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Long-Run Effects of Trade Liberalization on Local Labor Markets

Evidence from South Africa

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Abstract

This paper uses municipal-level data from South Africa for the period 1996–2011 to estimate the medium to long-run effects of trade liberalization on local labor markets. It finds that local labor markets that were more exposed to tariff cuts tended to experience slower growth in employment and income per capita than less exposed regions. The longer-term effects of trade liberalization on regional earnings are stronger than the medium-term effects, and tend to be more pronounced among municipalities that included the former homelands.

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Long-Run Effects of Trade Liberalization on Local Labor Markets: Evidence from South Africa*

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1 Introduction

A growing body of evidence for both developing and developed countries reveals that trade liberalization and increased import competition have significant impacts on local labor markets and regional dynamics. A series of influential papers report significant short and medium-run adverse relative effects on local income and employment in India, Brazil, South Africa and the United States (Topolova, 2010; Kovak 2011; Autor et al., 2013; Hakobyan and McLaren, 2017; Erter et al., 2019). This empirical evidence points to strong distributional consequences of trade liberalization across regions within countries, and suggests that the costs of adjustment to import competition may partly offset the aggregate welfare gains generated by freer trade.

Until recently, it was typically assumed that these adverse effects of trade liberalization on local labor markets, although quantitatively important in the short and medium run, would tend to dissipate over longer time horizons. For example, Autor et al. (2013) argue that, as negatively impacted workers move to other sectors, retire or pass away, trade-induced wage losses or unemployment would dissipate, while the gains from trade should persist. However, this conventional wisdom has been challenged by recent evidence for Brazil. Using 25 years of administrative employment data, Dix-Carneiro and Kovak (2017) study the dynamics of local labor market adjustment following the trade liberalization in the early 1990s and find that regions facing larger tariff cuts experienced prolonged declines in formal sector employment and earnings relative to other regions. Surprisingly, the impact of tariff changes on regional earnings 20 years after liberalization was three times larger than the effect observed after 10 years. These rising impacts on regional earnings are inconsistent with conventional spatial equilibrium models, which predict declining effects due to spatial arbitrage. Instead, the evidence supports a mechanism involving imperfect interregional labor mobility and dynamics in labor demand, driven by slow capital adjustment and agglomeration economies. This mechanism gradually amplifies the effects of liberalization, explaining the slow adjustment path of regional earnings and

quantitatively accounting for the magnitude of the long-run effects.

While this evidence for Brazil is convincing, little is known about the extent to which these qualitative findings apply more generally to other developing countries and institutional settings. In this paper, we use municipal-level data from South Africa for the period 1996-2011 to empirically examine the medium- to long-term effects of trade liberalization on local labor markets. Following the 1994 democratic elections, there was a sudden and important shift in trade policy: South Africa adopted an ambitious programme of multilateral tariff liberalization as part of the Uruguay Round, and concluded several regional trade agreements. As in most of the previous literature (reviewed in more detail below), the empirical analysis exploits the fact that, because of initial heterogeneity in the production structure, municipalities across South Africa were differentially exposed to the sizable tariff reductions observed in the country after the introduction of democracy. Examining these differential regional impacts of trade liberalization is especially warranted in the South African context, where the large regional disparities associated with the homeland system imposed during the apartheid regime persisted long after the introduction of democracy (Bastos and Bottan, 2016).

The econometric results reveal that local labor markets that were more exposed to tariff reductions tended to experience slower growth in employment and income per capita than less exposed regions. Consistently with the findings of Dix-Carneiro and Kovak (2017), the effects on income per capita observed over the period 1996-2011 tend to be considerably larger and more precisely estimated than in the period 1996-2001. These findings are robust across different definitions of local labor markets. The long-term adverse effects of tariff cuts on relative employment and income per capita growth tend to be stronger among municipalities that included the former homelands (the territories reserved for marginalized black communities during apartheid). This result may plausibly reflect that the former homelands had little economic activity beyond subsistence agriculture and were already characterized by highly depressed

incomes. If a municipality that contained a former homeland was hit by a trade shock in another sector, it is less likely to be able to provide viable outside options for workers displaced by these trade shocks. Taken together, this evidence provides further support to a mechanism involving imperfect interregional labor mobility and dynamics in labor demand, driven by slow capital adjustment and agglomeration economies.

As noted above, this paper contributes to a growing literature examining the effects of import competition and tariff liberalization on local labor markets. Topolova (2010) exploits the 1991 Indian trade liberalization to estimate the impact of import competition on relative poverty dynamics across districts. The estimates provide evidence that rural districts in which sectors were more exposed to liberalization were concentrated experienced slower decline in poverty and lower consumption growth. The impact of liberalization was most pronounced among the least geographically mobile at the bottom of the income distribution, and in Indian states where inflexible labor laws impeded factor reallocation across sectors. Autor et al. (2013) examine the impacts of increased Chinese import competition on labor markets in the United States. They show that U.S. commuting zones were differentially exposed to Chinese import competition because of initial heterogeneity in their production structure, and argue the transition of China to a market economy (and the consequent rise of its productivity and trade flows) may be regarded as an exogenous trade shock to those local labor markets. They find that rising import competition from China caused higher unemployment, lower labor force participation, and reduced wages in local labor markets that house import-competing manufacturing industries. Import competition is found to explain about one-quarter of the contemporaneous aggregate decline in US manufacturing employment. Transfer benefit payments for unemployment, disability, retirement and health care also rose sharply in local labor markets more exposed to import competition. In the Brazilian context, Costa et al. (2016) distinguish between the impacts of competition and demand shocks arising from rising trade with China.

They find that local labor markets more affected by Chinese import competition experienced slower growth in manufacturing wages between 2000 and 2010. However, they also document that locations benefiting from rising Chinese commodity demand during the same period experienced faster wage growth. Hakobyan and McLaren (2017) estimate effects of NAFTA on wages using US data for 1990 and 2000. They estimate the effects of the agreement by industry and location, measuring each industry's exposure to Mexican imports and each locality's dependence on exposed industries. They find that tariff reductions reduced wage growth for blue-collar workers in the most affected industries and localities. These effects apply also to service-sector workers in affected localities, whose jobs do not compete with imports.

Using individual-level data from South Africa for 1994-2004, Erter et al. (2019) find that workers in districts facing larger tariff reductions experience a significant decline in both formal and informal employment in the tradable sector, driven primarily by a decline in manufacturing employment, relative to workers in districts less exposed to these reductions. Displaced workers do not appear to have moved to other sectors or to less affected regions. Instead, they are more likely to become discouraged workers or exit the labor force entirely, and show an increased probability of accessing government transfers. Using community-level data from several rounds of the South African population census, this paper extends and complements this evidence by distinguishing between medium and long-term effects of trade liberalization, and examining the heterogeneity of impacts according to the presence of the former homelands. As discussed above, the evidence we document provides further support to a mechanism involving imperfect interregional labor mobility and dynamics in labor demand, driven by slow capital adjustment and agglomeration economies.

The remainder of the paper is organized as follows. Section 2 provides a brief overview of the institutional background in South Africa. Section 3 outlines the econometric method, before Section 4 presents the data and summary statistics. Section 5 reports and discusses the econometric results. Section 6 provides a discussion

of the policy implications. Section 7 summarizes and concludes the paper.

2 Institutional background

Apartheid in South Africa was enforced through legislation introduced by National Party governments that ruled the country from 1948 to 1994. The government classified inhabitants into racial groups and introduced an identity card for all adult citizens specifying their race. Each race was allotted its own territory, which was later used as a basis for forced removals. Public goods provision was segregated. Through the homeland system, the government aimed to divide South Africa into separate nation-states. In the 1950s, the apartheid regime created separate government structures for white and black citizens and proposed self-governing Bantu units, which would have devolved administrative powers with the promise of later autonomy and self-government. The Black Homeland Citizenship Act of 1970 deprived black people of their citizenship, who legally became citizens of one of ten tribally based self-governing homelands. Panel A of Figure 1 shows the geographic location of each of these ten homelands. Four homelands were declared independent states by the South African government: Transkei in 1976, Bophuthatswana in 1977, Venda in 1979, and Ciskei in 1981. Between the 1960s and 1980s, there was a massive program of forced relocation, with millions of inhabitants forced from their homes, many being resettled in the homelands. The government aimed for a total removal of the black population to the homelands (Clark and Worger, 2011). During apartheid, black people were prevented from running businesses or being employed in white areas, unless a pass for a particular area was issued. A black person working in a white-designated area without a pass was subject to arrest and trial for being an illegal migrant, which would frequently lead to deportation to the corresponding homeland and prosecution of the employer.

Following the 1994 democratic elections, all homelands were legally reintegrated

into South Africa and the newly elected government committed to the effective dismantling of coercive institutions previously imposed on marginalized racial groups. The 1994 democratic election also led to a sudden and important shift in trade policy: from export promotion with import controls to greater openness through tariff liberalization. South Africa adopted an ambitious programme of tariff liberalisation as part of the Uruguay Round, and concluded free trade agreements with the European Union the Southern Africa Development Community, among several others. These trade reforms led to a substantial simplification and rationalization of the South African tariff structure (Jenkins et al., 1997; Edwards et al., 2009). The number of tariff lines fell from over 12,000 at the beginning of the 1990s to 6,420 in 2006 (Edwards et al., 2009). Figure 2 shows that the reduction in effectively applied tariffs was especially important in the manufacturing sector.

3 Econometric method

To examine the impacts of trade liberalization on local labor markets, we adopt the following econometric specification:

$$\Delta Y_m = \alpha + \beta \Delta WT_m + \gamma \Delta Controls_m + \epsilon_{mt} \tag{1}$$

where: ΔY_m denotes the change in employment or income per capita of municipality m, ΔWT_m is the change in the municipality's employment-weighted tariff, defined as the summation of sectoral tariff changes weighted by the initial share of labor allocated to the industry in the municipality (measured in 1996). In several specifications, we will introduce a set of demographic controls to account for changes in the composition of the population in each municipality. These include changes in total population, the percentage of male population, average age, percentage of population without education, and percentage of black/white population. We will also exploit the heterogeneity of effects by municipality, depending on the presence of a former

homeland, the initial levels of the majority racial group, and the skill composition of the workforce.

4 Data and descriptive statistics

For the main analysis, we use a municipal-level panel data set based on the community profiles from the 1996, 2001 and 2011 population censuses run by Statistics South Africa. These community profiles (available at the sub-place level) provide aggregated category counts for each variable in the census. South Africa is divided into 50 districts, 234 municipalities and over 21,000 sub-places (communities). Each municipality had a population of about 169,000 individuals on average in 1996, although there is significant heterogeneity. The census includes data on demographics, labor market (including employment, industry and salary), and access to infrastructure. Using cartographic data on communities and former homeland boundaries, we identified which communities were located inside and outside the former homelands. This information makes it then possible to identify if the municipality included or not former homeland communities. We merged industry-level data on effectively applied import tariffs from UNCTAD TRAINS, which we used to compute municipal-level, employment-weighted average tariffs. As our main measure, we use a simple employment-weighted average tariff at the municipality-sector level (using the initial share of the sector in employment of the municipality as weight), in which the sector-level average tariff is a simple average of import tariffs at a more disaggregated level. As described below, we will also use an alternative employment-weighted and import-weighted tariff. Figure 3 displays the distribution of the changes in these employment-weighted tariffs during 1996-2011, distinguishing between municipalities that include areas from the former homelands and municipalities that do not. The figure shows that there exists significant variation in the degree to which municipalities are exposed to tariff cuts. It also shows that the distributions of tariff cuts are

fairly similar between municipalities that include areas from the former homelands and other municipalities. These features of the data are convenient for the identification of the overall effects of trade liberalization, as well as heterogeneous effects depending on the presence of homeland areas.

Our main dependent variables of interest are the change in employment and income per capita at the municipality-level. The latter variable is defined as the difference in the natural logarithms of population-weighted income per capita between 1996 and 2011. Since data on income are grouped in categories (e.g. no income, 1 to 4800 rand a year, and so on), we take the midpoint of each cate- gory. All income values are expressed in December 2012 prices (obtained from Statistics South Africa).

For background, we provide descriptive evidence on the evolution of demographic and economic differentials across communities located just-inside and just-outside the former homelands. Following Bastos and Bottan (2016), communities are grouped in one-kilometer bins with respect to the minimum linear distance to the former homeland border. Panel A in Figure 4 reveals the extent to which black people were geographically segregated as a result of the homeland system: the large differences that existed in 1996 persist after a period of 15 years, though the share of black citizens increased in communities located just-outside the former homelands. Panel B depicts levels of income per capita, where former homeland communities fare significantly worse both in 1996 and 2011.

Table 1 reports summary statistics of the municipal level data we use in the regression analysis, for each census year: 1996, 2001 and 2011. We observe that the percentage of the black population in each municipality remained fairly stable over the period of analysis, varying between 72% to 75% on average. In contrast, the percentage of the population without formal education in the municipality declined considerably from 26% in 1996 to 9.11% in 2011. Real income per capita increased systematically over the sample period, whereas the proportion of employed population declined initially from 1996 to 2001, rising again between 2001 and 2011.

5 Results

In this section, we present the econometric results. We first present the baseline estimates. We then report several robustness checks. Finally, we assess the heterogeneity of effects across regions depending on initial attributes of the municipality.

5.1 Baseline estimates

Table 2 reports the baseline estimates for the model presented in (1), without the including the demographic controls. The upper panel examines effects on employment, while the lower panel reports the estimated effects on income per capita. We consider two measures of employment-weighted average tariffs. The first uses an employment-weighted average tariff at the municipality-sector level (using the initial share of the sector in employment of the municipality as weight), in which the sector-level average tariff is a simple average of import tariffs at a more disaggregated level. The second is also an employment-weighted average tariff at the municipality-sector level, but in which the sector-level tariff is an import-weighted average of the more disaggregated sector-level tariffs. In both cases, we observe that tariff reductions have significant negative effects on municipal-level employment and income per capita. These qualitative findings apply to both the 1996-2001 and 1996-2011 periods, and are robust across the two different measures of employment-weighted average tariffs. Consistent with Dix-Carneiro and Kovak (2017), the longer-term effects on income per capita tend to be considerably larger than the short-term effects. The estimate based on the employment-weighted average tariff for 1996-2011 is about four times larger than the estimate for the period 1996-2001. The estimate based on the employment-weighted and import-weighted average tariff for the period 1996-2011 is more than 50 percent higher than the estimate for 1996-2001. However, the difference between long-run and medium-run effects is not as clear for employment. The estimates based on the employment-weighted tariff point to larger long-term effects, but the estimates using

the employment-weighted and import-weighted tariffs are fairly similar across the two periods.

Table 3 reports similar estimates, but now including control variables that account for changes in the demographic composition of the population. Although the observed changes in demographics across municipalities might be partly a consequence of trade liberalization, they might also be driven by several other factors. In the latter case, the baseline estimates reported in Table 2 would be biased. To account for this concern, in Table 3 we include as controls changes in total population, the percent of male population, average age, percent of population without education and percent of black/white population. We observe that the main results remain qualitatively unchanged, although the inclusion of these controls tends to lower the magnitude of the point estimates. We also observe that the estimates in column (1) referring to the period 1996-2001 are less precisely estimated and not statistically significant at conventional levels. The remainder estimates point to a positive and significant relationship between import tariffs and local employment and income per capita. As before, the adverse effects on relative income per capita tend to increase when one considers a longer-time horizon: they are considerably larger in the period 1996-2011 than in the period 1996-2001. Overall, this evidence suggests that the long-term effects of trade liberalization on relative employment and income growth are not primarily driven by changes in the demographic and skill composition of the local population.

5.2 Robustness checks

We proceed by conducting a series of checks to verify the robustness of our baseline estimates. A potential concern about the results reported above is that the differential patterns we observe might be also driven by developments in the export sector, in particular by changes in the terms of trade associated with the evolution of the international price of mineral commodities. South Africa has some of the world's

largest mineral reserves, and is a leading producer of a range of mineral commodities such as gold, platinum and diamonds (US Department of Interior, 1996, 2011). The industry accounted for about 8% of GDP and 43% of exports in each of these years, and about 80% of mineral output was sold in export markets (US Department of Interior, 1996; 2011). From the early 2000s, the mining industry benefited from a favorable evolution of international prices. For instance, the real price of gold in U.S. dollars more than tripled between 1996 and 2011. During the period of analysis, the emergence of China in the global economy, and the resulting increase in global demand for natural resources is perhaps the clearest empirical counterpart to an exogenous shock to global demand (see, e.g., Autor et al., 2013). To address this concern, in Tables 4 and 5 the mining industry was excluded from the empirical analysis. Table 4 considers the baseline specification without controls, while Table 5 includes the set of controls considered in Table 3. Reassuringly, we observe that the baseline estimates tend to remain qualitatively similar when the mining sector is excluded. In particular, we find statistically significant long term adverse effects of trade liberalization on the relative growth of local employment and average earnings.

Another potential concern regards the level of aggregation at which local labor markets were defined. In the main analysis, we use the municipality as the geographic unit of analysis for identifying local labor markets. A potential concern about this approach is that these geographic units might be too small, and do not fully account for population movements within broader commuting zones. For example, some workers might live in a municipality and work in another. To account for this concern, in Table 6 we perform the analysis at the district-level, which is considerably larger than municipalities and commuting zones. There are 50 districts in South Africa, considerably fewer than the 234 municipalities considered in the main analysis. Reassuringly, the main results remain qualitatively similar. We observe significant adverse long-term effects of tariff cuts on regional employment and earnings. The effects income per capita over the period 1996-2001 are not statistically significant.

5.3 Heterogeneity of impacts

Examining the localized impacts of trade liberalization is especially warranted in the South African context, where the large regional disparities associated with the homeland system imposed during apartheid persisted long after the introduction of democracy (Bastos and Bottan, 2016). The magnitude of the effects of trade liberalization on local labor markets might be expected to depend on the initial conditions of the municipality. In particular, municipalities including the former homelands might be expected to have greater difficulties in adjusting to increased import competition. The homelands had little economic activity beyond subsistence agriculture, and were already characterized by highly depressed incomes. If on top of this a municipality that contains a homeland is hit by a trade shock in another sector (e.g. in manufacturing), it might have greater difficulties in providing viable outside options for workers displaced by these trade shocks. The results in Table 7 suggest that municipalities that contained a former homeland were indeed more adversely impacted by tariff reductions. The coefficient on the interaction term between the employment-weighted average tariffs and the dummy variable indicating if the municipality contained a former homeland is generally positive and statistically significant. For income per capita, the interaction between the employment-weighted tariff and the homeland dummy in the period 1996-2001 is only marginally significant (at the 10% level). For the remainder of the estimates, the coefficients of interest are always positive and statistically significant at least at the 5% level.

In Table 8 we examine the robustness of this finding by looking at the share of the black population in the municipality in 1996. Since the homelands were essentially areas with black citizens only, we would expect to observe a significant correlation between municipalities that had homelands and those with a high proportion of black population. The results for period 1996-2011 suggest again that the adverse effects of trade liberalization on employment and wages were stronger in municipalities with a relatively high initial share of the black population. The coefficient on the interaction

term between the employment-weighted average tariffs and the dummy variable indicating a high proportion of black population is positive and statistically significant in all specifications. The results for the period 1996-2001 are less conclusive, with insignificant differential effects for income per capita.

Finally, in Tables 9 and 10 we examine differential effects depending on the initial skill level of the population in the municipality. In Table 9 we consider a measure of skill based on occupations. According to this classification, skilled workers perform the occupations of legislators, senior officials and managers, skilled professionals, technicians and associate professionals, service workers, shop and market sales workers. In turn, unskilled occupations include agricultural and fishery workers, clerks, craft and related trade workers, plant and machine operators and assemblers, and workers performing elementary occupations. Interestingly, the share of unskilled workers exhibits a negative correlation with the share of the black population in 1996 (correlation of -0.32), and with a dummy variable indicating if the municipality had a former homeland (-0.49), perhaps reflecting a high degree of inequality in these municipalities. The results in columns (3) and (4) of Table 9, referring to the period 1996-2011, reveal that the adverse effects of trade liberalization on employment and income per capita tend to be weaker in municipalities with a higher share of unskilled workers. The results for the period 1996-2001 are less conclusive, with insignificant differential effects for income per capita (Panel B, columns (1) and (2)). In Table 10 we consider a measure of skill based on education, in which workers are classified as skilled if they have higher education. In each of these cases, we consider that a municipality is initially low-skilled abundant if the share of unskilled workers in 1996 is above the 50th percentile. Once again, the results in Table 10 suggest that, for the period 1996-2011, the adverse effects of trade liberalization on relative employment and income per capita tend to be weaker in municipalities with a higher share of unskilled workers. The results for the period 1996-2001 are less conclusive, with insignificant differential effects for income per capita.

6 Discussion

Trade liberalization typically generates aggregate gains for consumer welfare. Although reduced tariff protection may lower relative incomes for workers in locations more exposed to the resulting rise in import competition, it generates broader gains to consumers from lower product prices or increased product variety, as well as gains to firms from having inputs at lower cost and in greater diversity (Broda and Weinstein, 2006; Goldberg et al., 2010). Import competition may also contribute to productivity growth by inducing reallocations across firms and investments in innovation (Pavcnik, 2002; Melitz, 2003; Bloom et al., 2015). But international integration has distributional consequences across households and locations within countries, and for some groups the costs of adjustment to import competition may partly offset gains, even in the long term.

What can be done to deal with the localized relative impacts of tariff liberalization? There is no-one-size-fits all strategy for dealing with these impacts. The optimal policy design depends on the nature of the shock, as well as on country attributes and initial conditions (International Monetary Fund, World Bank and World Trade Organization, 2017). Facilitating geographical labor mobility may be especially important when such mobility has been historically lower. This is clearly the case in South Africa in the aftermath of the introduction of democracy. Indeed, the evidence presented above reveals that the adverse effects of import competition on some communities were significant and long-lasting. Well designed and targeted active labor market policies, such as job search assistance and training, can play an important role in facilitating mobility across sectors, regions and occupations. While the evidence on the effectiveness of training programs is mixed, specific training and education programs devoted to providing the skills required to face structural changes in the labor market have potential to succeed, especially if employer associations are involved in the process of defining the skills and expertise that are necessary (Almeida et al. 2012; Bastos et al., 2016). Education policies equipping workers with skills that are

portable across sectors and occupations may need to be strengthened. Protecting workers and their families (as opposed to protecting their jobs) is an important consideration in the design of policies and institutions seeking to mitigate the impacts of trade liberalization. Although employment protection legislation can reduce displacements, it can also be an impediment to necessary reallocation. Unemployment benefits can help smooth consumption, and make it possible for workers to participate in training and job search. They can also mitigate the impacts on the children of displaced workers. However, these policies should be carefully designed to avoid potentially adverse effects on employment and efficiency.

However, easing labor market adjustment and dealing with the localized effects of trade shocks may require a more comprehensive policy mix that goes beyond labor policies. The evidence reviewed above points to significant and long-lasting adverse effects of import competition on relative local income and employment growth. It also points to reduced geographical mobility of labor in response to trade shocks. Although place-based policies may help revitalize areas depressed by trade shocks and strengthen regional cohesion, it is necessary to assess the viability of such investments. Housing policies, such as relocation allowances, may facilitate geographical mobility of displaced workers. Well-functioning financial markets may ease access to credit to help to finance education, training and entrepreneurship of displaced workers.

7 Concluding remarks

In this paper we have used municipal-level data from South Africa for the period 1996-2011 to empirically examine medium to long-term effects on local labor markets of the tariff reductions observed after the introduction of democracy. We find that local labor markets that were more exposed to tariff cuts tend to have experienced slower growth in employment and income per capita (relative to regions less exposed to trade liberalization). The longer-term effects on income per capita tend to be stronger

than the shorter-term impacts. These results are robust across different definitions of local labor markets. The long-term adverse effects on relative income per capita were stronger among municipalities that included the former homelands (the former territories reserved for marginalized black communities) and a higher share of the black population. Although reduced tariff protection may lower relative incomes for workers in locations more exposed to the resulting rise in import competition, it generates broader gains to consumer welfare. Policy options to deal with the localized effects of trade shocks include general inclusive policies, such income redistribution, as well as policies seeking to facilitate worker mobility across sectors, regions and occupations.

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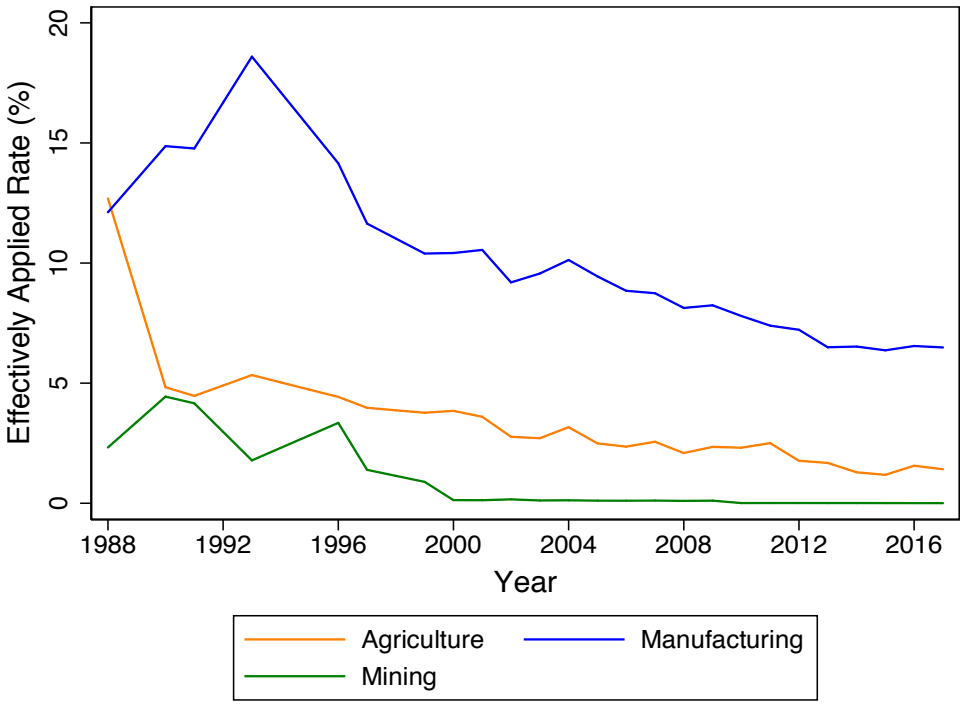
Figure 1: Former homelands in South Africa

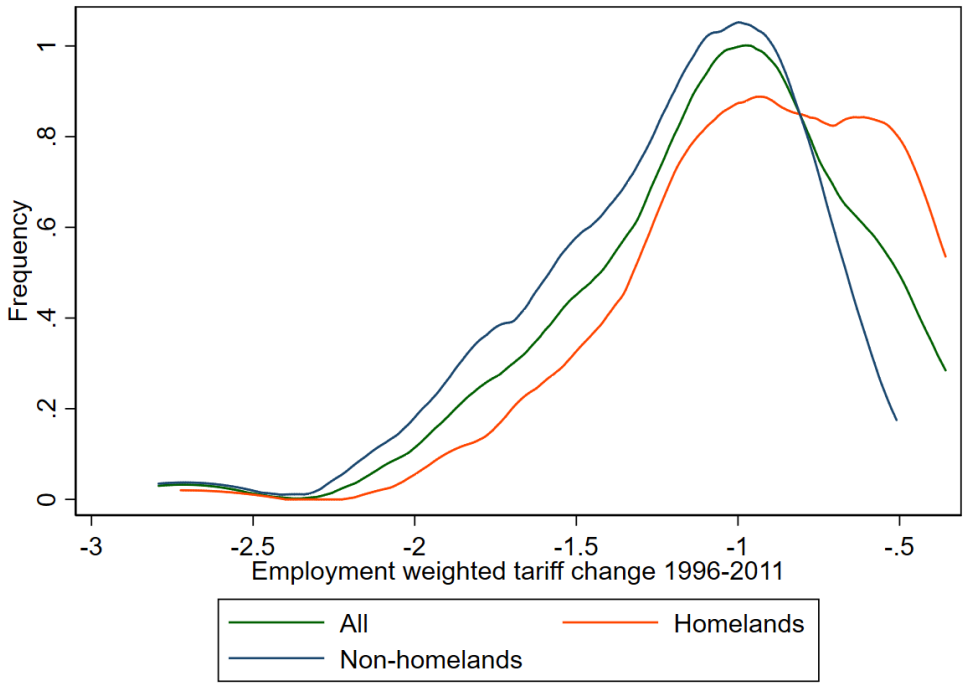
Notes: The shaded areas represent former homelands. The maps were generated using shape-files obtained from Statistics South Africa and *The Directorate: Public State Land Support*. Dashed area corresponds to Lesotho.

Figure 2: Import tariffs in South Africa, 1988-2016



Notes: The Figure displays the simple average of the effectively applied tariff rates in agriculture, manufacturing and mining over the period 1988-2016. Data come from UNCTAD TRAINS.

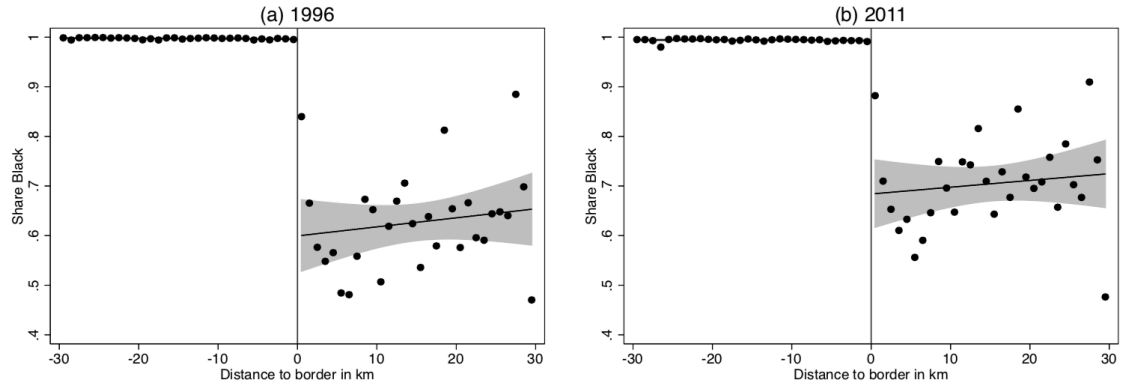
Figure 3: Distribution of the change in weighted tariffs across municipalities, 1996-2011



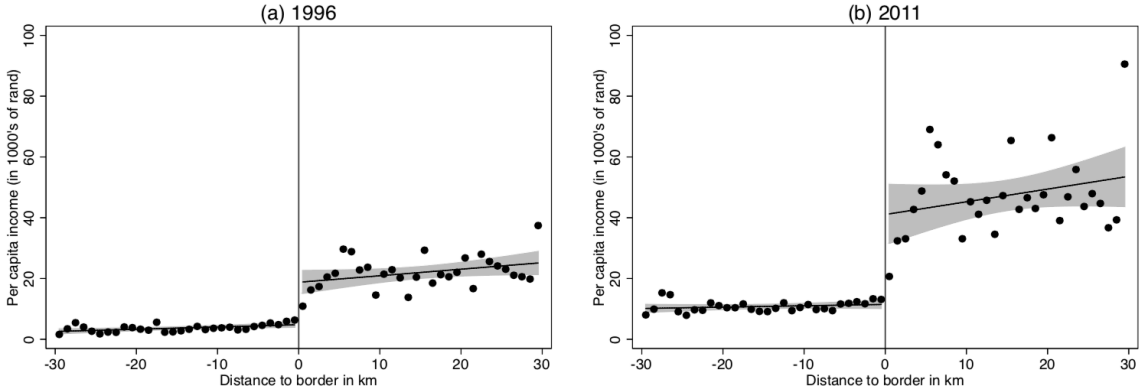
Notes: The figure displays the distribution of the changes in employment-weighted applied tariff rates across municipalities over 1996-2011, distinguishing between municipalities with and without the presence of a former homeland.

Figure 4: Racial and income gaps across communities inside and outside homelands

A. Share of Black population



B. Income per capita



Notes: The descriptive evidence presented in this Figure draws on the analysis of Bastos and Bottan (2016). Income expressed in December 2012 rand. Each dot represents population-weighted community averages for 1 km bins. Negative distances correspond to communities inside homelands. Linear fit and 95% CI represented by line and shaded area, respectively. Per capita income measured at 2012 prices.

Table 1. Summary statistics, municipality-level data

	1996		2001		2011	
	Mean	SD	Mean	SD	Mean	SD
Population	168852,8	343983,6	188014,9	401764,7	178887,1	422251,2
Black population (% of total)	72,49	32,61	74,49	31,88	75,72	30,16
White population (% of total)	9,57	8,83	7,92	7,28	6,89	7,14
No education (% of total)	26,13	11,93	24,31	11,88	9,15	4,05
Male (% of total)	48,13	3,27	47,80	2,59	48,22	2,31
Average age	25,30	2,33	26,55	2,31	27,76	2,44
Employed population (% of total)	62,58	18,09	56,30	16,49	65,93	11,34
Log income per capita	8,84	0,81	9,11	0,82	9,79	0,53
Obs.	234		234		234	

Notes: The table reports summary statistics on the municipal-level data from the 1996, 2001 and 2011 population censuses.

Table 2. Impacts of trade liberalization on employment and income per capita, baseline estimates

	(1)	(2)	(3)	(4)
	1996-2001		1996-2011	
A. % change in employment				
Δ Employment-weighted average tariff	4.155***		10.39***	
	(1.171)		(1.422)	
Δ Employment-weighted and import-weighted tariff		19.51***		18.29***
		(3.144)		(2.882)
Municipality-level controls	N	N	N	N
Observations	234	234	234	234
R-squared	0.049	0.107	0.182	0.175
B. Change in log income per capita				
Δ Employment-weighted average tariff	0.115***		0.475***	
	(0.0332)		(0.0489)	
Δ Employment-weighted and import-weighted tariff		0.401***		0.631***
		(0.105)		(0.100)
Municipality-level controls	N	N	N	N
Observations	234	234	234	234
R-squared	0.041	0.050	0.281	0.153

Notes: The table reports the effects of employment-weighted tariff changes on employment and income per capita. Data at the municipality-level. In the first row, we first take the simple average of the tariff at the sector level, and then weight by the employment share of the sector in the municipality in 1996. In the second row, we first use industry-level imports (at a more disaggregated level) to compute the average tariff at the sector level and then weight by the employment share of the sector in the municipality in 1996.

Table 3. Impacts of trade liberalization on employment and income, with controls

	(1)	(2)	(3)	(4)
	1996-2001		1996-2011	
A. % change in employment				
Δ Employment-weighted average tariff	0.846		5.308***	
	(1.651)		(1.677)	
Δ Employment-weighted and import-weighted tariff		13.81***		14.71***
		(3.281)		(2.506)
Municipality-level controls	Y	Y	Y	Y
Observations	234	234	234	234
R-squared	0.243	0.286	0.463	0.524
B. Change in log income per capita				
Δ Employment-weighted average tariff	0.0311		0.272***	
	(0.0446)		(0.0444)	
Δ Employment-weighted and import-weighted tariff		0.281**		0.433***
		(0.114)		(0.0712)
Municipality-level controls	Y	Y	Y	Y
Observations	234	234	234	234
R-squared	0.236	0.254	0.623	0.617

Notes: The table reports the effects of employment-weighted tariff changes on employment and income per capita. Data at the municipality-level. In the first row, we first take the simple average of the tariff at the sector level, and then weight by the employment share of the sector in the municipality in 1996. In the second row, we first use industry-level imports (at a more disaggregated level) to compute the average tariff at the sector level and then weight by the employment share of the sector in the municipality in 1996. Controls are: change in total population of the municipality, change in % of male population in the municipality, change in average municipality age, change in % of population without education in the municipality, change in % of black population in the municipality, change in % of white population in the municipality. Robust standard errors in parenthesis, *** p<0.01, ** p<0.05, * p<0.1

Table 4. Impacts of trade liberalization on employment and income, baseline estimates excluding mining sector

	(1)	(2)	(3)	(4)
	1996-2001		1996-2011	
A. % change in employment				
Δ Employment-weighted average tariff	9.056***		9.026***	
	(1.978)		(1.854)	
Δ Employment-weighted and import-weighted tariff		16.99***		15.50***
		(3.071)		(2.868)
Municipality-level controls	N	N	N	N
Observations	234	234	234	234
R-squared	0.073	0.088	0.115	0.140
B. Change in log income per capita				
Δ Employment-weighted average tariff	0.135**		0.324***	
	(0.0635)		(0.0676)	
Δ Employment-weighted and import-weighted tariff		0.313***		0.502***
		(0.104)		(0.107)
Municipality-level controls	N	N	N	N
Observations	234	234	234	234
R-squared	0.018	0.033	0.110	0.108

Notes: The table reports the effects of employment-weighted tariff changes on employment and income per capita, excluding the mining sector. Data at the municipality-level. In the first row, we first take the simple average of the tariff at the sector level, and then weight by the employment share of the sector in the municipality in 1996. In the second row, we first use industry-level imports (at a more disaggregated level) to compute the average tariff at the sector level and then weight by the employment share of the sector in the municipality in 1996. Robust standard errors in parenthesis, *** p<0.01, ** p<0.05, * p<0.1

Table 5. Impacts of trade liberalization on employment and income, baseline estimates excluding mining sector, with controls

	(1)	(2)	(3)	(4)	(5)	(6)
	1996-2001		1996-2011		2001-2011	
A. % change in employment						
Δ Employment-weighted average tariff	7.815***		7.695***		9.386***	
	(2.203)		(1.533)		(2.988)	
Δ Employment-weighted and import-weighted tariff		14.46***		13.56***		15.88***
		(3.322)		(2.287)		(2.852)
Municipality-level controls	Y	Y	Y	Y	Y	Y
Observations	234	234	234	234	234	234
R-squared	0.283	0.293	0.497	0.520	0.351	0.411
B. Change in log income per capita						
Δ Employment-weighted average tariff	0.179***		0.226***		0.158**	
	(0.0635)		(0.0433)		(0.0727)	
Δ Employment-weighted and import-weighted tariff		0.291***		0.369***		0.268***
		(0.109)		(0.0669)		(0.0765)
Municipality-level controls	Y	Y	Y	Y	Y	Y
Observations	234	234	234	234	234	234
R-squared	0.258	0.257	0.600	0.606	0.660	0.671

Notes: The table reports the effects of employment-weighted tariff changes on employment and income per capita. Data at the municipality-level. In the first row, we first take the simple average of the tariff at the sector level, and then weight by the employment share of the sector in the municipality in 1996. In the second row, we first use industry-level imports (at a more disaggregated level) to compute the average tariff at the sector level and then weight by the employment share of the sector in the municipality in 1996. Controls are: change in total population of the municipality, change in % of male population in the municipality, change in average municipality age, change in % of population without education in the municipality, change in % of black population in the municipality, change in % of white population in the municipality. Robust standard errors in parenthesis, *** p<0.01, ** p<0.05, * p<0.1

Table 6. Impacts of trade liberalization on employment and income, district-level estimates with controls

	(1)	(2)	(3)	(4)
	1996-2001		1996-2011	
A. % change in employment				
Δ Employment-weighted average tariff	0.119***		0.182**	
	(0.0364)		(0.0723)	
Δ Employment-weighted and import-weighted tariff		0.230***		0.372***
		(0.0791)		(0.136)
Municipality-level controls	Y	Y	Y	Y
Observations	50	50	50	50
R-squared	0.460	0.429	0.548	0.575
B. Change in log income per capita				
Δ Employment-weighted average tariff	0.0426		0.178***	
	(0.0646)		(0.0634)	
Δ Employment-weighted and import-weighted tariff		0.144		0.346***
		(0.128)		(0.119)
District-level controls	Y	Y	Y	Y
Observations	50	50	50	50
R-squared	0.186	0.198	0.538	0.560

Notes: The table reports the effects of employment-weighted tariff changes on employment and income per capita. Data at the district-level. In the first row, we first take the simple average of the tariff at the sector level, and then weight by the employment share of the sector in the district in 1996. In the second row, we first use industry-level imports (at a more disaggregated level) to compute the average tariff at the sector level and then weight by the employment share of the sector in the district in 1996. Controls are: change in total population of the municipality, change in % of male population in the district, change in average municipality age, change in % of population without education in the district, change in % of black population in the district, change in % of white population in the district. Robust standard errors in parenthesis, *** p<0.01, ** p<0.05, * p<0.1

Table 7. Interaction with homeland dummy =1 if municipality contained a homeland

	(1)	(2)	(3)	(4)
	1996-2001		1996-2011	
A. % change in employment				
Homeland	6.615***	8.878***	17.85***	11.96***
	(2.141)	(1.863)	(3.447)	(2.961)
Δ Employment-weighted average tariff	-2.453		-0.903	
	(1.854)		(2.356)	
Δ Employment-weighted average tariff x Homeland	8.458**		10.90***	
	(3.684)		(3.158)	
Δ Employment-weighted and import-weighted tariff		-3.764		6.471**
		(4.480)		(3.013)
Δ Employment-weighted and import-weighted tariff x Homeland		31.67***		10.74**
		(7.056)		(4.644)
Municipality-level controls	Y	Y	Y	Y
Observations	234	234	234	234
R-squared	0.284	0.364	0.558	0.573
B. Change in log income per capita				
Homeland	0.0597	0.0806	0.364***	0.300***
	(0.0641)	(0.0505)	(0.101)	(0.102)
Δ Employment-weighted average tariff	-0.0311		0.142**	
	(0.0497)		(0.0552)	
Δ Employment-weighted average tariff x Homeland	0.171*		0.231***	
	(0.101)		(0.0818)	
Δ Employment-weighted and import-weighted tariff		-0.0323		0.210**
		(0.139)		(0.0914)
Δ Employment-weighted and import-weighted tariff x Homeland		0.525***		0.317**
		(0.183)		(0.137)
Municipality-level controls	Y	Y	Y	Y
Observations	234	234	234	234
R-squared	0.234	0.278	0.650	0.635

Notes: The table reports the effects of employment-weighted tariff changes on employment and income per capita. Data at the municipal-level. In the first row, we first take the simple average of the tariff at the sector level, and then weight by the employment share of the sector in the municipality in 1996. In the second row, we first use industry-level imports (at a more disaggregated level) to compute the average tariff at the sector level and then weight by the employment share of the sector in the municipality in 1996. Controls are: change in total population of the municipality, change in % of male population in the municipality, change in average municipality age, change in % of population without education in the municipality, change in % of black population in the municipality, change in % of white population in the municipality. Robust standard errors in parenthesis, *** p<0.01, ** p<0.05, * p<0.1

Table 8. Interaction with dummy Black=1 if initial share of black population in top 50th percentile

	(1)	(2)	(3)	(4)
	1996-2001		1996-2011	
A. % change in employment				
Black	3.931**	2.719	12.60***	9.727***
	(1.738)	(1.838)	(3.116)	(3.715)
Δ Employment-weighted average tariff	-1.592		-0.341	
	(1.991)		(1.623)	
Δ Employment-weighted average tariff x Black	4.446*		9.637***	
	(2.596)		(2.676)	
Δ Employment-weighted and import-weighted tariff		9.841**		6.365*
		(4.347)		(3.450)
Δ Employment-weighted and import-weighted tariff x Black		8.311		14.17**
		(7.370)		(5.682)
Municipality-level controls	Y	Y	Y	Y
Observations	234	234	234	234
R-squared	0.259	0.294	0.499	0.547
B. Change in log income per capita				
Black	-0.0602	0.0133	0.387***	0.294**
	(0.0514)	(0.0535)	(0.0944)	(0.116)
Δ Employment-weighted average tariff	0.0383		0.141***	
	(0.0519)		(0.0457)	
Δ Employment-weighted average tariff x Black	-0.0117		0.218***	
	(0.0732)		(0.0753)	
Δ Employment-weighted and import-weighted tariff		0.150		0.239**
		(0.142)		(0.0998)
Δ Employment-weighted and import-weighted tariff x Black		0.362		0.280*
		(0.222)		(0.150)
Municipality-level controls	Y	Y	Y	Y
Observations	234	234	234	234
R-squared	0.248	0.278	0.656	0.637

Notes: The table reports the effects of employment-weighted tariff changes on employment and income per capita. Data at the municipal-level. In the first row, we first take the simple average of the tariff at the sector level, and then weight by the employment share of the sector in the municipality in 1996. In the second row, we first use industry-level imports (at a more disaggregated level) to compute the average tariff at the sector level and then weight by the employment share of the sector in the municipality in 1996. Controls are: change in total population of the municipality, change in % of male population in the municipality, change in average municipality age, change in % of population without education in the municipality, change in % of black population in the municipality, change in % of white population in the municipality. Robust standard errors in parenthesis, *** p<0.01, ** p<0.05, * p<0.1

Table 9. Interaction with dummy Unskilled=1 if initial share of unskilled population in top 50th percentile

	(1)	(2)	(3)	(4)
	1996-2001		1996-2011	
A. % change in employment				
Unskilled	-4.832***	-4.141**	-19.66***	-16.37***
	(1.750)	(1.900)	(2.601)	(2.925)
Δ Employment-weighted average tariff	4.491***		6.886***	
	(1.702)		(1.853)	
Δ Employment-weighted average tariff x Unskilled	-6.358**		-11.37***	
	(2.589)		(2.186)	
Δ Employment-weighted and import-weighted tariff		19.71***		16.99***
		(4.257)		(3.197)
Δ Employment-weighted and import-weighted tariff x Unskilled		-12.39*		-17.34***
		(7.052)		(4.282)
Municipality-level controls	Y	Y	Y	Y
Observations	234	234	234	234
R-squared	0,266	0,304	0,599	0,603
B. Change in log income per capita				
Unskilled	-0.0948*	-0.0123	-0.333***	-0.376***
	(0.0529)	(0.0521)	(0.0998)	(0.106)
Δ Employment-weighted average tariff	0.0600		0.282***	
	(0.0570)		(0.0638)	
Δ Employment-weighted average tariff x Unskilled	-0.0677		-0.178**	
	(0.0727)		(0.0780)	
Δ Employment-weighted and import-weighted tariff		0.202		0.478***
		(0.139)		(0.116)
Δ Employment-weighted and import-weighted tariff x Unskilled		0.225		-0.392***
		(0.206)		(0.150)
Municipality-level controls	Y	Y	Y	Y
Observations	234	234	234	234
R-squared	0.252	0.276	0.655	0.649

Notes: The table reports the effects of employment-weighted tariff changes on employment and income per capita. Data at the municipal-level. In the first row, we first take the simple average of the tariff at the sector level, and then weight by the employment share of the sector in the municipality in 1996. In the second row, we first use industry-level imports (at a more disaggregated level) to compute the average tariff at the sector level and then weight by the employment share of the sector in the municipality in 1996. Controls are: change in total population of the municipality, change in % of male population in the municipality, change in average municipality age, change in % of population without education in the municipality, change in % of black population in the municipality, change in % of white population in the municipality. Robust standard errors in parenthesis, *** p<0.01, ** p<0.05, * p<0.1

Table 10. Interaction with dummy Unskilled=1 if initial share of unskilled population (based education level) in top 50th percentile

	(1)	(2)	(3)	(4)
	1996-2001		1996-2011	
A. % change in employment				
Unskilled	-4.364**	-5.794***	-20.43***	-15.18***
	(2.024)	(1.778)	(2.906)	(2.934)
Δ Employment-weighted average tariff	3.605		10.69***	
	(3.438)		(2.227)	
Δ Employment-weighted average tariff x Unskilled	-4.680		-14.13***	
	(3.768)		(2.587)	
Δ Employment-weighted and import-weighted tariff		26.24***		20.09***
		(5.733)		(3.476)
Δ Employment-weighted and import-weighted tariff x Unskilled		-20.90***		-17.31***
		(6.721)		(4.470)
Municipality-level controls	Y	Y	Y	Y
Observations	234	234	234	234
R-squared	0.263	0.319	0.576	0.595
B. Change in log income per capita				
Unskilled	-0.0496	0.00815	-0.366***	-0.321***
	(0.0671)	(0.0498)	(0.110)	(0.0996)
Δ Employment-weighted average tariff	-0.0155		0.330***	
	(0.100)		(0.0926)	
Δ Employment-weighted average tariff x Unskilled	0.0204		-0.223**	
	(0.111)		(0.100)	
Δ Employment-weighted and import-weighted tariff		0.0624		0.459***
		(0.157)		(0.128)
Δ Employment-weighted and import-weighted tariff x Unskilled		0.271		-0.280*
		(0.185)		(0.147)
Municipality-level controls	Y	Y	Y	Y
Observations	234	234	234	234
R-squared	0.252	0.271	0.656	0.654

Notes: The table reports the effects of employment-weighted tariff changes on employment and income per capita. Data at the municipal-level. In the first row, we first take the simple average of the tariff at the sector level, and then weight by the employment share of the sector in the municipality in 1996. In the second row, we first use industry-level imports (at a more disaggregated level) to compute the average tariff at the sector level and then weight by the employment share of the sector in the municipality in 1996. Controls are: change in total population of the municipality, change in % of male population in the municipality, change in average municipality age, change in % of population without education in the municipality, change in % of black population in the municipality, change in % of white population in the municipality. Robust standard errors in parenthesis, *** p<0.01, ** p<0.05, * p<0.1