namibia. It also has a free trade agreement with the Southern African Development Community (Botswana, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, Tanzania, Zambia, and Zimbabwe. Furthermore, South Africa has a Trade, Development and Cooperation Agreement with the EU. SACU and thus South Africa have a free trade agreement with the European Free Trade Association and a preferential

Table 1: Descriptive Statistics

	Observations	Mean	SD	Min	Max[5]
Imports (in ZAR 1,000)	5,758,228	870.09	46,100	0.018	3,780,000
Average price per unit (in ZAR 1,000)	5,758,227	20.15	1,441.3	0.00	1,740,000
Total statistical quantity	5,758,228	190,079.5	168,000,000	0.01	277,000,000,000
Modal effective tariff rate (%)	5,758,228	8.414	12.593	0	45
Modal tariff rate (%, $\overline{Tariff}_{c_i,t,int}$)	89,569	7.942	7.486	0	19.36
Modal tariff rate (%, $\overline{Tariff}_{c_i,t,fin}$)	89,569	2.414	3.122	0	10.856
Gross Profits (in ZAR 1,000)	148,218	13,600	367,000	-32,500,000	43,000,000
Gross Sales (in ZAR 1,000)	148,219	264,000	2,740,000	0.263	199,000,000
Total assets (in ZAR 1,000)	148.219	73,500	3,250,000	0	444,000,000
Total Workforce	146,721	178	1,976	1	193,483
Total labor costs (in ZAR 1,000)	148,219	28,800	345,000	0.001	27,600,000
Total employee wages (in ZAR 1,000)	88,441	41,100	394,000	0	24,900,000
Wage in bottom decile (in ZAR 1,000)	142,707	45.42	81.93	0,0001	10,500
Wage in 2nd decile (in ZAR 1,000)	142,707	61.89	85.6	0.0001	10,500
Wage at median (in ZAR 1,000)	142,707	118.56	120.82	0.0001	10,500
Wage in 8th decile (in ZAR 1,000)	142,707	234.78	226.02	0.001	19,200
Wage in top decile (in ZAR 1,000)	142,707	359.963	7,578,474	1	2,020,000

Data for the years 2010 – 2019. Sources: South African CIT, PIT, and customs data. UN Comtrade tariff data.

ports of entry below the equator[7]. As country-of-origin-product-specific tariff rates are not readily available we calculate the applied bilateral tariff rates from the customs data. This is done by dividing the levied duty amount by the customs value for each transaction within a given year and then calculating the modal tariff rate per HS6 product and trading partner.[8] Using the modal rather than the mean tariff eliminates the influence of outliers due to inaccurate customs recording. To further mitigate the risk that modal tariff rates are determined by only a few or possibly singular observations we trim the bottom and top 1% of tariff rates, see Edwards (2005) for a discussion of tariff dispersion in South Africa.

In Figure 3 we observe that the applicable MFN tariffs levied by South Africa differ substantially from the effectively levied tariffs. In fact, the modal effective tariffs are significantly lower than MFN tariffs due to preferential trade agreements. The applied tariffs are approximately 2.5 percentage points below their respective MFN tariffs for our sample and exhibit substantially more variation. The development of the applied modal tariffs compared to MFN tariffs also rationalizes the rise in total imports given their larger reduction. Consequently, employing MFN tariffs rather than effectively applied tariffs would result in significant measurement error and a loss of useful variation that can be exploited in the analysis. The finding that MFN tariffs generally deviate from applied tariffs is also well documented in Teti (2020). This is further illustrated in Table 2 which presents the correlation across time between MFN tariffs and the effectively applied tariffs. MFN and effectively applied tariffs show a strong positive correlation. Nevertheless, the correlations are relatively far away from unity. This point becomes even more apparent when plotting the applied

trade agreement with MERCOSUR (Argentina, Brazil, Paraguay, and Uruguay).

[7]Durban and Port Elizabeth

[8]Note that this constrains the analysis to products that are actually traded for any given country-of-origin-year combination.

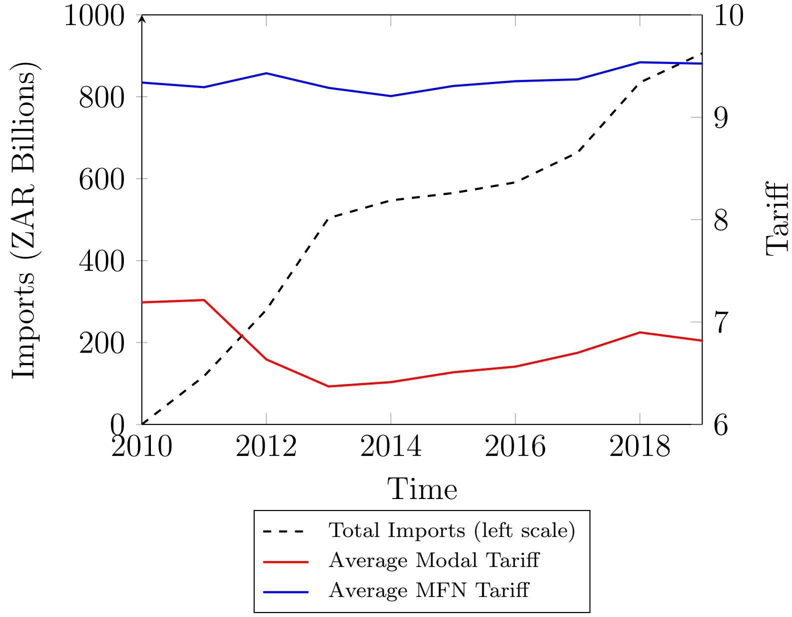

Figure 3: Development of Trade, Applied and MFN Tariffs over time

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Overall
ρ	0.846	0.852	0.799	0.787	0.796	0.798	0.799	0.804	0.807	0.799	0.808

Table 2: Yearly correlations: Trade-weighted modal tariffs and MFN tariffs at product-year level

modal tariffs against MFN tariffs, as is done in Figure 4. Perfect correlation would imply that all points are on the 45 degree line; however, we observe deviations in the applied tariffs from the MFN tariffs as large as 45 percentage points.[9] MFN tariffs will introduce substantial measurement error and we consequently rely on effectively applied tariffs throughout the analysis.

To explore the impact on income inequality, we rely on the personal income tax (PIT) returns for individuals. PIT returns are lodged by individuals and firms, thus we have a per-job measure of individual incomes. Linking individuals to their employers gives us access to the intra-firm income distribution, the gender composition of the workforce, and the external workload of employees. Following the work of Amiti and Davis (2012), we use the exact linkage of product-specific tariffs to a firm's product-level imports and exports and its characteristics, as captured in the tax authority's data. We combine the firm-level data from the South African tax authority with the calculated modal effectively applied tariffs at the HS6 product category level.

This provides us with a rich data set to explore firm-level behavior in various dimensions. Specifically, how South African applied modal tariffs will affect monetary flows within the firm and affect inequality across its workers. The bottom half of Table 1 provides firm-year-level descriptive

[9] Of over 1.1 million tariff lines (by product-country-of-origin year), a mere 75,627 are above the MFN tariff. Moreover, the fact that the effective tariffs that we calculate from the data are predominantly located on horizontal lines indicates that the modal tariffs pick up the true tariff rates.

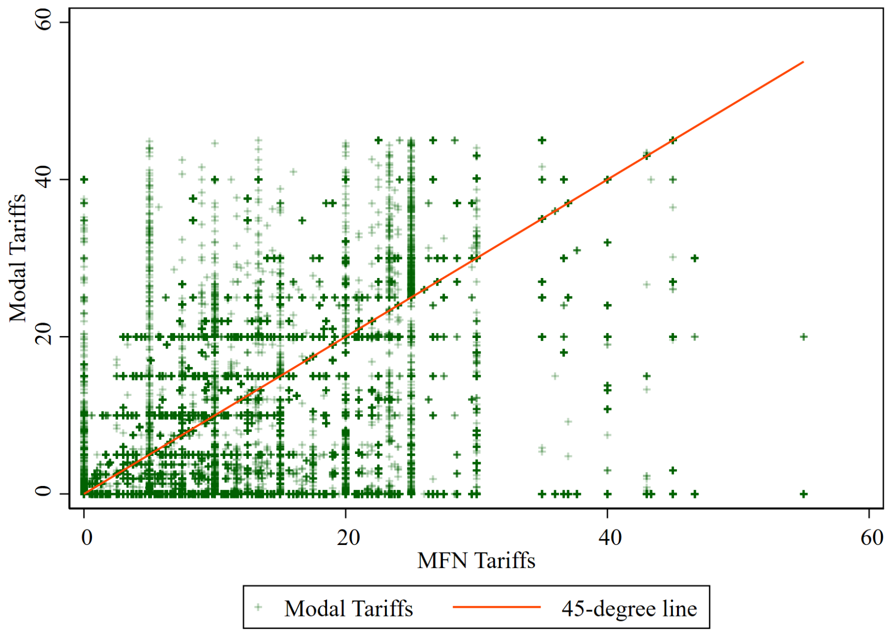

Figure 4: Applied Modal and MFN Tariffs

statistics of all variables used in the following analysis. After cleaning, the administrative data cover more than 5 million firm-product-year observations in South Africa. At the firm-year level, we cover more than 54,000 observations. This corresponds to about 20% of the full CIT sample. Our final sample as well covers more than 25% of total imports entering South African.

As a major point of entry for overall trade with Africa, the customs records include entries for pass-through trade, as well as several large domestic transactions. The trade flows and firms included in our sample must be destined or domiciled in South Africa and not originate from it. To be included in the sample, firms must report positive sales and labor costs and file a CIT return.

For the firm-level analysis, we differentiate our analysis between all firms and high-trading firms, whose response to tariff changes may be more intense than for the overall sample of firms. Also differentiate between three different subsamples, respectively: (i) an unbalanced sample of all/high-trading firms, (ii) all/high-trading manufacturing firms, as we expect the response of service sector firms be substantially different from firms producing in South Africa, and lastly, (iii) a subsample of all/high-trading firms that lodge a corporate tax return in every year of our observational period. We focus on firms between 2010 and 2019. We next discuss the methodological approaches used to obtain estimates of tariff semi-elasticities.

4. Methodology

To study the impact of tariffs on trade, firm fundamentals, and within firm worker inequality, we rely on high-dimensional fixed effects estimation. The analysis will proceed in two steps. First, we will establish the impact of import tariffs on import volume, prices, and quantities. The unit of observation in this part of the analysis is the firm-product-year-country-of-origin specific trade and we are exploiting variation in the product-year-country-of-origin-specific tariff rates. The second part of the analysis studies the impact of tariffs on firm fundamentals like sales, profits, wages, investment, but also firm-level inequality measures like the change in the lower and upper deciles of the income distribution within the firm. In this case the unit of analysis is at the firm-year level and we are going to exploit variation in the average sector-level tariff over time. To retrieve the sector-level tariff we construct a weighted average of all product-specific tariffs relevant in a given sector.

In the first step of our analysis we need to identify if and how tariffs affect imports in South Africa. This part of the analysis ensures that tariff reductions create rents that can be shared within the firm, i.e., import volumes increase and prices decline after a tariff reduction. Given the lack of a bilateral effective tariff database, the findings are non-causal as tariffs are rarely exogenous. They are potentially driven by changes in the underlying economic variables or political economy aspects. Following the argument of Grossman and Helpman (1994) politicians are often influenced by special interest groups to provide favorable tariffs for firms. We estimate the following model:

$$Trade_{j,k,t,i} = \beta Tariff_{j,k,t} + \lambda_{h,k,t} + \zeta_i + \epsilon_{hkti}, \tag{1}$$

where $Trade_{j,k,t,i}$ denotes the import value, quantity, or price of firm i of product j with trading partner k in year t. $Tariff_{j,k,t}$ contains the effective import tariff South Africa charges on product k in year t vis-á-vis trading partner j. $\lambda_{h,k,t}$ denotes a fixed effect at the product category h, trading partner k, year t, and ζ_i represents a firm fixed effect. The product category h is the higher-level (three-digit) HS3 group of a (six-digit) HS6 product k. This broader product-category is chosen as HS6-level fixed effects result in too little variation. In a robustness check we also employ more rigid trading-partner-HS3-firm-year fixed effects. Standard errors are clustered on the trading-partner-HS6-firm-level and thus on the level of the tariff shock. Furthermore, we restrict the sample to annual product-level trade flows of ZAR 10,000 (approx. USD 1,000) or more in value to limit the analysis to economically relevant observations.

Since firm fundamentals are only observed at the firm-year level, we must map tariffs to a higher level. This is done by calculating weighted average tariffs aggregating product-level to sector-level tariff measures. Tariffs are aggregated by multiplying the product-level tariffs with the typical import share of a given product j in sector c following:

$$\overline{Tariff}_{c_i,t} = \sum_{j\in\Omega_{c_i}}\sum_{k=1}^{K}\frac{Y_{c_i,j,k}}{Y_{c_i}}Tariff_{j,k,t}, \tag{2}$$

where $Y_{c_i,j,k}$ are total imports of product category j from country of origin k in sector c_i and Y_{c_i} are total imports of sector c_i that firm i belongs to, both in the base year 2010. The weighting scheme accounts for products and countries of origin. To derive meaningful results using weighted sector-level tariffs, it is essential that the weighting scheme is both exogenous and constant over time. Given that import values and thus, weights can change due to tariff changes we calculate all weights based on 2010 as the starting period of the analysis. This ensures that the tariff weights do not respond to tariff changes and that any variation in $\overline{Tariff}_{c_i,t}$ stems from changes in the underlying tariff as the weighting scheme is kept constant. We choose to aggregate to the sector level rather than the firm level for several reasons. First, a firm's import choices are endogenous to the tariff-level. Aggregating to the sector level resolves this problem under the assumption that the individual firm cannot influence tariffs directly, or is large enough to make up a significant share of the average sector-level imports. Second, using weighted sector-level tariffs ensures that we are picking up on broader tariff liberalizations rather than minor changes in tariffs on a small subset of products. Based on the weighting we are confident that $\overline{Tariff}_{c_i,t}$ are as good as exogenous to the individual firm.

After aggregating the tariff rates to the sector level we proceed with analyzing the impact of tariff changes on firm and inequality outcomes. In this part of the analysis we are differentiating between tariffs on intermediate and final goods denoted by $\overline{Tariff}_{c_i,t,int}$ and $\overline{Tariff}_{c_i,t,fin}$, respectively. The differentiation between intermediate and final products is based on the UN's Classification by Broad Economic Categories (BEC), which groups products into capital, intermediate, and consumption goods.[10] We make this differentiation as we expect a different effect on firm outcomes if intermediate or final goods tariff change. Specifically, we would expect a reduction in intermediate goods tariffs to have an unambiguous positive effect on firms as costs decrease, resulting in higher sales and profits. The effect of tariff changes for final goods, however, is less straight forward. On the one hand, firms may find it more profitable to import and resell final goods leading to higher sales and profits.[11] On the other hand, domestic producers may face stiffer competition through cheaper imports resulting in lower sales and profits. To study the influence of the different tariffs, we again employ a high-dimensional fixed effects model, to estimate:

$$\ln(b_{i,t}) = \beta\overline{Tariff}_{c_i,t,int} + \eta\overline{Tariff}_{c_i,t,fin} + \alpha X_{i,t} + \iota_i + \zeta_t + \nu_{i,t}, \tag{3}$$

[10]The UN's classification may underestimate the number of intermediary products, while an alternative classification based on production input-output table may overestimate it.

[11]Felbermayr et al. (2015) show that lowering cost of goods through tariffs (intermediate goods) will generate welfare gains, while demand shifting through tariffs will decrease welfare in a simple Krugman trade model.

where $b_{i,t}$ is the firm i variable of interest in year t, $X_{i,t}$ is a vector of time-varying firm-level controls, ι_i and ζ_t are firm- and time-fixed effects. $\nu_{i,t}$ is the error term. Standard errors are clustered on the sector level. $X_{i,t}$ includes lagged log values of the number of employees, gross sales, fixed assets, as well as the lagged profit margin[12]. Our outcomes of interest include gross profits, inventories, gross sales, total assets, size of the workforce registered with the tax authorities, total wages paid, and total labor cost. To gauge the effect on within-firm inequality, we are also interested in the average wage, as well as the distribution of wages within a firm (measured in the bottom, 2nd, 5th, 8th, and top decile).

5. Empirical Analysis

In this section we first discuss the effect of product-country-of-origin-specific tariffs on firm-product-country-of-origin-specific imports to establish the first link in the chain between tariff changes and tax revenues. We then establish the link between tariffs (aggregated at the firm's sectoral level) and firm fundamentals, as well as within-firm measures of inequality, in a second step.

5.1. Trade Effects

The empirical results of the impact of tariff changes on imports are depicted in Table 3. Looking at Column (1) of Table 3, we observe that an increase in tariff rates by one percentage points is associated with an reduction in value of imports of approximately ZAR 24,000 ($\approx$ USD 2,300) for the average country-of-origin-product-firm pair. Turning to Columns (2) and (3), it becomes apparent that the reduction in import value is solely driven by changes in the prices which decreases significantly. This response can reflect both importers bearing the burden of tariff increases or affiliated firms understating the import value to reduce their tariff payments. Surprisingly, we find no systematic quantity adjustment when tariffs change. Columns (4)-(6) confirm that these results are robust to including more rigid fixed effects, even the though the overall change in import values is now less significant.

To ensure that affiliated party trade – trade between firms in the same multinational entity – is not driving our results we re-run Equation (1) using only non-affiliated party trade.[13] The results are depicted in Table 4 and only change quantitatively but not qualitatively.

[12] Profit margin is the ratio of gross profits to gross sales.

[13] We thank the authors of Böhm et al. (2024), who very graciously shared the code for this last step. Lassmann and Zoller-Rydzek (2019) argue that tariffs can vastly impact price and quantity decisions of affiliated firm transactions.

Table 3: Trade Effects: All Trade

	(1) Value	(2) Price	(3) Quantity	(4) Value	(5) Price	(6) Quantity
$Tariff_{j,k,t}$	-23.972^{***}	-0.549^{***}	$3,513.600$	-24.457^{*}	-0.455^{***}	$-3,393.524$
	(6.518)	(0.090)	(8, 197.207)	(13.237)	(0.0681)	(2, 682.649)
R^2	0.418	0.108	0.271	0.430	0.347	0.625
Observations	2,886,883	2,886,883	2,886,883	1,618,285	1,618,285	1,618,285
Firm FE	✓	✓	✓			
Origin-HS3-year FE	✓	✓	✓			
Firm-Origin-HS3-year FE				✓	✓	✓

Notes: Robust standard errors in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 4: Trade Effects: Non-Affiliated Trade

	(1) Value	(2) Price	(3) Quantity	(4) Value	(5) Price	(6) Quantity
$Tariff_{j,k,t}$	-18.513^{***}	-0.530^{***}	$6,390.043$	-19.902^{*}	-0.406^{***}	$-3,580.596$
	(4.877)	(0.092)	(8, 285.691)	(10.790)	(0.061)	(2, 832.489)
R^2	0.428	0.108	0.273	0.441	0.346	0.625
Observations	2,778,197	2,778,197	2,778,197	1,537,171	1,537,171	1,537,171
Firm FE	✓	✓	✓			
Origin-HS3-year FE	✓	✓	✓			
Firm-Origin-HS3-year FE				✓	✓	✓

Notes: Robust standard errors in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

However, this part of the analysis should be taken with a grain of salt as tariffs are likely endogenous to trade. Nevertheless, the results in Table 3 and 4 establish that tariffs are linked to import changes and thus create possible profit shocks. The fact that prices, rather than recorded quantities, vary as a result of tariff changes implies that these may be true rents and thus profit shocks. Based on these results, we can proceed to the main part of the analysis that analyzes the sharing of these trade liberalization rents within firms.

5.2. *Tariff Semi-Elasticity of Firm-level Fundamentals and Inequality*

In the next step, we establish the link between a firm's exposure to tariffs (proxied by its average applied sector-level tariffs) on intermediate products and final products on different firm fundamentals to gauge the possibility for tax changes to reclaim lost tariff revenues. We proceed by analyzing the effect on different measures of incomes, different expenditure categories, as well as the effect on the firm's workers.

In this analysis we are able to exploit detailed data from 13,500 firms over a span of 9 years. As mentioned above, we split the analysis between all firms and intensively trading firms and three different subsamples for each: (i) an unbalanced sample, (ii) manufacturing firms only, and (iii) the set of annual filers.

5.2.1 Firm Fundamentals: Incomes

Gross Profits As previously mentioned, a decrease in the tariffs for intermediary products should have an unambiguously positive effect on gross profits, while the effect of final goods tariff changes would be more ambiguous. In Table 5 we present the results of estimates of equation (3) for the log of gross profits.

Table 5: Firm-level Regression: Log Gross Profits

	All firms			Intensive traders		
	(1)	Annual Filers (2)	Manufacturing (3)	(4)	Annual Filers (5)	Manufacturing (6)
$\overline{Tariff}_{c_i,t,int}$	−0.001	0.002	0.000	0.000	0.003	−0.001
	(0.001)	(0.002)	(0.002)	(0.002)	(0.005)	(0.003)
$\overline{Tariff}_{c_i,t,fin}$	−0.002	−0.013**	0.002	−0.004	−0.012	0.002
	(0.002)	(0.004)	(0.002)	(0.003)	(0.009)	(0.002)
$\ln(Workforce)_{i,t-1}$	0.044**	0.021	0.018	0.024	−0.024	−0.015
	(0.020)	(0.042)	(0.041)	(0.025)	(0.047)	(0.083)
$\ln(GrossSales)_{i,t-1}$	0.396***	0.456***	0.496***	0.425***	0.536***	0.546***
	(0.020)	(0.089)	(0.045)	(0.027)	(0.084)	(0.092)
$\ln(Capital)_{i,t-1}$	−0.004	−0.011	−0.001	−0.002	−0.014	0.009
	(0.003)	(0.010)	(0.007)	(0.003)	(0.010)	(0.010)
$ProfitMargin_{i,t-1}$	0.032***	0.117***	0.037	0.024*	0.122***	0.025
	(0.011)	(0.027)	(0.030)	(0.012)	(0.040)	(0.013)
Fixed Effects	i,t	i,t	i,t	i,t	i,t	i,t
Adj R^2	0.807	0.840	0.804	0.789	0.826	0.802
Number of Observations	61,650	11,073	15,061	34,063	5,914	7,427
Number of Firms	13,522	2,182	3,260	7,667	1,305	1,694
Years	9	9	9	9	9	9
Clusters	14	14	6	14	14	6

Notes: Standard errors in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level. Intensive traders' imports to sales ratio is greater than 5%. Annual filers are the set of firms that file a tax return every year in our sample.

Overall, the results do no indicate that tariff reductions have any significant influence on gross profits. In fact, only annual fillers appear to show significant profit reductions from final tariff changes. This hints at increased import competition stemming from tariff reductions. However, this effect is not robust to excluding small traders and should thus be interpreted with caution. Surprisingly, intermediate tariff changes appear to have no effect on importing firm's profits.

Gross Sales We next focus on gross sales in Table 6. While log gross profits remain unchanged when tariffs change, this null results might been driven by counteracting changes in sales and costs. Log gross profits are negatively affected by increases in tariffs on intermediary products. Intuitively, increased costs on inputs that are passed on to the consumer will undoubtedly lead to reductions in sales. This finding is robust for manufacturing firms and firms continuously filing a tax report both for all traders and larger traders.

On the other hand, an increase in the tariff on final products is associated with an increase in gross sales. As tariffs fall, stiffer import competition might drive down the sales of local firms. This effect is robust for manufacturing firms which are most likely the most exposed firms in terms of import competition.

Table 6: Firm-level Regressions: Log Gross Sales

	All firms			Intensive traders		
		Annual Filers	Manufacturing		Annual Filers	Manufacturing
	(1)	(2)	(3)	(4)	(5)	(6)
$\overline{Tariff}_{c_i,t,int}$	0.000	−0.002*	−0.001**	0.000	−0.003**	−0.002**
	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)
$\overline{Tariff}_{c_i,t,fin}$	0.002	0.003	0.002**	0.002	0.005**	0.004**
	(0.001)	(0.003)	(0.001)	(0.002)	(0.002)	(0.001)
$\ln(Workforce)_{i,t-1}$	0.098***	0.093***	0.085***	0.099***	0.065***	0.090**
	(0.009)	(0.015)	(0.011)	(0.009)	(0.014)	(0.027)
$\ln(GrossSales)_{i,t-1}$	0.452***	0.517***	0.431***	0.449***	0.525***	0.421***
	(0.026)	(0.017)	(0.034)	(0.025)	(0.022)	(0.054)
$\ln(Capital)_{i,t-1}$	0.007***	0.003	0.006**	0.007***	0.003	0.005
	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.004)
$ProfitMargin_{i,t-1}$	0.000***	−0.030	−0.011**	−0.010	0.017*	0.000
	(0.000)	(0.026)	(0.003)	(0.009)	(0.009)	(0.003)
Fixed Effects	i,t	i,t	i,t	i,t	i,t	i,t
Adj R^2	0.960	0.973	0.967	0.958	0.971	0.968
Number of Observations	85,184	15,050	20,764	46,770	8,096	10,093
Number of Firms	16,783	2,405	4,032	9,582	1,517	2,103
Years	9	9	9	9	9	9
Clusters	14	14	6	14	14	6

Notes: Standard errors in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

5.2.2 Firm Fundamentals: Expenditures

Changes in sector-relevant tariffs can affect firm fundamentals in various ways. Previously we explored the income side, we next explore the expenditure side. Focusing on the different expenditure margins through which increases in the cost of imports may be absorbed or decreases distributed.

Inventory The effect of the sector-specific tariffs on intermediate products has generally negative effect, especially on manufacturing firms, see Table 7. This implies that as import costs increase, firms build up inventories (or unsold/unfinished products) when inputs cost more, this is consistent with the findings of Muris et al. (2023) for the US steel sector. The opposite is true for the relationship to final goods tariffs, which is positive for manufacturing firms. As final goods cost more, firms build up more inventories to compete with greater import competition.

Table 7: Firm-level Regressions: Log Inventories

	All firms			Intensive traders		
		Annual Filers	Manufacturing		Annual Filers	Manufacturing
	(1)	(2)	(3)	(4)	(5)	(6)
$\overline{Tariff}_{c_i,t,int}$	0.001	−0.004*	−0.004***	0.002	−0.002	−0.003***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)
$\overline{Tariff}_{c_i,t,fin}$	0.002	0.004	0.004*	−0.001	0.002	0.004**
	(0.001)	(0.003)	(0.002)	(0.002)	(0.004)	(0.001)
$\ln(Workforce)_{i,t-1}$	0.140***	0.126***	0.134***	0.123***	0.079**	0.130***
	(0.013)	(0.037)	(0.019)	(0.014)	(0.031)	(0.017)
$\ln(GrossSales)_{i,t-1}$	0.307***	0.368***	0.260***	0.316***	0.386***	0.258**
	(0.018)	(0.028)	(0.043)	(0.013)	(0.027)	(0.065)
$\ln(Capital)_{i,t-1}$	0.009***	0.004	0.018**	0.008***	0.008	0.018*
	(0.003)	(0.004)	(0.005)	(0.002)	(0.005)	(0.007)
$ProfitMargin_{i,t-1}$	0.000***	0.010	−0.007***	−0.009***	0.016	−0.008
	(0.000)	(0.037)	(0.002)	(0.003)	(0.059)	(0.005)
Fixed Effects	i,t	i,t	i,t	i,t	i,t	i,t
Adj R^2	0.920	0.937	0.929	0.915	0.933	0.927
Number of Observations	75,175	13,690	19,152	43,141	7,599	9,523
Number of Firms	14,632	2,225	3,682	8,764	1,433	1,970
Years	9	9	9	9	9	9
Clusters	14	14	6	14	14	6

Notes: Standard errors in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level. Intensive traders' imports to sales ratio is greater than 5%. Annual filers are the set of firms that file a tax return every year in our sample.

Capital A reduction in tariffs would allow a firm to accumulate more capital as a direct consequence of its production costs decreasing. Allowing for higher investments into production capabilities. The increased capital intensity is as well consistent with findings of Edwards and Lawrence (2008). Similarly, stiffer import competition may have the opposite effect as South African firms loose market share and produce less. Table 8 looks at the relationship between total assets and import tariffs. For total assets, or capital in a wider sense, the results are largely negative and significant for intermediaries in the intensively trading firms and for final products among manufacturing firms. Thus, tariffs do not appear to have significant impact on investment. However, the negative final goods tariff coefficient in Table 8 again hints at stiffer import competition for large trading manufacturing firms.

Table 8: Firm-level Regressions: Log Total Assets

	All firms			Intensive traders		
		Annual Filers	Manufacturing		Annual Filers	Manufacturing
	(1)	(2)	(3)	(4)	(5)	(6)
$\overline{Tariff}_{c_i,t,int}$	−0.003	−0.006	−0.004	−0.004*	−0.003	−0.003
	(0.002)	(0.005)	(0.003)	(0.002)	(0.008)	(0.002)
$\overline{Tariff}_{c_i,t,fin}$	−0.001	−0.001	−0.007*	−0.004	−0.001	−0.012**
	(0.003)	(0.007)	(0.003)	(0.004)	(0.008)	(0.003)
$\ln(Workforce)_{i,t-1}$	0.091***	0.198	0.001	0.107***	0.280*	0.059
	(0.028)	(0.119)	(0.026)	(0.030)	(0.146)	(0.073)
$\ln(GrossSales)_{i,t-1}$	0.258***	0.199**	0.256***	0.272***	0.223*	0.252**
	(0.032)	(0.075)	(0.037)	(0.053)	(0.121)	(0.086)
$\ln(Capital)_{i,t-1}$	0.416***	0.422***	0.415***	0.409***	0.401***	0.397***
	(0.011)	(0.028)	(0.017)	(0.017)	(0.026)	(0.036)
$ProfitMargin_{i,t-1}$	0.000***	0.020	−0.005	0.001	0.059	−0.052
	(0.000)	(0.037)	(0.004)	(0.011)	(0.040)	(0.032)
Fixed Effects	i,t	i,t	i,t	i,t	i,t	i,t
Adj R^2	0.793	0.821	0.845	0.778	0.812	0.835
Number of Observations	82,323	14,597	20,335	45,143	7,839	9,867
Number of Firms	16,359	2,360	3,958	9,322	1,484	2,060
Years	9	9	9	9	9	9
Clusters	14	14	6	14	14	6

Notes: Standard errors in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level. Intensive traders' imports to sales ratio is greater than 5%. Annual filers are the set of firms that file a tax return every year in our sample.

Labor Costs, Wage Bill, and Workforce Rather than drawing down inventories or building up capital, firms may invest any cost savings from reductions in import tariffs (particularly on intermediary products) in their workforce. This may come in the form of new hires, higher wages, longer hours, or worker benefits, such as pensions, health provisions, etc.. Furthermore, the change in tariffs may render capital more or less costly and thus induce a substitution to labor.

Initial results on the overall cost of labor (which accounts for total wages, medical provisions, pension, and directors remuneration, etc.) in Table 9 indicate that overall labor costs are negatively affected by an increase in the tariffs on inputs, significant in the overall sample. Conversely, as tariffs on final products increase, labor costs increase for intensively trading firms. Interestingly, this effect is insignificant for manufacturing firms. This indicates that non-manufacturing firms compete with more expensive imports by producing domestically and/or substitute to labor. Focusing solely on total labor costs may hide interesting dynamics at the intensive and extensive margin; are changes in the labor cost driven by changes in wages (intensive margin) or changes in the overall workforce (extensive margin).

Table 9: Firm-level Regression: Log Total Labor Costs

	All firms			Intensive traders		
		Annual Filers	Manufacturing		Annual Filers	Manufacturing
	(1)	(2)	(3)	(4)	(5)	(6)
$\overline{Tariff}_{c_i,t,int}$	−0.001*	−0.002	−0.001	−0.001	−0.002	−0.001
	(0.001)	(0.002)	(0.001)	(0.001)	(0.003)	(0.001)
$\overline{Tariff}_{c_i,t,fin}$	0.001	0.004	0.000	0.002**	0.010***	0.002
	(0.002)	(0.003)	(0.003)	(0.001)	(0.002)	(0.002)
$\ln(Workforce)_{i,t-1}$	0.277***	0.312***	0.252***	0.282***	0.296***	0.254***
	(0.009)	(0.029)	(0.022)	(0.011)	(0.031)	(0.033)
$\ln(GrossSales)_{i,t-1}$	0.280***	0.287***	0.247***	0.300***	0.314***	0.256***
	(0.010)	(0.024)	(0.025)	(0.009)	(0.032)	(0.028)
$\ln(Capital)_{i,t-1}$	0.014***	0.010***	0.012**	0.010***	0.010*	0.010
	(0.002)	(0.003)	(0.004)	(0.002)	(0.005)	(0.005)
$ProfitMargin_{i,t-1}$	0.000***	−0.003	−0.006**	−0.005	0.018	−0.006
	(0.000)	(0.016)	(0.002)	(0.003)	(0.019)	(0.004)
Fixed Effects	i,t	i,t	i,t	i,t	i,t	i,t
Adj R^2	0.926	0.943	0.913	0.922	0.946	0.919
Number of Observations	85,184	15,050	20,764	46,770	8,096	10,093
Number of Firms	16,783	2,405	4,032	9,582	1,517	2,103
Years	9	9	9	9	9	9
Clusters	14	14	6	14	14	6

Notes: Standard errors in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level. Intensive traders' imports to sales ratio is greater than 5%. Annual filers are the set of firms that file a tax return every year in our sample.

As labor costs are composed of wages as well as mandatory and voluntary benefits paid on workers, we may explore the direct effect on wages to explore whether tariffs are affecting the cost of the additional benefits or the wages directly. Table 10 presents the results for the overall wage bill. Here the positive effect of changes in the tariffs on final products is present in both the full set of annual filers and the high-trading firms as well as larger trading manufacturers. As before, the positive relationship is driven by import competition. As final goods tariffs decrease, import competition intensifies and drives down wages. Thus, final goods tariffs appear to have an intensive margin effect.

Table 10: Firm-level Regression: Log Total Employee Wages

	All firms			Intensive traders		
	(1)	Annual Filers (2)	Manufacturing (3)	(4)	Annual Filers (5)	Manufacturing (6)
$\overline{Tariff}_{c_i,t,int}$	−0.002	−0.001	−0.001	−0.001	0.000	−0.001
	(0.001)	(0.003)	(0.001)	(0.001)	(0.003)	(0.002)
$\overline{Tariff}_{c_i,t,fin}$	0.000	0.008***	0.003	0.001	0.012***	0.005*
	(0.001)	(0.002)	(0.003)	(0.001)	(0.003)	(0.002)
$\ln(Workforce)_{i,t-1}$	0.295***	0.338***	0.233***	0.310***	0.335***	0.266***
	(0.016)	(0.038)	(0.021)	(0.021)	(0.042)	(0.038)
$\ln(GrossSales)_{i,t-1}$	0.237***	0.236***	0.220***	0.258***	0.239***	0.231***
	(0.016)	(0.020)	(0.019)	(0.017)	(0.040)	(0.032)
$\ln(Capital)_{i,t-1}$	0.017***	0.017***	0.024***	0.012***	0.009	0.025***
	(0.002)	(0.006)	(0.006)	(0.003)	(0.006)	(0.005)
$ProfitMargin_{i,t-1}$	−0.004	0.028	−0.019	−0.007	0.031	−0.021
	(0.008)	(0.030)	(0.013)	(0.007)	(0.039)	(0.016)
Fixed Effects	i,t	i,t	i,t	i,t	i,t	i,t
Adj R^2	0.910	0.922	0.886	0.903	0.932	0.902
Number of Observations	46,521	9,067	13,825	23,899	4,551	6,719
Number of Firms	9,180	1,552	2,635	4,980	912	1,401
Years	9	9	9	9	9	9
Clusters	14	14	6	14	14	6

Notes: Standard errors in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level. Intensive traders' imports to sales ratio is greater than 5%. Annual filers are the set of firms that file a tax return every year in our sample.

We can drill down on the extensive effect of the tariffs on the wage bill by exploring the effects of tariff changes on the number of employees registered with the firm. Table 11 highlights that the relationship to input tariffs is negative though not generally significant across samples. As before, the effect of final goods tariffs is positive, though not generally significant. Thus, firms may opt to adjust on the hiring front to changes in production cost or changes in import competition, but this does not seem to be general response throughout South African importers. Consequently, the effects on the overall wage bill appear to be more fundamentally driven by changes in wages rather than employment.

Table 11: Firm-level Regressions: Log Workforce

	All firms			Intensive traders		
		Annual Filers	Manufacturing		Annual Filers	Manufacturing
	(1)	(2)	(3)	(4)	(5)	(6)
$\overline{Tariff}_{c_i,t,int}$	0.000	−0.002**	−0.001	0.000	−0.001	0.000
	(0.000)	(0.001)	(0.002)	(0.000)	(0.001)	(0.002)
$\overline{Tariff}_{c_i,t,fin}$	0.000	0.001	0.001	0.001	0.003***	0.000
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
$\ln(Workforce)_{i,t-1}$	0.423***	0.514***	0.425***	0.407***	0.472***	0.398***
	(0.012)	(0.017)	(0.028)	(0.014)	(0.020)	(0.038)
$\ln(GrossSales)_{i,t-1}$	0.150***	0.137***	0.155***	0.148***	0.157***	0.146***
	(0.007)	(0.017)	(0.022)	(0.008)	(0.021)	(0.025)
$\ln(Capital)_{i,t-1}$	0.010***	0.010***	0.012**	0.008***	0.009**	0.009**
	(0.001)	(0.002)	(0.004)	(0.002)	(0.004)	(0.003)
$ProfitMargin_{i,t-1}$	−0.003***	0.003	−0.004***	0.002	0.015	0.004
	(0.000)	(0.013)	(0.001)	(0.002)	(0.018)	(0.002)
Fixed Effects	i,t	i,t	i,t	i,t	i,t	i,t
Adj R^2	0.963	0.973	0.959	0.960	0.972	0.969
Number of Observations	84,217	14,932	20,618	46,221	8,013	10,032
Number of Firms	16,609	2,398	4,001	9,483	1,507	2,088
Years	9	9	9	9	9	9
Clusters	14	14	6	14	14	6

Notes: Standard errors in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level. Intensive traders' imports to sales ratio is greater than 5%. Annual filers are the set of firms that file a tax return every year in our sample.

5.2.3 Firm Fundamentals: Inequality

In the following, we will focus on the effects of final and intermediate goods import tariff changes on the income distribution within firms. Given the impact of tariff changes on wages in Table 10, we are now identifying where these wage changes materialize and which part of the income distribution benefits from them.

Average Wages The institutional setting in South Africa implies a high degree of remuneration through in-kind benefits and other non-cash benefits, which appear in the pay statistics and are taxable. We focus here on average cash wages. While this significantly restricts the samples, there is a positive effect of an increase in final goods tariffs in Table 12. However, this effect only persists for firms that are consistently filing tax returns throughout our observational period. [14] Again, this finding implies that stiffer import competition through decreasing final goods tariffs drives down average wages.

[14] We can also differentiate the average wage effects by gender; however, there is no differential effect by gender.

Table 12: Firm-level Regressions: Log Average Wages

	All firms			Intensive traders		
		Annual filers	Manufacturing		Annual Filers	Manufacturing
	(1)	(2)	(3)	(4)	(5)	(6)
$\overline{Tariff}_{c_i,t,int}$	−0.001	0.002	−0.001	0.000	0.003	−0.003
	(0.001)	(0.003)	(0.003)	(0.001)	(0.004)	(0.004)
$\overline{Tariff}_{c_i,t,fin}$	0.001	0.009***	0.004	0.001	0.011**	0.004
	(0.001)	(0.003)	(0.003)	(0.001)	(0.004)	(0.002)
$\ln(Workforce)_{i,t-1}$	−0.164***	−0.229***	−0.205***	−0.153***	−0.169***	−0.179***
	(0.016)	(0.040)	(0.029)	(0.016)	(0.028)	(0.035)
$\ln(GrossSales)_{i,t-1}$	0.097***	0.132***	0.072***	0.120***	0.092***	0.098***
	(0.018)	(0.017)	(0.014)	(0.015)	(0.021)	(0.021)
$\ln(Capital)_{i,t-1}$	0.003*	0.000	0.010	0.002	−0.004	0.011
	(0.001)	(0.005)	(0.006)	(0.003)	(0.004)	(0.008)
$ProfitMargin_{i,t-1}$	−0.008	0.011	−0.014*	−0.013**	0.005	−0.022*
	(0.006)	(0.014)	(0.006)	(0.004)	(0.016)	(0.009)
Fixed Effects	i,t	i,t	i,t	i,t	i,t	i,t
Adj R^2	0.767	0.774	0.749	0.779	0.811	0.806
Number of Observations	46,306	9,037	13,786	23,795	4,532	6,704
Number of Firms	9,150	1,549	2,630	4,962	908	1,399
Years	9	9	9	9	9	9
Clusters	14	14	6	14	14	6

Notes: Standard errors in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level. Intensive traders' imports to sales ratio is greater than 5%. Annual filers are the set of firms that file a tax return every year in our sample.

Distribution of Wages The effect on average wages from above is quite weak; however, this may hide the fact that different ends of the income distribution experience the effect of tariffs differently.

The wages of the bottom decile are affected very differently from upper deciles. Overall, input tariffs have a positive effect that trends to zero as we move up the wage deciles, while final goods tariffs are positive in the lower deciles and negative at or above the median.

The bottom deciles' wages (1st and 2nd) increase with both tariffs – potentially through firms replacing higher paid with lower paid workers. The median's wages increase with higher input tariffs but decrease with final goods tariffs. The 8th decile's wages continue with a negative relationship to final good tariffs, while input tariffs have no effect. This likely due to the workers in these higher deciles being on fixed salaries. The results in the lower deciles indicate that low income workers are most exposed to globalization. Falling tariffs result in wage losses among these workers.

The effect of tariffs disappears in the highest deciles – these workers are likely managers, supervisors, and firm owners that may draw down a wage. It is less surprising that their cash wages are not affected by tariffs – an analysis of other forms of pay may highlight corresponding increases.

Table 13: Firm-level Regressions: Log Wages per Income Decile

		All firms			Intensive traders		
			Annual Filers	Manufacturing		Annual Filers	Manufacturing
Bottom	$\overline{Tariff}_{c_i,t,int}$	0.000	0.005***	0.005**	0.001	0.006*	0.007**
		(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.002)
	$\overline{Tariff}_{c_i,t,fin}$	0.001	0.007***	−0.002	0.001	0.002	0.001
		(0.002)	(0.002)	(0.004)	(0.002)	(0.004)	(0.005)
	Adj R^2	0.551	0.554	0.556	0.528	0.536	0.535
2nd decile	$\overline{Tariff}_{c_i,t,int}$	−0.001	0.006***	0.001	0.000	0.007***	0.000
		(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
	$\overline{Tariff}_{c_i,t,fin}$	0.000	0.002	−0.002	0.000	−0.003	0.000
		(0.002)	(0.002)	(0.002)	(0.003)	(0.004)	(0.003)
	Adj R^2	0.590	0.617	0.622	0.565	0.605	0.629
Median	$\overline{Tariff}_{c_i,t,int}$	0.000	0.003***	0.000	−0.001	0.003**	−0.001
		(0.000)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
	$\overline{Tariff}_{c_i,t,fin}$	−0.003***	−0.002	0.000	−0.002**	−0.002	0.002
		(0.001)	(0.002)	(0.002)	(0.001)	(0.003)	(0.002)
	Adj R^2	0.734	0.787	0.767	0.717	0.774	0.774
8th decile	$\overline{Tariff}_{c_i,t,int}$	0.000	0.001	0.000	0.000	0.001	−0.001
		(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
	$\overline{Tariff}_{c_i,t,fin}$	−0.003***	0.000	0.000	−0.002**	0.001	0.001
		(0.001)	(0.002)	(0.002)	(0.001)	(0.003)	(0.002)
	Adj R^2	0.772	0.814	0.823	0.755	0.798	0.825
Top	$\overline{Tariff}_{c_i,t,int}$	0.000	−0.001	−0.001	0.000	−0.001	−0.002
		(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
	$\overline{Tariff}_{c_i,t,fin}$	−0.001	0.002	0.001	−0.001	0.001	0.002
		(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.003)
	Adj R^2	0.767	0.809	0.807	0.751	0.801	0.803
Fixed Effects		i,t	i,t	i,t	i,t	i,t	i,t
Additional Controls		✓	✓	✓	✓	✓	✓
Number of Observations		81,796	14,569	20,304	44,611	7,780	9,877
Number of Firms		16,302	2,374	3,948	9,266	1,487	2,062
Years		9	9	9	9	9	9
Clusters		14	14	6	14	14	6

Notes: Standard errors in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level. Intensive traders' imports to sales ratio is greater than 5%. Annual filers are the set of firms that file a tax return every year in our sample.

6. Tax Revenue Impact

We are using the estimates from the previous sections to provide back-of-the-envelope calculations to quantify the effect of falling tariff revenues in South Africa and the implications for firms, workers, and revenues. When considering the revenue implications we have to take both first and second order revenue effects into account. First-order revenue effects are the direct effects of tariff reductions on tariff revenues driven by rate and base responses. Second-order revenue implications are driven by the impact of tariff liberalization on other tax bases including sales, profits, and wages. We base our calculations, where possible, on the actual sample of our analysis.

For the baseline tariff impact on government revenues we rely on the estimates given in Table 3. The sample used in this regression contains on average imports of around ZAR 260 billion (or USD 25 billion) per year (about 25% of total imports in 2021) and tariff revenues of more than ZAR 20.74 billion, or USD 2 billion for the South African government.[15]

In Section 5 we estimated that on average a one percentage point decline of import tariffs in South Africa will increase imports by about ZAR 24,000. This implies a increase of total imports by about 2.7%. Although, the the tariff base increases, total tariff revenues would decline by close to ZAR 2 billion, or USD 192 million, due to the lower tariff rate. In most countries, including South Africa, VAT is charged on imports. The current VAT rate is 15%. Hence, the additional imports will generate about ZAR 1.04 billion, or USD 100 million, in additional VAT revenues. In total, the one percentage point tariff reduction would decrease government revenues by a little less than ZAR 954.04 million, or USD 92 million.

In terms of profits, we did not find any consistently significant effects of a tariff reduction, implying that no additional corporate income tax revenues will be generated by the tariff reduction.

An alternative government revenue stream could arise from additional VAT revenues through higher gross sales arising from lower import tariffs. In our empirical analysis we find some indication for such a channel, see Table 6. However, it appears that only tariff reductions for intermediate goods could raise gross sales and thus increase VAT revenues. A one percentage point decline in intermediate good tariffs would raise gross sales between 0.2% and 0.3% depending on firm characteristics. To compute the expected change in gross sales, we weight the final and intermediate goods $Tariff$ variables with their respective import shares, i.e., 0.157% for final goods and 0.842% for intermediate goods. With these weights, we can compute a counterfactual for a 1 percentage points in overall tariffs and its impact on specific outcome variables.[16]

We estimate that a 1 percentage point decline in tariffs (split according to the aforementioned

[15] We consistently use the average exchange rate of USD 1 per ZAR 10.37 during our sample period.

[16] For a specific outcome, the impact of a tariff reduction is given by $\hat{\beta}_{int}0.843 + \hat{\beta}_{fin}0.154$, where $\hat{\beta}_{int}$ and $\hat{\beta}_{fin}$ are the estimated regression coefficients of the tariff variables.

weighting scheme) would have a net positive effect of 0.12% for all firms given our full sample of annual filers in Table 6 and 0.17% for intensively trading firms among the annual filers. Consequently, a decline in tariffs will generate about ZAR 25.2 million, or USD 2.43 million, in additional VAT revenues from all firms (USD 1.87 million from intensively trading firms[17]).

The literature has shown that trade liberalization increases the capital intensity in a country, see Edwards et al. (2018). Table 8 shows that total assets in firms increase, especially in intensively trading manufacturing firms. Overall, a 1 percentage point decline in tariffs results in a increase of 0.4% in manufacturing firms' total assets independent of the trading intensity status. This implies that on average a manufacturing firm will increase total assets on average by about ZAR 518,000 or USD 50,000. Assuming that these additional assets yield at least the long-term risk free interest rate of South African government bonds (9.785%), it will generate ZAR 50,700 or USD 4,890 in additional capital gains for investors. Using the maximum capital gains tax rates for individuals of 18%, the 1 percentage point decline will generate ZAR 28.23 million or USD 2.72 million in additional capital gains tax revenues.

Lastly, it is well established that trade liberalization can create large disruptions in the labor market, especially impacting workers in import-competing firms. In Table 10 we show that total employee wages are considerably affected by changing final goods tariffs. Lowering final goods tariffs by one percentage point decreases total employee wages on average by 0.8% and 1.2% for all firms and intensive traders, respectively. A general reduction of tariffs by 1 percentage point would decrease the total wage bill of firms in our sample on average by 0.04% and 0.19% of all firms and intensive traders in our set of annual filers. We estimate the impact of a declining import tariff on the total personal income tax using an average personal income tax rate of 23.6%, which is the rate of the median tax bracket in 2022. In this case total personal income tax revenues decline by ZAR 20.74 million or USD 2 million after a 1 percentage decline of tariffs.

Table 14 summarizes the total net effect of a 1 percentage point reduction of all tariffs (final and intermediate goods). Unsurprisingly, the direct impact of reducing tariffs on government revenues is negative. Yet, there are some revenue sources which can offset the losses. Most importantly, the VAT levied on the increase in imported goods compensates more than 50% of the tariff revenue losses. We also observe that a tariff reduction will actually generate higher VAT revenues from increased sales and higher capital gains tax revenues from the increased capital intensity of production. Yet, workers will face lower wages after trade liberalization which will lead to a decline in terms of personal income tax revenues. Overall the revenue effect of a tariff reduction is still negative.

[17] As the number of firms differs between the trade effect regressions and the firm-level outcomes due to data limitations, we scale the later to match the number of firms in the trade regressions. This ensures a consistent comparison of revenues. We also assume that the ratio of intensively trading firms in the sample population of 54,316 trading firms is the same as the ratio indicated in Table 6, i.e., 0.53.

Table 14: Revenue Impact

Revenue	ZAR	USD
Tariff revenues	-1,991.04	-192.00
VAT on imports	1,037.00	100.00
VAT on gross sales	25.20	2.43
Capital gains tax	28.23	2.72
Personal income tax	-20.74	-2.00
Net effect	-921.37	-88.85

Notes: Revenue impact of a one percentage point reduction of import tariffs based on estimated semi-elasticities. All values in millions of ZAR or millions of USD.

Note that in Table 13 a general tariff reduction increases intra-firm inequality by reducing the wages of the lower income deciles. At the same time, overall government revenues decline. Thus, reducing tariffs will limit the government's ability to mitigate the negative distributional effects for workers through increased unemployment, pensions, or welfare. To neutralize the tariff revenue losses complete the South African government would need to raise its effective corporate income tax rate by 0.45 percentage from 21.6% to 22.1%.[18] Of course, this adjustment does not consider any behavioral responses of firms.

Our back-of-the-envelope calculations should be taken with a grain of salt. Our empirical estimation only covers a quarter of total trade, and our firm level data is even more limited. Extrapolating to the population of South African firms is more difficult. Moreover, we do not consider the actual distribution of firms, we merely take averages where needed. Thus, heterogeneous effects may distort our results, further changing any estimated effect of a tariff decrease.

7. Conclusion

This paper takes a detailed view on tariff pass-through within the firm. It explores behavioral responses of firms with regard to globalization in the form of tariff reductions. While the general literature focuses on firm-level productivity and product-level characteristics such as pricing and quality upgrading, we consider firm behavior in a much more granular way. A reduction in tariffs can create a profit shock for firms that has distributional consequences within the firm, i.e., additional profits might be captured by workers in terms of higher wages, by management in terms of higher executive compensation, by shareholders or capital owners in terms of higher capital gains, or by consumers in terms of lower prices and more sales. This does not only have direct

[18] We use the composite average effective tax rate for South African firms in the year 2019 provided by OECD (2023) together with average yearly gross profits of firms in our sample to compute the necessary change of the effective corporate income tax rate.

distributional consequences, but will alter the tax base for VAT, corporate income tax, capital gains tax, and personal income taxes. Hence, lowering tariffs will impact government revenues and limit the government's ability to react to the previously described distributional consequences.

In this paper we use linked employer-employee data combined with transaction-level customs data from South Africa between 2009 and 2019 to evaluate the impact of a tariff reduction on firms. We reconstruct the applied bilateral product-level tariffs and construct a plausibly exogenous tariff measure at the firm's sectoral level. We calculated modal effectively applied tariffs at the HS6 product-country-of-origin level and aggregate the tariffs up to the firm's respective sectoral level. By relying on sector-level tariffs we reduce the endogeneity that arises from large firms lobbying for preferential treatment (Grossman and Helpman, 1994). We use the data to estimate semi-elasticities of various tax bases with regard to import tariffs.

We find that reducing tariffs will increase import volumes mainly due to lower import prices. This indicates that indeed firms in South Africa face a profit shock. However, the additional profits are not reflected at firm-level gross profits but rather on increased expenditures. We find that inventories and capital will increase after a tariff reduction. On the other hand, the wage bill of firms is declining, mainly due to lower wages of employees in the bottom deciles of the within firm wage distribution. This indicates that trade liberalization will have negative distributional consequences within the firm's wage distribution and that capital gains occur. This is very much consistent with the general idea of a Heckscher-Ohlin trade model, where trade liberalization would lead to gains of the scarce factor (capital in South Africa) and losses of the abundant factor (labor in South Africa).

We provide a back-of-the-envelope calculation using the estimated semi-elasticities for different tax bases to compute the net government revenue effect of a one percentage point reduction of tariffs for South Africa. Such a policy would directly lead to a reduction of tariffs revenues of over ZAR 2 billion or USD 192 million in our sample. Yet, changes in other tax bases reduce these revenue losses to ZAR 921 million or USD 89 million.

Our research indicates that lowering tariffs may lead to adverse distributional effects in South Africa, while constraining the government's capacity to address these impacts due to diminished revenues. Nonetheless, it is crucial to recognize that these conclusions should not be considered an advocacy for protectionist measures. The context of our analysis is the incremental change of tariffs within an environment where the baseline tariff rate is comparatively low. Non-linear dynamics could significantly modify our results. Additionally, our study employs short-term semi-elasticity measures, and the implications over the long term may diverge substantially from our current findings.

Subsequent work will delve deeper into the effects of tariff changes on individual labor market outcomes and will apply an event-study approach to disentangle tariff rises from tariff decreases to explore the effect on firm expenditures and what this means for tax policy.

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