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Gendered Effects of Tariff Liberalisation on the Sectoral Structure of Employment in South Africa

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Abstract

This paper investigates the effects of tariff liberalisation on services sector employment over the period 1996 to 2011 in South Africa. This period corresponds with substantial reductions in tariff protection, low employment growth and declines in the manufacturing share of total employment. Following a local labour market approach, we empirically examine whether reductions in employment-weighted tariffs at the municipality-level led to structural shifts in employment from manufacturing to services, and whether these shifts differ by gender or race. The paper draws on a database comprising of 234 municipalities that is constructed using South African Population Census data for 1996, 2001 and 2011. Consistent with theoretical expectations, the paper illustrates that tariff liberalisation was associated with strong increases in the services to manufacturing employment ratio, but this shift was not driven by the absorption of employment in the services sector. Employment in the services sector also fell in regions experiencing relatively large tariff reductions. We demonstrate that the decline in services employment was driven by lower derived demand, income, and infrastructure investment linked to the decline in manufacturing from tariff reductions. Finally, we show distinct differences in the impact of tariff liberalisation across gender and race. We find evidence of tariff-induced structural reallocation towards services that is more pronounced among Black women while negative tariff effects on services employment is found among Black men and White women. Overall, we show that that spillover effects from the decline in manufacturing diminished the absorption of labour by the services sector, thus exacerbating the regional employment impact associated with tariff liberalisation.

Keywords: Tariff liberalisation, Structural Change, Services Sector; Labour Market, Gender
JEL Codes: F16, F66, J16, J21, R10

1 Introduction

Over the past two decades, the South African economy has experienced structural shifts in the composition of employment away from manufacturing towards services. Whereas manufacturing accounted for 16.4% of total employment in formal non-agricultural businesses in 2006, by 2015, the employment share had fallen to 12.5%.[1] This has led to concerns regarding premature industrialisation and the curtailment of future growth and employment creation potential in the economy (Bhorat et al. 2020).

Several reasons have been advanced for this trend, one of which is trade liberalisation. Rodrik (2008), for example, argues that trade liberalisation in South Africa from the early 1990s played a substantive part in reducing the profitability of manufacturing relative to services and, together with technological change, the consequent decline in manufacturing employment. This story is, therefore, one of dynamic structural adjustment of the economy in response to liberalisation. Indeed, it is the structural changes in the allocation of factors of production induced by liberalisation that are expected to yield the gains from trade.[2]

However, the international empirical evidence is more circumspect with respect sectoral reallocations of labour in response to liberalisation. In their study of 25 liberalisation periods, mostly within emerging economies, Wacziarg and Wallack (2004) find that trade liberalization had far smaller effects on intersectoral (at 1-digit level of disaggregation) labour shifts than is often anticipated.[3] Similarly, Menezes-Filho and Muendler (2011) find that while trade liberalisation in the 1990s in Brazil increased labour transition into services, this was not sufficient to absorb displaced workers. They show that the response to tariff liberalisation was slow due to high adjustment costs. Labour reallocation into services is also muted in advanced economies. In the US, Acemoglu et al. (2016) find no significant expansion of employment in nontradable industries in response to the dramatic increase in import competition from China after 2001.

Authors have explained these findings as the results of restrictive labour market regulations (Revenga,1997; Topalova, 2010), institutional frictions including search and matching frictions (Helpman et al., 2010), sectoral inertia because of specificity of factors of production, including investment (Albuquerque & Rebelo, 2000), and rigidities to the movement of labour across regions (Dix-Carneiro & Kovak, 2015).

In this paper, we focus on how linkages between services and manufacturing at the local level may diminish sectoral labour reallocation in response to tariff liberalisation. We do for several reasons. Firstly, inter-sectoral production linkages between services and manufacturing imply

[1] Own calculations using the Quarterly Employment Series data (P0277) from Statistics South Africa.

[2] These adjustments away from import competing sectors, as manufacturing is in South Africa, towards services and exportables is illustrated clearly in the three-sector Heckscher-Ohlin based theoretical model of Edwards (1988). Structural reallocation of labour is also predicted by the Ricardian and Heckscher-Ohlin models. Reallocations across sectors are less pronounced in models of product differentiation and increasing returns (Dixit & Norman, 1980), framework, but, as Melitz (2003) illustrates, re-allocations of labour across firms can be large once heterogeneous firms are introduced.

[3] See Wacziarg and Wallack (2004) for a more extensive review of the literature.

that adverse production shocks in manufacturing arising from tariff liberalisation can spill over to services in the form of negative demand shocks (Acemoglu et al., 2016; Dehejia & Panagariya, 2014; Eichengreen & Gupta, 2013; Wacziarg & Wallack, 2004). Manufacturing in South Africa is shown to be particularly important as a source of demand for the services sector through its strong backward linkages, implying that adverse (or positive) shocks to manufacturing production transmit directly to demand for services inputs (Tregenna, 2008).[4] Acemoglu et al. (2016) find that these input-output linkages contributed to the overall weak growth in employment in the United Stated in response to import competition from China after 2000. However, their study estimates these effects at the national level, not at the local level where the impacts on services are likely to be concentrated.

Secondly, changes in employment opportunities and factor returns, including wages, in manufacturing associated with tariff liberalisation affect household incomes, and through this demand for services. Thirdly, changes in manufacturing production may influence local level investments in economic infrastructure. Declines in manufacturing production reduce the need for new investment in roads, electricity provision, telecommunication infrastructure in the manufacturing industrial areas. To the extent that reduced manufacturing production lowers municipal tax receipts, this will further reduce local public investment and the provision of municipal services. Together, these aggregate demand effects may magnify the impact of tariff liberalisation on the local economy, as is found in the US (Acemoglu et al. 2016).[5]

In this paper we analyse how these three spillover effects impact upon labour reallocation into services at the local municipality level in response to tariff liberalisation. Our focus is on the local level for several reasons. By their nature, services are non-tradable. Consequently, sectoral reallocation effects into services are expected to be highly localised. South Africa is also characterised by historical rigidities to the movement of people across regions that were associated with the Apartheid policies of separate development, including influx control that restricted the movement of black Africans and the Homeland policies that designated areas where black Africans were forcefully relocated. While these policies were removed with the ending of apartheid in 1994, the spatial patterns of development, income and wages remain highly unequal reflecting a persistency in the legacy of apartheid on the spatial distribution of the population (World Bank, 2018; Reed, 2013). These persistent rigidities to the movement of labour further imply strong localised effects arising from liberalisation. Such rigidities have been shown to be influential in driving local labour market effects from tariff liberalisation, such as in Brazil (Dix-Carneiro & Kovak, 2015).

We also focus on how labour reallocation differs by gender and race. Workers differ in terms of their characteristics, and this can be expected to influence their transition into other sectors. The services sector, particularly business-related services, are skill-intensive in comparison to

[4] The input-output tables for South Africa show that on average services inputs account for 15% of total intermediate input costs in manufacturing (Edwards et al., 2014).

[5] Given our focus on the local level, we do not capture the input-output linage and aggregate demand effects that spillover to other regions in the economy. This could result in an exaggeration or under-estimation of the total effects, depending on the direction of the spillover effects in different regions.

manufacturing, implying that structural shifts in employment towards services from manufacturing are likely to raise the demand for skilled labour. If the average skill composition of men and women differ in manufacturing, then this could give rise to gendered effects of tariff liberalisation on the reallocation of labour across sectors. Industry segregation within manufacturing will further entrench a gendered outcome. For example, the relatively strong reductions in South African tariffs on clothing and textile products, is likely to impact women more than men given the predominance of women employed in the industry. These gendered outcomes may be particularly strong in South Africa given the distinct gendered and racial characteristics of industry employment arising from apartheid policies.[6] [7]

For our empirical analysis we draw on employment data for 234 municipalities obtained from the South African Population Censuses for 1996, 2001 and 2011, as well as industry-level annual nominal tariff data from Edwards (2005) that we update using published tariff schedules.[8] We regress indicators of employment and wages on employment-weighted tariffs at the municipality-level following the Bartik (1991) approach. This approach has been widely used in the literature and interacts local industry employment shares with tariff rates to obtain a region's exposure to tariff protection.

This paper contributes towards a broader understanding of the effect of tariff liberalisation on the services sector in the context of Sub-Saharan Africa, a region where there is little empirical evidence on this matter. Further, it extends the available literature on South Africa. Bhorat and Hodge (1999), Bhorat et al. (2014), Edwards (2001), Rodrik (2008), Tregenna (2008) highlight structural shifts in the composition of employment from manufacturing to services in response to trade, but they focus on national level industry data and do not directly estimate the link between tariff changes and structural change.

In contrast, Erten et al. (2019) use household level data at the district level, obtained from the Post-Apartheid Labour Market Series (PALMS) dataset, to estimate the impact of tariffs on employment in South Africa from 1994 to 2004. They find statistically significant declines in the probability of being employed in manufacturing in response to tariff liberalisation, but no association with services employment. Our paper extends the time period to 2011 allowing us to capture the longer-term dynamic effects from liberalisation, and we provide insight in the

[6] Some support for gendered outcomes is provided by Gaddis and Pieters (2017), who find weak reallocation of workers from tradable to nontradable among low-skilled men in Brazil in response to liberalisation, but no reallocation effects for women and high-skilled workers.

[7] South Africa's history of apartheid is entrenched racial discrimination and gender discrimination. At the core of apartheid was racial segregation and discrimination against Blacks (Africans, Coloureds, and Indians/Asians) people 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). The education policies discriminated by race, resulting in substantive differences in education curricula, educational attainment, and education departments (Bhorat, 2005). Apartheid labour and employment policies also clearly discriminated by race. Black people were prevented from fully participating in the economy, being restricted to unskilled-intensive and low-wages industries. This legacy has resulted in huge gaps in terms of employment and skills levels between Blacks and Whites (Burger & Jafta, 2006).

[8] Tariff schedules at the 8-digit level of the Harmonized System are obtained from the UNCTAD Trade Analysis Information System (TRAINS)

channels that give rise to their findings for services. Finally, our paper provides insights on the gendered employment effects of tariff liberalisation and thus extends earlier work by Bhorat (2000) and Thurlow (2006). They argue that technological change and computerisation, together with trade liberalisation contributed to the growth of the services sector and especially female employment.

Consistent with theoretical expectations, we find that tariff liberalisation in South Africa was associated with strong increases in the services to manufacturing employment ratio, but this shift was not driven by the absorption of employment in the services sector. Our results show that employment in the services sector also fell in regions experiencing relatively large tariff reductions. The observed structural shift into services is underpinned by relatively large reductions in manufacturing employment rather than an increase in services employment. We demonstrate that the decline in services employment was driven by lower derived demand, income, and infrastructure investment linked to the decline in manufacturing from tariff reductions.

The employment effects of liberalisation differ starkly across gender and race. The structural shifts in employment towards services is predominately found amongst Black[9] women relative to their male and White counterparts, while the adverse effects of tariff reductions on services employment is stronger for Black men and White women. This variation in outcomes reflects distinct racial and gender differences and rigidities in the composition of employment across industries in South Africa. Such rigidities impede adjustment leading to concentrated effects, high adjustment costs and lower welfare gains from trade across different population groups.

The remainder of the paper is structured as follows: Sections 2 of the paper presents the empirical model and the data utilised in the paper. Section 3 provides an analysis of the empirical estimation results and discusses the sensitivity of the results. Section 4 concludes the paper.

2 Empirical Model and Data

To estimate the effect of tariff liberalisation on the reallocation of labour into services we estimate the following relationship:

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

where the dependent variable, ΔlnE_{mt}^{serv}, is an indicator of labour market outcomes in the services sector, such as the change in log employment or average wage, in municipality *m* at time *t*. We define local labour markets as municipalities, following Weir-Smith and Ahmed (2013). $\Delta TPmn_{mt}$ represents the change in the manufacturing tariff protection measure for municipality *m* at time *t*. To control for other factors that may influence labour market outcomes, we include time-varying variables, such as the time-varying log working-age

[9] We follow the definition of the Employment Equity Act, 55 of 1998 of Blacks as Africans, Coloureds and Indian/Asian.

population and migration rate, denoted by $\Delta X'_{mt}$, and lagged variables for the skill composition of the working age population, the share unemployed in the working-age population, the employment share of manufacturing, and indicators of infrastructure denoted by $Z'_{m,t-1}$. We also account for period fixed effects (λ_t) to capture general trends in labour market outcomes common to all regions.

To construct the municipal level tariff exposure measure, $\Delta TPmn_{mt}$, we follow the widely used Bartik (1991) method (Dix-Carneiro & Kovak, 2015; Gaddis & Pieters, 2017; Kis-Katos et al. 2018; Kovak, 2013; Topalova 2010) and construct a time-varying local labour market measure of trade protection. This is constructed as the average industry tariff weighted by regional manufacturing employment share in the initial period, 1996 as follows:

$$TPman_{mt} = \sum_i \frac{Emp_{im,1996}}{Emp_{m,1996}} * Tr_{it} \quad (2)$$

where $TPman_{mt}$ represents the manufacturing trade protection measure at time *t*, $Emp_{im,1996}$ is 1996 manufacturing employment in industry *i*, and municipality *m*, while $Emp_{m,1996}$ is total manufacturing employment in 1996 in municipality *m*. Tr_{it} denotes the simple average tariff rates in industry *i* at time *t*. Values of *TPman* will, therefore, differ across regions according to a combination of their industry-mix and the tariffs associated with these industries. For example, regions with high initial shares of manufacturing employment in industries that face high tariffs will have comparatively high levels of *TPman*.

The above specification uses the across municipality variation in the change in local level worker exposure to tariffs and the change in labour market indicators to identify the relationship between tariff liberalisation and labour market outcomes. One concern in estimating the relationship is the endogeneity of tariff rates. Changes in tariffs are not independent of political interference and lobbying arising from the employment effects associated with liberalisation. Failure to account for this endogeneity may thus bias the estimated coefficient on the tariff variable.

The endogeneity problem is likely to be muted in the post-1990 period, given that South Africa's multilateral tariff reductions were guided by its Offer during Uruguay Round of the World Trade Organisation in 1994. Tariff reductions post-2000 were also guided by the preferential trade agreements negotiated with the European Union (EU) and the Southern African Development Community (SADC) (Cassim et al., 2004). Nevertheless, concerns regarding the endogeneity of tariffs persist. For example, Holden and Casale (2002) find evidence that employment considerations influenced tariffs set by the South African Board on Tariffs and Trade, even in the face of tariff lines having been bound under the Uruguay Round. Their estimates find support for the Grossman and Helpman (1994) "protection for sale" model.

To deal with the potential endogeneity issue, we follow Ahsan (2013), Amiti and Konings (2007) and Goldberg and Pavcnik (2007) and use an instrumental variable (IV) estimation strategy that involves the use of the initial tariff level as an instrument for subsequent changes.

The validity of our IV strategy depends on two key requirements. First, we require that initial tariffs are correlated with changes in tariffs. This is supported by the fact that the South African multilateral tariff liberalisation followed a rationalisation process that targeted the heavily protected industries (Edwards, 2005). Therefore, industries with the highest initial tariffs had the largest cuts in tariff rates. Supportive evidence for this is provided in
Figure ***1*** where a negative association between initial tariff and the change in tariff is evident. Second, we require that initial tariffs be uncorrelated with 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.

Data and variables

We utilise data from several sources. The first datasets are those of the South African population censuses for 1996, 2001, and 2011, released by the national statistics agency, Statistics South Africa. Two versions of the population censuses are available: a version based on all census observations where data are aggregated in spatial units; and a 10% sample dataset with individual-level and household-level data. Variables obtained from the full population census include gender, industry (at the one-digit Standardized Industrial Classification (SIC) level), income, migration and unemployment. Education, employment by two-digit SIC level, occupation and race are acquired from the census 10% sample. The household-level census data provides us with indicators of household access to infrastructure and municipal services, including access to electricity, piped water, a flush toilet, and weekly refuse removal by the local authority.

Several challenges arose in using the census data. To deal with changes in the country's administrative boundaries over the period, we used ArcGIS to overlay 1996 sub-place boundaries onto 2001/2011 municipality boundaries.[10] This provides us with a consistent longitudinal and cross-sectional dataset of 234 municipalities in each year.

Since the census does not collect data on wages, we use the income of workers as a proxy for wages, following Redding and Venables (2004). Although income includes basic salary, bonuses, allowances, income from grants, transfers, remittances and any other income source, we argue that it is a good proxy, especially in the case of South Africa where total income received is comprised largely of salaries or wages (Leibbrandt et al., 2010). A further challenge is that income in the censuses is reported in brackets. To overcome this challenge, we use the midpoints of each bracket and the highest bracket is set at twice the value of the lowest bound. We use the mean income per worker in the respective municipality as our indicator of wage.

For services employment, we included working age individuals (15-65 years old) employed in the following services sectors: construction, wholesale and retail trade, transport and communication, finance and business services, community, social and personal services, public administration, private households, and other services.

[10] We assign the 1996 population values of each sub place unit to their corresponding 2001/2011 municipalities based on a ratio of the area common to both sub place and municipality.

For tariff data we update the data used by Edwards (2005). The tariff data are available at the 6-digit level of the Harmonized System (HS) and include ad valorem equivalent values for specific and mixed tariffs. To construct $TPman_{mt}$, we aggregate the tariff rates, using the simple average, to ten 2-digit level manufacturing industries that correspond with the industry classification of employment used in 1996.[11] We use the 1996 employment values within municipalities as weights to calculate the regional average tariffs in accordance with equation (2).

Turning to the control variables, we measure the unemployment rate following the strict definition restricting our sample to include individuals between 15 and 65 years old.[12] The migration rate is calculated as the number of individuals who migrated since the prior census as a share of the current census working-age population. The skill rate is calculated as the proportion of the working-age population with a matric or Grade 12 qualification and higher. 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.

Tariff Liberalisation in South Africa in the Post-Apartheid period

Figure 2 presents the average tariff faced by manufacturing workers over the period 1993 and 2011. The tariff rate is calculated as per equation (2), but using 1996 employment data aggregated to the national level for the ten manufacturing industries as weights. Three different employment-weighted tariff rates are presented: the aggregate measure uses total (male plus female) manufacturing employment, while the male and female measures use the industry employment levels for men and women separately. We include the gender-specific measures as the gender composition of employment differs across industries reflecting industry-specificity and non-substitutability in employment across industries.

As shown in Figure 2, South Africa experienced a substantial reduction in tariff protection over the period, with average tariffs falling 12 percentage points, from 20% in 1993 to 8% in 2011. The declines in tariffs is initially driven by the multilateral liberalisation programme adopted as part of South Africa's offer at the Uruguay Round of the GATT/WTO, while the post-2000 tariff reductions are largely associated with the implementation of the free trade agreements with the European Union and the Southern African Development Community (SADC) (Edwards, 2005).

Interestingly, the female employment-weighted tariffs fell more strongly than for males (29% to 12% compared to 16% to 7%). The reason is attributed to the relatively sharp reductions in

[11] The 2-digit SIC level employment data is only available from 10% sample. This data, however, is reported at the magisterial district level, not the more disaggregated main-place level used to construct the other municipality level variables. There are 354 magisterial districts in South Africa. We mapped the weighted magisterial district industry data to the 2011 municipalities to calculate the trade protection measure in each of the 234 municipalities.
[12] The strict or official definition of unemployment includes individuals who did not work during the seven days prior to census night, individuals who wanted to work, and were available to start work within a week of census night, as well as individuals who had taken active steps to look for work in the four weeks prior to census night (Statistics South Africa, 2012).

tariffs on manufacturing industries in which female employment was concentrated in 1996. This is illustrated in Figure 3 that plots a negative relationship between the change in industry tariff from 1996 and 2011 and the period average share of women in total employment within the industry. The textile, clothing, and footwear industry, which has the highest female-intensity of employment in manufacturing, experienced particularly large reductions (over 20 percentage points) in tariff protection. The implication of these trends is that the tariff liberalisation process is expected to have a gendered impact based on industrial segregation, with more pronounced effects on women than men through this channel.

A spatial map of the initial (1996) female employment share in manufacturing (left hand side) and the change in employment-weighted tariffs between 1996 and 2011 (right hand side) is presented in
Figure ***4***. The darker shade denotes municipalities with higher female manufacturing employment shares and lower reductions in tariffs. The maps show significant variation in both female manufacturing employment share and the change in tariffs across municipalities in South Africa. The maps also reveal that municipalities that had a relatively large share of female manufacturing employment also experienced relatively large reductions in tariffs. These municipalities are predominantly located in KwaZulu-Natal, Western Cape, the Eastern Cape and Gauteng.

Employment in the Post-Apartheid period

The post-Apartheid period also corresponds with substantial changes in labour market outcomes including the sectoral composition of employment. Table 1 presents data on employment in services as a share total employment for 1996, 2001 and 2011. Services account for the bulk of employment of South African workers with its share rising from 69.7% in 1996 to 82% in 2011. The employment shares differ for men and women. In 2011, the employment share of women in services was about 87% compared to 78% for men. Further, trends in employment shares vary by race with the initially higher share of Whites relative to Blacks working in services (78% vs 67.5% in 1996) eliminated by 2011 (82.9% and 81.8% in 2011, respectively). Within race categories, the gender employment gap in services employment shares is wider among Blacks than Whites. However, gender employment gaps have declined over time. By 2011, the gender gap among Blacks was 8.9 percentage points, and among Whites, 7.9 percentage points. Although not presented here, the gender composition of employment also differs across services sub-sector. The community sub-sector is by far the largest employer of women in services, followed by private households and wholesale, while men are mostly employed in the community, wholesale, and finance sub-sectors.[13]

Further summary statistics on the change in tariff protection and employment from 1996 to 2011 are provided in Table 2 . The mean and median change across municipalities plus the 75-25 percentile difference in the change across municipalities are presented. The summary

[13] The community sub-sector employs about 33% of women and 25% of men. The largest variation in the employment of men and women is shown to be that of private households and construction. The employment share of women and men in private households is 33% and 7% respectively, while in construction the share is 1% and 17% respectively.

statistics show an average rise in the services to manufacturing employment ratio across municipalities in the post-apartheid period of 27.5 log points (approximately percentage points). The standard deviation is 61 log points, reflecting enormous regional variation in structural shifts from manufacturing to services. Furthermore, the structural shift from manufacturing to services is marginally stronger for men (29.4 log point change) than for women (25.3 log points). This is associated with higher growth in employment in services for men (68.5 log points) compared to women (63.4 log points).

The disparities across race are large. The employment growth of Blacks in services (71.1 log points) far exceeds that of Whites (33.2 log points). The gender services employment disparity is higher among Blacks than Whites. Employment growth of Black men exceeded that of Black women by 0.6 log points, while the gender disparity for Whites was 0.3 log points. Further, as shown by the standard deviations, the mean hides substantial variation across regions in the change in services employment by race and gender.

Finally, we see sizeable differences in the extent to which workers in municipalities experienced changes in tariff exposure. While the average reduction in tariffs was 8 percentage points across municipalities, the 75th percentile municipality experienced a 2.7 percentage point larger reduction than the 25th percentile municipality.

3 Empirical Results

We conduct the empirical analysis in five parts. First, we study the effect of tariff liberalisation on wages in the services sector. Second, we look at how tariff reductions are associated with shifts in the services to manufacturing employment ratio. Third, we present estimates of the effect of tariffs on employment levels. Fourth, we control for spillover effects, and, finally, we analyse how the impact differs by race and gender.

Tariff Liberalisation Effects on Wages in the Services Sector

We begin the analysis of tariff liberalisation effects in the services sector by investigating whether liberalisation affected wages of services sector workers. The estimation results are presented in Table 3. The baseline results in columns (1) and (2) are estimated using OLS. Column (1) only controls for the working-age population, while column (2) includes other control variables, such as migration rate, skill rate, unemployed rate, infrastructure, and initial manufacturing share. Given the endogeneity concerns regarding tariff changes, columns (3) to (4) instrument the change in *TPman* with the lagged level of *TPman*.

We find that the coefficients on the tariff variable are insignificantly different from zero in all estimates. This finding corroborates that of Erten et al. (2019), who, in addition to services, finds no response in manufacturing wages to tariff liberalisation. One potential explanation is South Africa's wage setting processes, such as the centralized bargaining mechanisms and sectoral determinations, that limit firm's responses to shocks along the wage margin (Erten et al., 2019; Magruder, 2012; Dinkelman & Ranchhod, 2012). In the following estimates, we check whether the adjustment may occur across the employment margin.

Tariff Liberalisation Effects on Structural Change

Theoretically, tariff liberalisation in manufacturing importing countries such as South Africa is expected to reduce the price of manufacturing relative to services, thus leading to a structural shift in employment away from manufacturing into services and export industries (Edwards, 1988). In this section, we test for the presence of this hypothesised relationship across municipalities in South Africa. Table 4 presents the instrumental variable estimate results.

The estimates in column (1) show a weak (at 10% level of significance) negative effect of tariff protection on the services to manufacturing employment ratio, as is expected from theory. A 1 percentage point increase in the average tariff faced by a municipality is estimated to raise the ratio of services to manufacturing employment by 3.5%. Since tariff protection declined by an average of 8 percentage points, as shown in Table 2, this translates to an approximately 28 percentage point increase in the services to the manufacturing employment ratio, holding all other factors constant. As shown in the same Table 2, the services to manufacturing employment ratio rose by 27.5 percentage points on average across municipalities. The results suggest that tariff liberalisation effects can account for the entire change in the services to manufacturing employment ratio for the mean municipality.

The results also explain some of the variation in the change in employment ratios across municipalities. For example, there is a 3 percentage point difference in tariff reductions between the 75th and 25th percentile municipalities. The results imply that this led to a 10.62 percentage point increase in the difference in services to manufacturing employment ratios between these municipalities. Overall, the results support the theoretical expectation of tariff-induced structural shift in the composition of employment. These results are comparable with those of Dix-Carneiro and Kovak (2015), Menezes-Filho and Muendler (2011), all of which show liberalisation to induce modest structural shifts in employment towards services.

The estimates also indicate other municipal level characteristics that affect the change in the services to manufacturing employment ratio. Municipalities with higher unemployment rates, lower initial skill ratios, and higher initial shares of employment in manufacturing, experienced greater increases in the services to employment ratio. The results for skill are peculiar as we would expect that skilled individuals would face fewer rigidities in reallocating to the relatively skill-intensive services sector. A possible explanation for this result is that fewer skilled workers are being released from manufacturing in response to liberalisation and technological progress. For this reason, there could be a reduced incentive for skilled workers to reallocate from manufacturing to services.

To further investigate the sources of this structural shift, we estimate the effect of tariff reductions on the change in the level of manufacturing (column 2) and services (column 3) employment. A positive coefficient on the tariff variable means that tariff reductions are associated with employment declines. We find that changes in tariffs are positively and significantly associated with changes in manufacturing employment levels. A 1 percentage point reduction in the regional tariff indicator is associated with a 4.8% decline in

manufacturing employment within that municipality, as shown in column (1). This finding is in line with existing literature by Autor et al. (2015) and Gaddis and Pieters (2017).

In column (3) for services employment, we anticipate a negative coefficient on the manufacturing tariff variable, signalling that falling tariffs induce a reallocation of employment from manufacturing towards services. Contrary to our expectations, our estimates reveal a significant (5% level) *positive* coefficient on the tariff variable. The estimated coefficient of 1.29 implies that a 1 percentage point reduction in the municipal level tariff rate *reduce*s employment in the services sector by 1.29 percent, holding all other factors constant. Tariff liberalisation is thus shown to have *reduced* employment in services relative to its trend. This result differs slightly from that of Erten et al. (2019) who estimate an insignificant relationship between tariffs and services employment. This may reflect their use of individual level data over a shorter period.

These results imply that the services sector failed to absorb labour that was released from manufacturing in response to liberalisation. Rather, tariff liberalisation diminished employment growth in services within municipalities, leading to a much larger aggregate negative effect on employment. Those municipalities facing large tariff reductions, therefore, experienced disproportionately large reductions in employment in both manufacturing and services.

One potential explanation for these results for services employment is the presence of negative spillover effects associated with the decline in manufacturing. Such effects have been noted by Acemoglu et al. (2016), Autor et al. (2015) and Dehejia and Panagariya (2014) who find evidence of negative spillover effects for the US that diminished the structural shift towards services. The following section explores the effect of these linkages at the local level in South Africa, possibly through spillover effects from manufacturing, in more detail.

Spillover Effects on Services Sector Employment

One potential explanation for the results for services employment for South Africa is the presence of negative spillover effects associated with the decline in manufacturing. Such effects have also been noted by Acemoglu et al. (2016), Autor et al. (2015) and Dehejia and Panagariya (2014) who find evidence of negative spillover effects for the US that diminished the structural shift towards services. This section explores the effect of these linkages at the local level in South Africa, possibly through spillover effects from manufacturing, in more detail.

As mentioned earlier, liberalisation of tariffs in the manufactured goods sector can spill over to services through three channels, namely, (1) derived demand for services inputs, (2) income effects, and (3) infrastructure effects. To the extent that these effects are present and not accounted for, they will bias the services employment estimates of the tariff coefficient upwards. Consequently, we test for the influence of the three channels on services employment at the local level.

To capture the derived demand effects, we ideally require a measure of the change in services input demanded by manufacturing associated with liberalisation.[14] Unfortunately, we do not have an indicator from the population censuses of manufacturing output at the local level. As an alternative, we proxy the derived demand for services inputs indicator as follows:

$$DD_{mt} = \sum_i c_i E_{mit} \quad (3)$$

where c_i denotes the services share in total costs of manufacturing industry i obtained from South African Input-Output Tables and E_{mit} is the total employment in manufacturing industry i in municipality at time t. We essentially use employment as a proxy for manufacturing output.[15] The change in DD_{mt} is included in the estimates.

To control for income effects, we include the change in mean individual income in the municipality, obtained from the population census. Since the population census reports bracketed income, we calculate income using the mid-point and derive mean income per capita (calculated as the sum of income divided by the population) in each municipality. While this variable captures changes in income within the municipality from all sources, it will be influenced by changes in income associated with changes in employment within the manufacturing sector.

We tried several different measures to control for the infrastructure investment channel. Our final choice that provided the strongest results, was electricity infrastructure, measured as the share of households with electricity. Reductions in manufacturing production and employment in response to tariff liberalisation are expected to have reduced demand for infrastructure services, including electricity, by households and manufacturing firms in those regions. These regions will, therefore, experience low increases in the provision of such services compared to other municipalities.

To control for the impact of the spillover channels from manufacturing on services employment, we include each variable into the into the services employment regressions. Support for the influence of these channels in driving the positive tariff coefficient illustrated in Table 4 (column 3) would be revealed by a declining significance and size of the tariff coefficient, together with positive and significant coefficients on the variables controlling for the spillover effects. Table 5 presents the various estimates.

Column (1) includes derived demand as a control. While the tariff coefficient remains positive, it falls slightly and becomes significant only at the 10% level. The derived demand coefficient is positive and significant at the 5% level, implying that lower manufacturing production, as proxied by lower employment, in response to liberalisation, adversely affects services through demand for services inputs in manufacturing.

[14] Acemoglu et al. (2016) calculate the demand for good by a sector via forward linkages using input-output tables.
[15] The one implication is that the indicator will be biased upwards for regions that have high shares of labour-intensive manufacturing sectors.

In column (2), we include the income variable. The tariff effect remains positive, but is smaller and less significant (10% level). The income coefficient is also positive and significant (5%) pointing to a positive association between changes in local incomes and the demand for services. These results imply that lower income associated with employment losses in manufacturing from tariff liberalisation negatively spills over to the services sector.

The effects on services employment when controlling for infrastructure investment (proxied by electricity) is displayed in column (3). In line with our expectation, we find that the estimated effect of manufacturing tariff liberalisation on services employment diminishes and loses some of its significance. The infrastructure coefficient is also positive, suggesting that an increase in infrastructure investment is associated with higher services employment. When combining all the controls in column (4), we find significant positive coefficients on all spillover variables, while the manufacturing tariff effect on services employment becomes insignificantly different from zero.

The implication is that, once we control for spillover effects from manufacturing, tariffs have no additional effect on services employment. Failure to include controls for the spillover effects biases the coefficient on the tariff variable upwards reflecting the positive effect that tariffs on manufacturing have on employment in services via these spillover channels. The results imply that, as the manufacturing sector contracts following tariff reductions, employment in services declines because of reduced derived demand for services, lower income, and less investment in infrastructure.

However, support for sectoral reallocation of labour in response to liberalisation would be revealed by a significant negative coefficient on the tariff variable. We therefore still do not observe in the data the anticipated increase in services employment arising from liberalisation. The structural changes and labour reallocation predicted by theory (Edwards, 1988) does not appear to have occurred.

There are several possible explanations for this result. Perfect mobility of workers across sectors may be hampered by rigidities. These could include wage rigidities associated with the wage bargaining process (Bhorat et al., 2009). In general equilibrium trade models, such as the Heckscher-Ohlin model, adjustment takes the form of relative price changes and through this relative wage changes (or relative factor price changes) that alter the industry composition of employment. If wages are unable to adjust downwards, there is little incentive for firms (in both manufacturing and services) to absorb the displaced labour resulting in unemployment and slower employment growth in the industry or sector experiencing rising relative prices. Employment losses in the sector facing tariff cuts, manufacturing in this case, will also be greater. [16]

[16] Note that employment levels in manufacturing would still decline even if wages are flexible, but with fixed wages, the employment decline would be greater. Erten et al. (2019) find that labour market adjustment in manufacturing to trade liberalization in South Africa also takes place along the employment margin and not via wage adjustments.

A second explanation is that sector-specific skills impede the relocation of manufacturing workers into services. For example, if services production is more skill-intensive than manufacturing, the less-skilled workers with manufacturing-specific skills that lose their jobs may not be able to find employment in services because they lack the requisite skills. The implication is a much smaller increase in services employment than would otherwise be the case.

Our results broadly reflect a subdued reallocation of labour from manufacturing to services, possibly associated with rigidities in labour market adjustment. In addition, employment growth in services is further undermined by negative spillover effects through derived demand, income, and infrastructure linkages associated with the decline in manufacturing.

Gendered Tariff Liberalisation Effects on Services Sector Employment

The objective of this section is to assess the gendered employment effects in services associated with tariff liberalisation in manufacturing. With gender-specific rigidities and industry segregation in manufacturing and services, tariff liberalisation may give rise to very different impacts for males and females.

Theory predicts several channels through which tariff liberalisation may have an impact on the gender composition of employment. Neoclassical trade theory predicts that increased import competition reduces discrimination against women because of the pro-competitive effects of trade (Becker 2010).[17] Trade-induced skill-biased technological change alters the relative demand for skills (Wood 1995; Acemoglu 2003; Thoenig & Verdier 2003), and should skill endowments differ by gender, this give rise different outcomes across gender. Further, trade-induced technological change may alter the relative demand for "brain versus brawn", thus benefiting the employment of women (Galor & Weil 1993; Weinberg 2000; Juhn et al. 2014). Finally, sectoral reallocation of factors in response to liberalisation will have gender implications if male and female workers are imperfect substitutes in the production process across manufacturing and services industries (Galor & Weil 1993; Sauré & Zoabi 2014; Do et al. 2016).

We first seek to determine if the tariff-induced structural change in the employment composition, as measured by the ratio of services to manufacturing employment, differs for men and women. The estimation results are displayed in Table 6. The shift in the services/manufacturing employment ratio in response to tariff liberalisation is substantially larger for women than for men (column 1 and 2). When splitting gender by race, we find that the larger effect for women is driven by particularly pronounced shifts for Black women (column 3). There is no evidence of a structural change in response to tariff liberalisation for men (Black or White) and White women. These findings differ from those found for Brazil by

[17] Black and Brainerd (2004) find evidence for this and show that there is a positive relationship between market power and "taste for discrimination", a potentially important determinant of gender inequality in employment and wages.

Gaddis and Pieters (2017). They find modest sector reallocation of men, in particular, low-skilled men, but no movement of women.

To explore this further, Table 7 presents estimates of manufacturing tariff changes on the change in employment levels within services. Columns (1) to (3) do not include the spillover controls, while columns (4) to (6) include these controls. The results reveal that tariff liberalisation is adversely associated with employment growth in the services sector for men (column 2 and 5), but not women (column 1 and 4). Further disaggregation of the data by race, as displayed in Table 8, reveals that the significant positive coefficient for men arises from the positive tariff association for Black men and White women. If we unpack this further, by looking at the effect of tariffs on services employment at the sub-service sector level (See Table A3 in the appendix), we find that the positive coefficient for Black men and White women arises from the Construction and Finance sectors.

What are the implications of the above? The data reveals distinct differences in the impact of trade liberalisation on employment according to gender and race. We find strong and significant structural shifts towards services employment, as measured by the ratio of services to manufacturing, but this is not driven by re-allocation of manufacturing labour into services, but rather by declines in manufacturing employment.[18] The declines in manufacturing employment were particularly strong for Black women, reflecting the intensity of their employment in industries, such as clothing and textiles, that experienced sharp cuts in tariffs. According to our results, these workers were unable to relocate into the services sectors.

For men, we find no significant structural shifts from manufacturing towards services at the local level. What drives this result is a decline in employment of men, primarily Black men, in *both* manufacturing and services, particularly in construction and finance, in response to tariff reductions. Employment of men was thus adversely affected by liberalisation through lower employment growth in manufacturing and lower employment growth in services.

Robustness Check

In this section, we test for the sensitivity of the main instrumental variable results by using the 1996 working-age population as a share of the national working-age population as weights. In doing so the estimated coefficients better reflect the outcomes of the more populous municipalities where much of the economic activity is concentrated.

The coefficients for the structural change regressions are presented in Table A3. The results corroborate our earlier findings, and if anything, are stronger. We estimate significant structural shifts in employment from manufacturing to services in response to tariff liberalisation that primarily driven by the association for Black females.[19] Yet as shown in Table A4 that presents the estimated results for employment in services, this shift is not driven by a reallocation of

[18] This finding is consistent with that of Erten et al. (2019) who find significant negative effect of tariff liberalization on manufacturing employment, but no impact on services employment.

[19] We do now estimate a positive a positive coefficient for White men, suggesting that lower tariffs reduced the services to manufacturing employment ratio.

labour to services. Employment in services at the local level declined in response to liberalisation, with stronger effects for Black men and White women. Much of the adverse effect on services is explained by the spillover effects. The implication is that the rise in the services to manufacturing employment ratio in response to liberalisation is driven by the stronger adverse effects of employment in manufacturing than in services, and not from labour reallocation. The decline in services employment, exacerbated the local labour market effects of liberalisation leading to particularly strong declines in manufacturing and services employment in municipalities relative exposed to sharp tariff cuts.

4 Conclusion

This paper analyses the effect of liberalisation of manufacturing tariffs on service employment across local labour markets in South Africa from 1996 to 2011. Our focus is on understanding the extent to which labour reallocates from manufacturing to services, and how spillover effects may undermine this process. Further, we unpack the gender and race dynamics behind these shifts.

We find that much of the structural shift in employment from manufacturing to services can be explained by tariff liberalisation. These findings corroborate those from the international literature, Dix-Carneiro and Kovak (2015) and Menezes-Filho and Muendler (2011) who find similar evidence in Brazil. However, we show that this effect is not driven by reallocation of labour into services. Contrary to our expectations, regions that experienced higher tariff reductions also experienced slower growth in services employment.

Further analysis reveals that lower derived demand, income, and infrastructure investment linked to the decline in manufacturing from tariff liberalisation explain this negative association. Our results therefore corroborate the findings of Autor et al. (2015) and Acemoglu et al. (2016) for the US and Dehejia and Panagariya (2014) for India. However, even after controlling for the spillover effects, we find no evidence of reallocation labour into services employment. Our results are, therefore, similar to the study in Brazil by Dix-Carneiro and Kovak (2015), who find that the structural change into the nontradable sector is not enough to compensate for the loss in the tradable sector.

Finally, we find significant differences in labour market adjustments across gender and race. The increases in the services to manufacturing employment ratio are stronger for women, particularly Black women, but this is primarily driven by strong declines in manufacturing employment rather than reallocation into services employment. Within services, tariff liberalization negatively impacted upon employment of men with stronger effects for Black men and White, largely in response to the negative tariff effects on employment growth in construction and finance.

Several implications follow from the results. Firstly, the South African economy appears to be characterized by substantial rigidities to the reallocation of workers in response to adverse demand shocks. One potential explanation for the failure of services to absorb employment is the presence of wage rigidities associated with the centralised Bargaining Council processes or

the minimum wages imposed under the Sectoral Determinations. Our results, as is also found by Erten et al. (2019) show that wages do not adjust to tariff liberalisation resulting in labour market adjustments taking place along the employment margin. While this may adversely affect retention of workers within manufacturing, our results suggest that this may also impede absorption of workers from manufacturing into the services sector.

The poor reallocation into services may also reflect the industry-specificity of skills required in production across sectors. Without retraining support and programmes, manufacturing workers that lose their jobs may not be able to find work in alternative sectors.

These effects are compounded by several factors. Firstly, services are highly localised and key providers of inputs into manufacturing. The implication is that declines in manufacturing spillover into declines in demand for services, therefore compounding adverse reallocation effects associated with employment rigidities within each sector. Secondly, although not studied in this paper, rigidities to the movement of people will exacerbate the localisation of the impact of tariff liberalisation on labour market outcomes. Thirdly, the gender, race and spatial characteristics of sectoral employment still strongly reflect the outcomes of the Apartheid policies of separate development.

The implication is that adverse shocks that affect industries differently, such as trade liberalisation, do not have uniform effects across all workers and regions. As we show, spillover effects from the decline in manufacturing exacerbated the regional employment impact of tariff liberalisation. A particular challenge for countries such as South Africa, is that these impacts may compound the prior distributional gaps across individuals and location.

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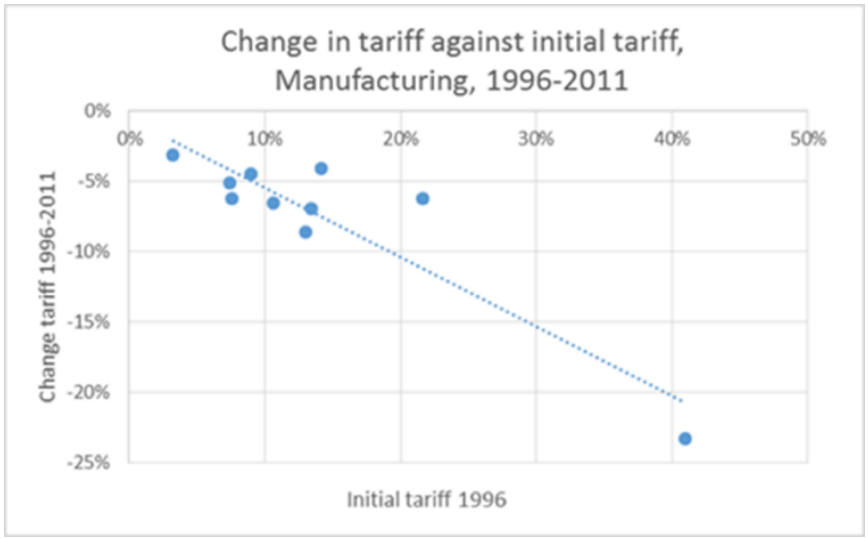
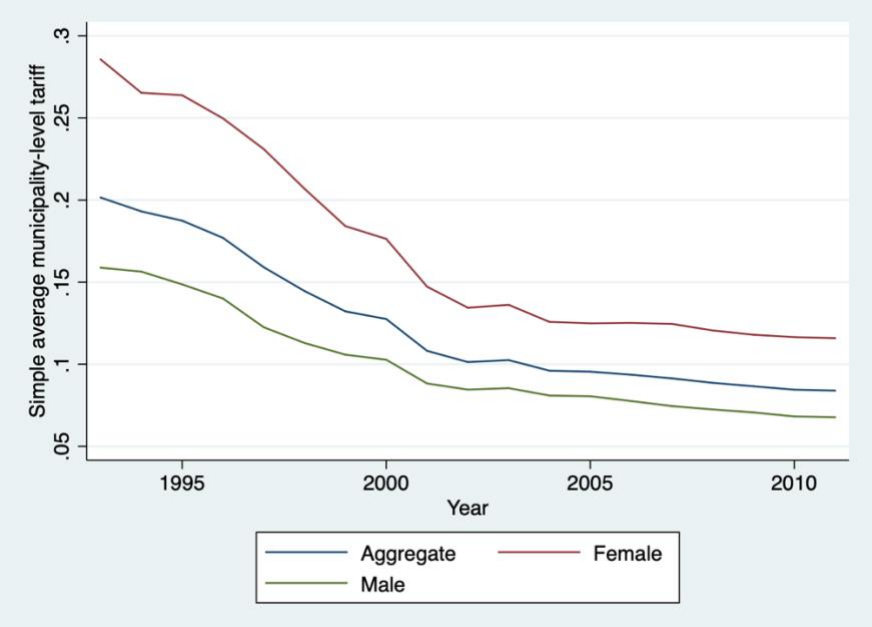
Figure 1: Correlation between initial tariff rates and change in tariff rates



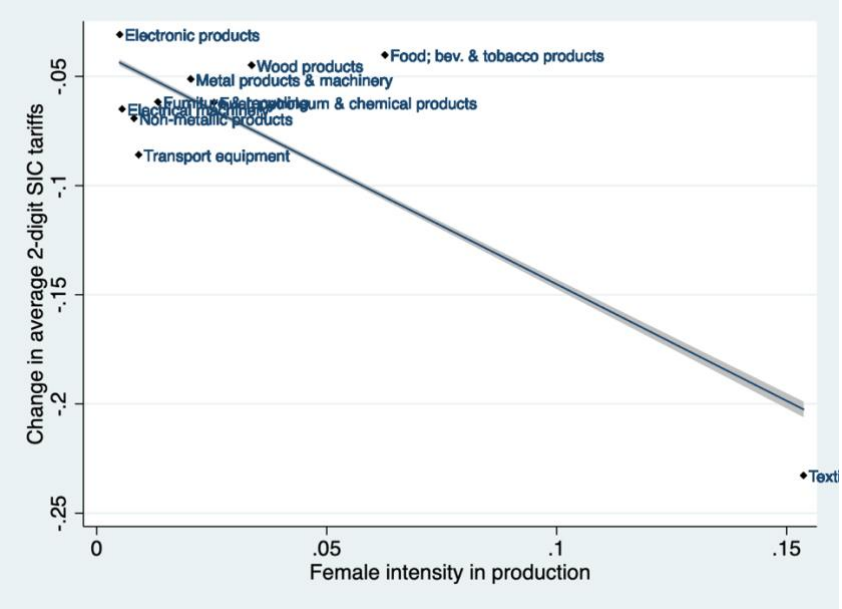
Source: Own calculations using annual nominal tariff data updated from Edwards (2005)

Figure 2: Evolution of average municipality-level tariff exposure



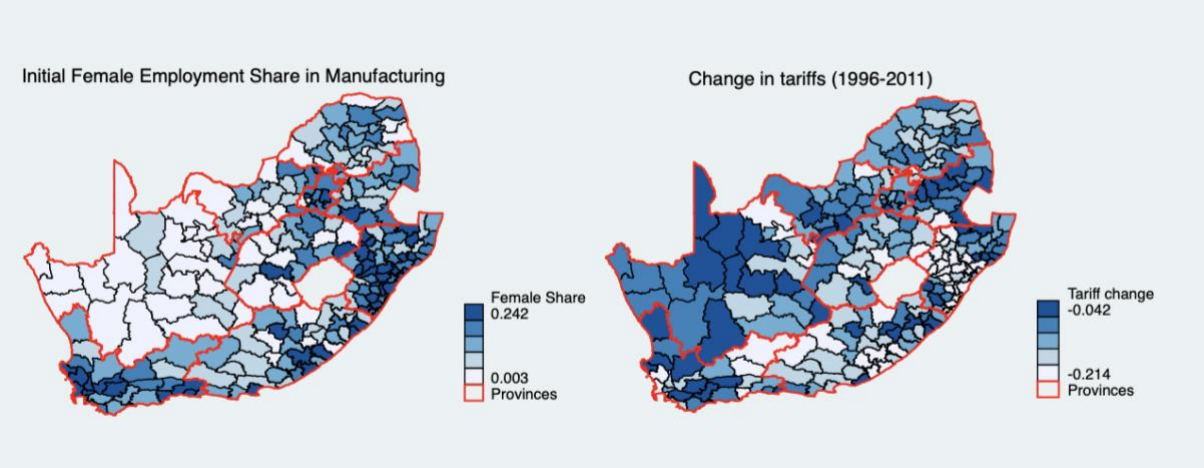
Notes: The figure presents the simple average tariff exposure measure across municipalities. 1996 employment levels for all workers, males and females are used as weights to construct the aggregate, male and female tariff exposure measures, respectively.
Sources: Own calculations using the 10% sample of the 1996 Population Census and tariff data updated from Edwards (2005).

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



Notes: Tariffs changes are constructed using 2-digit SIC industry-level tariffs. The female intensity in production measures the share females in total employment within the manufacturing industry.
Sources: Own calculations using Population Census data and tariff data updated from Edwards (2005)

Figure 4: Initial female share in manufacturing and the change in manufacturing employment-weighted tariffs



Notes: Initial female employment share in manufacturing represent female employment as a share of total manufacturing employment in 1996. The change in tariff reflects change in manufacturing employment-weighted tariffs between 1996 and 2011.
Sources: Own calculations using Population Census data and tariff data updated from Edwards (2005)

Table 1: Share of total employment in the services sector, 1996 to 2011

	1996	2001	2011
Aggregate	69.7	70.8	82.0
Female	80.1	80.2	86.9
Male	62.6	64.0	78.3
Black	67.5	68.5	81.8
Female	78.3	77.4	86.9
Male	60.4	61.6	78.0
White	78.0	77.3	82.9
Female	87.0	86.2	87.1
Male	71.3	70.4	79.2

Notes: Services employment shares are calculated as services employment divided by respective total employment. The values are expressed as percentages. Black comprises of Africans, Coloured and Indians/Asians.
Source: Own calculations using South African Population Census data for 1996, 2001 and 2011.

Table 2: Summary statistics of the change in tariffs and services employment, 1996 to 2011

Variable	Mean	P50	SD	P75-P25
Δ*TPman*	-0.080	-0.073	0.026	0.027
Δln(Services/Manufacturing employment)	0.275	0.235	0.610	0.754
Female	0.253	0.248	0.847	1.012
Male	0.294	0.232	0.574	0.721
Δln(Services employment)	0.662	0.687	0.331	0.419
Female	0.634	0.660	0.371	0.471
Male	0.685	0.686	0.352	0.391
Gender gap	0.051	0.040	0.296	0.316
Δln(Services employment: Black)	0.711	0.740	0.349	0.442
Female	0.681	0.699	0.390	0.504
Male	0.736	0.726	0.375	0.432
Gender gap	0.006	0.003	0.041	0.044
Δln(Services employment: White)	0.332	0.323	0.586	0.611
Female	0.333	0.320	0.602	0.650
Male	0.369	0.305	0.839	0.604
Gender gap	0.003	-0.007	0.387	0.057

Notes: Gender gap measures the difference between the change in ln(male employment) and the change in ln(female employment). Black comprises Africans, Coloured and Indians/Asians.
Source: Own calculations using South African Population Census data for 1996, 2001 and 2011, and tariff data updated from Edwards (2005)

Table 3: The effects of tariff liberalisation on services wages

	(1)	(2)	(3)	(4)	(5)
	Dependent variables: Change in log services wage				
VARIABLES	Baseline	Extended	Extended (IV)	Extended Female (IV)	Extended Male (IV)
ΔTariff	0.538	0.573	1.573	1.296	1.535
	(1.061)	(1.123)	(1.604)	(1.930)	(1.571)
ΔWorking-age population	0.407**	0.391**	0.383**	0.513***	0.313*
	(0.189)	(0.179)	(0.178)	(0.196)	(0.177)
ΔMigration rate		-0.222	-0.224	-0.108	-0.140
		(0.296)	(0.296)	(0.274)	(0.320)
L.Skill rate		-0.314	-0.314	-0.307	-0.172
		(0.540)	(0.540)	(0.528)	(0.563)
L.Unemployed rate		0.073	0.133	0.300	0.043
		(0.532)	(0.529)	(0.565)	(0.538)
L.Infrastructure		0.009	0.010	0.012	0.006
		(0.015)	(0.015)	(0.014)	(0.016)
L.Manufacturing share		-0.001	0.031	0.193	-0.071
		(0.349)	(0.349)	(0.346)	(0.370)
Constant	0.907***	1.094***	1.102***	0.984***	0.998***
	(0.058)	(0.279)	(0.279)	(0.269)	(0.301)
Observations	468	468	468	468	468
R-squared	0.169	0.172	0.172	0.170	0.151
Year FE	Yes	Yes	Yes	Yes	Yes

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

Notes: Wages reflect income/capita. 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 4: Tariff liberalisation effects on structural change in employment composition

VARIABLES	(1) Change in log services/manufacturing employment	(2) Change in log manufacturing employment	(3) Change in log services employment
ΔTariff	-3.539*	4.824***	1.285**
	(1.868)	(1.700)	(0.583)
ΔWorking-age population	0.177	0.891***	1.070***
	(0.145)	(0.151)	(0.052)
ΔMigration rate	-0.195	0.405**	0.211***
	(0.190)	(0.196)	(0.067)
L.Skill rate	-1.426***	0.538	-0.888***
	(0.357)	(0.389)	(0.133)
L.Unemployed rate	0.698*	-0.957**	-0.256*
	(0.394)	(0.437)	(0.150)
L.Infrastructure	0.007	-0.002	0.004
	(0.010)	(0.011)	(0.004)
L.Manufacturing share	2.644***	-2.418***	0.227**
	(0.401)	(0.317)	(0.109)
Constant	0.014	0.488**	0.501***
	(0.194)	(0.199)	(0.068)
Observations	467	467	468
R-squared	0.173	0.296	0.763
Year FE	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. 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 5: Tariff liberalisation and the spillover effects on services employment

	(1)	(2)	(3)	(4)
	Dependent variables: Change in log services employment			
VARIABLES	Model 1	Model 2	Model 3	Model 4
ΔTariff	1.226*	1.136*	1.193*	1.002
	(0.634)	(0.608)	(0.608)	(0.631)
ΔLog Derived demand	0.024**			0.024*
	(0.012)			(0.012)
ΔLog Income		0.126***		0.121***
		(0.040)		(0.041)
ΔLog Electricity			0.064**	0.056**
			(0.027)	(0.026)
ΔWorking-age population	1.055***	1.051***	1.001***	0.979***
	(0.074)	(0.075)	(0.077)	(0.074)
ΔMigration rate	0.222***	0.213**	0.205**	0.220**
	(0.084)	(0.085)	(0.084)	(0.086)
L.Skill rate	-0.923***	-0.803***	-0.743***	-0.712***
	(0.134)	(0.128)	(0.141)	(0.147)
L.Unemployed rate	-0.256	-0.352**	-0.394**	-0.466***
	(0.164)	(0.167)	(0.173)	(0.172)
L.Infrastructure	0.004	0.006	0.006	0.006
	(0.005)	(0.005)	(0.005)	(0.005)
L.Manufacturing share	0.261**	0.267**	0.262**	0.330***
	(0.126)	(0.117)	(0.118)	(0.121)
Constant	0.493***	0.378***	0.481***	0.355***
	(0.086)	(0.105)	(0.090)	(0.111)
Observations	467	468	468	467
R-squared	0.765	0.769	0.766	0.774
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. Derived demand is the share of services in cost weighted by employment shares. Income is calculated using the mid-point of the income bracket. Income reflects income per capita. Electricity reflects the number of households with electricity as a share of total households. 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 6: The effects of tariff liberalisation on structural change across gender and race

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable: Change in log services/manufacturing employment					
	Aggregate		Black		White	
VARIABLES	Female	Male	Female	Male	Female	Male
ΔTariff	-6.626***	-1.461	-7.394***	-1.849	2.624	3.128
	(2.457)	(1.764)	(2.748)	(1.784)	(5.074)	(6.895)
ΔWorking-age population	0.399*	0.108	0.397	0.073	0.120	0.414
	(0.205)	(0.140)	(0.241)	(0.144)	(0.414)	(0.316)
ΔMigration rate	0.631**	-0.552***	0.692**	-0.565***	-0.935	-1.595**
	(0.283)	(0.198)	(0.336)	(0.207)	(0.695)	(0.672)
L.Skill rate	-1.531***	-1.399***	-1.421***	-1.369***	-1.534	-2.702*
	(0.487)	(0.338)	(0.542)	(0.355)	(1.395)	(1.429)
L.Unemployed rate	1.332**	0.532	1.277**	0.307	0.731	1.368
	(0.536)	(0.429)	(0.646)	(0.464)	(1.245)	(1.346)
L.Infrastructure	0.006	0.016	0.016	0.020	-0.046*	0.015
	(0.017)	(0.012)	(0.018)	(0.012)	(0.025)	(0.018)
L.Manufacturing share	2.279***	2.638***	2.365***	2.673***	2.181**	3.370***
	(0.477)	(0.389)	(0.506)	(0.407)	(1.030)	(1.026)
Constant	-0.777***	0.372*	-0.844**	0.412*	0.293	0.858*
	(0.291)	(0.202)	(0.360)	(0.211)	(0.593)	(0.506)
Observations	465	466	463	466	387	415
R-squared	0.100	0.191	0.083	0.175	0.052	0.050
Year FE	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. 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 7: Tariff liberalisation effects on gendered services employment

VARIABLES	(1) Female	(2) Male	(3) Gender Gap	(4) Female	(5) Male	(6) Gender Gap
ΔTariff	0.771	1.689**	0.918	0.475	1.421*	0.946
	(0.620)	(0.739)	(0.640)	(0.605)	(0.786)	(0.663)
ΔLog Derived demand				-0.004	0.051***	0.055***
				(0.016)	(0.015)	(0.018)
ΔLog Income				0.130***	0.106*	-0.024
				(0.044)	(0.057)	(0.060)
ΔLog Electricity				0.106***	0.011	-0.095***
				(0.028)	(0.029)	(0.027)
ΔWorking-age population	1.126***	1.015***	-0.111	0.993***	0.964***	-0.029
	(0.090)	(0.083)	(0.086)	(0.091)	(0.079)	(0.088)
ΔMigration rate	0.413***	0.037	-0.376***	0.402***	0.066	-0.336***
	(0.080)	(0.108)	(0.103)	(0.079)	(0.109)	(0.096)
L.Skill rate	-0.859***	-0.910***	-0.050	-0.520***	-0.887***	-0.366**
	(0.144)	(0.145)	(0.131)	(0.158)	(0.172)	(0.161)
L.Unemployed rate	0.001	-0.482**	-0.482***	-0.333*	-0.573***	-0.240
	(0.176)	(0.200)	(0.182)	(0.185)	(0.205)	(0.193)
L.Infrastructure	-0.001	0.010	0.011**	0.003	0.010*	0.007
	(0.006)	(0.006)	(0.005)	(0.005)	(0.006)	(0.005)
L.Manufacturing share	0.301**	0.152	-0.149	0.394***	0.267*	-0.127
	(0.132)	(0.132)	(0.115)	(0.129)	(0.138)	(0.115)
Constant	0.225***	0.739***	0.514***	0.068	0.608***	0.539***
	(0.086)	(0.111)	(0.107)	(0.102)	(0.145)	(0.131)
Observations	468	468	468	467	467	467
R-squared	0.687	0.717	0.204	0.707	0.729	0.243
Year FE	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 dependent variable in columns (1), (2), (4) and (5) denotes changes in log services employment while in columns (3) and (6) it is the change in log services employment gap (male employment/female employment). The services gender gap is male services employment divided by female services employment. 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 8: Tariff liberalisation and gendered services employment by race

VARIABLES	(1) Female	(2) Male	(3) Gender Gap
Panel A: Unconditional estimates			
Black			
ΔTariff	0.806	1.845**	1.039
	(0.680)	(0.792)	(0.716)
White			
ΔTariff	7.352*	5.594	-3.297
	(4.153)	(5.085)	(3.237)
Panel B: Conditional estimates			
Black			
ΔTariff	0.551	1.626*	1.076
	(0.676)	(0.843)	(0.726)
White			
ΔTariff	6.893*	5.162	-3.513
	(4.011)	(5.053)	(3.214)
Year FE	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 dependent variable in columns (1) and (2) denotes change in log services employment while in columns (3) is change in log services employment gap (male employment/female employment). The services gender gap is male services employment divided by female services employment. Black comprises of Africans, Coloured and Indians/Asians. 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. The conditional estimates include the three spillover effects (derived demand, income effect, and infrastructure investment effect) on services employment and the opposite holds for unconditional estimates.

Appendix

Table A1: Effects of tariff liberalisation on derived demand, income and investment

VARIABLES	(1) Derived demand	(2) Income	(3) Investment
ΔTariff	0.151	1.565**	2.068*
	(2.285)	(0.711)	(1.175)
ΔWorking-age population	0.595***	0.125*	1.034***
	(0.229)	(0.068)	(0.087)
ΔMigration rate	-0.591*	-0.021	0.213
	(0.312)	(0.079)	(0.140)
L.Skill rate	1.177***	-0.893***	-2.556***
	(0.392)	(0.149)	(0.267)
L.Unemployed rate	-0.036	0.863***	2.291***
	(0.578)	(0.169)	(0.301)
ΔInfrastructure	-0.017**	0.009***	-0.008**
	(0.008)	(0.003)	(0.004)
ΔManufacturing share	5.150***	-0.109	0.004
	(0.669)	(0.221)	(0.316)
Constant	0.343	0.978***	0.185
	(0.307)	(0.083)	(0.113)
Observations	467	468	468
R-squared	0.189	0.560	0.374
Year FE	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 dependent variables are the change in log derived demand, income and investment, respectively. Derived demand is the share of services in cost weighted by employment shares. Income is calculated using the mid-point of the income bracket. Income reflects income per capita. Electricity reflects the number of households with electricity as a share of total households. 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 trade union members. Skill rate denotes skilled workers as a share of 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 access to electricity (including solar), weekly refuse collection, a 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 employment in the primary sector.

Table A2: Employment effects of tariff liberalisation on services sub-sectors

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	Electricity	Construction	Wholesale	Transport	Finance	Community	Private
Panel A: Unconditional estimates							
Aggregate	-2.663	2.497**	1.020	1.155	3.351**	0.945	1.978*
	(2.265)	(1.200)	(0.861)	(1.229)	(1.305)	(0.800)	(1.131)
Female	0.335	6.944	0.767	-0.077	1.860	0.630	1.499
	(10.906)	(12.117)	(0.999)	(2.659)	(1.449)	(0.714)	(1.138)
Male	-3.541	3.013**	1.252	1.478	4.270***	1.254	2.902
	(2.238)	(1.244)	(0.913)	(1.321)	(1.563)	(1.041)	(1.859)
Panel B: Conditional Estimates							
Aggregate	-3.141	1.959*	0.916	0.632	2.766*	0.881	1.663
	(2.315)	(1.131)	(0.879)	(1.297)	(1.431)	(0.804)	(1.123)
Female	0.168	6.717	0.615	-0.906	0.897	0.632	1.197
	(11.046)	(12.291)	(0.989)	(2.601)	(1.439)	(0.687)	(1.115)
Male	-3.979*	2.555**	1.168	1.080	3.922**	1.131	2.534
	(2.264)	(1.172)	(0.978)	(1.409)	(1.720)	(1.067)	(1.839)
Year FE	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. Dependent variables denote the change in log for the respective sub-sector. The services gender gap is male services employment divided by female services employment. Wholesale includes wholesale and retail trade while private denotes private households. 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. The conditional estimates include the three spillover effects (derived demand, income effect, and infrastructure investment effect) on services employment and the opposite holds for unconditional estimates.

Table A3: Tariff liberalisation and structural change (weighted)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Dependent variables: Change in log services/manufacturing employment								
	Aggregate			Black			White		
VARIABLES	Aggregate	Female	Male	Aggregate	Female	Male	Aggregate	Female	Male
ΔTariff	-2.541**	-9.247***	1.155	-4.406**	-12.390***	0.086	3.541	10.108*	15.491**
	(1.266)	(1.844)	(1.211)	(2.166)	(3.297)	(2.019)	(4.811)	(5.395)	(7.259)
ΔWorking-age population	-0.013	0.226	-0.141	0.117	0.410	-0.052	0.184	-0.430	0.454
	(0.165)	(0.240)	(0.158)	(0.209)	(0.322)	(0.184)	(0.529)	(0.838)	(0.856)
ΔMigration rate	-0.527***	-0.166	-0.734***	-0.548***	-0.271	-0.736***	-2.048***	-4.730***	-4.611***
	(0.133)	(0.194)	(0.128)	(0.190)	(0.274)	(0.198)	(0.766)	(1.197)	(1.288)
L.Skill rate	-0.664***	-0.506	-0.801***	-0.651**	-0.480	-0.761**	-0.993	-1.839	-3.341*
	(0.234)	(0.341)	(0.224)	(0.317)	(0.381)	(0.329)	(0.953)	(1.620)	(1.771)
L.Unemployed rate	0.875**	0.422	1.154***	0.470	-0.033	0.826	1.952*	-1.745	-1.522
	(0.385)	(0.561)	(0.369)	(0.525)	(0.814)	(0.534)	(1.181)	(2.472)	(2.322)
L.Infrastructure	-0.004	-0.019	0.013	0.004	-0.010	0.018	0.019	0.187**	0.256***
	(0.012)	(0.017)	(0.011)	(0.015)	(0.019)	(0.017)	(0.022)	(0.092)	(0.091)
L.Manufacturing share	2.169***	1.226***	2.528***	2.134***	1.081**	2.484***	3.670***	1.914	4.100**
	(0.254)	(0.369)	(0.243)	(0.367)	(0.476)	(0.386)	(0.960)	(1.422)	(1.730)
Constant	0.296*	0.080	-0.188*	0.335	0.184	-0.164	-0.207	5.153***	2.044**
	(0.155)	(0.226)	(0.114)	(0.215)	(0.322)	(0.156)	(0.493)	(0.907)	(0.850)
Observations	467	465	466	467	463	466	429	289	325
R-squared	0.330	0.113	0.402	0.286	0.116	0.351	0.084	0.371	0.352
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IV	Yes	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. 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 trade union members. Skill rate denotes skilled workers as a share of 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 access to electricity (including solar), weekly refuse collection, a 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 employment in the primary secto

Table A4: Tariff liberalisation and gendered employment in services (weighted)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent variables: Change in log services employment							
	Aggregate				Black		White	
VARIABLES	Aggregate	Aggregate	Female	Male	Female	Male	Female	Male
ΔTariff	0.896**	0.854*	-0.205	1.703***	-0.370	2.071***	6.028***	5.621*
	(0.449)	(0.442)	(0.452)	(0.542)	(0.503)	(0.578)	(2.260)	(3.363)
ΔLog Derived demand		0.017	-0.005	0.040***	-0.007	0.043***	-0.050	-0.032
		(0.012)	(0.012)	(0.015)	(0.014)	(0.016)	(0.064)	(0.096)
ΔLog Income		0.123***	0.124***	0.123***	0.082*	0.106**	0.487**	0.722**
		(0.039)	(0.040)	(0.047)	(0.044)	(0.051)	(0.201)	(0.297)
ΔLog Electricity		0.043**	0.092***	0.002	0.097***	-0.004	0.073	-0.091
		(0.022)	(0.022)	(0.026)	(0.025)	(0.028)	(0.111)	(0.167)
ΔWorking-age population	1.043***	0.945***	1.047***	0.852***	1.003***	0.799***	0.693**	0.764
	(0.058)	(0.063)	(0.064)	(0.077)	(0.072)	(0.083)	(0.328)	(0.486)
ΔMigration rate	0.152***	0.156***	0.262***	0.080	0.171***	0.051	0.558**	0.791**
	(0.047)	(0.047)	(0.049)	(0.058)	(0.054)	(0.062)	(0.248)	(0.366)
L.Skill rate	-0.626***	-0.483***	-0.337***	-0.592***	-0.128	-0.375***	0.289	-0.118
	(0.083)	(0.096)	(0.098)	(0.117)	(0.109)	(0.125)	(0.494)	(0.732)
L.Manufacturing share	0.150*	0.284***	0.200**	0.350***	0.216**	0.357***	0.166	0.109
	(0.090)	(0.095)	(0.097)	(0.116)	(0.108)	(0.124)	(0.489)	(0.726)
Constant	0.495***	0.346***	0.183***	0.470***	0.300***	0.512***	0.012	-0.479
	(0.055)	(0.065)	(0.067)	(0.080)	(0.074)	(0.085)	(0.247)	(0.498)
Observations	468	467	467	467	467	467	456	458
R-squared	0.813	0.821	0.798	0.771	0.780	0.760	0.130	0.100
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 and include unemployed rate as well infrastructure share control variables. Unemployed rate is the number of unemployed individuals as a share of the working-age population. Infrastructure represents households with access to electricity (including solar), weekly refuse collection, a flush toilet, and piped water, as a share of the total number of households. represents households with access to electricity (including solar), weekly refuse collection, a flush toilet, and piped water, as a share of the total number of households.. 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 trade union members. Skill rate denotes skilled workers as a share of the working-age population. Manufacturing share reflects manufacturing employment as a share of total employment, excluding employment in the primary sector.