Policy Research on International Services and Manufacturing

Tariff Liberalisation Effects on Gendered Manufacturing Employment in South Africa

Refilwe Lepelle

School of Economics, University of Cape Town
Policy Research in International Services and Manufacturing (PRISM)
refilwe.lepelle@uct.ac.za

Lawrence Edwards

School of Economics, University of Cape Town
Policy Research in International Services and Manufacturing (PRISM)
lawrence.edwards@uct.ac.za

Working Paper Series
Number 2025-4

Abstract

This paper investigates the gendered effects of tariff liberalisation on manufacturing employment in post-apartheid South Africa. The paper draws on a regional-level database of employment and wages using South African Population Census data and product-level import tariff data over the period 1996 to 2011. We employ a Bartik-style approach that exploits variation in regional industry composition, estimated using a first-difference instrumental-variable strategy. We find that tariff reductions had no effect on manufacturing wages, with their impact falling entirely on employment. Municipalities more exposed to tariff cuts experienced slower manufacturing employment growth for both men and women, with significantly larger losses for women, particularly Black women, thereby widening the gender employment gap. The dominant transmission channel is industry segregation, as the largest tariff reductions occurred in female-intensive sectors such as textiles, clothing, and footwear. These findings contrast with evidence from other emerging economies, where liberalisation often benefits women, highlighting the country-specific nature of South Africa's labour-market response to trade liberalisation.

Keywords: Tariff Policy, Gender, Labour Markets, South Africa

JEL Codes: F16, J16, J21, R12

Acknowledgments

We are grateful to Dr Asha Sundaram, Professor Murray Leibbrandt, and Professor Fiona Tregenna for their helpful comments and suggestions. The statements made and views expressed are solely the responsibility of the authors.

Recommended citation:

Lepelle, R. and Edwards, L., 2025. 'Tariff Liberalisation Effects on Gendered Manufacturing Employment in South Africa'. *PRISM Working Paper 2025-4. Cape Town: Policy Research on International Services and Manufacturing, University of Cape Town.*

Policy Research in International Services and Manufacturing (PRISM) is a research and policy unit located within the School of Economics. PRISM provides a lens to focus research and policy work broadly on issues of globalization, trade and industrialization. It is home to a number of related research activities, projects and programmes concerned with issues of globalization, global value chains, industrialization paths, international trade, foreign investment, the defence industry, policy governance, infrastructure development, the role of knowledge intensive services, innovation, and international competitiveness. Another feature of PRISM's work has been its applied focus, responding to economic policy questions issues in South Africa, the rest of Africa and beyond.

Working Papers can be downloaded in Adobe Acrobat format from
https://commerce.uct.ac.za/prism

School of Economics Building, Middle Campus,
University of Cape Town Private Bag,
Rondebosch 7700, CapeTown,
South Africa
Tel: +27 (0)21 6504470
Website: https://commerce.uct.ac.za/prism

1. Introduction

South Africa's labour market has historically been male-dominated, though female participation has risen steadily in the post-apartheid period (Casale & Posel, 2002; Ntuli, 2007). This feminisation has taken place against a backdrop of globalisation and deepening trade integration. Once one of the most protected economies in Sub-Saharan Africa, South Africa undertook sweeping tariff reductions after joining the World Trade Organisation (WTO) in 1994 (Edwards, 2005). The role of trade reform in labour market outcomes, including gender convergence, has received increasing attention in international research (Ertürk & Darity, 2000; Wood, 1995; Bussmann, 2009).

Standard trade theories predict gains for unskilled workers in developing countries, with women expected to benefit due to their overrepresentation in labour-intensive industries. These predictions assume a national factor market with full mobility of factors across regions and industries. However, in the short to medium term, when workers are tied to specific regions or sectors, trade shocks give rise to persistent adjustment frictions (Topalova, 2010; Kovak, 2013; Autor et al., 2015). In these circumstances, the adverse effects of tariff cuts are likely to be concentrated among workers with skills specific to sectors experiencing the steepest reductions in protection. Regional differences in industrial composition, factor endowments, and competitiveness can compound these effects. Regions dominated by highly exposed industries may face sharper employment and wage declines, as region-specific workers are less able to relocate or shift sectors. Finally, workers tied to both a particular industry and a specific region are the most vulnerable to liberalisation shocks.

The empirical literature on gendered employment effects of trade reform is highly context-dependent. In the United States, openness reduced firms' ability to discriminate, benefiting women (Black & Brainerd, 2004). Similar outcomes are found in parts of Africa (Baliamoune-Lutz, 2007) and Mexico (Juhn et al., 2014). Other studies highlight gains for women in export-oriented sectors, such as Colombia (Ederington et al., 2024) and Mexico (Aguayo-Téllez et al., 2014). In South Africa, however, results are mixed. Bhorat (2000) reports that liberalisation increased female employment shares in services, and Thurlow (2006) shows gains among highly skilled women. In contrast, Cockburn et al. (2007) find that women's employment declined due to their concentration in highly protected industries, such as textiles, clothing, and footwear[1].

Available studies are primarily conducted at the national level, with literature at the regional level remaining limited in emerging economies. This paper augments the available literature by investigating the gendered effects of tariff liberalisation on regional employment in South Africa, an emerging economy in Sub-Saharan Africa.

The focus on South Africa is for several reasons. First, tariff reductions from the early 1990s were driven by World Trade Organisation (WTO) membership and preferential agreements, including the Southern African Development Community (SADC) Free Trade Protocol and the EU Trade, Development and Cooperation Agreement (TDCA). Unlike in other emerging economies, liberalisation fell most heavily on the textile industries, which are dominated by women (Erten et al., 2019; Lepelle & Edwards, 2024). In countries like Indonesia, tariff reform

[1] The textiles, clothing, and footwear industry is hereafter referred to simply as textiles.

boosted female employment in these sectors; in South Africa, it exposed them to heightened competition.

Second, apartheid-era policies of separate development produced sharp racial and spatial disparities in industrial activity, infrastructure, and employment (Bosker & Krugell, 2006). This variation provides a valuable source of regional identification while also shaping heterogeneous adjustment to trade shocks.

Third, South Africa differs from middle-income countries such as Indonesia (Kis-Katos & Sparrow, 2015), India (Banerjee & Veeramani, 2017) and Brazil (Lattimore & Kowalski, 2008) because it lacks a comparative advantage in labour-intensive manufacturing. In Brazil and Indonesia, liberalisation fostered growth in female-intensive sectors and narrowed gender employment gaps (Gaddis & Pieters, 2017; Kis-Katos et al., 2018). By contrast, South African tariff cuts disproportionately targeted the same female-intensive industries, producing adverse consequences for women.

Fourth, the effects of increased competition are mediated by South Africa's distinctive labour market. A higher average educational attainment among employed women than among their male counterparts (Statistics South Africa, 2012) suggests that liberalisation, if it has a skill bias, could mitigate employment losses for women. Further, competition raises the cost of discrimination (Becker, 2010), potentially leading firms to increase their demand for female labour. Yet distinct institutional rigidities in South Africa's labour market shape the outcomes of these demand shifts. Centralised bargaining councils, dominated by trade unions, set wages and conditions, limiting wage flexibility (Bhorat et al., 2009). Consequently, adjustments to tariff cuts are expected to occur primarily through employment rather than wages (Erten et al., 2019; Lepelle & Edwards, 2024).

This paper builds on three key studies of the impact of trade liberalisation on South African local labour markets. Erten et al. (2019) analyse 1994–2004 household survey data and find that tariff reductions reduced manufacturing employment and increased labour force exits, with little movement into other sectors or regions. Lepelle and Edwards (2024) use population census data for 1996, 2001 and 2011, and also find no evidence of structural shifts in employment from manufacturing to services following liberalisation. In contrast, they find that negative demand spillovers from manufacturing declines reduce employment in services in local labour markets. Bastos and Santos (2022) also use the 1996, 2001, and 2011 population census data and show that liberalisation reduced overall local employment and income in the medium to long term, particularly in municipalities containing former homelands.

We extend these studies in several ways. We explicitly examine heterogeneity in effects by gender and race. Unlike Erten et al. (2019) and Bastos and Santos (2022), we employ an instrumental variable (IV) strategy to address potential endogeneity in tariff changes, thus providing a tighter estimate of the causal effect of tariff liberalisation on labour market outcomes. Finally, while Bastos and Santos (2022) emphasise spatial immobility and regional disadvantage as key frictions driving employment outcomes, we identify industry segregation in the textile industry as the dominant channel behind gendered outcomes.

We find that tariff reductions have had no effect on manufacturing wages, with its impact falling entirely on employment. Municipalities that were more exposed to tariff reductions experienced slower growth in manufacturing employment of both men and women. The effect was significantly stronger for women, particularly Black[2] women, thus widening the gender employment gap. The dominant sources of these gendered effects are shown to be industry segregation, combined with comparatively significant tariff reductions in female-intensive industries such as textiles. Overall, the results show that tariff liberalisation in South Africa not only deepened gender inequalities in manufacturing but also reinforced regional and racial disparities. This highlights the intersectional nature of trade shocks in post-apartheid labour markets.

The rest of the paper is structured as follows: Section two discusses the theoretical literature review, and Section three presents the empirical approach employed in the analysis. Section four presents the data sources and an overview of tariff liberalisation and the labour market in South Africa. Section five discusses the estimation results and robustness checks. Lastly, the paper presents concluding remarks.

2. Theoretical Literature Review

Trade liberalisation may affect men and women differently through several transmission channels rooted in trade theory. The first channel is through industrial segregation. Gender-based sorting across industries is a global phenomenon, often reinforced by social norms, discrimination, and stereotypes (Anker et al., 2003; Braunstein & Seguino, 2018; Elson & Pearson, 1981). These norms restrict women's occupational mobility, making them more vulnerable to trade shocks when concentrated in industries experiencing large tariff cuts. In South Africa, women tend traditionally to be employed in specific industries, particularly textiles (Nattrass & Seekings, 2012). Tariff reductions in this industry are therefore likely to affect women disproportionately.

The second channel presented is competition. According to Becker's (2010) theory, increased import competition should reduce employer discrimination, as less efficient discriminatory firms are priced out of the market. This suggests a convergence in wages and employment between genders.

The third channel is technological progress. Liberalisation of tariffs may be associated with innovation and the adoption of new technologies that are more skill-intensive and less brawn-intensive (Galor & Weil, 1996; Juhn et al., 2014; Weinberg, 2000). If men and women have different skills or levels of educational attainment, this may have implications for gendered labour market outcomes (Acemoglu, 2003; Thoenig & Verdier, 2003; Wood, 1995). The gender group with the highest average level of educational attainment will benefit from liberalisation.

Technological change may also be gender-biased due to differences in physical strength, often framed as a "brain versus brawn" dynamic (Galor & Weil, 1996; Juhn et al., 2014; Weinberg, 2000). Women, on average, are less endowed with physical strength than men,

[2] We use racial categories in accordance with the Employment Equity Act (1998). Black comprises Africans, Coloureds, and Indians/Asians.

and as production shifts away from physically demanding tasks, this can favour female employment. In this context, technological upgrading in industries reliant on strength may reduce gender disparities by increasing demand for cognitive rather than physical attributes.

However, gendered differences in skills may also shape how technological change affects employment. The impact on female employment depends not only on the relative skill endowments of women compared to men (Acemoglu, 2003; Thoenig & Verdier, 2003; Wood, 1995), but also on how firms respond to those differences. For example, suppose technological upgrading increases the demand for cognitive rather than manual tasks. In that case, firms may prefer relatively more educated women if they possess higher average qualifications.

Feminist economists such as Braunstein and Folbre (2001) point out that technological progress, often accompanying tariff liberalisation, can shift relative prices between market and household work, thereby promoting women's participation in the formal labour market. This, in turn, could contribute to a narrowing of the gender employment gap.

The implication is that liberalising tariffs, accompanied by technological progress and coupled with societal norms that restrict women to specific industries, such as the textile industry, is likely to benefit women in countries with a comparative advantage in labour-intensive, female-intensive industries (Gaddis & Pieters, 2017). Conversely, the gender gap may widen where women are disproportionately represented in industries facing increased international competition following liberalisation.

3. Empirical Framework

To estimate the effect of tariff liberalisation on regional manufacturing employment, we adopt a first-difference approach for two periods: 1996–2001 and 2001–2011. The baseline model is:

$$\Delta lnE_{mt}^{manuf} = \alpha + \beta_1 \Delta TPman_{mt} + \beta_2 \Delta X'_{mt} + \beta_3 Z'_{m,t-1} + \lambda_t + \Delta\varepsilon_{mt} \quad (1)$$

where the dependent variable, ΔlnE_{mt}^{mauf}, is the change in log manufacturing employment. $\Delta TPman_{mt}$ represents a change in the municipality's trade protection measure. We estimate the specifications for aggregate manufacturing employment and manufacturing employment disaggregated by gender and race.

The first set of controls includes the change in log working-age population, the change in migration rate, and the change in union intensity, denoted by $\Delta X'_{mt}$[3]. We include these as changes in employment may reflect changes in migration rates, which in turn may be influenced by tariff liberalisation. Tariff liberalisation has been found to reduce union intensity (Ogeda et al., 2025), which can, in turn, mediate its effect on employment. Given higher union intensity amongst male workers in South Africa, these changes may influence the outcome of

[3] Working-age population is transformed into a natural logarithm. Migration rate is calculated as individuals who moved subsequent to the last census as a share of the working-age population. Union-intensity is the share of union members.

trade liberalisation on the gender gap. Changes in tariff protection and control variables between the census years 1996 and 2001 and between 2001 and 2011 are annualised to account for uneven time gaps. Other controls, denoted by $Z'_{m,t-1}$, include lagged municipality characteristics such as the share of skilled workers (number of skilled workers normalised by the skilled working-age population), number of unemployed individuals as a share of the working-age population, and infrastructure quality (indicators include electricity, flush toilet, piped water and regular collection of refuse). Further, to control for relatively rapid technological change in manufacturing that can drive deindustrialisation, we include the initial share of manufacturing sector in employment. Finally, we control for period fixed effects (λ_t) to capture macroeconomic shocks or developments that affect all industries equally.

We also test for the effect of tariff liberalisation on the gender employment gap in manufacturing using equation (2).

$$\Delta ln\left(\frac{m}{f}\right)_{mt} = \alpha + \beta_1 \Delta TPman_{mt} + \beta_2 \Delta X'_{mt} + \beta_3 Z_{m,t-1} + \lambda_t + \Delta\varepsilon_{mt} \quad (2)$$

where $\Delta ln\left(\frac{m}{f}\right)_{mt}$ is the indicator of the gender employment gap measured as a change in the natural logarithm of the level of male employment (*m*) to female employment (*f*).

The main variable of interest, the trade protection measure[4], is calculated using equation (3) as follows:

$$TPman_{mt} = \sum_i \frac{Emp_{i,m,initial}}{Emp_{m,initial}} * Tr_{it} \quad (3)$$

where $TPman_{mt}$ represents the manufacturing trade protection measure at time *t*, $Emp_{i,m,initial}$ is initial manufacturing employment in industry *i*, and municipality *m,* while $Emp_{m,initial}$ is the initial total manufacturing employment in municipality *m*. Tr_{it} denotes simple average tariff rates in industry *i* at time *t*. *TPman* values will differ across regions based on their industry mix and the tariffs associated with those industries. Regions with high initial shares of manufacturing employment in industries that face high tariffs will have comparatively high levels of *TPman*.

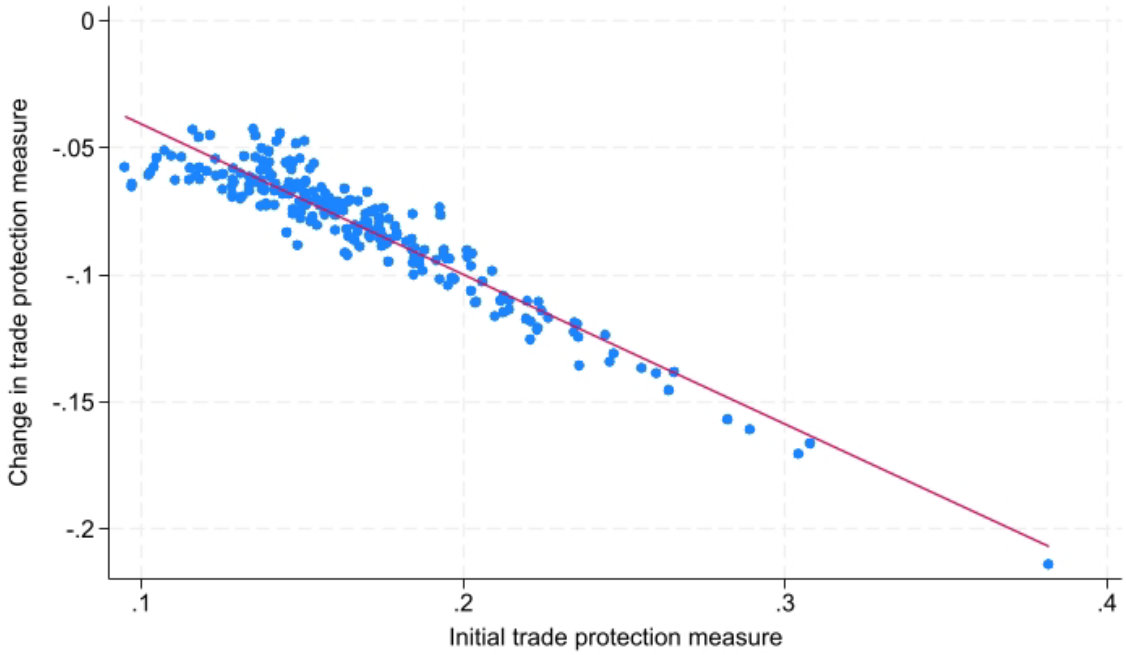
A potential estimation issue is that tariff changes themselves may be a function of employment changes. For example, in the face of job losses, tariffs may be increased or the reduction in tariffs slowed. This can bias the estimate of the tariff coefficient downwards, leading to an under-estimate of the employment effects of liberalisation. We address the potential endogeneity issue by following Ahsan (2013), Amiti and Konings (2007), and Goldberg and Pavcnik (2007) and use an IV estimation strategy that treats the initial tariff level as an instrument for the subsequent change.

The validity of our IV strategy depends on two key assumptions. First, that initial tariffs are correlated with subsequent tariff changes. As shown in Figure 1, regions with employment concentrated in industries with the highest initial tariffs faced the largest cuts in tariff exposure.

[4] The trade protection measure contains manufacturing tariffs only, tariffs for the primary sector and services are excluded.

This association is driven by the tariff liberalisation and rationalisation offered by South Africa during the Uruguay Round of the WTO in 1995, which disproportionately cut high tariff line items (Edwards, 2005). Second, we assume that initial tariffs are uncorrelated with changes in the error term. This does not seem to be an unrealistic assumption because the 1996 tariffs are likely to be far removed from current changes in the error term.

Figure 1: Correlation between initial tariff rates and change in tariff rates



Notes: Own calculations using the South African Population Census data for 1996, and tariff data from Edwards (2015). Employment-weighted tariffs are constructed by averaging the regional tariff variable, where regional tariffs are weighted by the 1996 regional manufacturing employment shares. The change in the protection measure is defined as the difference in values between 1996 and 2011.

4. Data and variables

In this study we draw on the full and 10% sample of the South African Population Censuses for 1996, 2001, and 2011, using municipalities as the spatial unit of analysis. The dataset comprises 234 municipalities and provides information on gender, education, income, industry, occupation, migration, and employment status for individuals aged 15–65.

Employment is defined as full-time work, and unemployment is defined as an active job search within the past four weeks. Migration is recorded when individuals have changed location since the last census. To approximate wages, we use reported income as a proxy, following Redding and Venables (2004). While income includes transfers and allowances, it is dominated by earnings in the South African context (Leibbrandt et al., 2010). Income brackets are converted to continuous variables using midpoints; the top bracket is capped at twice its lower bound. This approach has commonly been used in the literature (Mudiriza & Edwards, 2020).

Trade exposure is captured through industry-level average nominal tariff rates, updated from Edwards (2005), who compiled tariffs from UNCTAD's TRAINS database[5]. The updated tariff series spans 1996 to 2011 and is aggregated, using simple averages, to 10 manufacturing industries defined at the 2-digit level of the International Standard Industrial Classification (ISIC)[6].

Additional controls include union intensity, skill gap, brawn intensity and infrastructure. Union intensity is the share of unionised manufacturing workers from the October Household Survey (1996), the Labour Force Survey (2001), and the Quarterly Labour Force Survey (2011). The skills gap refers to the ratio of skilled workers (individuals with a post-matric or post-Grade 12 qualification) to unskilled workers, as determined from the full census. We use the production/non-production employment ratio in manufacturing industries as a proxy for brawn-intensity. Production occupations include craft and trades workers, and plant and machine operators. The infrastructure variable is derived as a principal component of households with access to electricity, regular refuse collection, a flush toilet, and piped water as a share of the total number of households.

4.1 Tariff Liberalisation in South Africa in the Post-Apartheid Era

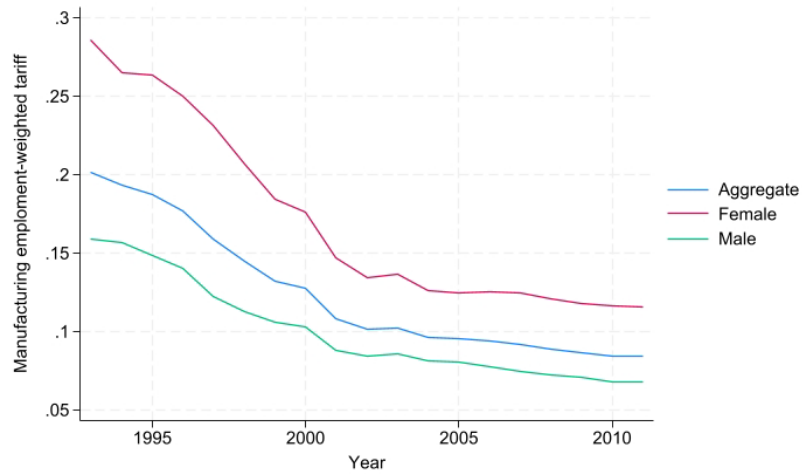
In the early 1990s, South Africa emerged from a period of international isolation. The extensive process of reducing import tariffs commenced with the agreements in the Uruguay Round of the WTO in 1995 and the subsequent implementation of free trade agreements with the EU and SADC. Figure 2 illustrates the trend in average regional tariff exposure using three different employment-weighted tariff rates derived from equation (3). The aggregate measure reflects the average protection faced by male and female workers. To account for differences in the gender composition of employment across industries, gender-specific tariff exposure measures are calculated using industry employment shares for men and women separately.

Between 1993 and 2011, aggregate employment-weighted tariffs fell by 12 percentage points, from 20% to 8%. The gender-specific tariff exposure measures reveal higher tariff levels, but steeper cuts for women. Average tariffs on female-weighted employment shares decreased from 29% to 12% (17 percentage points), compared to a decrease from 16% to 7% for men (9 percentage points). Women were thus concentrated in industries facing higher initial protection and larger tariff reductions.

[5] South Africa has a complex set of trade measures, including ad-valorem, specific and mixed tariffs, which pose a challenge for the calculation of tariff measures. We considered only the ad valorem tariffs and the ad valorem component of the mixed tariffs. Specific tariffs were excluded.

[6] The two-digit SIC level manufacturing industries include: (1) Food, beverages and tobacco products; (2) Textiles; clothing and footwear; (3) Wood products; (4) Fuel, petroleum and chemical products; (5) Non-metallic products; (6) Metal products and machinery; (7) Electrical machinery; (8) Electronic products; (9) Transport equipment; and (10) Furniture & recycling.

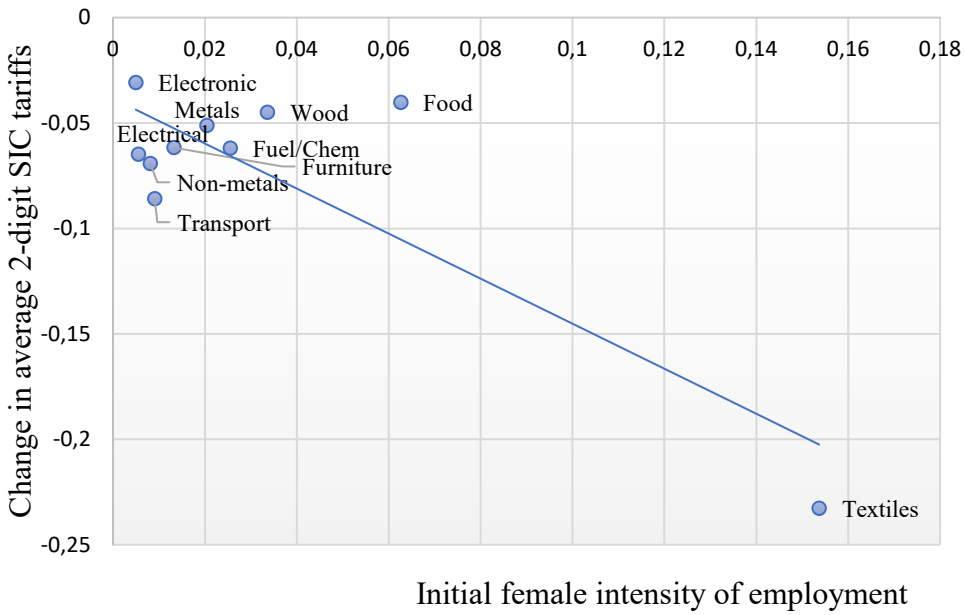
Figure 2: Evolution of manufacturing employment-weighted tariff rates



Notes: Own calculations using the South African Population Census data for 1996, and tariff data from Edwards (2015). Employment-weighted tariffs are constructed by averaging the regional tariff variable, where regional tariffs are weighted by the 1996 regional manufacturing employment shares.

Figure 3 plots the change in average tariffs from 1996 to 2011 against the 1996 female employment intensity for the ten manufacturing industries. The steepest cuts occurred in the textile industry, which has the highest female employment intensity. Similar negative associations are found when plotting the change in regional tariffs from 1996 to 2011 against the 1996 regional share of females in manufacturing employment. Reductions in tariff exposure disproportionately affected women through industrial segregation.

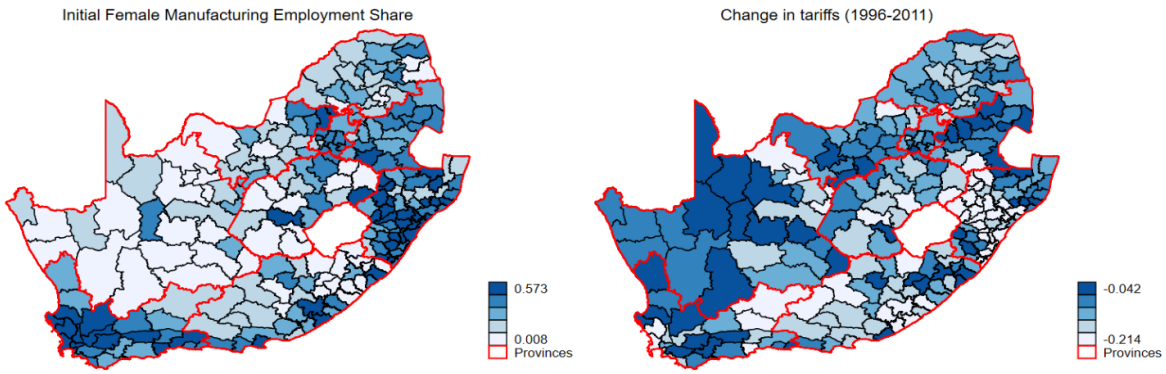
Figure 3: Industry and Gender-biased tariff reductions between 1996 and 2011



Notes: Own calculations using the South African Population Census data for 1996, and tariff data from Edwards (2005) updated to 2011. Employment-weighted tariffs are constructed by averaging the regional tariff variable, where regional tariffs are weighted by the 1996 regional manufacturing employment shares. The change in the protection measure is defined as the difference in values between 1996 and 2011. Abbreviations correspond to industry names as follows: Food = Food; beverages & tobacco products, Textiles = Textiles; clothing & footwear, Wood = Wood products, Fuel/Chem = Fuel; petroleum & chemical products, Non-metals = Non-metallic products, Metals = Metal products & machinery, Electrical. = Electrical machinery, Electronic = Electronic products, Transport = Transport equipment, Furniture = Furniture & recycling.

A spatial visual illustration of the distribution of the share of female employment within municipalities in 1996 and the change in tariffs between 1996 and 2011 is presented in Figure 4. The left map shows a wide variation in the share of females in manufacturing, with relatively high shares in provinces such as the Western Cape, KwaZulu-Natal, Gauteng, and parts of the Eastern Cape and Mpumalanga, as indicated by the darker shades. In the map on the right, the lighter shades denote larger reductions in tariff exposure. The map shows vast differences in tariff reductions across the municipalities, with relatively significant declines in protection occurring in the metropolitan areas of Cape Town (Western Cape), Buffalo City (Eastern Cape) and eThekwini (KwaZulu-Natal), as well as smaller municipalities such as Prince Albert (Western Cape), Ladysmith (KwaZulu-Natal) and Ngqushwa (Eastern Cape) where employment was concentrated in the clothing industry. We exploit this spatial variation to identify the effects of tariff changes on manufacturing employment.

Figure 4: Spatial distribution of female employment share in manufacturing and changes in tariff protection



Notes: Own calculations using the South African Population Census data for 1996 and 2011. Female manufacturing employment shares are calculated as female manufacturing employment as a share of total employment in each municipality. Tariff change refers to the percentage point difference in tariff rates between 1996 and 2011.

4.2 The South African Labour Market

The post-apartheid labour market has been characterised by slow employment growth and persistent gender disparities. Table 1 shows that the overall employment rate rose from 32.9% in 1996 to 38.9% in 2011, with women's rate increasing from 25.5% to 33.2%. Men continued to have higher rates (41% to 44.9%), though the gender employment gap narrowed from 15.5 to 11.7 percentage points.

Table 1: Total employment rates trend from 1996 to 2011

	1996	2001	2011
Employment rate: total employment/working-age population (%)			
Aggregate	32.9	30.8	38.9
Female	25.5	24.6	33.2
Male	41.0	37.7	44.9

Notes: Own calculations using the South African Population Census data for 1996, 2001 and 2011. The employment rate reflects employment normalised by the working-age population.

Manufacturing, central to this study, experienced sharper contractions. Its share of total employment fell from 14% in 1996 to 9.8% in 2011, shown in Table 2. Men remained more concentrated in manufacturing than women (11.6% vs. 7.5% in 2011), but female-dominated industries faced deeper tariff cuts, increasing women's vulnerability.

Table 2: Manufacturing employment shares from 1996 to 2011

	1996	2001	2011
Manufacturing share/total employment (%)			
Aggregate	14.0	13.8	9.8
Female	11.7	11.0	7.5
Male	15.6	15.8	11.6

Notes: Own calculations using the South African Population Census data for 1996, 2001 and 2011. The manufacturing share is the percentage of manufacturing employment as a share of total employment.

As shown in Table 3, the skill intensity in manufacturing rose significantly over the period. Skill share (measured as the share of skilled workers[7]) of workers in manufacturing has risen strongly over the period, rising from 5.0% in 1996 to 10.0 % in 2011, with stronger increases for women than for men. Conversely, the production (brawn) share is defined as the proportion of workers engaged in production[8] work in manufacturing industries declined to 40.4% in 2011 from 50.7% in 1996. This trend is also evident across genders, which suggests a technological shift toward less physically demanding work. These patterns are consistent with liberalisation-linked structural change.

Table 3: Skill and brawn employment shares in manufacturing from 1996 to 2011

		1996	2001	2011
Skill share				
	Aggregate	5.0	6.8	10.0
	Female	5.0	6.6	12.8
	Male	5.3	7.0	8.4
Production share				
	Aggregate	50.7	48.8	40.4
	Female	42.9	37.8	35.8
	Male	53.2	52.0	42.7

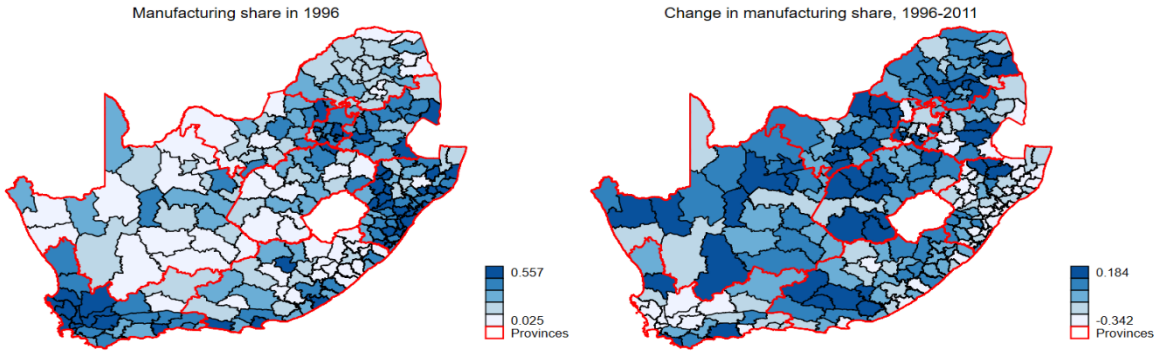
Notes: Own calculations using the South African Population Census data for 1996, 2001 and 2011. The figures are presented as a percentage. Skill-share is calculated as the number of skilled workers divided by the total number of skilled and unskilled workers across all manufacturing industries. Skilled workers are defined as workers with post-matric (Grade 12) qualifications. Production share represents the number of workers employed as craft and trade workers and plant and machine operators as a percentage of the total number of workers employed in all occupations (production/non-production occupations) in manufacturing industries. We ran a t-test to determine whether the differences between men and women in terms of employment, manufacturing employment, skill share, and production share in manufacturing are statistically significant. The results are presented in Table A1 in the appendix. All the p-values are less than 0.05, indicating that the gender differences are significant.

Spatial variation of manufacturing employment is also evident. Figure 5 maps manufacturing employment shares in 1996 and subsequent changes to 2011. High initial manufacturing

[7] Share of skilled workers is computed as skilled workers divided by the sum of skilled and unskilled workers.
[8] Production workers are defined as individuals working as craft and trades workers as well as plant and machine operators in manufacturing industries. The share of production workers reflects brawn-intensity.

employment shares were found in Gauteng, KwaZulu-Natal, and the Western and Eastern Cape, the country's industrial hubs. These regions also experienced the sharpest declines in share from 1996 to 2011. Elsewhere, some municipalities, such as Kgatelopele (Northern Cape), Greater Tubatse (Limpopo), and Albert Luthuli (Mpumalanga), saw modest increases, reflecting uneven regional adjustment.

Figure 5: Spatial distribution of manufacturing employment share



Notes: Own calculations using the South African Population Census data for 1996 and 2011. Manufacturing employment shares are calculated as manufacturing employment as a share of total employment in each municipality. The change in manufacturing employment share is defined as the difference in the shares between 1996 and 2011.

Table 4 summarises annualised changes in trade protection, manufacturing wages, and employment across municipalities[9]. The data show significant variation in exposure to tariff reductions and employment outcomes. We observe substantial differences in exposure to international competition through tariff reductions. The average change in aggregate trade protection across municipalities is 7 percentage points; the median is about 5 percentage points, and the standard deviation is about 6 percentage points. The municipality in the 25th percentile experienced a tariff reduction that was nearly 8 percentage points larger than that of a municipality in the 75th percentile.

While manufacturing wages and employment rose modestly overall, the dispersion was considerable, particularly for women, whose employment changes had a higher standard deviation (10.2 percentage points) than men (8.6), suggesting greater volatility. Although the average change in the gender employment gap was close to zero, its large standard deviation (7.9) points to substantial spatial variation.

Disaggregation by race reveals further asymmetries. Black workers experienced substantial average employment gains (17.5 percentage points), though the gender gap varied significantly across space. For White workers, employment changes were negligible (−2.1 for women, −0.8 for men). The White gender gap averaged just 0.8 points but with a large standard deviation (26.3), again pointing to uneven local effects.

[9] Some municipalities had no manufacturing base; these zeros reduce sample size but not identification.

Table 4: Summary statistics of the change in tariffs and manufacturing employment between 1996 and 2011

Variable	Mean	P50	SD	P75-P25
Δ*TPman*	-0.007	-0.005	0.006	0.008
Δln(Manufacturing wage)	0.079	0.075	0.111	0.105
Female	0.087	0.080	0.149	0.126
Male	0.071	0.065	0.130	0.112
Δln(Manufacturing employment)	0.019	0.024	0.085	0.086
Female	0.018	0.026	0.102	0.110
Male	0.019	0.025	0.086	0.075
Gender gap	0.001	0.002	0.079	0.089
Δln(Manufacturing employment: Black)	0.175	0.108	0.523	0.368
Female	0.151	0.133	0.456	0.377
Male	0.176	0.114	0.529	0.367
Gender gap	0.000	0.002	0.088	0.096
Δln(Manufacturing employment: White)	0.000	0.019	0.272	0.107
Female	-0.021	0.027	0.306	0.146
Male	-0.008	0.016	0.268	0.108
Gender gap	0.008	-0.005	0.263	0.114

Notes: Own calculations using the South African Population Census data for 1996, 2001 and 2011. Variables specified in changes are annualised and cover the periods 1996–2001 and 2001–2011. ΔTPman is the change in trade protection measure (tariff rates weighted by manufacturing employment shares). *M*anufacturing employment share is the percentage of manufacturing jobs as a share of total employment in each municipality. The gender gap is defined as the ratio of male manufacturing employment to female manufacturing employment. Black includes Africans, Coloureds and Indians/Asians.

5. Estimation Results

5. 1 The Effects of Tariff Liberalisation on Manufacturing Wages

We begin by examining whether tariff reductions affected wages. Table 5 presents separate IV estimates covering all workers, female workers and male workers, using initial tariff levels as an instrument for tariff changes[10]. No significant association between tariff reductions and average municipal wages in municipalities is found. This aligns with findings by Erten et al. (2019) and Lepelle and Edwards (2024) for South Africa. However, they are inconsistent with findings in the United States of America (USA) by Autor et al. (2015) and Brazil by Benguria and Ederington (2023) where regional exposure to increased imports from China reduced wages and the gender wage gap. Our results suggest that wage rigidity, institutional structures, or sectoral bargaining in South Africa dampen wage flexibility. Our results also indicate that adjustment to tariff liberalisation is likely to occur through changes in employment.

[10] First-stage IV results are provided in the appendix, Table A2.

Table 5: The effects of tariff liberalisation on manufacturing wages

	(1)	(2)	(3)
	Dependent variables: Change in log manufacturing wage		
VARIABLES	Aggregate	Female	Male
ΔTariff	0.897	2.016	-4.568
	(2.548)	(2.644)	(6.943)
ΔLog working-age population	-0.053	-0.522	0.525
	(0.448)	(0.600)	(0.609)
ΔLog labour force	-0.015	0.376	-0.193
	(0.313)	(0.461)	(0.395)
ΔMigration rate	1.220***	1.673***	0.862*
	(0.374)	(0.504)	(0.490)
ΔUnion intensity	-0.302	0.369	-0.194
	(0.622)	(0.799)	(0.658)
Initial skill rate	-0.071	-0.122	-0.022
	(0.137)	(0.156)	(0.173)
Initial unemployed rate	-0.094	0.065	-0.275
	(0.127)	(0.145)	(0.202)
Initial manufacturing share	-0.015	-0.039	-0.020
	(0.057)	(0.076)	(0.093)
Initial infrastructure	0.047	0.084**	0.021
	(0.029)	(0.034)	(0.033)
Dummy variable year 2011	-0.100***	-0.086**	-0.026
	(0.033)	(0.042)	(0.052)
Constant	0.139***	0.133**	0.074
	(0.043)	(0.053)	(0.061)
Observations	467	464	466
R-squared	0.063	0.048	0.065
Year FE	Yes	Yes	Yes

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

Notes: Estimation is based on the 2SLS IV strategy. Municipalities with zero manufacturing employment in a given census year are excluded. The tariff variable is the manufacturing employment-weighted tariff rates. ΔTariff is the change in tariffs, which comprises the difference in tariffs in the initial period (1996) and tariffs in the final period (2011). Working-age population includes individuals aged between 15 and 65 years. Labour force is the sum of employed and unemployed individuals within the working-age population. Migration rate represents the number of individuals who have migrated since the last census as a percentage of the working-age population. Union intensity refers to the percentage of trade union members. Skill rate denotes the proportion of skilled workers within the working-age population, and the unemployment rate represents the number of unemployed individuals as a percentage of the working-age population. Infrastructure represents the number of households with access to electricity (including solar), weekly refuse collection, a flush toilet and piped water, as a share of total households. Manufacturing share reflects manufacturing employment as a percentage of total employment, excluding employment in the primary sector.

5.2 The Effects of Tariff Liberalisation on Aggregate Manufacturing Employment

We next examine the effect of tariff cuts on manufacturing employment, with the results presented in Table 6. In the baseline estimates in column (1), we find that changes in tariffs are positively and significantly associated with changes in employment levels. The results imply that a one percentage point reduction in the regional tariff indicator is associated with a 4.1% decline in manufacturing employment within that municipality. This finding is in line with those for other countries found by Kovak (2013) and Gaddis and Pieters (2017).

On average, tariffs declined by 0.7 percentage points (Table 4). These tariff reductions translate into a 2.8% decrease in manufacturing employment. The raw data reveal that

manufacturing employment declined by 1.9 log points between 1996 and 2011, suggesting that tariff cuts can account for the full decline in employment over this period.

Column (2) extends the regression to include a measure of regional import exposure, constructed as imports per worker, following the approach of Autor et al. (2015). We do this to assess whether tariff liberalisation has an additional effect beyond the import effect. For example, producers of domestically produced import substitutes may reduce prices in response to liberalisation, thereby offsetting the negative import responses. The coefficient on import is insignificant. While the coefficient on tariffs falls, as expected, it remains statistically significant at the 5% level. The implication is that the full effect of tariff liberalisation on employment is not captured by imports alone. The price effect presents an additional important channel through which employment is affected.

Table 6: Effects of tariff liberalisation on manufacturing employment

	(1)	(2)
	Dependent variables: Change in log manufacturing employment	
VARIABLES	Baseline	Baseline with imports
ΔTariff	4.133**	3.857**
	(1.805)	(1.786)
ΔImports		-0.414
		(0.306)
ΔLog working-age population	-0.190	-0.238
	(0.375)	(0.376)
ΔLog labour force	1.005***	1.046***
	(0.315)	(0.317)
ΔMigration rate	1.004***	0.986***
	(0.238)	(0.237)
ΔUnion intensity	1.747***	1.854***
	(0.438)	(0.434)
Initial skill rate	-0.053	-0.063
	(0.076)	(0.076)
Initial unemployed rate	0.050	0.046
	(0.076)	(0.075)
Initial manufacturing share	-0.258***	-0.258***
	(0.053)	(0.053)
Initial infrastructure	0.036*	0.036**
	(0.019)	(0.018)
Dummy variable year 2011	-0.006	0.067
	(0.021)	(0.055)
Constant	0.038	0.027
	(0.027)	(0.027)
Observations	467	467
R-squared	0.314	0.320
Year FE	Yes	Yes

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

Notes: Estimation is based on the 2SLS IV strategy. Municipalities with zero manufacturing employment in a given census year are excluded. The tariff variable is the manufacturing employment-weighted tariff rates. ΔTariff is the change in tariffs, which comprises the difference in tariffs in the initial period (1996) and tariffs in the final period (2011). ΔImports is calculated as imports per worker. Working-age population includes individuals aged between 15 and 65 years. Labour force is the sum of employed

and unemployed individuals within the working-age population. Migration rate represents the number of individuals who have migrated since the last census as a percentage of the working-age population. Union intensity refers to the percentage of trade union members. Skill rate denotes the proportion of skilled workers within the working-age population, and the unemployment rate represents the number of unemployed individuals as a percentage of the working-age population. Infrastructure represents the number of households with access to electricity (including solar), weekly refuse collection, a flush toilet and piped water, as a share of total households. Manufacturing share reflects manufacturing employment as a percentage of total employment, excluding employment in the primary sector.

5.3 Tariff Liberalisation Effects on Gendered Employment in Manufacturing

Table 7 unpacks the effects of the liberalisation of tariffs on manufacturing employment by gender and the gender gap, as measured by the employment ratio of men to women. The results show that municipalities more exposed to tariff reductions experienced slower growth in manufacturing employment among women than municipalities less exposed. A 1 percentage point tariff cut is associated with a 6.9% decrease in female manufacturing employment, with no effect on male manufacturing employment, suggesting that the tariff effect is disproportionately on women.

To evaluate whether the effects differ significantly by gender, we extend the analysis using equation (2). Column (3) indicates that tariff liberalisation widened the gender employment gap in manufacturing, particularly in municipalities more exposed to tariff reductions. Specifically, a 1 percentage point cut in tariffs is associated with a 4.8% increase in the gender employment gap.

These findings differ from Brazil and Indonesia, where liberalisation reduced gender gaps (Gaddis & Pieters, 2017; Kis-Katos et al., 2018). In South Africa, the concentration of women in industries facing the steepest tariff cuts hindered the expected pro-female effect of trade.

Table 7: Tariff liberalisation effects on gendered employment in manufacturing

	(1)	(2)	(3)
	Dependent variables: Change in log manufacturing employment		
VARIABLES	Female	Male	Gender gap
ΔTariff	6.994***	2.293	-4.842***
	(2.418)	(1.608)	(1.749)
ΔLog working-age population	-0.777*	0.009	0.830**
	(0.445)	(0.370)	(0.353)
ΔLog labour force	1.339***	0.875***	-0.494*
	(0.359)	(0.310)	(0.281)
ΔMigration rate	0.484	1.193***	0.715**
	(0.326)	(0.235)	(0.281)
ΔUnion intensity	1.648***	1.935***	0.283
	(0.574)	(0.427)	(0.477)
Initial skill rate	-0.047	-0.047	0.003
	(0.097)	(0.075)	(0.073)
Initial unemployed rate	0.038	0.019	-0.016
	(0.092)	(0.079)	(0.081)
Initial manufacturing share	-0.191***	-0.277***	-0.087*
	(0.067)	(0.048)	(0.050)
Initial infrastructure	0.036	0.032*	-0.003
	(0.022)	(0.019)	(0.017)

Dummy variable year 2011	-0.007	0.005	0.013
	(0.029)	(0.020)	(0.023)
Constant	0.079**	0.014	-0.067**
	(0.035)	(0.028)	(0.028)
Observations	465	466	464
R-squared	0.188	0.337	0.023
Year FE	Yes	Yes	Yes

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

Notes: Estimation is based on the 2SLS IV strategy. Municipalities with zero manufacturing employment in a given census year are excluded. The gender employment gap is derived as male employment/female employment in manufacturing. The tariff variable is the manufacturing employment-weighted tariff rates. ΔTariff is the change in tariffs, which comprises the difference in tariffs in the initial period (1996) and tariffs in the final period (2011). Working-age population includes individuals aged between 15 and 65 years. Labour force is the sum of employed and unemployed individuals within the working-age population. Migration rate represents the number of individuals who have migrated since the last census as a percentage of the working-age population. Union intensity refers to the percentage of trade union members. Skill rate denotes the proportion of skilled workers within the working-age population, and the unemployment rate represents the number of unemployed individuals as a percentage of the working-age population. Infrastructure represents the number of households with access to electricity (including solar), weekly refuse collection, a flush toilet and piped water, as a share of total households. Manufacturing share reflects manufacturing employment as a percentage of total employment, excluding employment in the primary sector.

5.4 Tariff Liberalisation and Gendered Manufacturing Employment across Race

South Africa is distinct from other middle-income countries because of its history of apartheid, which entrenched racial discrimination and deepened gender discrimination. At the core of apartheid was racial segregation and discrimination against the Black population in terms of access to land, education, location of settlement, mobility, employment opportunities across industries, and economic participation (Choe & Chrite, 2014; Von Fintel & Moses, 2017). A list of Apartheid Laws that affected the employment of women and people of colour in South Africa is available in Table A3 in the appendix.

Table 8 shows that Black women experienced the largest employment losses. A 1 percentage point tariff cut widened the Black gender employment gap by 5.2%. White workers, by contrast, were unaffected. This suggests that liberalisation reinforced both racial and gender divides: adjustment costs fell disproportionately on Black women, while White employment remained stable.

Table 8: Tariff liberalisation gendered effects on manufacturing employment across race

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variables: Change in log manufacturing employment					
	Black			White		
VARIABLES	Female	Male	Gender Gap	Female	Male	Gender gap
ΔTariff	7.478***	2.471	-5.207***	4.146	5.470	0.022
	(2.668)	(1.701)	(1.864)	(4.027)	(5.173)	(5.488)
ΔLog working-age population	-0.719	0.168	0.941**	-0.584	-0.438	0.261
	(0.460)	(0.393)	(0.389)	(0.491)	(0.590)	(0.491)
ΔLog labour force	1.287***	0.682**	-0.638**	1.595***	1.160***	-0.281
	(0.366)	(0.301)	(0.299)	(0.315)	(0.447)	(0.412)
ΔMigration rate	0.012	-0.373*	-0.338	-0.235	-0.289	-0.056
	(0.225)	(0.204)	(0.267)	(0.182)	(0.316)	(0.057)
ΔUnion intensity	1.725***	2.036***	0.293	0.010	-0.792	-0.068

	(0.495)	(0.366)	(0.426)	(1.019)	(1.005)	(1.213)
Initial skill rate	-0.011	0.087	0.106	0.139	-0.186	-0.316
	(0.139)	(0.094)	(0.113)	(0.234)	(0.186)	(0.284)
Initial unemployed rate	0.039	-0.033	-0.072	0.195	0.854	1.492
	(0.106)	(0.090)	(0.093)	(1.011)	(0.867)	(1.681)
Initial manufacturing share	-0.201***	-0.276***	-0.075	-0.379**	-0.583	-0.240*
	(0.071)	(0.050)	(0.054)	(0.177)	(0.354)	(0.135)
Initial infrastructure	0.032*	0.016	-0.016	0.114**	0.078	-0.015
	(0.017)	(0.014)	(0.014)	(0.050)	(0.047)	(0.057)
Dummy variable year 2011	0.007	0.061***	0.055***	0.050	-0.005	-0.060
	(0.028)	(0.020)	(0.021)	(0.043)	(0.052)	(0.061)
Constant	0.092***	0.025	-0.071**	0.001	0.232*	0.203
	(0.034)	(0.024)	(0.030)	(0.136)	(0.124)	(0.191)
Observations	463	466	462	387	416	376
R-squared	0.168	0.313	0.009	0.306	0.261	0.055
Period FE	Yes	Yes	Yes	Yes	Yes	Yes

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

Notes: Estimation is based on the 2SLS IV strategy. Municipalities with zero manufacturing employment in a given census year are excluded. The gender employment gap is derived as male employment/female employment in manufacturing. The tariff variable is the manufacturing employment-weighted tariff rates. ΔTariff is the change in tariffs, which comprises the difference in tariffs in the initial period (1996) and tariffs in the final period (2011). The control variables are restricted to the respective population group. Working-age population includes individuals aged between 15 and 65 years. Labour force is the sum of employed and unemployed individuals within the working-age population. Migration rate represents the number of individuals who have migrated since the last census as a percentage of the working-age population. Union intensity refers to the percentage of trade union members. Skill rate denotes the proportion of skilled workers within the working-age population, and the unemployment rate represents the number of unemployed individuals as a percentage of the working-age population. Infrastructure represents the number of households with access to electricity (including solar), weekly refuse collection, a flush toilet and piped water, as a share of total households. Manufacturing share reflects manufacturing employment as a percentage of total employment, excluding employment in the primary sector.

5.5 Determinants of Gendered Manufacturing Employment Effects

The pronounced adverse effect of trade liberalisation on women in South Africa stands in contrast to the experiences observed in countries such as Indonesia and Brazil, as well as to Becker's (2010) theoretical prediction that increased international competition should mitigate gender-based discrimination and thereby benefit women. To further unpack the mechanisms underlying this outcome, we investigate three potential channels – namely, skill or brawn intensity and industry segregation, focusing on manufacturing employment for Black workers, which our preliminary findings identify as the most affected group.

5.5.1 Transmission channels: Skills and Brawn

Technological upgrading associated with liberalisation may favour skill over physical strength (Galor & Weil, 1996; Juhn et al., 2014). If this effect is present, it may attenuate the potential adverse effects of tariff liberalisation on employment and the gender gap. To assess whether this effect is present for South Africa, we include measures for the change in brawn-intensity and skill-intensity of employment as controls in the regression, as presented in Table 9. If the skill and brawn channels are important, we expect that controlling for these factors should remove their mitigating influence, resulting in a more substantial adverse estimated effect of tariff liberalisation on the gender employment gap.

Broadly, the results presented do not find support for technological upgrading reducing the adverse effects of tariff reductions on Black female employment and the gender gap among Black workers. The coefficient on the skill gap is negative but statistically insignificant, indicating that variations in skill composition are not a key channel. By contrast, the brawn-intensity gap is statistically significant, though the coefficient's magnitude is very small, suggesting only a minor role. Across all specifications, the tariff coefficient remains unchanged — mainly after including these controls — and remains consistently negative and highly significant, confirming that tariff reductions disproportionately reduced Black female employment.

In the aggregate regressions, results are presented in the appendix Table A4, a similar pattern emerges for the tariff coefficient, but the skill gap becomes significant while the brawn-intensity gap loses significance. The negative coefficient for the skill gap suggests that regions with a higher share of skilled workers experienced larger reductions in employment, particularly among females. However, the skill gap did not have a significant effect on the gender employment gap.

Overall, our findings are similar to a study in Brazil by Gaddis and Pieters (2017), which finds that the skills gap and brawn-intensity gap are not the primary channels through which tariff liberalisation influences the employment gap.

Table 9: The effects of tariff liberalisation and transmission channels on manufacturing employment among Black workers

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variables: Change in log manufacturing employment among Black workers					
VARIABLES	Aggregate	Aggregate	Aggregate	Female	Male	Gender gap
ΔTariff	4.358**	4.247**	4.370**	7.521***	2.520	-5.187***
	(1.949)	(1.919)	(1.925)	(2.660)	(1.658)	(1.870)
ΔSkill gap	-0.523		-0.500	-0.241	-0.426	-0.163
	(0.788)		(0.780)	(0.897)	(0.795)	(0.635)
ΔBrawn-intensity		-0.008***	-0.008***	-0.005*	-0.010***	-0.005*
		(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
ΔLog working-age population	-0.063	0.092	0.006	-0.695	0.253	0.985**
	(0.389)	(0.384)	(0.383)	(0.466)	(0.383)	(0.390)
ΔLog labour force	0.853***	0.776**	0.810***	1.270***	0.634**	-0.663**
	(0.308)	(0.304)	(0.305)	(0.368)	(0.296)	(0.300)
ΔMigration rate	-0.250	-0.051	-0.235	-0.019	-0.341	-0.324
	(0.188)	(0.232)	(0.186)	(0.252)	(0.207)	(0.267)
ΔUnion intensity	1.928***	1.937***	1.924***	1.713***	2.010***	0.282
	(0.362)	(0.364)	(0.361)	(0.494)	(0.358)	(0.427)
Initial skill rate	0.084	0.080	0.100	0.006	0.115	0.119
	(0.099)	(0.100)	(0.098)	(0.140)	(0.090)	(0.115)
Initial unemployed rate	-0.021	-0.019	-0.039	0.025	-0.049	-0.081
	(0.088)	(0.086)	(0.087)	(0.111)	(0.090)	(0.093)
Initial manufacturing share	-0.263***	-0.259***	-0.259***	-0.199***	-0.271***	-0.073
	(0.055)	(0.055)	(0.055)	(0.071)	(0.049)	(0.054)

Initial infrastructure	0.018	0.018	0.016	0.030*	0.013	-0.017
	(0.014)	(0.014)	(0.014)	(0.017)	(0.014)	(0.014)
Dummy variable year 2011	0.039*	0.038*	0.039*	0.007	0.061***	0.055***
	(0.021)	(0.021)	(0.021)	(0.028)	(0.020)	(0.021)
Constant	0.051**	0.046*	0.050**	0.092***	0.023	-0.071**
	(0.025)	(0.024)	(0.025)	(0.035)	(0.024)	(0.030)
Observations	466	467	466	462	466	462
R-squared	0.299	0.295	0.304	0.170	0.322	0.011
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

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

Notes: Estimation is based on the 2SLS IV strategy. Municipalities with zero manufacturing employment in a given census year are excluded. The gender employment gap is derived as male employment/female employment in manufacturing. The tariff variable is the manufacturing employment-weighted tariff rates. ΔTariff is the change in tariffs, which comprises the difference in tariffs in the initial period (1996) and tariffs in the final period (2011). All control variables are restricted to black workers. Working-age population includes individuals aged between 15 and 65 years. Labour force is the sum of employed and unemployed individuals within the working-age population. Migration rate represents the number of individuals who migrated since the last census as a share of the working-age population. The change in log skill gap is measured as skilled workers ((individuals with a post-matric or post-Grade 12 qualification)/unskilled workers in manufacturing. The change in log brawn-intensity measured as production workers (craft and trade workers and plant and machine operators)/non-production workers in manufacturing industries excluding food & beverage, textiles and electronics. Migration rate represents the number of individuals who migrated since the last census as a share of the working-age population. Union-intensity is the share of union members. Skilled rate denotes skilled workers as a share of skilled working within the working-age population and unemployed rate is the number of unemployed individuals as a share of the working-age population. Infrastructure represents households with electricity (including solar). weekly refuse collection. flush toilet and piped water as a share of the total number of households. Manufacturing share reflects manufacturing employment as a share of total employment, excluding the primary sector.

5.5.2 Gender-based Industry Segregation

An important channel driving these results is gender-based employment segregation across industries, characterised by the disproportionate concentration of men and women in specific sectors. This segregation, as already shown in Figure 3, is well documented in the international literature. Kis-Katos et al. (2018) show that in Indonesia, 61.9% of female manufacturing workers are employed in textiles compared with only 8.2% in basic metals, while Gaddis and Pieters (2017) find that in Brazil, women are overrepresented in the nontradable sector. Borrowman and Klasen (2020) similarly emphasise that structural constraints and gender norms contribute to women's concentration in a narrow set of industries, often those with lower wages and weaker growth prospects.

This dynamic is particularly relevant in South Africa, where women, particularly Black women, are disproportionately employed in low-wage, labour-intensive sectors such as textiles. The widening gender gap in employment outcomes may therefore reflect not only aggregate trade liberalisation effects, but also the interaction between industry-specific tariff reductions and pre-existing patterns of gender segregation across industries.

To capture the extent of industry segregation, we computed the absolute difference in industry employment shares across municipalities, as defined in equation (4). This measure quantifies the divergence between male and female employment distributions across manufacturing industries within each municipality.

$$abs\ diff_{mt} = \left| \frac{E^{F}_{imt}}{E^{F}_{mt}} - \frac{E^{M}_{imt}}{E^{M}_{mt}} \right| \quad (4)$$

where $abs\ diff_{mt}$ is the absolute difference in employment across all manufacturing industries in municipality *m*. $\frac{E_{imt}^{F}}{E_{mt}^{F}}$ and $\frac{E_{imt}^{M}}{E_{mt}^{M}}$ represent the shares of female and male employment in industry *i* in municipality *m*, respectively, relative to total female and male employment in manufacturing.

Appendix Table A5 presents the evolution of industry employment shares, revealing a clear shift in the structure of manufacturing employment. In 1996, women, particularly Black women, were concentrated in textiles (46% overall; 52% among Black women), but by 2011, textile employment had fallen sharply (14% overall; 16% among Black women; 7% among White women), alongside increases in metals and food. Male distributions remained stable in metals (22%) and food (21%). These changes, especially the contraction of textiles, contributed to a gradual decline in gender segregation, although Black workers continued to face a more unequal industrial distribution.

The contraction of the textile industry represents a major between-sectoral shift in the manufacturing employment structure and thus offers a key case for examining how sectoral change mediates the employment effects of tariff liberalisation. To test this mechanism, we first regress the change in textile employment on the change in tariffs (appendix Table A6). The coefficient is positive and significant, indicating that regions experiencing larger tariff reductions also saw significant contractions in textile employment. This supports the view that structural change away from textiles is closely associated with tariff liberalisation.

Next, we include the change in textile employment in the main regression. The results in Table 10 show that once we account for changes in textile employment, the tariff effect on aggregate employment among Black workers disappears, and the coefficients for Black female employment and the gender gap remain significant only at the 10% level. We find similar results for aggregate manufacturing employment (Table A7). Although the tariff effect does not fully dissipate, the attenuation suggests that part of the gendered employment impact of tariff reductions operates through structural shifts toward less female-intensive sectors.

These results underscore three key points. First, tariff reductions are not gender-neutral: male- and female-intensive industries experienced different levels of liberalisation. Second, while industry segregation, particularly in textiles, amplified women's vulnerability, the persistence of tariff effects even after controlling for textiles indicates that liberalisation itself disproportionately reduced women's relative employment. Third, racial differences in industry segregation explain the contrasting impacts between Black and White workers.

Our findings align with those of Gaddis and Pieters (2017) and Kis-Katos et al. (2018), who also identify industry segregation as the key channel for gendered trade effects. However, in Brazil and Indonesia, segregation favoured women; liberalisation supported growth in female-intensive sectors. In contrast, South Africa's female-intensive industries were the most exposed, resulting in adverse outcomes for women.

Table 10: The role of the textile industry in gendered employment among Black workers

	(1)	(2)	(3)	(4)
	Dependent variables: Change in log manufacturing employment among Black workers			
VARIABLES	Aggregate	Female	Male	Gender gap
ΔTariff	2.276	4.608*	1.149	-3.459*
	(1.998)	(2.638)	(1.771)	(1.787)
ΔTextile employment	0.059**	0.079**	0.043	-0.037
	(0.025)	(0.034)	(0.028)	(0.037)
ΔLog working-age population	0.142	-0.465	0.304	0.769*
	(0.400)	(0.461)	(0.408)	(0.392)
ΔLog labour force	0.714**	1.077***	0.603*	-0.474
	(0.315)	(0.361)	(0.313)	(0.304)
ΔMigration rate	-0.300	-0.175	-0.370*	-0.195
	(0.195)	(0.248)	(0.217)	(0.251)
ΔUnion intensity	2.083***	1.815***	2.148***	0.333
	(0.371)	(0.483)	(0.373)	(0.418)
Initial skill rate	0.049	0.003	0.063	0.060
	(0.101)	(0.136)	(0.097)	(0.115)
Initial unemployed rate	-0.011	0.022	-0.008	-0.030
	(0.089)	(0.108)	(0.093)	(0.094)
Initial manufacturing share	0.022	0.030	0.022	-0.008
	(0.015)	(0.018)	(0.015)	(0.015)
Initial infrastructure	-0.280***	-0.226***	-0.284***	-0.058
	(0.058)	(0.074)	(0.052)	(0.055)
Dummy variable year 2011	0.091***	0.078**	0.096***	0.018
	(0.029)	(0.037)	(0.028)	(0.028)
Constant	0.002	0.023	-0.009	-0.032
	(0.032)	(0.044)	(0.032)	(0.037)
Observations	424	424	424	424
R-squared	0.341	0.217	0.341	0.016
Year FE	Yes	Yes	Yes	Yes

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

Notes: All the estimations are based on the 2SLS IV strategy. Municipalities with zero manufacturing employment in a given census year are excluded. The gender employment gap is calculated as the ratio of male employment to female employment in manufacturing. Tariff variable is the manufacturing employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. All control variables are restricted to black workers. ΔTextile employment reflects the change in the log textile employment in total manufacturing, which comprises the difference between the initial period (1996) and the final period (2011). Working-age population includes individuals aged between 15 and 65 years. Labour force is the sum of employed and unemployed individuals within the working-age population. Migration rate represents the number of individuals who have migrated since the last census as a percentage of the working-age population. Union intensity refers to the percentage of trade union members. Skill rate denotes the proportion of skilled workers within the working-age population, and the unemployment rate represents the number of unemployed individuals as a percentage of the working-age population. Infrastructure represents the number of households with access to electricity (including solar), weekly refuse collection, a flush toilet and piped water, as a share of total households. Manufacturing share reflects manufacturing employment as a percentage of total employment, excluding employment in the primary sector.

5.6 Robustness Check

We perform several robustness exercises to assess the stability of our results and the validity of the underlying transmission channel. The results are presented in the appendix.

First, we re-estimate the model using an alternative instrument for tariff changes. The instrument is constructed from average tariffs of nine low- and middle-income countries (LMICs), including Chile, China, India, Malawi, Malaysia, Mali, Mauritius, Mexico, and Nigeria. These countries were liberalised over the same period. These countries were selected for their similar development status and alignment with WTO reforms. Their tariff trajectories are plausibly correlated with South Africa's but unlikely to directly influence South African labour outcomes, satisfying relevance and exclusion restrictions. Following Autor et al. (2015), we weight-average LMIC tariffs by the 1996 municipal employment shares. This approach follows similar strategies used in the literature on trade exposure and labour market outcomes, where global trade shocks have been used to instrument for domestic policy changes, such as Topalova (2010) and Autor et al. (2015), leveraging exogenous variation in external tariff trends to identify the causal effect of trade liberalisation on gendered labour outcomes.

The first-stage results show a significant positive correlation between the instrument and domestic tariff changes at the municipal level (Table A8). The second-stage estimates in the Table A9, corroborate our main findings that tariff cuts reduced manufacturing employment, with larger adverse effects for women, particularly Black women, thereby widening the gender employment gap.

Second, we examine whether the results are driven by tariff reductions in the highly female-intensive textile, clothing, and footwear industries. We construct a tariff-exposure measure excluding these industries, which experienced the steepest tariff cuts. The results in Table A10 show that the effect of tariff liberalisation on gendered employment and the gender gap largely disappears once textiles are excluded. The tariff coefficient becomes small and statistically insignificant in most specifications, and the gender-gap coefficient turns positive, suggesting that tariff cuts may even narrow the gap slightly when textiles are removed. These results demonstrate that the strong gendered effects identified earlier are concentrated in municipalities exposed to tariff reductions in female-dominated industries. The larger standard errors in this specification indicate that removing textiles eliminates much of the identifying variation in the tariff measure.

Lastly, to verify that the observed effects are specific to female-intensive industries rather than general manufacturing decline, we conduct a placebo test using the metals industry. This male-intensive industry faced relatively minor tariff reductions. If the mechanism operates through female-intensive industries, controlling for changes in metals employment should not attenuate the tariff coefficient. As shown in Table A11 and Table A12, controlling for metals has little effect. The tariff coefficient remains large and statistically significant, unlike the strong attenuation observed when controlling for textiles. This confirms that the contraction of the textile industry, not broad industrial adjustment, is the key channel through which tariff liberalisation disproportionately reduced women's employment, particularly among Black women.

These robustness checks show that our results are not sensitive to the choice of instrument or specification. Tariff liberalisation consistently emerges as detrimental to female employment, especially for Black women, with industry segregation in female-intensive sectors playing a central role in driving these gendered outcomes.

6. Concluding Remarks

This paper examines the gendered employment effects of tariff liberalisation in South Africa's manufacturing sector between 1996 and 2011. The first-difference model and IV estimation strategy are employed. The first critical finding of the study is that tariff liberalisation had no effect on manufacturing wages in South Africa. This implies that tariff liberalisation rather impacts the manufacturing sector through changes in employment.

We also find that post-apartheid tariff reductions were associated with slower growth in manufacturing employment, consistent with existing international evidence on the effects of trade on regional employment. However, this aggregate effect masks substantial gendered differences. We found that employment losses were significantly larger for women than for men, revealing that tariff liberalisation widened the gender employment gap.

Disaggregating further by race, we show that tariff cuts had no effect on the gender gap among White workers, but had a particularly adverse effect on Black women, who were disproportionately employed in industries exposed to deep tariff reductions. The implication is that the adverse effects of tariff liberalisation were concentrated among workers defined simultaneously by gender, race, and industry of employment, and that tariff shocks became more concentrated as worker characteristics became more specific.

We identify industrial segregation, particularly the concentration of women in the textile, clothing, and footwear industries, as the primary transmission channel through which tariff cuts affect gendered employment outcomes. We find no evidence supporting alternative channels, such as declines in discrimination or trade-induced technological change that reduces brawn intensity or narrows skill gaps. Robustness checks confirm that once textiles are removed from the tariff-exposure measure, the gendered effects largely disappear, underscoring the central role of female-intensive industries in shaping South Africa's adjustment to tariff liberalisation.

We demonstrate that South Africa's experience diverges sharply from that of other emerging economies such as Brazil and Indonesia. In those countries, tariff liberalisation has been shown to improve women's relative employment outcomes. Instead, South Africa's highly segregated industrial structure, combined with deep tariff cuts concentrated in female-intensive industries, resulted in more adverse and unequal employment outcomes for women, particularly Black women. This divergence highlights that the effects of liberalisation depend critically on initial patterns of protection, the demographic composition of industries, and the legacy of structural inequality.

Overall, our findings underscore that country-specific industrial structures and labour-market inequalities shape the distributional consequences of trade reform. In South Africa, the interaction of initial tariff protection, gender and race segmentation, and industry-specific exposure resulted in an adjustment path fundamentally different from that observed in other developing economies.

References

Acemoglu, D. (2003). Patterns of skill premia. *Review of Economic Studies*, *70*(2), 199–230. https://doi.org/10.1111/1467-937X.00242

Aguayo-Téllez, E., Airola, J., & Juhn, C. (2014). Did trade liberalization help women? The case of Mexico in the 1990s. In S. W. Polachek & K. Tatsiramos (Eds.), *New analyses of worker well-being* (Vol. 38, pp. 1–35). Emerald Group Publishing. https://doi.org/10.1108/S0147-9121(2013)0000038001

Ahsan, R. N. (2013). Input tariffs, speed of contract enforcement, and the productivity of firms in India. *Journal of International Economics*, *90*(1), 181–192. https://doi.org/10.1016/j.jinteco.2012.11.006

Amiti, M., & Konings, J. (2007). Trade liberalization, intermediate inputs, and productivity: Evidence from Indonesia. *The American Economic Review*, *97*(5), 1611–1638. https://doi.org/10.1257/aer.97.5.1611

Anker, R., Melkas, H., & Korten, A. (2003). *Gender-based Occupational Segregation in the 1990s*. International Labour Office.

Autor, D. H., Dorn, D., & Hanson, G. H. (2015). Untangling trade and technology: Evidence from local labour markets. *Economic Journal*, *125*(584), 621–646. https://doi.org/10.1111/ecoj.12245

Baliamoune-Lutz, M. (2007). Globalisation and gender inequality: Is Africa different? *Journal of African Economies*, *16*(2), 301–348. https://doi.org/10.1093/jae/ejl037

Banerjee, P., & Veeramani, C. (2017). Trade liberalisation and women's employment intensity: Analysis of India's manufacturing industries. *Economic and Political Weekly*, 37-47. https://www.jstor.org/stable/26698668

Bastos, P., & Santos, N. (2022). Long-run effects of trade liberalisation on local labour markets: Evidence from South Africa. *The World Economy*, *45*(10), 3059-3079. https://doi.org/10.1111/twec.13281

Becker, G. S. (2010). *Economics of discrimination*. University of Chicago Press.

Benguria, F., & Ederington, J. (2023). Decomposing the effect of trade on the gender wage gap. *Canadian Journal of Economics/Revue canadienne d'économique*, 56(3), 1082-1120. https://doi.org/10.1111/caje.12668

Bhorat, H. (2000). The impact of trade and structural changes on sectoral employment in South Africa. *Development Southern Africa*, *17*(3), 437–466. https://doi.org/10.1080/713661411

Bhorat, H., Van der Westhuizen, C., & Goga, S. (2009). Analysing wage formation in the South African labour markets: The role of bargaining councils. *Development Policy Research Unit Working Paper* (No. 09/135). http://dx.doi.org/10.2139/ssrn.2184181

Black, S. E., & Brainerd, E. (2004). Importing equality? The impact of globalization on gender discrimination. *Industrial and Labor Relations Review*, *57*(4), 540–559. https://doi.org/10.1177/001979390405700404

Borrowman, M., & Klasen, S. (2020). Drivers of gendered sectoral and occupational segregation in developing countries. *Feminist Economics*, *26*(2), 62-94. https://doi.org/10.1080/13545701.2019.1649708

Bosker, E. M., & Krugell, W. F. (2006). *Convergence or divergence of South African cities and towns?.* http://www.ecomod.net/sites/default/files/document ... mod2006-rum/1207.pdf

Braunstein, E., & Folbre, N. (2001). To honor and obey: Efficiency, inequality, and patriarchal property rights. *Feminist Economics*, *7*(1), 25–44. https://doi.org/10.1080/713767276

Braunstein, E., & Seguino, S. (2018). The impact of economic policy and structural change on

gender employment inequality in Latin America, 1990–2010. *Review of Keynesian Economics*, *6*(3), 307–332. https://doi.org/10.4337/roke.2018.03.02

Bussmann, M. (2009). The effect of trade openness on women's welfare and work life. *World Development*, *37*(6), 1027–1038. https://doi.org/10.1016/j.worlddev.2008.10.007

Casale, D., & Posel, D. (2002). The Continued Feminisation of the Labour Force in South Africa. *South African Journal of Economics*, *70*(1), 156–184. https://www.africabib.org/rec.php?RID=243005660#:~:text=https%3A//onlinelibrary.wiley.com/doi/10.1111/j.1813%2D6982.2002.tb00042.x/pdf

Central Statistics Services. October Household Survey 1996 [dataset]. Version 1.1. Pretoria: Central Statistical Service (now Statistics South Africa) [producer], 1999. Cape Town: DataFirst [distributor], 2013. https://doi.org/10.25828/kn3m-x762

Cockburn, J., Fofana, I., Decaluwe, B., Mabugu, R., & Chitiga, M. (2007). A gender-focused macro–micro analysis of the poverty impacts of trade liberalization in South Africa. In J. Bishop (Ed.), *Research on economic inequality* (Vol. 15, pp. 269–305). Emerald Group Publishing. https://doi.org/10.1016/S1049-2585(07)15011-0

Choe, C., & Chrite, E. L. (2014). Internal migration of blacks in South Africa: An application of the roy model. *South African Journal of Economics*, *82*(1), 81–98. https://doi.org/10.1111/saje.12011

Ederington, J., Minier, J., & Troske, K. R. (2024). Trade and labor market segregation in Colombia. *Review of International Economics*, *32*(4), 1645-1670. https://doi.org/10.1111/roie.12744

Edwards, L. (2005). Has South Africa liberalised its trade? *South African Journal of Economics*, *73*(4), 754–775. https://doi.org/10.1111/j.1813-6982.2005.00052.x

Elson, D., & Pearson, R. (1981). "Nimble Fingers Make Cheap Workers": An Analysis of Women's Employment in Third World Export Manufacturing. *Feminist Review*, *7*(7), 87. https://doi.org/10.1057/fr.1981.6

Erten, B., Leight, J., & Tregenna, F. (2019). Trade liberalization and local labor market adjustment in South Africa. *Journal of International Economics*, *118*, 448–467. https://doi.org/10.1016/j.jinteco.2019.02.006

Ertürk, K., & Darity Jr, W. (2000). Secular changes in the gender composition of employment and growth dynamics in the North and the South. *World Development*, *28*(7), pp.1231-1238. https://doi.org/10.1016/S0305-750X(00)00024-3

Gaddis, I., & Pieters, J. (2017). The gendered labor market impacts of trade liberalization evidence from Brazil. *Journal of Human Resources*, *52*(2), 457-490. https://doi.org/10.3368/jhr.52.2.1014-6690R1

Galor, O., & Weil, D. N. (1996). The gender gap, fertility, and growth. *American Economic Review*, 86(3), 374–387. https://doi.org/10.3386/w4550

Goldberg, P. K., & Pavcnik, N. (2007). Distributional effects of globalization in developing countries. *Journal of economic Literature*, *45*(1), 39-82. https://doi.org/10.1257/jel.45.1.39

Juhn, C., Ujhelyi, G., & Villegas-Sanchez, C. (2014). Men, women, and machines: How trade impacts gender inequality. *Journal of Development Economics*, *106*, 179–193. https://doi.org/10.1016/j.jdeveco.2013.09.009

Kis-Katos, K., & Sparrow, R. (2015). Poverty, labor markets and trade liberalization in Indonesia. *Journal of development Economics*, *117*, 94-106. https://doi.org/10.1016/j.jdeveco.2015.07.005

Kis-Katos, K., Pieters, J., & Sparrow, R. (2018). Globalization and social change: Gender-

specific effects of trade liberalization in Indonesia. *IMF Economic Review*, *66*(4), 763–793. https://link.springer.com/article/10.1057/s41308-018-0065-5

Kovak, B. K. (2013). Regional effects of trade reform: What is the correct measure of liberalization? *American Economic Review*, *103*(5), 1960–1976. https://doi.org/10.1257/aer.103.5.1960

Lattimore, R. and Kowalski, P. (2008), *Brazil: Selected Trade Issues*, OECD Trade Policy Papers, No. 71, OECD Publishing, Paris. https://doi.org/10.1787/241457002468

Leibbrandt, M., Woolard, I., Finn, A., & Argent, J. (2010), *Trends in South African Income Distribution and Poverty since the Fall of Apartheid*, OECD Social, Employment and Migration Working Papers, No. 101, OECD Publishing, Paris. https://doi.org/10.1787/5kmms0t7p1ms-en

Lepelle, R., & Edwards, L. (2024). Manufacturing tariff liberalisation and the sectoral reallocation of employment in local labour markets: evidence from South Africa. *The Journal of International Trade & Economic Development*, 33(6), 1011-1039. https://doi.org/10.1080/09638199.2023.2229453

Mudiriza, G., & Edwards, L. (2021). The persistence of apartheid regional wage disparities in South Africa. *Journal of Economic Geography*, 21(6), 807-839. https://doi.org/10.1093/jeg/lbaa036

Nattrass, N., & Seekings, J. (2012). *Differentiation within the South African clothing industry: Implications for wage setting and employment*. Centre for Social Science Research: University of Cape Town. http://hdl.handle.net/11427/19262

Ntuli, M. (2007). *Determinants of South African women's labour force participation*, 1995-2004 (No. 3119). IZA Discussion Papers. https://hdl.handle.net/10419/34580

Ogeda, P., Ornelas, E., & Soares, R. R. (2025). Labor unions and the electoral consequences of trade liberalization. *Journal of the European Economic Association*, *23*(1), 236-280. https://doi.org/10.1093/jeea/jvae020

Redding, S., & Venables, A. J. (2004). Economic geography and international inequality. *Journal of International Economics*, *62*(1), 53–82. https://doi.org/10.1016/j.jinteco.2003.07.001

Sabinet. (n.d.). *Retrospective government gazettes*. https://discover.sabinet.co.za

Statistics South Africa. (2012). *Census 2011: Census in brief* (A6 booklet). Pretoria: Statistics South Africa. ISBN 978-0-621-41388-5. https://www.statssa.gov.za/census/census_2011/census_products/Census_2011_Census_in_brief.pdf

Statistics South Africa. (2003). *Labour Force Survey: September 2002* [dataset] (Version 2.1). Statistics South Africa. https://doi.org/10.25828/16dn-7x29

Statistics South Africa. (2012). *Quarterly Labour Force Survey 2011: Q1* [dataset] (Version 1.0). Statistics South Africa. https://doi.org/10.25828/p7p1-e950

Statistics South Africa. (1998). *South African Census 1996* [dataset] (Version 1.3). Statistics South Africa. https://doi.org/10.25828/7yrd-n169

Statistics South Africa. (2003). *South African Census 2001* [dataset] (Version 1.1). Statistics South Africa. https://doi.org/10.25828/bp70-m263

Statistics South Africa. (2015). *South African Census 2011: 10% sample* [dataset] (Version 2). Statistics South Africa. https://doi.org/10.25828/vjy1-tz66

Thoenig, M., & Verdier, T. (2003). A theory of defensive skill-biased innovation and globalization. *American Economic Review*, *93*(3), 709-728. https://doi.org/10.1257/000282803322157052

Thurlow, J. (2006). *Has trade liberalization in South Africa affected men and women differently?* (No. 580-2016-39331). https://doi.org/10.22004/ag.econ.55397

Topalova, P. (2010). Factor immobility and regional effects of trade liberalization: Evidence from India. *American Economic Journal: Applied Economics*, *2*, 1–41. https://doi.org/10.1257/app.2.4.1

United Nations Conference on Trade and Development (UNCTAD). (n.d.). *Trade Analysis Information System (TRAINS) dataset*. World Bank. https://databank.worldbank.org/source/unctad-%5E-trade-analysis-information-system-(trains)

Von Fintel, D., & Moses, E. (2017). Migration and gender in South Africa: Following bright lights and the fortunes of others? *Regional Science Policy and Practice*, *9*(4), 251–268. https://doi.org/10.1111/rsp3.12106

Weinberg, B. A. (2000). Computer use and the demand for female workers. *Industrial and Labor Relations Review*, *53*(2), 290–308. https://doi.org/10.1177/001979390005300206

Wood, A. (1995). How trade hurt unskilled workers. *Journal of Economic Perspectives*, *9*(3), 57–80. https://doi.org/10.1257/jep.9.3.57

Appendices

Table A1: Significance test of differences between the employment of men and women

Variables	t-statistic	p-value
Total employment	222.52	0.0000
Black	-219.70	0.0000
White	-205.14	0.0000
Manufacturing employment	-314.42	0.0000
Black	-236.87	0.0000
White	-100.42	0.0000
Skill share	3.19	0.0014
Brawn share	-17.16	0.0000

Notes: Own calculations using the full and 10% weighted sample of the South African Population Census data for 1996, 2001 and 2011. The Employment rates are normalised by the respective working-age population (ages 15-64). Manufacturing share is manufacturing employment as a share of total employment. Skill share is calculated as the number of skilled workers ((individuals with a post-matric or post-Grade 12 qualification) divided by the sum of skilled and unskilled workers in all the manufacturing industries. Production share represents workers who are employed as craft and trade workers and plant and machine operators as a share of the sum of workers employed in all occupations (production/non-production occupations) in manufacturing industries, excluding food & beverage. textiles and electronics.

Table A2: First-stage IV results

	(1)
VARIABLES	Change in tariffs
Initial Tariff	-0.052***
	(0.006)
ΔLog working-age population	0.034***
	(0.008)
ΔLog labour force	-0.028***
	(0.007)
ΔMigration rate	0.015**
	(0.006)
ΔUnion-intensity	0.021***
	(0.011)
Initial skill rate	-0.003
	(0.002)
Initial unemployed rate	-0.007***
	(0.002)
Initial manufacturing share	-0.001
	(0.001)
Initial infrastructure	0.000
	(0.000)
Dummy variable year 2011	0.009***
	(0.000)
Constant	-0.002*
	(0.001)
Observations	468
R-squared	0.884
Year FE	Yes
First-stage F-statistic	323.21
P-value	0.000

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

Notes: Estimation is based on the 2SLS IV strategy. The tariff variable is the manufacturing employment-weighted tariff rates. ΔTariff is the change in tariffs, which comprises the difference in tariffs in the initial period (1996) and tariffs in the final period (2011). Working-age population includes individuals aged between 15 and 65 years. Labour force is the sum of employed and unemployed individuals within the working-age population. Migration rate represents the number of individuals who have migrated since the last census as a percentage of the working-age population. Union intensity refers to the percentage of trade union members. Skill rate denotes the proportion of skilled workers within the working-age population, and the unemployment rate represents the number of unemployed individuals as a percentage of the working-age population. Infrastructure represents the number of households with access to electricity (including solar), weekly refuse collection, a flush toilet and piped water, as a share of total households. Manufacturing share reflects manufacturing employment as a percentage of total employment, excluding employment in the primary sector.

Table A3: Apartheid laws that restricted the employment of women

Name of laws	Description
Mines and Works Act (Colour Bar Act) (1911). and amendments	Reinforced racial job reservation in the mining sector. formally barring Black South Africans — including women — from skilled mining jobs and confining them to the lowest. most exploitative labour.
Natives (Urban Areas) Act (1923). and amendments	Empowered urban local authorities to set aside land for Africans in separate areas.
Native Law Amendment Act (1937)	Allowed Africans a maximum of only 14 days to find work in an urban area (reduced to three days in 1945).
Factories. Machinery and Building Works Act (1941). and amendments	Imposed restrictions that disproportionately affected women in industrial jobs. often excluding them from safer. better-paid work under the guise of "protecting women."
Natives (Urban Areas) Consolidation Act (1945)	Made it very difficult for Blacks to claim permanent residence in an urban area.
Natives Laws Amendment Act (1952)	Laid the basis for the entire state intervention to control the distribution of black labour.
Population Registration Act (1950–1991)	Required all citizens to be registered as Black. White. Coloured or Indian.
Group Areas Act (1950–1991)	Partitioned the country into different areas. with different areas being allocated to different racial groups. This law represented the very heart of Apartheid because it was the basis upon which political and social separation was to be constructed.
Bantu Authorities Act (1951)	Created separate government structures for Black population.
Native Services Levy Act (1952)	Imposes monthly taxes on employers of urban Blacks.
Pass Law Act (1952–1986)	Made it compulsory for all Black South Africans over the age 16 to carry a passbook.
Amendments to the Native Consolidation Act (1952. 1955 and 1957)	Restrictions on Blacks in urban areas could only remain without a pass under special Conditions.
Bantu Urban Areas Act (1953)	Curtailed black migration to the cities
Bantu Education Act (1953)	Limited access to quality education for Black South Africans. especially girls. meaning fewer professional employment opportunities later in life.
Native Administration Act (1956)	Permits government to send Africans into exile in remote parts of the country
Industrial Conciliation Act (1956)	Certain jobs were legally reserved for white workers. excluding Black. Coloured. and Indian women from skilled. higher-paying positions. Women of colour were largely restricted to domestic work. farm labour. or low-paid factory jobs.

Name of laws	Description
Wage Act (1957)	Legalized the setting of different wage levels based on race (and indirectly gender). often meaning women of colour were paid less for the same work as white men and women.
Promotion of Black Self-Government Act (1959–1993)	Set up separate territorial governments in the homelands. designated lands for Black people where they could have a vote. The aim was that these Bantustans would eventually become independent of South Africa.
Bantu Investment Corporation Act (1959)	Set up a mechanism to transfer capital to the homelands to create jobs in the Black homelands
Physical Planning and Utilisation of Resources Act (1959)	Allowed the government to stop industrial development in “white” cities and redirect such development to homeland border areas. The aim was to speed up the relocation of Blacks to the homelands by relocating jobs to homeland areas.
Bantu Laws Amendment Act (1970)	Job reservation – made possible the prohibition of the employment of Blacks in any job. in any area or the service of any employer.
Black Homeland Citizenship Act (1970)	Changed the status of the inhabitants of the “homeland” so that they were no longer citizens of South Africa. The aim was to ensure whites became the demographic majority within South Africa.

Own compilation based on government gazettes accessed through the Sabinet Retrospective Government Gazettes Collection.

Table A4: The effects of tariff liberalisation and transmission channels on aggregate manufacturing employment

	(1)	(2)	(3)	(4)
	Dependent variables: Change in log manufacturing employment			
VARIABLES	Aggregate	Female	Male	Gender gap
ΔTariff	4.175**	7.360***	2.310	-5.062***
	(2.055)	(2.749)	(1.875)	(1.925)
ΔSkill gap	-1.159***	-1.217**	-0.976**	0.253
	(0.438)	(0.493)	(0.474)	(0.456)
ΔBrawn-intensity	-0.015	-0.024	-0.012	0.012
	(0.036)	(0.039)	(0.036)	(0.022)
ΔLog working-age population	-0.145	-0.713	0.070	0.813**
	(0.365)	(0.437)	(0.363)	(0.356)
ΔLog labour force	0.985***	1.308***	0.845***	-0.486*
	(0.309)	(0.353)	(0.305)	(0.282)
ΔMigration rate	0.896***	0.374	1.114***	0.746***
	(0.236)	(0.334)	(0.230)	(0.288)
ΔUnion intensity	1.670***	1.497***	1.824***	0.327
	(0.429)	(0.573)	(0.420)	(0.476)
Initial skill rate	-0.020	-0.008	-0.019	-0.007
	(0.076)	(0.099)	(0.074)	(0.076)
Initial unemployed rate	0.036	0.041	0.021	-0.016
	(0.073)	(0.093)	(0.077)	(0.082)
Initial manufacturing share	-0.257***	-0.186***	-0.277***	-0.090*
	(0.054)	(0.068)	(0.049)	(0.050)
Initial infrastructure	0.031*	0.032	0.030	-0.002
	(0.018)	(0.022)	(0.019)	(0.017)
Dummy variable year 2011	-0.002	-0.007	0.008	0.014
	(0.021)	(0.030)	(0.020)	(0.024)
Constant	0.040	0.080**	0.014	-0.068**
	(0.028)	(0.036)	(0.028)	(0.029)
Observations	466	464	466	464
R-squared	0.334	0.199	0.349	0.023
Year FE	Yes	Yes	Yes	Yes

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

Notes: Estimation is based on the 2SLS IV strategy. Municipalities with zero manufacturing employment in a given census year are excluded. The gender employment gap is derived as male employment/female employment in manufacturing. The tariff variable is the manufacturing employment-weighted tariff rates. ΔTariff is the change in tariffs, which comprises the difference in tariffs in the initial period (1996) and tariffs in the final period (2011). Working-age population includes individuals aged between 15 and 65 years. Labour force is the sum of employed and unemployed individuals within the working-age population. Migration rate represents the number of individuals who migrated since the last census as a share of the working-age population. The change in log skill gap is measured as skilled workers ((individuals with a post-matric or post-Grade 12 qualification)/unskilled workers in manufacturing. The change in log brawn-intensity measured as production workers (craft and trade workers and plant and machine operators)/non-production workers in manufacturing industries excluding food & beverage, textiles and electronics. Migration rate represents the number of individuals who migrated since the last census as a share of the working-age population. Union-intensity is the share of union members. Skilled rate denotes skilled workers as a share of skilled working within the working-age population and unemployed rate is the number of unemployed individuals as a share of the working-age population. Infrastructure represents households with electricity (including solar). weekly refuse collection. flush toilet and piped water as a share of the total number of households. Manufacturing share reflects manufacturing employment as a share of total employment. excluding the primary sector.

Table A5: Industry composition of municipality employment by gender, 1996 and 2011

	Aggregate			Black			White		
				1996					
Industry	Female Share	Male Share	Abs diff	Female Share	Male Share	Abs diff	Female Share	Male Share	Abs diff
Food	18.59	20.60	2.01	18.95	22.12	3.17	17.29	14.71	2.58
Textiles	45.62	10.36	35.26	51.99	11.27	40.72	15.33	6.49	8.84
Wood	9.99	14.73	4.74	8.08	14.97	6.89	18.89	13.47	5.42
Fuel/Chem	7.57	11.56	3.99	6.27	11.07	4.80	13.78	13.59	0.19
Non-metals	2.41	5.00	2.59	2.09	5.34	3.25	3.96	3.71	0.25
Metals	6.07	21.07	15.01	4.32	19.42	15.10	14.33	27.82	13.48
Electrical	1.64	2.53	0.89	1.38	2.23	0.85	2.71	3.72	1.01
Electronic	1.47	1.24	0.24	1.16	0.92	0.24	2.83	2.50	0.33
Transport	2.70	7.87	5.17	2.16	7.45	5.29	5.20	9.56	4.36
Furniture	3.95	5.04	1.09	3.59	5.20	1.61	5.68	4.43	1.24
				2011					
Food	23.94	20.60	3.34	25.27	21.57	3.70	18.74	15.77	2.97
Textiles	14.06	5.54	8.52	15.76	5.49	10.27	7.07	5.55	1.52
Wood	14.19	14.83	0.64	13.78	15.04	1.26	15.80	13.72	2.08
Fuel/Chem	13.25	14.02	0.77	12.52	13.70	1.18	16.18	15.66	0.52
Non-metals	5.20	6.60	1.40	5.29	6.85	1.56	4.70	5.21	0.51
Metals	14.55	22.49	7.94	13.46	22.31	8.86	19.15	23.76	4.61
Electrical	0.78	0.86	0.07	0.63	0.74	0.11	1.44	1.47	0.03
Electronic	1.36	1.11	0.25	1.19	0.96	0.23	2.09	1.88	0.21
Transport	7.69	8.89	1.20	7.17	8.29	1.12	9.73	11.92	2.19
Furniture	4.98	5.07	0.09	4.93	5.06	0.13	5.12	5.07	0.05

Notes: Own calculations using the 10% weighted sample of the South African Population Census data for 1996 and 2011. The values reflect the average employment shares across municipalities. The variable “abs diff” measures the absolute value of the difference in female and male employment shares. Abbreviations correspond to industry names as follows: Food = Food; beverages & tobacco products, Textiles = Textiles; clothing & footwear, Wood = Wood products, Fuel/Chem = Fuel; petroleum & chemical products, Non-metals = Non-metallic products, Metals = Metal products & machinery, Electrical. = Electrical machinery, Electronic = Electronic products, Transport = Transport equipment, Furniture = Furniture & recycling.

Table A6: Tariff liberalisation effect on textile employment

	(1)
VARIABLES	Change in textile employment
ΔTariff	2.915
	(4.704)
ΔLog working-age population	-0.884**
	(0.368)
ΔLog labour force	0.320
	(0.237)
ΔMigration rate	-1.313***
	(0.367)
ΔUnion intensity	-0.800
	(0.499)
Initial skill rate	0.012
	(0.068)
Initial unemployed rate	-0.009
	(0.063)
Initial manufacturing share	0.066
	(0.080)
Initial infrastructure	-0.007
	(0.012)
Dummy variable year 2011	-0.022
	(0.044)
Constant	0.085
	(0.052)
Observations	467
R-squared	0.081
Year FE	Yes

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

Notes: Estimation is based on the 2SLS IV strategy. The tariff variable is the manufacturing employment-weighted tariff rates. ΔTariff is the change in tariffs, which comprises the difference in tariffs in the initial period (1996) and tariffs in the final period (2011). Working-age population includes individuals aged between 15 and 65 years. Labour force is the sum of employed and unemployed individuals within the working-age population. Migration rate represents the number of individuals who migrated since the last census as a share of the working-age population. Union-intensity is the share of union members. Skilled rate denotes skilled workers as a share of skilled working within the working-age population and unemployed rate is the number of unemployed individuals as a share of the working-age population. Infrastructure represents households with electricity (including solar). weekly refuse collection. flush toilet and piped water as a share of the total number of households. Manufacturing share reflects manufacturing employment as a share of total employment. excluding the primary sector.

Table A7: The role of the textile industry on aggregate gendered employment

	(1)	(2)	(3)	(4)
	Dependent variable: Change in log manufacturing employment			
VARIABLES	Aggregate	Female	Male	Gender gap
ΔTariff	2.260	4.154*	1.217	-2.897*
	(1.862)	(2.399)	(1.702)	(1.694)
ΔTextile employment	0.060***	0.076**	0.047**	-0.029
	(0.023)	(0.030)	(0.023)	(0.028)
ΔLog working-age population	-0.021	-0.476	0.142	0.647*
	(0.382)	(0.444)	(0.385)	(0.367)
ΔLog labour force	0.918***	1.154***	0.815**	-0.361
	(0.319)	(0.355)	(0.319)	(0.291)
ΔMigration rate	1.137***	0.720**	1.308***	0.594**
	(0.241)	(0.324)	(0.244)	(0.282)
ΔUnion intensity	1.958***	1.758***	2.078***	0.314
	(0.444)	(0.567)	(0.440)	(0.477)
Initial skill rate	-0.111	-0.113	-0.097	0.021
	(0.074)	(0.091)	(0.075)	(0.072)
Initial unemployed rate	0.050	0.044	0.048	0.009
	(0.072)	(0.091)	(0.077)	(0.080)
Initial manufacturing share	-0.265***	-0.215***	-0.276***	-0.060
	(0.055)	(0.070)	(0.049)	(0.052)
Initial infrastructure	0.042**	0.044**	0.041**	-0.004
	(0.019)	(0.022)	(0.019)	(0.017)
Dummy variable year 2011	0.013	0.017	0.016	-0.002
	(0.021)	(0.028)	(0.021)	(0.022)
Constant	0.024	0.055	0.004	-0.053*
	(0.028)	(0.036)	(0.029)	(0.030)
Observations	431	430	431	430
R-squared	0.367	0.245	0.370	0.032
Year FE	Yes	Yes	Yes	Yes

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

Notes: All the estimations are based on the 2SLS IV strategy. Municipalities with zero manufacturing employment in a given census year are excluded. The gender employment gap is calculated as the ratio of male employment to female employment in manufacturing. The tariff variable is the manufacturing employment-weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. Working-age population includes individuals aged between 15 and 65 years. Labour force is the sum of employed and unemployed individuals within the working-age population. Migration rate represents the number of individuals who have migrated since the last census as a percentage of the working-age population. Union intensity refers to the percentage of trade union members. Skill rate denotes the proportion of skilled workers within the working-age population, and the unemployment rate represents the number of unemployed individuals as a percentage of the working-age population. Infrastructure represents the number of households with access to electricity (including solar), weekly refuse collection, a flush toilet and piped water, as a share of total households. Manufacturing share reflects manufacturing employment as a percentage of total employment, excluding employment in the primary sector.

Table A8: First-stage IV using the tariff protection measure for LMIC

VARIABLES	(1) Change in tariffs
ΔLMIC tariffs	9.490**
	(4.041)
ΔLog working-age population	-0.411
	(0.412)
ΔLog labour force	1.151***
	(0.336)
ΔMigration rate	0.933***
	(0.256)
ΔUnion-intensity	1.535***
	(0.495)
Initial skill rate	-0.038
	(0.081)
Initial unemployed rate	0.124
	(0.093)
Initial manufacturing share	-0.228***
	(0.055)
Initial infrastructure	0.035*
	(0.019)
Dummy variable year 2011	-0.055
	(0.039)
Constant	0.085*
	(0.044)
Observations	467
R-squared	0.243
Frist-stage F-statistic	324.35
P-value	0.000
Year FE	Yes

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

Notes: Estimation is based on the 2SLS IV strategy. The tariff variable is the manufacturing employment-weighted tariff rates. ΔTariff is the change in tariffs, which comprises the difference in tariffs in the initial period (1996) and tariffs in the final period (2011). Working-age population includes individuals aged between 15 and 65 years. Labour force is the sum of employed and unemployed individuals within the working-age population. Migration rate represents the number of individuals who have migrated since the last census as a percentage of the working-age population. Union intensity refers to the percentage of trade union members. Skill rate denotes the proportion of skilled workers within the working-age population, and the unemployment rate represents the number of unemployed individuals as a percentage of the working-age population. Infrastructure represents the number of households with access to electricity (including solar), weekly refuse collection, a flush toilet and piped water, as a share of total households. Manufacturing share reflects manufacturing employment as a percentage of total employment, excluding employment in the primary sector.

Table A9: The effects of tariff liberalisation on manufacturing employment using tariffs to other low and middle-income countries

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent variables: Change in log manufacturing employment							
	Total				Black			
VARIABLES	Aggregate	Female	Male	Gender gap	Aggregate	Female	Male	Gender gap
ΔLMIC tariffs	9.490**	14.145***	7.316*	-6.898**	10.883**	17.099***	8.312*	-8.945**
	(4.090)	(5.174)	(4.037)	(3.233)	(4.589)	(6.218)	(4.317)	(3.804)
ΔLog working-age population	-0.411	-1.077**	-0.197	0.916**	-0.265	-1.141**	-0.084	1.105***
	(0.417)	(0.520)	(0.403)	(0.376)	(0.447)	(0.579)	(0.427)	(0.421)
ΔLog labour force	1.151***	1.537***	1.012***	-0.551*	1.007***	1.564***	0.847***	-0.746**
	(0.340)	(0.407)	(0.326)	(0.292)	(0.348)	(0.444)	(0.325)	(0.318)
ΔMigration rate	0.933***	0.393	1.127***	0.741***	-0.093	-0.027	-0.397**	-0.323
	(0.259)	(0.349)	(0.255)	(0.285)	(0.236)	(0.237)	(0.198)	(0.272)
ΔUnion-intensity	1.535***	1.367**	1.735***	0.365	1.736***	1.430**	1.856***	0.407
	(0.501)	(0.652)	(0.486)	(0.504)	(0.417)	(0.569)	(0.409)	(0.452)
Initial skill rate	-0.038	-0.026	-0.032	-0.003	0.105	0.051	0.123	0.081
	(0.081)	(0.103)	(0.080)	(0.074)	(0.106)	(0.148)	(0.099)	(0.116)
Initial unemployed rate	0.124	0.138	0.088	-0.045	0.062	0.131	0.022	-0.108
	(0.095)	(0.119)	(0.096)	(0.091)	(0.107)	(0.134)	(0.106)	(0.102)
Initial manufacturing share	-0.228***	-0.150**	-0.249***	-0.098*	-0.228***	-0.150*	-0.246***	-0.095*
	(0.056)	(0.072)	(0.051)	(0.051)	(0.059)	(0.080)	(0.052)	(0.056)
Initial infrastructure	0.035*	0.035	0.032	-0.003	0.018	0.028	0.013	-0.015
	(0.019)	(0.023)	(0.020)	(0.017)	(0.014)	(0.018)	(0.014)	(0.014)
Dummy variable year 2011	-0.055	-0.072	-0.040	0.032	-0.025	-0.085	0.005	0.090**
	(0.040)	(0.051)	(0.039)	(0.034)	(0.046)	(0.062)	(0.044)	(0.039)
Constant	0.085*	0.140**	0.058	-0.085**	0.106**	0.176***	0.076*	-0.103**
	(0.045)	(0.057)	(0.045)	(0.038)	(0.046)	(0.063)	(0.044)	(0.044)
Observations	467	465	466	464	467	463	466	462

R-squared	0.243	0.093	0.287	0.002	0.212	0.046	0.265	
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

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

Notes: All the estimations are based on the 2SLS IV strategy. The centred R-squared is negative (–0.036) for column (8) because the fitted values explain less of the variation in the dependent variable than the mean-only model; hence, the R-squared is omitted from the table. Municipalities with zero manufacturing employment in a given census year are excluded. The gender employment gap is calculated as the ratio of male employment to female employment in manufacturing. The tariff variable is the manufacturing employment weighted tariff rates. ΔTariff is the change in tariffs, which comprises the difference in tariffs in the initial period (1996) and tariffs in the final period (2011). Control variables are restricted to the respective population group in columns (4) to (9). Working-age population includes individuals aged between 15 and 65 years. Labour force is the sum of employed and unemployed individuals within the working-age population. Migration rate represents the number of individuals who have migrated since the last census as a percentage of the working-age population. Union intensity refers to the percentage of trade union members. Skill rate denotes the proportion of skilled workers within the working-age population, and the unemployment rate represents the number of unemployed individuals as a percentage of the working-age population. Infrastructure represents the number of households with access to electricity (including solar), weekly refuse collection, a flush toilet and piped water, as a share of total households. Manufacturing share reflects manufacturing employment as a percentage of total employment, excluding employment in the primary sector.

Table A10: Gendered manufacturing employment effects of tariff exposure excluding the textile industry

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent variables: Change in log manufacturing employment							
	Total				Black			
VARIABLES	Aggregate	Female	Male	Gender gap	Aggregate	Female	Male	Gender gap
ΔTariffs excluding textile employment	1.745	-6.703	8.500	16.940*	3.435	-2.364	7.318	12.095
	(9.259)	(12.603)	(8.380)	(10.212)	(9.905)	(13.450)	(8.620)	(10.637)
ΔLog working-age population	-0.019	-0.488	0.106	0.637*	0.208	-0.395	0.283	0.732*
	(0.362)	(0.424)	(0.364)	(0.351)	(0.375)	(0.432)	(0.384)	(0.376)
ΔLog labour force	0.889***	1.155***	0.801***	-0.388	0.691**	1.079***	0.593**	-0.524*
	(0.304)	(0.337)	(0.307)	(0.276)	(0.297)	(0.339)	(0.299)	(0.288)
ΔMigration rate	1.070***	0.530	1.279***	0.765***	-0.058	0.051	-0.388*	-0.403
	(0.236)	(0.323)	(0.235)	(0.280)	(0.238)	(0.236)	(0.216)	(0.270)
ΔUnion-intensity	1.953***	1.763***	2.232***	0.497	2.135***	1.912***	2.245***	0.351
	(0.471)	(0.605)	(0.471)	(0.515)	(0.395)	(0.524)	(0.396)	(0.443)
Initial skill rate	-0.065	-0.068	-0.054	0.017	0.038	-0.061	0.073	0.142
	(0.075)	(0.094)	(0.075)	(0.072)	(0.099)	(0.134)	(0.093)	(0.109)
Initial unemployed rate	-0.008	-0.056	-0.017	0.043	-0.041	-0.032	-0.057	-0.024
	(0.072)	(0.088)	(0.074)	(0.077)	(0.086)	(0.103)	(0.088)	(0.091)
Initial manufacturing share	-0.284***	-0.218***	-0.306***	-0.092*	-0.292***	-0.236***	-0.304***	-0.073
	(0.057)	(0.070)	(0.053)	(0.052)	(0.060)	(0.074)	(0.056)	(0.055)
Initial infrastructure	0.037**	0.035	0.036*	0.003	0.023	0.034*	0.020	-0.013
	(0.019)	(0.022)	(0.019)	(0.017)	(0.015)	(0.017)	(0.015)	(0.015)
Dummy variable year 2011	0.023	0.086	-0.012	-0.106**	0.063	0.088	0.053	-0.046
	(0.043)	(0.058)	(0.039)	(0.047)	(0.044)	(0.058)	(0.038)	(0.046)
Constant	0.013	-0.022	0.045	0.076	0.032	0.013	0.048	0.049
	(0.060)	(0.083)	(0.054)	(0.066)	(0.063)	(0.086)	(0.056)	(0.068)
Observations	467	465	466	464	467	463	466	462

R-squared	0.324	0.214	0.332	0.040	0.287	0.187	0.302	0.039
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

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

Notes: All the estimations are based on the 2SLS IV strategy. Tariff variable is the manufacturing employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. The dependent variables in the first two estimates are the change in log manufacturing employment, and in the third estimate, it is the change in log gender employment gap. The skill gap is the ratio of skilled to unskilled workers, and brawn intensity is the ratio of production to non-production workers. Migration rate represents the number of individuals who migrated since the last census as a share of the working-age population. Union intensity is the share of union members. Skilled rate denotes skilled workers as a share of skilled workers within the working-age population, and the unemployment rate is the number of unemployed individuals as a share of the working-age population. Infrastructure represents households with electricity (including solar), weekly refuse collection, flush toilet and piped water, as a share of the total number of households. Manufacturing share reflects manufacturing employment as a share of total employment, excluding the primary sector.

Table A11: Effects of the metals industry on gendered manufacturing employment among Black workers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent variables: Change in log manufacturing employment							
VARIABLES	Aggregate	Female	Male	Gender gap	Aggregate	Female	Male	Gender gap
ΔTariffs	4.085**	7.004***	2.258	-5.066***	2.486	4.744*	4.744*	-3.298*
	(1.985)	(2.669)	(1.714)	(1.874)	(1.979)	(2.616)	(2.616)	(1.775)
ΔTextile employment					0.037	0.061*	0.061*	-0.045
					(0.025)	(0.037)	(0.037)	(0.040)
ΔMetals employment	0.052***	0.078***	0.052***	-0.026	0.059***	0.066***	0.066***	-0.001
	(0.014)	(0.018)	(0.016)	(0.023)	(0.015)	(0.022)	(0.022)	(0.023)
ΔLog working-age population	0.039	-0.657	0.293	1.001**	0.223	-0.431	-0.431	0.844**
	(0.384)	(0.464)	(0.385)	(0.395)	(0.394)	(0.461)	(0.461)	(0.393)
ΔLog labour force	0.765**	1.219***	0.581**	-0.675**	0.641**	1.037***	1.037***	-0.529*
	(0.305)	(0.366)	(0.295)	(0.306)	(0.310)	(0.362)	(0.362)	(0.306)
ΔMigration rate	-0.350*	-0.185	-0.452**	-0.269	-0.364*	-0.262	-0.262	-0.172
	(0.191)	(0.246)	(0.215)	(0.256)	(0.201)	(0.246)	(0.246)	(0.244)
ΔUnion intensity	2.064***	1.928***	2.136***	0.198	2.172***	1.931***	1.931***	0.311
	(0.368)	(0.511)	(0.362)	(0.442)	(0.371)	(0.501)	(0.501)	(0.428)
Initial skill rate	0.113	0.040	0.134	0.102	0.091	0.039	0.039	0.077
	(0.103)	(0.141)	(0.094)	(0.113)	(0.102)	(0.137)	(0.137)	(0.113)
Initial unemployed rate	-0.022	0.041	-0.030	-0.079	-0.005	0.031	0.031	-0.035
	(0.086)	(0.110)	(0.090)	(0.094)	(0.088)	(0.111)	(0.111)	(0.094)
Initial manufacturing share	0.014	0.026	0.011	-0.016	0.020	0.028	0.028	-0.009
	(0.014)	(0.017)	(0.014)	(0.014)	(0.015)	(0.018)	(0.018)	(0.015)
Initial infrastructure	-0.251***	-0.186***	-0.261***	-0.077	-0.268***	-0.213***	-0.213***	-0.058
	(0.055)	(0.071)	(0.049)	(0.054)	(0.058)	(0.074)	(0.074)	(0.055)
Dummy variable year 2011	0.077***	0.066**	0.098***	0.035	0.117***	0.111***	0.111***	0.010
	(0.025)	(0.032)	(0.024)	(0.026)	(0.030)	(0.038)	(0.038)	(0.028)
Constant	0.003	0.022	-0.024	-0.050	-0.034	-0.019	-0.019	-0.028

	(0.029)	(0.040)	(0.028)	(0.033)	(0.035)	(0.046)	(0.046)	(0.036)
Observations	455	452	455	452	419	419	419	419
R-squared	0.321	0.201	0.335	0.017	0.357	0.231	0.231	0.023
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

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

Notes: All the estimations are based on the 2SLS IV strategy. Tariff variable is the manufacturing employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. The dependent variables in the first two estimates are the change in log manufacturing employment, and in the third estimate, it is the change in log gender employment gap. The skill gap is the ratio of skilled to unskilled workers, and brawn intensity is the ratio of production to non-production workers. Migration rate represents the number of individuals who migrated since the last census as a share of the working-age population. Union intensity is the share of union members. Skilled rate denotes skilled workers as a share of skilled workers within the working-age population, and the unemployment rate is the number of unemployed individuals as a share of the working-age population. Infrastructure represents households with electricity (including solar), weekly refuse collection, flush toilet and piped water, as a share of the total number of households. Manufacturing share reflects manufacturing employment as a share of total employment, excluding the primary sector.

Table A12: Effects of the metals industry on aggregate gendered manufacturing employment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent variables: Change in log manufacturing employment							
VARIABLES	Aggregate	Female	Male	Gender gap	Aggregate	Female	Male	Gender gap
ΔTariffs	4.105**	6.950***	2.241	-4.841***	2.595	4.585*	1.561	-2.975*
	(1.766)	(2.395)	(1.550)	(1.762)	(1.814)	(2.387)	(1.624)	(1.720)
ΔTextile employment					0.045*	0.063**	0.030	-0.033
					(0.023)	(0.032)	(0.024)	(0.031)
ΔMetals employment	0.043**	0.058***	0.042**	-0.016	0.041**	0.051***	0.042**	-0.008
	(0.017)	(0.017)	(0.019)	(0.020)	(0.018)	(0.018)	(0.021)	(0.023)
ΔLog working-age population	-0.135	-0.706	0.102	0.851**	0.012	-0.465	0.188	0.684*
	(0.370)	(0.445)	(0.363)	(0.355)	(0.379)	(0.445)	(0.380)	(0.369)
ΔLog labour force	0.964***	1.296***	0.808***	-0.519*	0.891***	1.143***	0.778**	-0.390
	(0.310)	(0.357)	(0.302)	(0.283)	(0.315)	(0.355)	(0.313)	(0.293)
ΔMigration rate	0.980***	0.442	1.198***	0.763***	1.121***	0.697**	1.292***	0.602**
	(0.237)	(0.324)	(0.237)	(0.281)	(0.240)	(0.324)	(0.242)	(0.281)
ΔUnion intensity	1.969***	1.926***	2.074***	0.151	2.085***	1.925***	2.209***	0.279
	(0.442)	(0.590)	(0.431)	(0.490)	(0.446)	(0.581)	(0.439)	(0.487)
Initial skill rate	-0.031	-0.027	-0.020	0.010	-0.092	-0.093	-0.073	0.025
	(0.076)	(0.098)	(0.074)	(0.073)	(0.074)	(0.093)	(0.074)	(0.071)
Initial unemployed rate	0.040	0.058	0.019	-0.037	0.062	0.068	0.056	-0.006
	(0.073)	(0.093)	(0.076)	(0.081)	(0.071)	(0.092)	(0.074)	(0.081)
Initial manufacturing share	-0.237***	-0.169**	-0.256***	-0.087*	-0.249***	-0.196***	-0.259***	-0.062
	(0.052)	(0.067)	(0.047)	(0.050)	(0.054)	(0.070)	(0.048)	(0.052)
Initial infrastructure	0.029	0.032	0.026	-0.006	0.039**	0.042*	0.037*	-0.005
	(0.019)	(0.022)	(0.019)	(0.016)	(0.019)	(0.022)	(0.019)	(0.016)
Dummy variable year 2011	0.026	0.036	0.034	-0.001	0.038	0.047	0.042*	-0.007
	(0.023)	(0.031)	(0.023)	(0.025)	(0.023)	(0.029)	(0.023)	(0.024)
Constant	0.000	0.028	-0.026	-0.056*	-0.008	0.015	-0.030	-0.047

	(0.032)	(0.039)	(0.032)	(0.031)	(0.032)	(0.040)	(0.033)	(0.031)
Observations	459	457	459	457	427	426	427	426
R-squared	0.331	0.205	0.352	0.029	0.375	0.252	0.381	0.036
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

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

Notes: All the estimations are based on the 2SLS IV strategy. Tariff variable is the manufacturing employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. The dependent variables in the first two estimates are the change in log manufacturing employment, and in the third estimate, it is the change in log gender employment gap. The skill gap is the ratio of skilled to unskilled workers, and brawn intensity is the ratio of production to non-production workers. Migration rate represents the number of individuals who migrated since the last census as a share of the working-age population. Union intensity is the share of union members. Skilled rate denotes skilled workers as a share of skilled workers within the working-age population, and the unemployment rate is the number of unemployed individuals as a share of the working-age population. Infrastructure represents households with electricity (including solar), weekly refuse collection, flush toilet and piped water, as a share of the total number of households. Manufacturing share reflects manufacturing employment as a share of total employment, excluding the primary sector.