The Gendered Effects of Tariff Liberalisation on Local Labour Markets in Post-Apartheid South Africa

By

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Thesis Presented for the Degree of

DOCTOR OF PHILOSOPHY

In the School of Economics

UNIVERSITY OF CAPE TOWN

March 2020

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Abstract

This thesis uses South Africa as a case study to examine the gendered effects of tariff liberalisation on labour market outcomes at the local level. Specifically, the thesis focuses on the effect of tariff liberalisation on regional employment growth, labour adjustment in the manufacturing sector and services sector, and internal migration over a period (1996 to 2011) in which South Africa substantially reduced tariff protection. This was also a period corresponding with low employment growth and declines in the manufacturing share of employment that vary by gender and race as well as across regions. The experience of South Africa, therefore, presents a useful context to empirically identify the association between tariff liberalisation and gendered outcomes in local labour markets.

To analyse the relationship between tariff liberalisation and local labour market outcomes, the structure of the thesis chapters is configured around four research questions:

1. How is regional employment growth distributed in South Africa?
2. What is the effect of tariff liberalisation on gendered employment and wages in manufacturing?
3. How does tariff liberalisation in manufacturing affect wages and employment by gender in the services sector?
4. Does tariff liberalisation drive internal migration?

The thesis draws on a regional level database of employment, wages and migration constructed using South African Population Census data for 1996, 2001 and 2011, that is combined with product-level import tariff data over the period.

Chapter 2 sets the context for the thesis by assessing key sources of regional employment growth across the 234 local municipalities in South Africa. The chapter adopts a dynamic industry shift-share analysis method that decomposes the growth in national employment into three sources: (i) national growth effects, (ii) industry-mix effects and (iii) regional competitive effects. The results reveal substantial variation in employment growth across regions that is closely associated with the regions' industry composition and competitiveness. Our findings also reveal that industry-mix effects are negatively correlated with the initial employment ratio of tradable to nontradable sectors. Further, the industry-mix effect is positively correlated with

the regions' initial income level, initial share of female workers, initial share of Black female workers, initial share of Black male workers, and initial share of White female workers. This descriptive review and data analysis demonstrates the importance of industry composition in driving regional patterns of employment growth and reveals how these changes are associated with the gender and racial composition of workers in the region. The remainder of the thesis analyses how tariff liberalisation may have contributed towards these outcomes.

Chapter 3 investigates the gendered effects of tariff liberalisation on manufacturing employment in South Africa. The chapter adopts the Bartik (1991) approach and exploits variations in the regional composition of industries to identify how tariffs affect manufacturing employment at the local level. To examine the effect of tariff reductions on manufacturing employment, a first-difference instrumental variable estimation strategy is employed. First, the results indicate that tariff reductions had no effect on manufacturing wages, with its impact falling entirely on employment. Municipalities that were more exposed to tariff reductions experienced slower growth in manufacturing employment of both men and women. The effect was significantly stronger for women, particularly Black women, thus widening the gender employment gap. The results of testing for the various channels that may have given rise to these gendered effects reveal the dominant sources to be industry segregation combined with the comparatively large reductions in tariffs in female-intensive industries such as textiles, clothing, and footwear.

Chapter 4 investigates whether tariff liberalisation is associated with structural shifts in employment from manufacturing to services by employing a similar empirical approach to that used in Chapter 3. Consistent with theoretical expectations, the chapter 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. In fact, employment in the services sector also fell in regions experiencing relatively large tariff reductions. Further analysis demonstrates that the decline in services employment was driven by lower derived demand, income, and manufacturing infrastructure investment that are linked to the decline in manufacturing from tariff reductions. The results also show that tariff effects differed by gender and race. The implication of the results is that spillover effects from the decline in manufacturing diminished the absorption of labour by the services sector, thus exacerbating the regional employment impact of tariff liberalisation.

The final chapter, Chapter 5, provides a descriptive analysis on how tariff liberalisation affects internal migration in South Africa. Tariff liberalisation alters relative wages and relative employment opportunities across regions, thus giving rise to internal migration. The extent to which labour responds to these changes by migrating affects the local market outcomes of liberalisation. The analysis utilises a gravity-style model and instrumental variable estimation strategy to estimate the effect of tariff liberalisation on internal bilateral migration flows. The main finding is that there was higher out-migration and lower in-migration in regions that experienced relatively large tariff reductions, as is predicted by theory. The chapter reveals that tariff-induced internal migration differed across gender in both locations with women appearing to be more spatially mobile than men. The chapter also teases out gender implication by race and family structure. The core finding is that tariff-induced gendered internal migration varied according to individual characteristics.

Overall, the thesis provides new evidence regarding the impact of tariff liberalisation on local labour market outcomes in South Africa. Liberalisation had no effect on regional wages, but lowered employment and induced internal migration. The research also reveals substantial changes in the gender and industry composition of regional employment associated with tariff liberalisation. The thesis contributes to international trade theory by highlighting that the gendered effects of tariff liberalisation are country-specific, largely dependent on the intensity of tariff reductions and the gender intensities across industries. The study also demonstrates that internal migration is a mechanism for mitigating the undesirable effects of liberalisation. Accordingly, the thesis emphasises that tariff liberalisation effects are not homogenous across gender, and thus gender-specific policies may be required to ameliorate the unequal adjustment costs across different genders.

Declaration

I, *Refilwe Lepelle*, declare that this thesis is my own work and that the material included in this thesis is the result of new research, and other sources have been acknowledged through referencing. I also declare that this thesis has not been submitted for a PhD degree in any another university.

Signed: Signed by candidate

Acknowledgements

I want to start by thanking God for His grace and for giving me the strength and ability to complete this thesis.

My sincere and heartfelt gratitude goes to my supervisor, Prof. Lawrence Edwards, for the invaluable and continuous support of my PhD thesis, including his immense knowledge, encouragement, motivation and patience during this period. His guidance constantly drove me during the research and writing phases of this thesis. Moreover, his insightful comments and critical questions compelled me to reinforce the quality of my research from various perspectives and extend my research skills.

I want to give a special thanks to my co-supervisor Prof. Murray Leibbrandt, for believing in me from the first day he met me. In addition to encouraging and motivating me, he also funded the initial years of my studies through the Southern Africa Labour and Development Research Unit (SALDRU). Without this funding, I would not have been able to complete my PhD. I am eternally grateful to him.

I acknowledge, with gratitude, funding from the National Research Foundation (NRF) of South Africa (Grant number 112162). This funding enabled me to allocate more time to my research while being a full-time lecturer at the University of Cape Town. Through this funding, I was also able to showcase my research at several international conferences and research visits to other academic institutions. I also gratefully acknowledge other funding from the University of Cape Town's Research Development Grants and University Research Committee funding (URC), which was mainly geared towards providing more time for teaching and conference attendance and the Paul Walker Scholarship, which provided me with an opportunity to visit the University of Nottingham to further my PhD research.

I would also like to thank Dr Asha Sundaram, Prof. Oliver Morrissey and Associate Prof. Janneke Pieters for the time they dedicated to reviewing some of my thesis chapters, their comments and suggestions as well as enlightening me at the initial stages of my research. To Prof. Oliver Morrissey and Associate Prof. Janneke Pieters, I would also like to thank you for hosting me at the University of Nottingham and Wageningen University respectively.

This research required new regional data, and I want to thank DataFirst and Mr Sive Sithole at Statistics South Africa (StatsSA) for providing me with the full South African population census data, which is the vital data source for this PhD.

I would also like to extend my appreciation to my colleagues at the School of Economics at the University of Cape Town who have provided me with support and encouragement. In particular, I am grateful to the Heads of the School of Economics during my PhD journey, Prof. Lawrence Edwards and Prof. Justine Burns for allowing me to take some time off periodically to focus on my PhD research. My gratitude also goes to the staff at the University of Cape Town Research Office and the Emerging Researcher Programme, specifically Dr Gaelle Ramon, Dr Charles Masango, Dr Dheshnie Keswell and Dr Gudrun Oberprieler as well as Dr Robert Morrell in the Office of the Vice-Chancellor for the emotional support, encouragement and invaluable advice that I needed at times.

To the School of Economics Trade Group, I am grateful to you for the stimulating discussions and comments on my research. Thank you for walking this PhD journey with me. A special thanks go to my friends who I met during my PhD, Dr Gibson Mudiriza, Dr Onkokame Mothobi and Dr Jacqueline Mosomi, Dr Ester Kimani, Mr Samson Mbewe and Ms Lerato Shai. We shared a lot of stimulating conversations and laughter, which carried me through. Thank you for also being a constant shoulder to cry on. I would also like to thank my long-time friends, my cheerleaders. There are too many of you to mention. You have all been enthusiastic about my PhD even when I did not think it was possible. Thank you for having so much faith in me and for not allowing me to give up.

Last but not the least, I would like to thank my family especially my mother and daughter for supporting me spiritually throughout my thesis and for the many sacrifices to allow me to pursue my dream of obtaining a PhD. Thank you for your love, support, understanding and patience. You lifted me so many times when I was feeling down. Sincere thanks also go to my extended family. Thank you for the unconditional love that you show me constantly.

Dedication

To my daughter and mother: Bohlokwa Oratilwe Lepelle and Faith Kelebogile Motau

and

To my late grandparents: Mr Richard Roddy Motau and Mrs Wilhelmina Motau

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List of Acronyms

BTT	Board on Tariffs and Trade
CE	Competitive Effect
EU	European Union
FTA	Free Trade Agreements
GATT	General Agreement on Tariffs and Trade
GEAR	Growth, Employment and Redistribution
GEIS	General Export Incentive Scheme
GPS	Global Positioning System
ILO	International Labour Organisation
IM	Industry-mix Effect
ISIC	International Standard Industrial Classification of All Economic Activities
IV	Instrumental Variable
LFS	Labour Force Survey
LMA	Labour Market Areas
LQ	Location Quotients
NE	National Effect
NEG	New Economic Geography
NOAA	National Oceanic and Atmospheric Administration
NTR	Normal Trade Relations
OHS	October Household Survey
OLS	Ordinary Least Squares
PALMS	Post-Apartheid Labour Market Series
PPML	Poisson Pseudo-Maximum Likelihood
SADC	Southern African Development Community
SDI	Spatial Development Initiative
SIC	Standard Industrial Classification
SSA	Sub-Saharan African
TDCA	Trade, Development and Cooperation Agreement
US	United States
WTO	World Trade Organisation

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Chapter 1

1. Introduction

1.1 Background and Motivation

The impact of tariff liberalisation on employment is an interesting economic issue because the world has become more integrated through multilateral and preferential tariff reductions. The influence of tariff liberalisation on the labour market has preoccupied trade negotiators, trade economist and policymakers across the globe for the past 40 years. Debates have largely been centred around determining the 'winners' and 'losers' of international trade among developed and developing countries. Existing research illustrates that in developed countries tariff reductions have reduced employment and increased wage inequality, particularly in the manufacturing sector (Autor et al., 2015; Pierce & Schott, 2016) while in developing countries outcomes has been more positive. For example, tariff liberalisation has reduced poverty and improved welfare in China (Huang et al., 2003) and India (Pavcnik, 2017), and expanded the manufacturing export sectors in Vietnam (Nguyen, 2016).

The effect of tariff liberalisation on labour market outcomes within countries is relevant from a theoretical and empirical perspective. In general, analysis of the impact of tariff liberalisation on factor markets has drawn on traditional trade theories such the Heckscher-Ohlin model and Stolper-Samuelson theorem. However, two pivotal considerations need to be noted about these models.

Firstly, these models focus on the long-run and assume that labour is fully mobile across sectors and regions. The consideration of costs associated with adjustment in the production structure across industries and regions of the economy in the short to medium-run is necessary in order to estimate the entire adjustment effects of tariff liberalisation in the labour market. These considerations may be particularly important in emerging economies given pronounced frictions to the mobility of workers across industries and regions in these economies.

Secondly, the adjustment and welfare effects are commonly assumed in the application of these theories to be homogenous between men and women. However, recently, the debate has shifted

towards understanding the potential gendered effects of tariff liberalisation. This is because the participation of women in the labour market has increased over the years in the context of global integration and tariff liberalisation. Historically, global labour markets have been dominated by male workers, but this trend has been changing as the gender employment gap has narrowed. Even though global labour force participation has declined for men and women, men face stronger reductions. The International Labour Organization (2018) shows that labour force participation of women has decreased from 51.2% in 1998 to 48.5% in 2018 while that of men declined from 78.8% to 75.1% over the same period. Moreover, empirical evidence shows that tariff policies have heterogeneous effects on industries. For example, in some emerging economies such as Brazil (Gaddis & Pieters, 2017) and Indonesia (Kis-Katos et al., 2018), liberalisation promoted the growth of female-intensive industries, especially the clothing and textile industries, and this led to distinctive impacts on the gender composition of employment.

Other theories, such as the Specific-Factors model, that allow for labour market rigidities provide alternative perspectives of labour market adjustments to tariff liberalisation. In this model, when factors are specific to an industry or a region, tariff shocks result in industry-specific or region-specific changes in wages and labour market outcomes. Gendered labour market outcomes will arise if there are differences in industry or regional specificities in employment of men and women.

Feminist economics provides additional explanations for the industry specificities and rigidities. This theoretical literature focuses on the labour force participation of women by touching on several aspects such labour market participation (Tejani & Milberg, 2016), working conditions (Benería, 2003) and household responsibilities (Braunstein & Folbre, 2001).

Seguino and Braunstein (2018) explain that gender inequality in the labour market is driven by persistent stratification ingrained in institutions which favour men at the expense of women. One of the main mechanisms through which stratification occurs is the exclusion of women in the workforce where men monopolise jobs (Braunstein & Seguino, 2018) through collective bargaining (Braunstein & Folbre, 2001) and thereby maintain their economic status which may be socially costly (Berik et al., 2009). This collective bargaining and strong social network prevent women from accessing those jobs (Braunstein & Seguino, 2018). The practice of

excluding women in the labour market is facilitated by societal norms and stereotypes. Norms and stereotypes are societal perceptions of suitability of work for men and women that are based on gender roles (Braunstein & Seguino, 2018) and bolster gender inequality in the labour market (Berik et al., 2009). For example, society has a perception that men are more suited for formal employment while women are expected to be in unpaid work in the household (Berik et al., 2009; Braunstein & Folbre, 2001; Braunstein & Seguino, 2018).

Individuals face societal pressures to follow these norms and this creates boundaries to women from entering formal employment and certain industries which may be deemed more suitable for men. These norms and stereotypes also affect the demand side of the labour market. Seguino and Braunstein (2018) highlight that firms may be resistant to hiring women in skill-intensive or capital-intensive industries to avoid increasing costs associated with investing in training women. This is a form of a stereotype that assumes that women require more training than men. Firms also discriminate against women by employing them in low-paying jobs that often lack job security. Elson and Pearson (1981) state that women are perceived as having 'nimble fingers', docility, submissiveness and are non-union members. These stereotypes make women more vulnerable to exploitation and exclusion.

Nonetheless, Braunstein and Folbre (2001) acknowledge that technological progress (associated with tariff liberalisation) and the resultant shift in relative prices between formal employment and household work can improve the employment of women primarily in the formal labour market. This will lead to a narrow gender employment gap.

The implication is that liberalisation of tariffs accompanied by technological progress and coupled with societal norms, which restrict women to certain industries such as the clothing and textile industry, are likely to benefit women in countries that have a comparative advantage in the labour-intensive and female-intensive industries. Furthermore, the interaction of tariff liberalisation in countries with rigidities that affect employment opportunities and industry composition of employment can give rise to differential impacts across gender.

The thesis is motivated by the observation that few studies have examined Sub-Saharan African (SSA) countries. International studies that employ the Specific-Factors model show that liberalisation has unanticipated differential labour market effects on men and women (Autor et al., 2015; Gaddis & Pieters, 2017; Kis-Katos et al., 2018) and on skilled and unskilled workers

(Artuç et al., 2010; Pavcnik, 2017). These findings demonstrate that the dynamics to adjustments vary and the distribution of gains and losses are dependent on rigidities. Failure to account for rigidities leads to an underestimation of the full effect of tariffs on labour market outcomes.

This thesis aims to fill the gap in the existing literature by providing new evidence of tariff liberalisation effects on labour market outcomes in a middle-income country. The thesis is structured to expand the existing literature by focusing on five key dimensions of labour market outcomes, namely: Regional employment dynamics, gender, sectoral employment and wages (specifically manufacturing and services) as well as migration. The thesis focuses on the manufacturing and services sectors and not in other tradable (primary) sectors specifically agriculture and mining for the following reasons. First, there were minimal tariff reductions in mining. As a result, the tariff data on mining does not have provided sufficient variation across the mining industries. Second, census data on employment in agriculture is noisy. There are a number of inconsistencies regarding the collection of this data in all three censuses, 1996, 2001 and 2011. Third, a similar study by Erten et al. (2019) found the effect of tariff reductions in agriculture and mining are statistically insignificant.

1.2 Relevance and Contribution of the Thesis

Evidence in developed countries on the tariff liberalisation effects in the labour market are well documented. The existing body of international literature has highlighted the importance of regional economies and regional variation in labour market outcomes. These studies provide empirical evidence of large and persistent within-country regional employment variation and the sources of regional employment change (Brox & Carvalho, 2008; Cochrane & Poot, 2008; Matlaba et al., 2014; Mitchell & Carlson, 2003). This literature highlights that national employment growth is driven by regional employment growth, which in turn is predominantly underpinned by differential industry composition.

The thesis also draws on two strands of emerging theoretical and empirical international literature to address the scarcity of research on the effects of tariff liberalisation on the labour market in the SSA region. The first strand highlights spatially differentiated labour market outcomes (employment, wages, and poverty) arising from international trade (Autor et al., 2015; Dix-Carneiro & Kovak, 2015; Gaddis & Pieters, 2017; Topalova, 2010). Specifically,

the literature shows that tariff liberalisation can increase the wage gap between skilled and unskilled workers (Dix-Carneiro & Kovak, 2015), decrease employment in manufacturing (Autor et al., 2015; Gaddis & Pieters, 2017), lower poverty levels (Topalova, 2010) and stimulate internal migration (Dix-Carneiro & Kovak, 2017; Kovak, 2013).

Differences in regional industry composition, factor endowment and region-specific competitiveness give rise to differentiated local labour market responses to the liberalisation of tariffs. Focussing on regions within a country allows for sector-specific, region-specific and other local labour market frictions that influence outcomes in the economy.

There is a widespread view of local labour market view of the effects of tariffs in emerging economies such as Brazil, India and Indonesia. However, evidence for SSA countries is minimal. This is an important gap in the literature because countries in the SSA region are characterised by far more frictions than countries in other regions. Specifically, South Africa differs from both advanced and emerging economies because it does not have a comparative advantage in female-intensive manufacturing industries (Alleyne & Subramanian, 2001; Bell & Cattaneo, 1997). Despite being a middle-income country with an abundance of labour, South Africa's trade is found to be relatively capital abundant and the country has low exports volumes in labour-intensive goods (Alleyne & Subramanian, 2001) such as clothing and textiles. Furthermore, South Africa has a unique history, having experienced the negative effects of colonisation and apartheid, unlike other African countries. This history has created a complex set of challenges for the country. One of the legacies of apartheid is high and persistent unemployment, which varies by gender and population group (Casale, 2004; Casale & Posel, 2002). Historically women have been discriminated against in the labour market, and this discrimination is fuelled by cultural and legal constraints. Initiatives have been implemented to increase the economic activity of women, however, South Africa is still lagging behind other countries in terms of gender convergence (Leibbrandt et al., 2010). It is for these reasons we anticipate that the effects of tariff liberalisation may play out differently for SSA than for advanced and emerging economies.

The second strand of international literature proposes that the labour market effects of tariff liberalisation are gendered. Wage and manufacturing employment effects of tariff liberalisation are likely to be gendered given that men and women may differ in terms of skills levels, physical strength "brawn", and industry segregation both within manufacturing and between

manufacturing and services. The evidence from the emerging literature is inconclusive, suggesting that gendered employment effects differ according to the level of development of a country. Studies from a developed country point to an increase in the gender employment gap, while those from developing countries suggest that international trade reduces the gap. Autor et al. (2015) reveal that increased Chinese competition in the US led to a decline in employment of both men and women, but the negative trade effects were sturdier on female workers. In contrast, Gaddis and Pieters (2017) find that the negative employment effects of tariff liberalisation in Brazil were larger on male employment. In Indonesia, the reduction of input tariffs benefitted female-intensive industries, increasing work participation of women (Kis-Katos et al., 2018).

Based on the literature, empirical evidence on the effects of tariff liberalisation on gendered labour market outcomes at the local level remains limited, particularly in SSA countries. This thesis aims to fill this research gap by empirically examining the gendered effects of tariff liberalisation on manufacturing employment, services and internal migration in South Africa using new and regionally consistent population census data between 1996 and 2011.

The thesis contributes to the existing literature in several ways: Firstly, Chapter 1 sets the scene for the rest of the thesis by utilising an industry shift-share decomposition approach to assess regional dynamics. The analysis is extended by exploring contributing factors to the regional industry-mix. This analysis is underexplored in existing literature in South Africa. The descriptive analysis shows huge variations in regional employment growth in South Africa underpinned by heterogeneity in region-specific factors namely the industry-mix and regional competitiveness. We also find that the industry-mix to be positively associated with high initial share of employment in nontradable sectors. These outcomes are consistent with the expected effects of tariff liberalisation since the employment effects of tariffs through changes in the industry composition.

Secondly, in Chapter 3, we investigate the gendered tariff effects on manufacturing employment using the Bartik (1991) approach. This chapter also investigates the channels through which tariff reductions have an effect on manufacturing employment. The results show that tariff liberalisation in South Africa had an unfavourable effect on manufacturing employment and the adverse effect was stronger on women compared to men. Our results differ from those in other emerging countries such as Brazil (Gaddis & Pieters, 2017) and Indonesia

(Kis-Katos et al., 2018) where tariff liberalisation benefitted women. The disproportionate effects on women in South Africa were driven mainly by industry-bias tariff reductions which disadvantaged female-intensive industries and industry-segregation.

Thirdly, literature that explores the gendered effects in services is also scarce. Moreover, the few studies that do examine services employment do not probe the channels through which tariffs in manufacturing affect employment in services. Chapter 4 explores the transmission channels namely: derived demand from manufacturing, income, and manufacturing infrastructure investment. The findings highlight a modest tariff-induced structural change. Additionally, we also find evidence that tariff liberalisation also slowed services employment growth through the transmission channels from manufacturing. Taken together, our results show that the structural change was due to much stronger reductions in manufacturing employment, rather than an increase in services employment. The effects of tariff liberalisation on services employment are heterogeneous across gender and race. The services sector employs more women relative to men. Tariff liberalisation slowed services employment of Black men and White women more than their counterparts.

Fourthly, the literature on internal migration in South Africa explores the various push and pull factors. Chapter 5 deepens this literature by including tariff reduction as a determinant of internal migration. This descriptive analysis provides insight into the response mechanism of internal migration in developing countries to tariff liberalisation. The results indicate that workers responded to the negative effects of tariff reductions by migrating out of regions. We also find a stronger movement of women compared to men. This suggests that women responded to the negative tariff effects in manufacturing by migrating to less-affected regions. We also find that tariff liberalisation had unequal effects on internal migration of women when taking into consideration the family structure, mainly marital status and fertility.

1.3 Why South Africa?

South Africa represents an important case study for several reasons. Firstly, South Africa has experienced significant reductions in tariffs from the early 1990s. The process started with the entry of South African into the World Trade Organisation (WTO). Moreover, the government signed several preferential trade agreements, including bilateral and regional trade agreements, such as the Southern African Development Community (SADC), Free Trade Protocol and the

South Africa-European Union Trade, Development and Cooperation Agreement (TDCA). Edwards and Abdi (2002) report that average nominal protection for the whole economy was reduced to 15.1% in 1997 from 29% in 1990, while, for manufacturing goods, average nominal protection was reduced to 15.6% from 30% over the same period. Unlike in other emerging economies, tariffs fell disproportionately on the textile, clothing and footwear industry (Erten et al., 2019) which is dominated by women. The experience in South Africa may, therefore differ substantially from that of other emerging economies such as Indonesia, where growth in this industry post-liberalisation provided a major boost to female employment. An overview of tariff liberalisation in South Africa is provided in Table 1.1A in the appendix section.

Secondly, there is a massive disparity in terms of economic activity, growth, and employment across space and population groups in South Africa. Historically, this is largely due to apartheid policies that reinforced spatial imbalances by developing major cities at the expense of the homelands and other remote rural areas. According to Bosker and Krugell (2006), the apartheid system encouraged the development of inefficient industries, inefficient land use, and excessive transport costs, together with under-investment in transport infrastructure, telecommunications, and electric power in the homelands. Therefore, given the apartheid spatial legacy, we may anticipate distinctive local level effects arising from liberalisation.

Thirdly, South Africa is also characterised by extremely high unemployment and low, albeit rising, labour force participation, particularly among women. Many academics argue that high unemployment reflects rigidities in the labour market with wages determined on a sectoral and regional basis for many manufacturing industries (Bhorat et al., 2009). The implication is that, in South Africa, the labour market outcomes of increased international competition may be revealed by changes in employment levels rather than wages.

Fourthly, there are strong reasons to anticipate differences in the effects of tariff liberalisation on men and women may also differ from the experience of other emerging economies. Tariffs fell disproportionately on the female intensive clothing and textiles industries in South Africa (Erten et al., 2019). Countering this effect is that average skill levels of employed women are higher than those of men, in large part due to the lower labour force participation of women and the selection of more skilled into employment (Statistics South Africa, 2012). Females, on aggregate, may thus be better placed to have higher wages and employment in response to the tariff-induced upgrading of technology.

Fifthly, the persisting effects of apartheid on the South African economy may give rise to distinctive heterogeneous effects of tariff liberalisation across race. South Africa is distinct from other middle-income countries because of its particular history of apartheid, which entrenched racial discrimination, and deepened 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)[1]. Historically, it is difficult to separate gender discrimination from race in a country like South Africa. 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).

Furthermore, unemployment in South Africa is disproportionately high among Africans, particularly in the rural areas and former homelands. This historical legacy is also what makes the country distinct from other middle-income countries in terms of its economic outcomes. The knock-on effect of this is that tariff liberalisation is expected to give rise to labour market effects that will differ starkly by race and gender. The racial divide in the economy has implication on the taste for discrimination by firms. The Neoclassical trade theory predicts that increased import competition reduces discrimination because of the pro-competitive effects of trade (Becker, 2010).

South Africa is also an interesting case study to look at tariff-induced gendered migration, given its apartheid history. The government initiated and implemented various laws which constrained the mobility and settlement of Africans (who constitute about 80% of the population) dating back from 1923 (Choe & Chrite, 2014; Von Fintel & Moses, 2017).

[1] The removal of African people from urban to rural areas, and to designated peri-urban areas, had an effect on their access to education and their choice and place of work. Access to education was skewed (Bhorat, 2005), with Whites getting a superior education in terms of tuition and resources, and one that allowed them to participate fully in the economy. African people, on the other hand, received "Bantu" education (Heugh, 1999; Thomas, 1996), an inferior and inadequately resourced education system. In the post-apartheid era, educational quality for, and attainment of, Africans is persistently lower than that of Whites (Burger & Jafta, 2006). There remain huge gaps in terms of employment and skills levels between Africans and Whites (Burger & Jafta 2006). Furthermore, unemployment in South Africa is disproportionately high among African people, particularly in rural areas and in the former homelands (Aliber, 2003).

Migration was also intrinsically gender-biased because it occurred within the labour migrant system which favoured men, in particular, African men, who worked in mines in the urban areas (Von Fintel & Moses, 2017; Posel, 2004). African women remained behind in the homelands (or rural areas). This historical fact indicates that tariff liberalisation may have unique gendered effects in South Africa.

Lastly, the choice of South Africa is reinforced by gaps in the empirical literature. Studies on the effect of tariff liberalisation on the labour market in South Africa by Bhorat and Hodge (1999), Edwards (2001) and Rodrik (2008) demonstrate a structural shift in employment away from manufacturing towards services from the early 1990s. The role of tariff liberalisation in driving these changes has not been firmly established. In contrast, Dunne and Edwards (2006) reveal that employment lost in the manufacturing sector in South Africa due to import penetration from 1994 to 2003 was counteracted by employment gains in the services sector, in particular, employment growth in the retail and wholesale industries.

Other national studies such as Bhorat (2000) and Thurlow (2006) find that tariff liberalisation decreased the employment share of male workers and increased the share of female workers in South Africa. In contrast, Cockburn et al. (2007) argue that liberalisation led to a decline in labour force participation and employment of women in South Africa, pointing to the fact that women are concentrated in the previously heavily protected textile, clothing, and footwear industry. None of these studies explores the gendered employment effects of tariff liberalisation at the local level.

The first published study on the effects of tariff liberalisation on regional labour market outcomes in South Africa, by Erten et al. (2019) finds no wage effects but large reductions in manufacturing employment relative to other sectors in districts that experienced relatively high tariff reductions. Their study does not identify the gendered effects of these employment changes.

Overall, the available literature on the tariff liberalisation effects on local labour market outcomes has several limitations. The bulk of the literature focuses on the national labour market, thus omits regional heterogeneity at the local labour market level. The literature also does not provide adequate evidence on the gendered effects of tariff liberalisation, more especially while accounting for regional heterogeneity. Channels that drive the effects of tariff

liberalisation on gendered employment have not been fully explored. Lastly, the South African literature fails to investigate the gendered tariff effects across race. This is a vital omission in a country that has a racially segmented labour market.

This thesis augments the available literature by investigating the gendered effects of tariff liberalisation on local labour market outcomes in a middle-income country. In doing so, the thesis contributes to the South African literature in several ways. First, the thesis contributes to policy by providing insight into the gendered effects of trade on local labour markets. Second, it provides additional and more nuanced evidence than is currently available on middle-income countries. Third, it unpacks the channels that explain the gendered employment effects of tariff liberalisation, thus contributing to the ongoing global debate on gender inequality. Fourth, the research provides empirical evidence on the tariff liberalisation effects on labour market outcomes by gender and across racial groups. Fifth, the thesis offers a comprehensive analysis of the dynamics of labour adjustment to tariff liberalisation in the manufacturing and services sectors and changes in migration patterns.

1.4 The South African Context

Following the political transformation in 1994, South Africa experienced economic transformation including the abolishment of sanctions, the inclusion of Blacks in the formal banking sector and other sectors of the economy as well as accelerated trade and capital controls liberalisation (Jonsson, 2001). At the onset of democracy, the government introduced a number of macroeconomic policies in an effort to bring about increased and balanced economic growth, reduce unemployment and narrow the inequality gap. These policies include the Reconstruction and Development Programme (1995), Growth, Employment and Redistribution (GEAR) adopted in 1996 and Accelerated and Shared Growth Initiative for South Africa (AsgiSA) which was implemented in 2006. Essentially these policies were geared towards redressing the inherited social, economic and spatial ills from apartheid.

There is a huge disparity in terms of economic activity, growth and employment across space. Apartheid reinforced the spatial imbalance by developing major cities at the expense of the homelands and other remote areas. Naudé & Krugell (2004) show that around 82% of Gross Domestic Product (GDP) is produced by only 20% of the areas in the country, the more

developed parts of the country. The spatial economy is also characterised by increased urbanisation.

South Africa's six largest cities include Johannesburg, Ekurhuleni metropolitan, Durban, Cape Town, Pretoria (currently known as Tshwane metropole) and Port Elizabeth which is now referred to as Nelson Mandela metropole (Naudé, 2010; Naudé & Krugell, 2004). These cities gained their prominence through trade, mining, favourable climate as well as Apartheid's policies which promoted the development of these areas (Feinstein, 2005).

1.4.1. The labour market and feminisation

The South African labour market is characterised by chronic unemployment and slow employment creation. Despite these efforts by the government, economic growth remains constrained. Bhorat & Cassim (2004) attribute the modest growth improvements to the decline in gross capital formation, slow growth in aggregate demand, poor international competitiveness and declining productivity growth.

We will separate our discussion of the labour market into two time periods: 1970-1995 and 1995-1999. The overview of the labour market post-2001 is presented in Section 2.5 of this paper.

South Africa entered a recession in the early 1970s, which coincided with a structural shift in the economy away from the traditional tradable sector to the non-tradable sector, with increasing capital intensity in production (Bhorat & McCord, 2003). According to Bhorat & McCord (2003), this had a major impact on the labour market. The change in the structure of the economy led to a change in the composition of labour demand, with increasing demand for skilled labour. Parallel to this, technological changes brought about by international trade increased the capital-to-labour ratio (Jenkins, 2008). Firms substituted labour for capital and the consequence was a further reduction in demand for unskilled labour. South Africa paid a heavy price for this because its labour force is largely unskilled. During this period, labour demand was skewed towards workers with matric and tertiary education, as opposed to workers with lower levels of education, making education an important determinant of employment (Bhorat & Leibbrandt, 1999; Bhorat & McCord, 2003).

This period in South Africa was also the beginning of feminisation of the labour force. Demand for female workers grew by 3%, while demand for male workers dropped marginally by 1.7% (Bhorat & McCord, 2003). The unequal effect across gender is underpinned by the contraction of the primary sector which was dominated by male workers, and the expansion of the services sector, which has a high share of female workers.

The period 1995 – 1999 was marked by an increase in labour supply, which exceeded labour demand. The end of Apartheid allowed South Africans of all races to participate freely in the labour market. South Africa was not, however, able to absorb all the labour that was available. Bhorat and McCord (2003) show that in this period employment rose by 12% but labour supply increased by 33.4%, reflecting subdued job creation. In real terms, Bhorat and McCord (2003) record that 1.1 million jobs were created, while 3.1 million people entered the job market, a shortfall of 2 million jobs. Feminisation of the labour market increased and the female economically active population grew by 30%, almost double that of males (Bhorat & McCord, 2003). Casale & Posel (2002) and Casale (2004) suggest that increased female labour force participation is spurred on by chronic female unemployment. Although the supply of female labour increased during this period, jobs created were insufficient to match the supply, resulting in female unemployment rising to 42.8%, compared to the male unemployment rate of 29.7% (Bhorat & McCord, 2003).

Empirical research on the causes of poor employment creation in South Africa is extensive. Some studies have pointed to supply-side factors, such as poor education, a skills shortage, and the lack of experience among job-seekers as major factors contributing to the slow growth of employment (Leibbrandt et al., 2010). This research area has been covered relatively well in South African literature, using household data.

Other studies have emphasised regulatory impediments to employment creation. Following the end of apartheid, South Africa implemented new labour policies and legislation, including the Labour Relations Act of 1995, the Basic Conditions of Employment Act of 1997, the Employment Equity Act of 1998, the Skills Development Act of 1998 and the Skills Development Levies Act of 1999 (Leibbrandt et al., 2010). In addition, wage bargaining councils were introduced, in which trade unions negotiate with employers on matters related to wages, working conditions, and employee benefits, on behalf of workers (Bhorat et al., 2009). These labour regulations increased the administrative burden on firms particularly

Small, Medium and Micro Enterprises (SMMEs), causing firms to substitute labour with capital (Kingdon & Knight, 2003; Nattrass & Seekings, 2012). Nattrass & Seekings (2012). Nattrass & Seekings (2012) also argue that the extension of wage bargaining agreements to all firms in industry has prevented the emergence of low-wage, labour-intensive firms.

Demand-side factors, such as technological change and international trade are also contributing factors to the observed structural change and declining employment levels (Bhorat et al., 2014; Rodrik, 2008). These factors may have reduced the labour content of output and possibly the share of skilled labour in production (Cassim et al., 2004). More relevant for this thesis is the relationship between tariff liberalisation and labour.

1.4.2 South African Tariff Liberalisation

South Africa has experienced major transitions in trade policies over the decades and the history of South Africa's tariff liberalisation prior to the 1990s has been covered extensively in the literature. From 1925 until the 1970s South Africa's tariff liberalisation was geared towards import substitution (Edwards & Behar, 2005). At the time, gold was a major source of export revenue, and this was a concern for policymakers. The Reynders Commission of Inquiry, established in 1972, recommended export promotion strategies focusing on non-gold exports (Edwards & Behar, 2005). During the 1980s, the South African government attempted to make their trade policies more export-orientated. Their efforts included the relaxation of quantitative restrictions (QRs), the introduction of tariffs and an export development assistance scheme. The debt crisis during the mid-1980s saw businesses lobbying for higher tariffs to protect local industries. According to the International Monetary Fund (2000), South Africa had the most tariff lines and highest tariffs among developing countries in the early 1980s, with about 77% of the country's imports subject to tariffs (International Monetary Fund 2000).

In the early 1990s, South Africa emerged from a period of isolation from the international community. With the ending of apartheid, financial and trade sanctions imposed on the economy from the mid-1980s were removed. The South African government then introduced the General Export Incentive Scheme (GEIS) as a structural adjustment programme, particularly for motor vehicles, clothing and textiles (Rangasamy & Harmse, 2005). Through the GEIS, the government provided export subsidies to local producers to promote exports and reduce protection.

The extensive process of reducing import tariffs, agreed upon during the Uruguay Round of the General Agreement on Tariffs and Trade (GATT) and WTO, commenced in 1994. In the agreement, the South African government made a commitment to reducing tariffs, binding 98% of the tariff lines, providing export incentives to local producers, reducing the number of tariff rates to six, rationalising tariff lines, and replacing quantitative restrictions (QRs) on agricultural products with tariffs (Edwards & Behar, 2005; Mabugu & Chitiga, 2009). The GEIS was discontinued in 1997 because the policy was incoherent with the GATT and WTO agreements (Mabugu & Chitiga, 2009) and by this period the QRs were also almost completely phased out. These tariff changes, particularly the multilateral tariff reductions offered by South Africa's government during the Uruguay Round of the GATT/WTO, were largely driven by a formulaic process of reducing the dispersion of tariffs. The government also signed several bilateral and regional trade agreements from the mid-1990s to early 2000s, including the Southern African Development Community (SADC) Free Trade Protocol and the South Africa-European Union Trade, Development and Cooperation Agreement (TDCA) (Edwards & Behar, 2005).

The subsequent entry of China into the WTO in 2001 also had an impact on the country's economy, as China quickly become one of South Africa's main trading partners. The reduction of tariffs exposed local producers to strong competition from international producers, especially those from China.

1.5 Thesis Objectives

The primary objective of this thesis is to examine the effects of tariff liberalisation on gendered labour market outcomes in the local labour market. To achieve this objective, the thesis uses South Africa as a case study, drawing on detailed regional data obtained from the population census. The analysis on gender is carried out with data on two racial groups in South Africa, Blacks and Whites. In the thesis, we follow the definition of the Employment Equity Act, 55 of 1998 of Blacks as Africans, Coloureds and Indian/Asian. The research is done to complement existing international empirical literature by providing insight into the local labour market adjustments to tariff liberalisation in a middle-income country. The thesis has four specific objectives that form the empirical chapters around which it is structured.

Objective 1

This analysis has two main objectives. The first objective is to analyse the sources of changes in regional employment patterns in South Africa. This is done by exploiting regional differences in industry mix to identify how these may have contributed towards changes in the regional composition of employment. Here, the thesis seeks to verify whether and to what extent the main determinants of regional employment growth are consistent with local labour market effects of tariff liberalisation, namely industry composition. This is achieved by applying the industry shift-share analysis method to analyse the evolving patterns of employment growth across regions in South Africa. Industry composition is isolated from the other two sources of regional employment growth, that is, the effects that are common to all regions in a country (national growth effects) and those that are specific to a region (regional competitive effects). The second objective is to examine region-factors that are associated with the industry-mix that may explain the contribution of the industry-mix effect and the variation in regional employment growth.

Objective 2

The second key objective is to investigate the gendered effects of tariff liberalisation on regional employment in South Africa. This is achieved by undertaking two types of analysis. The first is to analyse the effect of tariff liberalisation on wages and the gender employment gap in the manufacturing sector. Second, the thesis examines the channels through which tariff liberalisation affects relative outcomes for women. The channels include technological progress, demand for skills, and industry segregation within manufacturing. The thesis utilises the South African population census data for 1996, 2001, and 2011 as well as annual average tariff data obtained from Edwards (2005). These datasets provide an opportunity to exploit regional variation in initial manufacturing employment as well as tariff reductions across industries and time.

Objective 3

The third main objective is to evaluate whether tariff liberalisation prompted the reallocation of labour from manufacturing to services. Theory predicts a restructuring of the economy away from import competing sectors (manufacturing, in case of South Africa) towards export sectors

and the services sector (Edwards, 1988). This chapter tests for evidence of structural shifts towards services in the economy in response to tariff liberalisation. There are four aims to this part of the study. First, to assess the extent to which tariff liberalisation prompted structural shifts in the employment of labour from manufacturing to services. Second, the thesis studies the tariff liberalisation effect on wages and employment in the services sector. Third, it investigates the three transmission channels through which tariff liberalisation impacts employment in the services sector, specifically, derived demand for services by manufacturing firms, income effect, and infrastructure investment. These indirect effects have not been widely considered in the international literature or the South African literature. Third, the thesis investigates the extent to which the employment effects differ across gender and race.

Objective 4

The final core objective of the thesis is to determine whether tariff liberalisation induces internal migration. Jones (1975) argues that the benefits of tariff liberalisation depend on the extent to which labour is able to reallocate across sectors or regions. To complete the analysis of tariff liberalisation on gendered labour market outcomes, it is fitting to explore the extent to which labour is able to migrate across regions in response to tariff liberalisation. Tariff reductions are expected to have gendered effects because men and women face different rigidities and differences in gender intensities across industries. Women mainly dominate in the textile, clothing and footwear industry. They will be impacted more in regions that are dominated by this industry. Other rigidities include marital status and fertility. Married women and women with children experience stronger constraints to internal migration than married men and even single women, as well as counterpart women without children (Chort et al., 2017; Hoang, 2011; Jacobsen & Levin, 2000). Ignoring these rigidities to internal migration limits our understanding of tariff-induced migration and, ultimately, the labour market adjustment to tariff liberalisation. The central questions that the thesis aims to answer include: what is the effect of tariff liberalisation on internal migration? How do gender-associated rigidities influence the effect of tariff liberalisation on internal migration?

1.6 Thesis Structure

The remainder of the thesis is structured as follows: Chapter 2 provides an analysis of regional employment dynamics in South Africa. Chapter 3 examines the effect of tariff liberalisation on

gendered labour market outcomes, including wages and employment, in the manufacturing sector. Chapter 4 extends that analysis by investigating sector reallocation from manufacturing to services in response to tariff liberalisation. Chapter 5 assesses regional reallocation by examining the effect of tariff liberalisation on gendered internal migration. Chapter 6 synthesises the main thesis findings and provides the conclusion. Policy implications and suggestion for future research are also presented in this final chapter.

Chapter 2

2. An Analysis of Regional Employment Dynamics in Post-Apartheid South Africa

2.1 Introduction

The focus of this thesis is on tariff liberalisation and its gendered effects on employment at the local level in post-apartheid South Africa. Before embarking on an exploration of this relationship, it is useful to identify the extent to which regional employment dynamics have contributed to national employment growth over the post-apartheid period. This is of relevance to this study, but also to the international literature that shows rising interest in the contribution of regional employment to national labour markets. Globally, researchers and policymakers are concerned about the regional distribution of economic activity and labour market outcomes within countries because aggregate employment figures have been found to hide disparities in labour market status at the regional level.

The primary objective of this chapter is to analyse the regional employment dynamics in South Africa over the period 1996-2011. The first objective is to assess whether there is variation in employment growth across regions. The second objective is to identify regional characteristics associated with region-specific contributors to employment growth. To meet these objectives, the chapter adopts an industry shift-share analysis method that decomposes the change in regional employment into three sources:

(i) Effects that are common to all regions in a country (national growth effects).
(ii) Industry-mix (industry composition) effects associated with differences in the composition of industries within the region.
(iii) Effects that are specific to the region, such as location, climate, and infrastructure (regional competitive effects).

The national growth effect measures the share of regional employment growth attributed to national employment growth. The industry-mix effect represents the share of local employment growth that is driven by industry composition in that region. The competitive effect measures the part of a region's employment growth that results from region-specific factors.

The decomposition of regional employment changes into regional and national components sets the context for the subsequent analysis in the thesis. Tariff liberalisation affects industries differently, with some industries, such as textile, clothing and footwear, experiencing comparatively strong reductions in tariffs in South Africa, while others, for example mining face lower reductions in tariff protection. This may give rise to differential labour market effects across regions in the presence of frictions that impede workers moving across industries or regions (Pavcnik, 2017). This, however, requires differences in the industry composition of employment across regions because then industry-specific changes in tariffs will expose workers in each region to differential reductions in aggregate tariffs.

The decomposition approach adopted in this chapter isolates the role of differences in industry-mix across regions in driving aggregate employment and thus serves two purposes: Firstly, it provides insight into the extent to which industry-mix differs across regions in South Africa. Secondly, it allows us to calculate the contribution of differences in industry-mix across regions to regional and aggregate employment growth.

To guide the empirical analysis, the chapter is structured around answering the following research questions:

1. What are the sources of variations in employment growth across regions?
2. What is the contribution of national-level and regional-level (industry-mix and regional competitive) effects to regional employment growth?
3. How does industry structure contribute to employment growth and the variation in this growth across regions?

The empirical analysis in the chapter contributes to the South African literature in several ways. A considerable body of international literature reveals the importance of regional dynamics, namely industry-mix effects and regional competitive effects, in driving aggregate employment growth in economies (Brox & Carvalho, 2008; Cochrane & Poot, 2008; Matlaba et al., 2014; Mitchell & Carlson, 2003). Similar studies have not been widely conducted in SSA countries, largely because of a lack of long-range spatial data[2]. Existing studies do not decompose how regional employment dynamics contribute towards aggregate employment changes. In South Africa, the only comparable literature, by Kleynhans and Classen (2012) and Kleynhans and

[2] Bosker and Krugell (2008), Krugell (2014) and Von Fintel (2018) use regional data for South Africa and observe enormous spatial inequality in the country that persists over time.

Sekhobela (2011), focuses on one province, the North West province. This chapter extends the literature on South Africa by looking across all regions in South Africa using a spatially consistent regional employment database constructed from the Population Censuses for 1996, 2001 and 2011.

Changes in the regional composition of employment is driven by many factors: productivity, labour supply shocks, demand factors. In this context, isolating exogenous sources from endogenous sources of growth is very difficult. However, the liberalisation of tariffs from the early 1990s in South Africa presents a useful lens to interpret some of the trends in regional employment growth that are attributed to differences in the industry-mix. South Africa is thus an important case study for such a decomposition analysis.

While not its central focus, the decomposition analysis contributes to the South African literature on the effect of tariff liberalisation on the structure of the economy and employment. Other studies in the literature include that of Edwards (2001), Jenkins (2008) and Rodrik (2008), who present industry-based decompositions of aggregate employment growth using aggregated industry data for South Africa. The decomposition analysis adopted here explicitly allows for regionally driven sources of employment growth.

A second reason for South Africa being an important case study is that there exist large disparities in economic activity, growth, and employment across space and population groups in the country. This is largely due to the historical legacy of apartheid policies of "separate development" which restricted the movement of labour and were – and continue to be - responsible for unequal development of areas. For example, Bosker and Krugell (2008), Krugell (2014) and Von Fintel (2018) observe that the enormous spatial inequalities in South Africa have persisted over time. The economy is also characterised by distinct frictions that impede the mobility of workers across regions and industries. The implication is that there may be substantial differences in the sources of employment growth for individuals according to their gender, race and location. The chapter therefore extends the existing shift-share literature by decomposing the sources of regional employment growth by gender and race.

The remainder of the chapter is structured as follows: Section 2.2 provides the conceptual framework for the chapter, and Section 2.3 discusses the related empirical literature. Section 2.4 presents the shift-share decomposition methodology utilised in the analysis of the data. In

Section 2.5, the data used in the decomposition are described and discussed. Section 2.6 provides a summary of the results, and Section 2.7 offers concluding remarks on the chapter.

2.2 Conceptual Framework

This section provides a conceptual framework that support the study on regional dynamics. National labour market outcomes are an aggregate of local labour market outcomes. In other words, national employment is a balance between employment growth in some regions and contracting employment in others. The level of employment differs across regions for several reasons including: (i) differences in the level and composition of industry output; (ii) the mobility of factors in the short to medium term; and (iii) unequal factor endowments.

These features are, in turn, driven by a combination of factors. These include, factors such as climate, factor endowments, geography and natural resources, which the literature refers to as "first nature forces" (Cochrane, 2011). For example, the location of minerals such as gold in the Gauteng province, platinum in the North West province and diamonds in the Northern Cape province played a dominant role in determining the geographical location of production in South Africa.

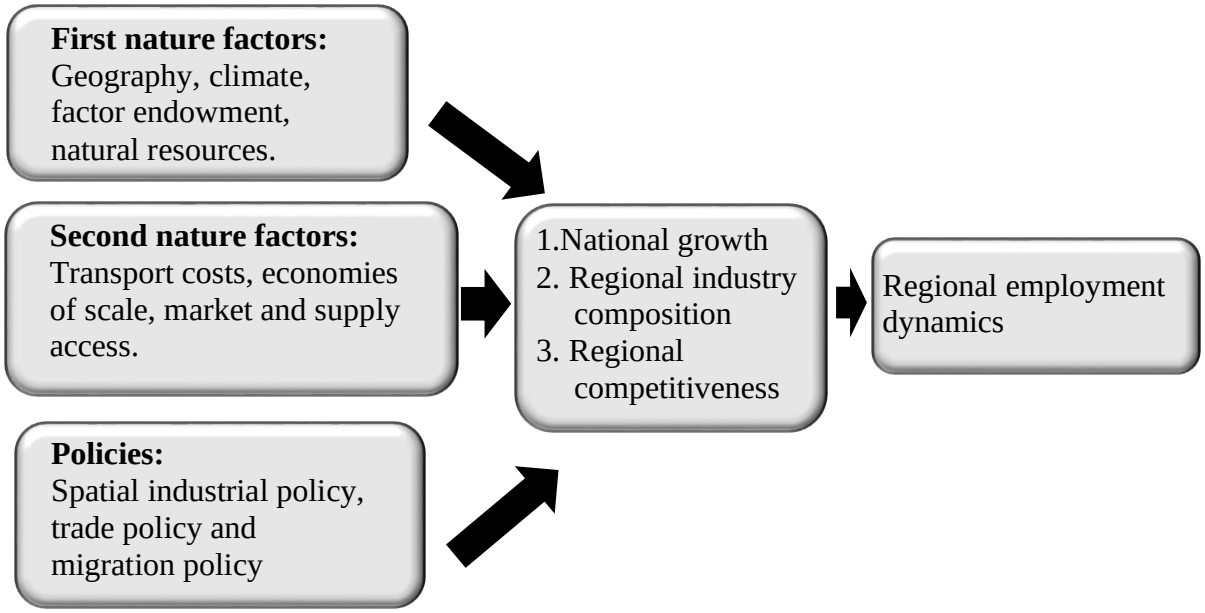
Secondly, there are the "second nature forces" which are factors that lead to the movement to and agglomeration of firms in certain regions. These may be termed "New Economic Geography (NEG)" factors. Unlike first nature forces, second nature forces are influenced by the interaction of economic agents. The main assumptions of the NEG theory include imperfect competition and increasing returns to scale (Krugman, 1991). The core idea of the theory is that geography, in terms of supply and market access, determines the level of economic activity. According to the NEG theory, physical geography or location matter for the agglomeration of economic activity mainly because of lower transport costs (Brakman et al., 2001). Firms agglomerate in regions where there are large markets and supply access, such as ports and borders (Fujita et al., 2001). The agglomeration of firms in certain regions allows for inter-industry linkages which come in the form of economies of scale (Venables, 1999). These linkages foster a close relationship between industry stakeholders. Accompanying the relocation and agglomeration of firms is labour migration to the same regions where there is high demand for labour, higher wages and a wider variety of goods. Therefore, the disparity between regional economies is a consequence of the interaction between transactions costs

(including transport costs), increasing returns to scale, factor mobility, and factor endowments across regions.

The third and final influencing factor is government policy. The first relevant type of policy is spatial industrial policy, such as the creation of spatial industrial zones or the promotion of industry in rural areas. For example, in the case of South Africa, the apartheid government provided firms with incentives to encourage them to locate around the homelands as part of the separate development plan. The second is trade policy, which is influential because, even though tariff liberalisation affects all industries in all regions, its impact can have varying effects on regional production and employment, given the industry composition. Finally, policies that control the movement of people are also relevant. For instance, the apartheid government in South Africa influenced regional employment by controlling where Black people especially Africans, work and reside. Africans people were clustered in former homelands and township areas. This policy consequently created regional labour supply heterogeneity.

The implication of these factors is that employment dynamics may differ across regions. These dynamics are in turn influenced by (i) region-specific shocks (for example declining in availability of minerals, dramatic and long-term changes in climate), (ii) region-specific policies (for example, the ending of spatial industry incentives in South Africa in 1991) and (iii) industry-specific shocks (for example, changes in world prices and liberalisation of tariffs across industries). National employment growth is underpinned by region-specific and industry-specific shocks that have implications for regional employment dynamics, and national shocks (for example, labour market or changes in macroeconomic factors) that affect all regions equally. A conceptual framework explaining regional employment dynamics and national employment growth is summarised in Figure 2.1.

Figure 2.1: Conceptual Framework Chart



2.3 Review of the Empirical Literature

There is extensive international literature on regional economies, including Breau and Saillant (2016), Brox and Carvalho (2008), Cochrane and Poot (2008), Crozet (2004), Head and Mayer (2006), Matlaba et al. (2014) and Mitchell and Carlson (2005). The core objective of this literature is to determine the distribution of economic activity and labour market outcomes, specifically wages and employment. A component of this literature, including Breau and Saillant (2016), Crozet (2004), Head and Mayer (2006), and Krugman (1991) draws on the NEG theory and applies spatial econometrics techniques in the study of regional economies. The evidence provided by these studies is overwhelmingly consistent, showing that economic activity, wages, and employment, continue to be concentrated in a few regions. Notwithstanding this, the NEG-influenced literature is not the focus of this chapter.

More relevant to the chapter is the second growing cluster in international literature that uses industry shift-share analysis to decompose national employment changes into their regional components (Brox & Carvalho, 2008; Cochrane & Poot, 2008; Matlaba et al., 2014; Mitchell & Carlson, 2005). The shift-share analysis approach was pioneered by Daniel Creamer in the

1940s and formalised by Dunn (1960). Its advantage lies in the accessible data requirements[3], which provide fairly easily interpretable results (Kleynhans & Sekhobela, 2011).

The industry shift-share method is a descriptive method and therefore, does not provide a causal effect. It serves to decompose the change in employment into three main components: national growth effect, industry-mix effect, and competitive effect. In this method, regional growth is directly linked to national growth and any diversion of regional growth from national growth can be attributed to the composition and growth of the industries in the regions (Cochrane & Poot, 2008). Therefore, it is an appropriate method to use for an analysis of the role of industry composition in regional employment and the region's contribution to national employment.

Since the national growth effect is equal across all regions, differences in regional employment are underpinned by industry-mix and regional competitive effects. Regional industry-mix will be beneficial in regions that are richly endowed with industries that are growing nationally as these regions are likely to experience higher employment growth compared to regions that have few or declining industries. The region competitive effect is the residual in regional growth after accounting for national and industry-mix effects. It measures the degree of competitiveness or region-specific factors that provide the industries in regions with advantage (or disadvantage) compared to national industries.

The main finding emerging from the literature that employs the industry shift-share decomposition technique is the existence of huge spatial inequality within countries that is underpinned by differentials in the industrial and regional composition of employment. There is also consensus among researchers that, while employment change across regions within a country is driven mainly by the industry composition and regional factors, a small number of regions have been found to have followed the national employment growth trend. These studies in the literature do not decompose employment growth within sectors, thus they do not include analyses of sectoral dynamics.

Mitchell and Carlson (2005) analyse the regional employment growth rate in Australia for the period 1985 to 2003. They find that region-specific factors have played a significant role in employment growth for non-metropolitan areas, while metropolitan areas have benefited from

[3] The industry shift-share methodology only requires data for national employment, industry employment, and regional employment.

a favourable industry structure (Mitchell & Carlson, 2005). They find that only two regions in Australia had a positive national growth effect, that is, employment growth in these regions was proportional to the national average (Mitchell & Carlson, 2005). In this study, regional employment growth was dominated by changes in region-specific factors rather than national effects.

Brox and Carvalho (2008) extend this approach by analysing regional labour markets in Canada for various age-gender cohorts over the period 1986 to 1995. They find that the employment growth of younger workers exceeded that of adult workers in most regions when accounting for changes in the labour force (Brox & Carvalho, 2008). The study also finds differential effects of regional competitiveness across demographic groups. The competitive effect has a predominantly negative effect on the employment of younger workers (both male and female) in the Atlantic region but has a positive effect on adult female workers (Brox & Carvalho, 2008). Moreover, they find the competitive share effect to be stronger on female workers than on male workers.

Cochrane and Poot (2008) examine the spatial distribution of employment in New Zealand, and the contributing factors. The study is performed over a longer period than that of the Canadian study, from 1986 to 2001. It aims to determine the persistence of regional diversity. To explore and determine this, a multi-period shift-share analysis is utilised for 58 labour market areas (LMAs). The research highlights that regions follow the same trend as the national labour market. The national growth effect is found to be the main contributing factor, affecting all LMAs equally. The second major contributing factor is shown to be the region competitive effect.

A study on employment change across states in Brazil was carried out by Matlaba et al. (2014). The study investigated 27 states between 1981 and 2006. The findings show that employment growth in the underdeveloped states can mostly be attributed to the states' comparative advantage, a combination of the appropriate industry-mix and competitiveness (Matlaba et al., 2014). The national growth effect is shown to contribute little to the change in total employment. Aggregate employment changes are primarily attributed to changes in region-specific effects.

This literature highlights that aggregate employment changes are driven by substantial changes in employment levels across regions. Regional composition effects are therefore an important part of the aggregate employment change in some countries. Only focussing on aggregate employment change may obscure important regional dynamics behind regional employment changes.

2.3.1 Related Empirical Literature in South Africa

The empirical literature dealing with the factors which influence employment change at a sub-national level in South Africa has covered a broad range of topics, including labour market outcomes, demographics, urbanisation, inequality, poverty, and migration. In South Africa, empirical evidence is provided by Bosker and Krugell (2008), Kleynhans and Classen (2012), Kleynhans and Sekhobela (2011) and Naudé and Krugell (2004). The evidence from these studies shows that South Africa has extreme regional inequality, and some regions remain marginalised as economic activity continues to be concentrated in a few regions. South Africa's six largest cities are Johannesburg, Ekurhuleni, Durban, Cape Town, Tshwane and the Nelson Mandela metropole[4] (Naudé, 2010; Naudé & Krugell, 2004). These cities gained their prominence through trade, mining, and favourable climate, as well as apartheid policies which promoted their development (Feinstein, 2005). These regions also have the highest employment levels relative to more remote regions. Naudé and Krugell (2004) show that around 82% of GDP is produced by only 20% of areas (specifically towns and cities) in the country. Moreover, in 2000, the richest 20% of areas had an average per capita income of R25 277 compared to R5 452 in the poorest 20% of areas (Naudé & Krugell, 2004).

In the reviewed literature, few studies have analysed changes in regional employment or have identified the key drivers of this change at a municipal level. Studies that use the industry shift-share decomposition in the South African context to identify the forces of regional employment growth are those by Kleynhans and Classen (2012) and Kleynhans and Sekhobela (2011). Kleynhans and Sekhobela (2011) employ this method, using Rex data from Global Insight Southern Africa, to decompose changes in value-added manufacturing in the North West province between 1996 and 2006. The analysis is across four local municipalities within the Southern District municipality, namely Klerksdorp, Potchefstroom, Ventersdorp, Merafong

[4] The chapter will refer to the cities by their previous names because it is focusing on the period between 1996 and 2001. The new names came into effect in the past decade.

City, and Wolmaransstad. Their main finding is that the industry-mix in the region has a negative effect on value-added manufacturing, while the national growth effect has an overwhelmingly positive effect (Kleynhans & Sekhobela, 2011).

Kleynhans and Classen (2012) extend this approach to evaluate the job creation and economic growth potential of the manufacturing industry in the North West province from 1996 to 2006, associated with the Platinum Spatial Development Initiative (SDI). The Platinum SDI is a development corridor between the North West province and Botswana set up to promote economic activity in the area. The study compares employment changes in magisterial districts in the SDI with the rest of the magisterial districts in the North West province. The authors find evidence that the SDI corridor has higher economic growth than the rest of the province. They find employment growth in the SDI to be significantly different from growth in the rest of the province and that this employment growth is mainly driven by industry-mix and regional competitive effects.

The main shortcoming of the literature that uses the industry shift-share decomposition approach to analyse regional employment in South Africa is that the studies are limited to the manufacturing sector and do not analyse South Africa as a whole. This chapter attempts to deepen the empirical analysis of regional employment growth in South Africa by employing the dynamic industry shift-share method across all the municipalities in the country. Furthermore, the study aims to expand and enhance the body of the literature by analysing the industry-mix component and its associations.

2.4 Estimation Method: Dynamic Industry Shift-Share Analysis

This section discusses the empirical methods employed in this chapter for exploring regional dynamics in South Africa. The chapter investigates the distribution and drivers of regional employment growth in South Africa by utilising a dynamic industry shift-share analysis to decompose employment growth in South Africa into national effects, industry-mix effects, and regional competitive effects, for the periods 1996-2001 and 2001-2011. In doing so, it replicates the regional growth analysis done by Cochrane and Poot (2008) in New Zealand and by Matlaba et al. (2014) in Brazil. Even though the shift-share decomposition is descriptive, it is an appropriate technique to use in this chapter. The causal determinants of regional employment changes will be analysed in more depth in subsequent chapters.

The dynamic shift-share approach adopted decomposes the sources of change in employment (ΔE_{im}^{t}) within the i^{th} industry in the m^{th} municipality as follows:

$$\Delta E_{im}^{t} \equiv E_{im}^{t} - E_{im}^{t-1} \equiv NE_{im}^{t} + IM_{im}^{t} + CE_{im}^{t} \quad (2.1)$$

where E_{im}^{t} denotes employment in the i^{th} industry in the m^{th} municipality at the end period (t). E_{im}^{t-1} is employment in the i^{th} industry in the m^{th} municipality during the initial period (t-1). NE_{im}^{t} indicates national growth effect on industry *i* in the m^{th} municipality between the initial period and the end period. IM_{im}^{t} represents the industry-mix effect on industry *i* in the m^{th} municipality between the initial period and end period. CE_{im}^{t} denotes competitive effect on industry *i* in the m^{th} municipality between the initial period and end period.

The national growth effect shows the hypothetical employment change if a region grows at the national growth rate and is defined by the following two equations:

$$NE_{im}^{t} = E_{im}^{t-1} g^{t} \quad (2.2)$$

$$g^{t} = (E^{t} - E^{t-1})/E^{t-1} \quad (2.3)$$

where E^{t}reflects national employment at the end period. E^{t-1} denotes national employment at the initial period. g^{t} is the growth rate in total national employment between the initial period and the end period. Equation (2.2) defines the national growth effect for each municipality in each industry as a product of the initial employment in municipality *m* in industry *i* and the total national employment growth.

The industry-mix effect represents the share of employment growth that is explained by the industry composition in that region. Regions differ in terms of their industry composition, and consequently, differential growth rates across industries will give rise to regional variation in employment change. For example, a region with a "favourable" mix of industries (industries that are growing fast nationally) is likely to experience relatively rapid growth in employment. These regions have a positive industry mix component. The following equations define the industry-mix:

$$IM_{im}^{t} = E_{im}^{t-1}(g_{i}^{t} - g^{t}) \quad (2.4)$$

$$g_{i}^{t} = (E_{i}^{t} - E_{i}^{t-1})/E_{i}^{t-1} \quad (2.5)$$

where E_i^t is national employment in industry *i* at the end period. E_i^{t-1} denotes national employment in industry *i* at the initial period. g_i^t represents the growth rate in national employment[5] in industry *i* between the initial period and end period.

Equation (2.4) calculates the industry-mix effect as the product of initial employment in municipality *m* in industry *i* and the difference between national industry employment growth and total national employment growth. Regions with large numbers of workers in industries facing high growth rates relative to the national growth rate will, therefore, experience a large industry-mix effect.

The regional competitive effect measures the part of employment growth that is due to region-specific factors that contribute to regional industries growing faster or slower than national industries. It reflects the difference between actual employment and hypothetical regional employment had the regional industries grown at the national industry growth rate. The competitive effect is defined as follows:

$$CE_{im}^t = E_{im}^{t-1}(g_{im}^t - g_i^t) \quad (2.6)$$

$$g_{im}^t = (E_{im}^t - E_{im}^{t-1})/E_{im}^{t-1} \quad (2.7)$$

g_{im}^t denotes actual employment growth on industry *i* in municipality *m* between the initial period and end period. Equation (2.6) defines the competitive effect as a product of initial employment in municipality *m* in industry *i* and the difference between regional industry employment growth and national industry employment growth.

It follows from equations (2.1), (2.2), (2.4) and (2.6) that municipal employment growth is an aggregate of employment over industries *i* in each municipality *m*. Consequently, aggregate municipality-level employment growth rate can be decomposed into national growth rate (g_m^t), industry-mix growth rate (n_m^t), and competitive effect growth rate (c_m^t), as illustrated in equation (2.8):

$$g_m^t = g^t + n_m^t + c_m^t \quad (2.8)$$

[5] The growth rate is based on total employment.

The growth rates of the industry-mix and the competitive effect that contribute to employment growth can, in turn, be expressed by equations (2.9) and (2.10), respectively:

$$n_m^t \equiv \sum_i w_{im}^{t-1}(g_i^t - g^t) \quad (2.9)$$

$$c_m^t \equiv \sum_i w_{im}^{t-1}(g_{im}^t - g_i^t) \quad (2.10)$$

where w_{im}^{t-1} is the share of municipality employment that is devoted to industry *i* at the initial period.

The classic industry shift-share decomposition method has been criticised for being comparatively static, thus not providing insight into the evolution of regional employment. This weakness is addressed by analysing two periods: 1996 – 2001 and 2001 – 2011. Thus, the chapter provides a dynamic component. Another criticism of the classic method is that the analysis does not reveal causality and only provides an indication of the direction of influence of the various components on regional employment growth (Patterson, 1991; Ray & Harvey, 1995). Proving causality is not a critical feature in this chapter because the aim is this study is to provide the context for the relative contribution of each component to total employment growth. Its objective is thus primarily descriptive. The subsequent chapters in the thesis focus on establishing a causal relationship between tariff liberalisation and the observed changes in regional employment.

The most common criticism of the industry shift-share decomposition method regards the possible association between the industry-mix effect and the competitive effect. Critics argue that the industry shift-share method cannot isolate the source of regional employment growth. That is, the method cannot determine whether the growth is due to the composition of industries in the region that are growing nationally or to a buoyant industry in the region which is not found in other regions which increases its competitiveness. Furthermore, the classic industry shift-share decomposition technique fails to take into account the role of region size. Firms are likely to agglomerate to large regions because of labour supply, and thus, there is a probability that those regions will have favourable industry composition, and this will lead to higher regional employment growth. Failure to account for region size in the analysis means that the industry-mix effect interacts with the competitive effect. This method therefore makes it difficult to measure if high employment growth is due to favourable industry composition.

Esteban-Marquillas (1972) proposes a solution by rearranging the shift-share equation to isolate the actual competitive effect. The alternative method he proposes includes an element called 'homothetic employment', which represents the employment that a region would have had in industry *i* if the share of industry *i* in regional employment was the same as the share of industry *i* in national employment.

In this chapter we apply the modified methodology of Esteban-Marquillas (1972) using equation (2.11), where total employment growth rate is the sum of national growth rate, industry-mix growth rate, and competitive growth rate, as defined in equations (2.12) to (2.14) respectively:

$$g^t_{m,alt} = g^t_{alt} + n^t_{m,alt} + c^t_{m,alt} \quad (2.11)$$

$$g^t_{alt} \equiv \sum_i w^{t-1}_{im,alt}(g^t_i) \quad (2.12)$$

$$n^t_{m,alt} \equiv \sum_i \left(w^{t-1}_{im} - w^{t-1}_{im,alt}\right) * g^t_i \quad (2.13)$$

$$c^t_{m,alt} \equiv \sum_i w^{t-1}_{im,alt} * (g^t_{im} - g^t_i) + (g^t_{im} - g^t_i) * \left(w^{t-1}_{im} - w^{t-1}_{im,alt}\right) \quad (2.14)$$

where $w^{t-1}_{im,alt}$ is national industry employment as a share of total national employment.

2.5 Data and Stylized Facts

2.5.1 Data Sources

The main data sources for the analysis are the population census conducted in 1996, 2001 and 2011 released by Statistics South Africa. The advantages of the census datasets are that they contain many observations and they provide detailed data on age, gender, race, employment status, industries and regions.

Statistics South Africa (StatsSA) disseminates the data in two formats: A full census database with data that is disaggregated to the sub-place level[6], and a 10% sample of individual-level data, at a more aggregated regional level to protect respondent privacy. One of the disadvantages of the full census is that it reports industries at an insufficient level of

[6] Sub-place represents a "suburb, section or zone of an (apartheid) township, smallholdings, village, subvillage, ward or informal settlement" (Statistics South Africa, 2012).

disaggregation. Industry data is reported only at the one-digit[7] Standard Industrial Classification (SIC) level. This chapter therefore employs the 10% weighted samples of 1996, 2001 and 2011 population censuses, which report industries at the two-digit SIC level. The 10% sample is weighted using individual weights to correct for potential issues of undercounting. The analysis restricts data to the working-age population that is individuals aged between 15 and 65 years. The final dataset for this chapter comprises nine industries[8] at the one-digit SIC level and ten manufacturing industries[9] in 234 municipalities covering the three census years.

The second disadvantage of the full census database is that the data does not include a common local level unit of analysis across censuses. The data is published at different geographical levels (province, local municipality, main-place, and sub-place). Since 1994, the government has been engaged in massive re-demarcation of the administrative boundaries to redress the regional imbalances of the past. This poses a challenge for the analysis of regional data as the geographic units are not comparable over time. For example, the local geographic unit of analysis in the 1996 census data is magisterial district, whereas the 2001 census contains variables for both magisterial district and municipality. New municipal demarcations also occurred between the 2001 and 2011 censuses. Additionally, the magisterial district variable was dropped in the 2011 census data. To allow comparison over time, some form of mapping is required to align the geographical units. For this chapter, we mapped the lowest available geographical units in 1996 (12 398 place-names) and 2001 (21 243 sub-places) to the 2011 municipalities (234 municipalities). A full description of data construction is available in Appendix 2.1.

[7] Industries at the one-digit SIC level are: (1) Agriculture, hunting, forestry and fishing; (2) Mining and quarrying; (3) Manufacturing; (4) Electricity, gas and water supply; (5) Construction; (6) Wholesale and retail trade; (7) Transport, storage and communication; (8) Financial, insurance; real estate and business services; (9) Community, social and personal services; and (10) Private households.

[8] The nine industries include agriculture, mining, manufacturing, utilities, construction, wholesale and retail trade, logistics, finance, and other services (including public administration). The exclusion of public administration in "other services" is because employment in government is centralised and not influenced by changes in industry structure.

[9] Manufacturing comprises the following industries: (1) Food, beverages and tobacco products; (2) Textiles, clothing, footwear and leather goods; (3) Wood products; (4) Fuel, petroleum; chemical and rubber products; (5) Other non-metallic mineral products; (6) Metal products, machinery and household appliances; (7) Electrical machinery and apparatus; (8) Electronics, sound/vision, medical and other appliances; (9) Transport equipment and (10) Furniture and other items not elsewhere classified (NEC), and recycling.

2.5.2 Stylized Facts: Employment trends

In this section, we present and discuss the stylized facts that characterise the South African labour market, focusing on employment trends from 1996. Table 2.1 illustrates sector employment as a share of total national employment from 1996 to 2011. Employment in South Africa was approximately 7.5 million in 1996 and grew to about 8 million in 2001, and then 12 million in 2011. A significant contributor to this growth is the services sector. The "Other services" industry has the largest share of national employment with a share of 29.2% in 2011. However, the fastest-growing sectors are finance and wholesale and trade. The share of employment in the finance sector rose by 7.3 percentage points while the employment share of the wholesale and trade sectors rose by 4.2 percentage points between 1996 and 2011.

With these growth rates in services, a structural shift in employment away from tradable sectors to nontradable sectors (services) is observed, as is also found by Bhorat et al. (2014), Bhorat and Hodge (1999), Edwards (2001), Rodrik (2008), and Tregenna (2008). The tradable sectors, such as agriculture, mining, and manufacturing shrank by 5, 3.8, and 4.2 percentage points, respectively in the 1996-2011 period. It is therefore expected that municipalities with an industry-mix biased towards the nontradable sector are likely to have experienced faster employment growth during the period than regions dominated by the tradable sector.

Table 2.1: National industry employment shares

	Industry Shares			Percentage Point Change		
Industry	**1996**	**2001**	**2011**	**1996-2001**	**2001-2011**	**1996-2011**
Agriculture	10.6%	12.0%	5.6%	1.3	-6.4	-5.0
Mining	7.0%	4.7%	3.2%	-2.3	-1.5	-3.8
Manufacturing	14.8%	15.0%	10.6%	0.2	-4.4	-4.2
Utilities	1.4%	0.9%	0.9%	-0.5	0.0	-0.5
Construction	7.3%	6.5%	8.8%	-0.8	2.3	1.5
Wholesale & trade	14.5%	18.0%	18.7%	3.5	0.7	4.2
Logistics	6.4%	5.5%	6.6%	-0.9	1.1	0.2
Finance	9.0%	11.2%	16.4%	2.1	5.2	7.3
Other services	29.1%	26.4%	29.2%	-2.6	2.8	0.1
National employment	7 530 756	8 055 077	12 207 562			

Notes: Industry shares are aggregate industries normalised by national employment.
Source: 10% weighted sample census data

Table 2.2 shows employment changes in the manufacturing sector between 1996 and 2011. Total manufacturing employment grew from 1.1 million in 1996 to 1.2 million in 2001 and to

almost 1.3 million in 2011. However, manufacturing as a share of total employment contracted, as shown in Table 2.1. In 1996, the largest industry within manufacturing was the textiles, clothing, and footwear sector, with a share of 22.2%, followed by food, beverages and tobacco products with a share of 20%, and metal products with a 16% manufacturing employment share. By 2011, the industry composition of manufacturing employment had changed, and the share of the textile, clothing, and footwear industry fell to 8.4%. The major manufacturing industries in 2011 were food, beverages, and tobacco (21.7%), metal products (19.8%) and petroleum products (13.8%). In terms of percentage change, industries with the largest growth in employment were metal products (3.8), petroleum products (3.5), transport equipment (2.4) and non-metallic products (2). In comparison, the textile, clothing and footwear, electrical machinery and electronic appliance sectors were the major losers, with employment shares contracting by 13.9, 1.4 and 0.1 percentage points from 1996 to 2011, respectively.

Table 2.2: National manufacturing employment shares

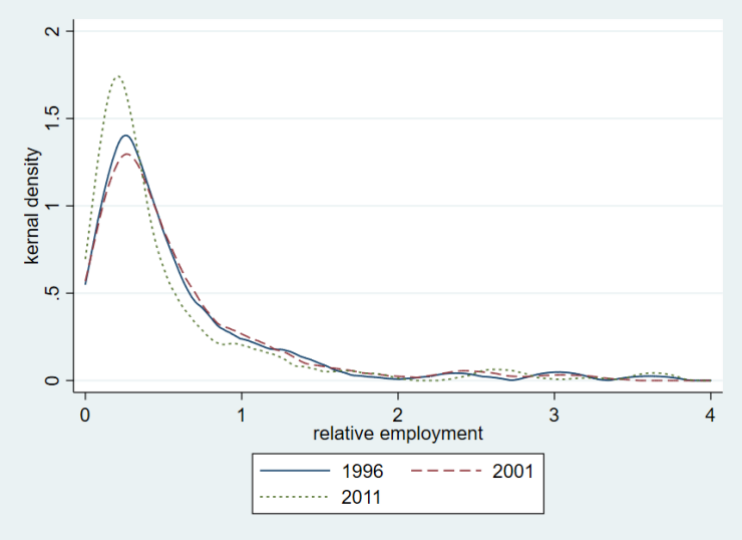
	Industry Shares			Percentage Point Change		
Industry	**1996**	**2001**	**2011**	**1996-2001**	**2001-2011**	**1996-2011**
Food products	19.9%	14.0%	21.7%	-6.0	7.8	1.8
Textiles et.	22.2%	18.4%	8.4%	-3.9	-10.0	-13.9
Wood products	13.1%	11.4%	14.6%	-1.7	3.2	1.5
Petroleum products	10.2%	12.7%	13.8%	2.5	1.1	3.5
Non-metallic products	4.1%	4.9%	6.1%	0.8	1.2	2.0
Metal products	16.0%	21.7%	19.8%	5.7	-1.8	3.8
Electrical machinery	2.2%	1.7%	0.8%	-0.6	-0.8	-1.4
Electronic appliances	1.3%	1.1%	1.2%	-0.2	0.0	-0.1
Transport equipment	6.1%	7.5%	8.5%	1.4	1.0	2.4
Furniture	4.7%	6.7%	5.0%	2.0	-1.6	0.4
National manufacturing	1 111 121	1 204 318	1 291 093			

Notes: Manufacturing industries are normalised by national manufacturing employment.
Source: 10% weighted sample census data

To provide a depiction of how employment levels vary across municipalities, Figure 2.2 presents kernel density estimates of relative employment. Relative employment is calculated by dividing each municipality's employment level by the average across all municipalities. A value of one means that the level of employment in the municipality is equal to the average across the nation. The figure shows a wide and skewed distribution in employment across municipalities. Employment for a large number of municipalities is less than the national average reflecting an unequal distribution of employment across municipalities in South Africa. The right tail reflects the presence of a few municipalities with very large levels of

employment. Comparing 1996 and 2011, we see a rising proportion of municipalities with below average employment levels, suggesting widening regional inequality in employment. Bosker and Krugell (2008), Krugell (2014) and Von Fintel (2014) also reveal a high degree of persistence in the regional inequality of economic activity and employment in South Africa over the period.

Figure 2.2: Relative employment from 1996 to 2011



Notes: Relative employment is municipality employment divided by national average employment
Source: 10% weighted sample census data

Table 2.3 presents the summary statistics of employment shares by gender and race across municipalities in 1996, 2001, and 2011. The data shows that more men are employed than women, but the gender employment gap (the difference between male and female employment) has declined marginally over the years. For example, the average employment share of men dropped from 58.6% in 1996 to 56.2% in 2011, while for women, the average share rose slightly from 41.4% to 43.8% over the same period.

The aggregate trends are therefore reflected in trends within race categories, although there are differences in levels. The gender employment gap is more distinct within racial groups. Women comprise a higher share of employment among Blacks (40.2%) than among Whites (38.3%). It is also observable that the share of women in employment rose for both Blacks and Whites, leading to a narrower gender employment gap for both racial groups. However, Whites experienced a larger reduction in the gender employment gap than Blacks. From 1996 to 2011, the gender employment gap decreased from 16.8 percentage points to 12.4 percentage points among Blacks, and from and 23.4 percentage points to 16.4 percentage points among Whites.

There is also evidence of wide variation in the gender composition of employment across municipalities. This is reflected in the standard deviation, but even more noticeable in the gap between the minimum and maximum shares. For instance, in 1996 the municipality with the lowest share of females in employment was Merafong City municipality in Gauteng Province with 16.1%, while the municipality, while the maximum share (56.9%) was Hlabisa municipality in KwaZulu-Natal Province. The variation is found in all years, although we see that in 2011 the minimum and maximum share of females in the workforce in these municipalities have risen compared to 1996. There is also substantial regional variation within races[10].

Table 2.3: Regional gendered average employment shares

	Gender	Mean	SD	Min	Max
		1996			
All	Female	0.414	0.415	0.161	0.569
	Male	0.586	0.585	0.431	0.839
Black	Female	0.402	0.414	0.045	0.575
	Male	0.598	0.586	0.425	0.955
White	Female	0.383	0.386	0.002	0.806
	Male	0.617	0.614	0.194	0.998
		2001			
All	Female	0.422	0.424	0.234	0.585
	Male	0.578	0.576	0.415	0.766
Black	Female	0.412	0.418	0.124	0.587
	Male	0.588	0.582	0.413	0.876
White	Female	0.391	0.398	0.017	0.554
	Male	0.609	0.602	0.446	0.983
		2011			
All	Female	0.438	0.435	0.273	0.587
	Male	0.562	0.565	0.413	0.727
Black	Female	0.429	0.429	0.000	0.656
	Male	0.571	0.571	0.344	1.000
White	Female	0.418	0.427	0.000	1.000
	Male	0.582	0.573	0.000	1.000

Notes: Employment share represents employed fe(male) as a share of the total number of employed individuals of each gender. "Blacks" comprise Africans, Coloureds, Indians/Asians, "Other" have been excluded in the final sample. The gender mean differences are significant at the 1% level.
Source: 10% weighted sample census data

[10] Some municipalities have no female workers, and this is evident in 2011 which shows zero for the "min" statistic. An explanation for the non-zero min value in 1996 and 2001 is because of the mapping process from magisterial districts to the 2011 municipalities. The zero count for women may also reflect the use of the 10% sample, meaning that women were probably not selected in these regions. Nonetheless, the values in 1996 and 2001 are extremely low which is in line with the municipalities having no female workers. White women workers are not represented in the following municipalities: Umzimkhulu (Kwa-Zulu Natal), Ntambana (Kwa-Zulu Natal), Maphumulo (Kwa-Zulu Natal), Mbizana (Eastern Cape), Nongoma (Kwa-Zulu Natal), Makhuduthamaga (Limpopo), Ntabankulu (Eastern Cape), while Kareeberg (Northern Cape) and Karoo Hoogland (Northern Cape) do not have Black female workers.

The important role of industry composition within municipalities can be estimated using the location quotients for the nine industries. The LQ_{im} is an index that quantifies the concentration of industries within a region relative to the reference area (Cochrane & Poot, 2008), which in our case is the national labour market. The index is estimated as follows:

$$LQ_{im} = \frac{E_{im}/E_m}{E_i/E} \tag{2.15}$$

where E_{im} is employment in industry *i* in municipality *m*, E_m is the total municipality employment, E_i is national employment in industry *i*, and *E* is total national employment. A LQ_{im} value of 1 indicates that the share of employment in industry *i* in municipality *m* is equivalent to that industry's share in national employment. A value greater (less) than one shows that the municipality has proportionally more (less) employment in industry *i* relative to the national labour market. Values that are greater than one also suggest that particular industry is dominant in that municipality (Cochrane & Poot, 2008).

Table 2.7A in the appendix presents provincial location quotients in 2011. The values in the table reflect the share of municipalities within a province that have LQ_{im} greater than or equal to one. The LQ_{im} shows wide dispersion of industries across municipalities. The services sector is concentrated in Gauteng, the Western Cape and Eastern Cape provinces. Gauteng, the economic hub of South Africa, has the largest share of municipalities where the following sectors dominate: manufacturing (80%), wholesale and trade (90%), logistics (90%), and finance (80%). The second largest province in terms of economic activity, the Western Cape, has about 56% and 72% of its municipalities specialising in manufacturing and wholesale & trade, respectively. About 90% of the municipalities in the Eastern Cape dominate in other services. About 93% of municipalities in the Northern Cape have a comparatively large agricultural sector while Mpumalanga has most employment in mining and construction with 61% and 94% of municipalities dominated by these industries, respectively.

Table 2.4 shows the correlation between employment growth, population growth and growth in migration in regions. The correlation matrix illustrates that employment growth is perfectly positively correlated with the population growth and the growth in migration. The positive associations of these three variables indicate that as the population grows, more people migrate into regions and this is also associated with increases in regional employment. This raises the

possibility that regional population dynamics, in particular changes in migration patterns, play a key role in regional employment dynamics. Thus, regions differ in terms of employment growth due to both industry composition (as shown by the location quotients) and changes in the population which is associated with changes in migration patterns. The data thus reveals the connection between employment, migration and population. This is a critical observation for the thesis which seeks to isolate the role of tariff changes in driving changes in employment and migration patterns.

Table 2.4: Correlation between growth in employment, population and migration between 1996 and 2011

	Employment growth	Migration growth	Population growth
Employment growth	1		
Migration growth	0.9397*	1	
Population growth	0.9825*	0.9480*	1

Note: The data employed is for the working-age population (individuals aged between 15-65 years). Regional growth rates in employment, migration and population are calculated as the difference between 1996 and 2011 normalised by 1996 figures. The correlations are statistically significant at the 1% level.
Source: 10% weighted sample census data

2.6 Industry Shift-Share Decomposition Results

This section presents the results of the dynamic industry shift-share decomposition applied to the 234 municipalities across three time periods, 1996-2001, 2001-2011, and 1996-2001. The decomposition is based on nine broadly defined industries (at the one-digit SIC level), namely: agriculture, mining, manufacturing, utilities, construction, wholesale & trade, logistics, finance and other services.

2.6.1 Dynamic Industry Shift-Share Decomposition

A summary of the dynamic industry shift-share employment decomposition is provided in Table 2.5. The table presents decomposition results for municipalities in the median, 10^{th} and 90^{th} percentiles. The decomposition results disaggregated by municipalities are presented in Table 2.8A in the appendix, with municipalities ranked according to 1996-2011 employment growth.

The disaggregated results show that, in the period 1996-2001, the municipality with the median employment growth was Sundays River Valley in the Eastern Cape province. As shown by the

summary results, employment in this municipality grew by 7.9%, in excess of the 7% national growth, suggesting that region-specific factors had an overall positive effect on the region's employment growth. The industry-mix effect raised employment growth by 2.7% and this was sufficient to cover the 1.7% negative regional competitive effect.

The decomposition results for the municipalities in the 10th and 90th percentiles show substantial variation in employment growth across regions. The municipality with employment growth in the 10th percentile is Umsobomvu, in the Northern Cape. This municipality experienced negative employment growth of about 16.4% while national employment growth was 7%. Regional factors, particularly the regional competitive effect, severely constrained growth in employment in this municipality. In contrast, employment growth in Polokwane in Limpopo Province was 32.7%, putting the region in the 90th percentile, and the growth was supported mainly by the regional competitive effect.

During 2001-2011, median employment growth of in Msinga in Kwa-Zulu Natal and Matzikama in the Western Cape was approximately 30.6%. This employment growth was below the national average of 51.5% and this poor regional performance was driven predominately by region-specific factors. The industry-mix effect slowed regional employment growth by an average of 17.2% and regional competitive effects reduced regional employment growth by on average 3.7%. However, these shift-share components had varying effects in the two municipalities. Matzikama experienced a 33% negative industry-mix effect while Msinga faced a 1.4% negative effect. Regional competitive effects reduced employment growth in Msinga by 19.4% but increased employment growth in Matzikama by 12%.

Employment growth in uMlalazi in Kwa-Zulu Natal contracted by 39.7%, putting the municipality in the 10th percentile. This negative employment growth was underpinned by the negative contribution of the industry-mix (16.6%) and regional competitiveness (74.6%). Interestingly, the municipality in the opposite end of the spectrum was Mtubatuba, also in Kwa-Zulu Natal, which was in the 90th percentile. Employment growth in this province was 122.7%, driven largely by the regional competitive effect, which contributed 72.6% to the region's employment growth. The industry-mix effect had a negative effect of 1.3%.

Over the entire period 1996-2011, the municipality with the median employment growth was Breede Valley in the Western Cape, which grew by 45.8% and the national growth effect was

62%. The industry-mix effect was the sole contributor to this slow employment growth, reducing this growth by 27%. The region competitive effect increased employment growth in this municipality by 10.8%. Dannhauser and Umuziwabantu, both in in Kwa-Zulu Natal, had employment growth in the 10^{th} and 90^{th} percentiles respectively. Dannhauser experienced negative employment growth of 41.7% while Umuziwabantu's employment growth was 137%, which exceeded the national growth effect of 62%. We find that the industry-mix effect was detrimental to employment growth in both regions, but the effect was more disadvantageous for Dannhauser. The regional competitive effect favoured Umuziwabantu by increasing employment growth by 88.3%, but reduced employment growth in Dannhauser by 84.3%.

Looking across municipalities in Table 2.8A in the appendix, employment growth from 1996 to 2011 was highest in Gamagara (877%) and lowest in Mier (-92%). Of the 234 municipalities, 61 experienced negative growth over the period 1996-2011. These municipalities with slow employment growth are located in the Eastern Cape (8), Northern Cape (9), Free State (13), KwaZulu-Natal (16), North West (5), Gauteng (4), Mpumalanga (1) and Limpopo (5). All the municipalities in the Western Cape had positive employment growth. These findings reinforce the observation that there is enormous regional disparity in employment growth in South Africa over the period examined.

With respect to the determinants, employment growth was, on average, driven mainly by the national growth effect. The dominance of the national growth effect in driving regional employment is in line with evidence for New Zealand and Australia (Cochrane & Poot, 2008; Mitchell & Carlson, 2005).

More importantly, the results point to substantial heterogeneity in the industry-mix effects across municipalities. The municipal level data in the appendix Table 2.8A shows that employment growth in 183 out of 234 of the municipalities over the period 1996-2011was adversely affected by their industry-mix. The negative industry-mix effect is comparable with findings from the study conducted in Brazil by Matlaba et al. (2014), indicating that the industry-mix effect is a vital contributor to regional employment growth in both countries.

The regional competitive effect was a positive contributor to employment growth. Decomposition results at the municipality level in the appendix in Table 2.8A reveal that in the period 1996-2011, 120 municipalities faced negative regional competitive effects.

Overall, the decomposition highlights large variation in employment growth across regions. Regions did not follow the national trend, 96 regions grew faster and 135 regions grew slower than the national average[11]. The finding that more than half of the municipalities faced negative industry-mix and regional competitive effects suggests that region-specific factors play a vital role in regional employment growth in South Africa. The effect of the industry-mix effect is particularly interesting for the thesis as it lends itself to a study on the contribution of sector-biased shocks, such as tariff liberalisation.

Table 2.5: Summary of the dynamic industry shift-share decomposition results

Time period	Components	Median	P10	P90
1996 - 2001	ΔE	7.9	-16.4	32.7
	NE	7.0	7.0	7.0
	IM	2.7	3.6	0.1
	CE	-1.7	-27.0	25.7
2001 - 2011	ΔE	30.6	-39.7	122.7
	NE	51.5	51.5	51.5
	IM	-17.2	-16.6	-1.3
	CE	-3.7	-74.6	72.6
1996 - 2011	ΔE	45.8	-41.7	137.5
	NE	62.0	62.0	62.0
	IM	-27.0	-19.5	-12.8
	CE	10.8	-84.3	88.3

Notes: Results are for the 234 local municipalities. Figures are expressed as percentages. ΔE is change in regional employment growth, NE is national growth effect, IM is industry-mix effect and CE is regional competitive effect.

The chapter further explores the contribution of the industry shift-share decomposition components to regional employment. Table 2.6 presents an overview of the distribution of decomposition components across provinces between 1996 and 2011. The Northern Cape, Free State and North West were adversely affected by region-specific factors particularly the effect of their industry-mix, and over 74% of municipalities in these provinces experienced employment growth that was in deficit to national growth. Gauteng was the least affected province, with 30% of municipalities facing negative industry-mix effects, but with a high share (over 64%) of municipalities in each province experiencing negative industry-mix effects. This reflects the dominance of Gauteng in terms of employment growth and suggests

[11] Beaufort West, Camdeboo and Karoo Hoogland have missing values for regional employment growth because these regions experienced zero growth in the mining industry. This resulted in missing values for the regional competitive effect, and ultimately regional employment growth, by construction.

that sectoral employment growth patterns are diverging between municipalities in Gauteng and those in other provinces.

Table 2.6: Industry shift-share decomposition components distribution: 1996-2011

	NE		IM		CE	
Province (total municipalities)	Number	Share	Numbers	Share	Numbers	Share
Western Cape (25)	12	48%	20	80%	7	28%
Eastern Cape (39)	19	49%	25	64%	16	41%
Northern Cape (27)	20	74%	26	96%	18	67%
Free State (20)	19	95%	17	85%	19	95%
Kwa-Zulu Natal (51)	26	51%	43	84%	25	49%
North West (19)	16	84%	16	84%	14	74%
Gauteng (10)	4	40%	3	30%	4	40%
Mpumalanga (18)	10	56%	15	83%	9	50%
Limpopo (25)	9	36%	18	72%	8	32%

Notes: The share reflects the share of municipalities with negative IM and CE in total municipalities in each province. ΔE is change in regional employment growth, NE is national growth effect, IM is industry-mix effect and CE is regional competitive effect.

2.6.2 Gender Shift-Share Decomposition

Gender differences have increasingly been at the forefront of research for the past couple of decades, with analysts investigating the persistence, or convergence, of gender gaps within countries. Table 2.3 shows that there are differences in gender employment shares, and this necessitates an investigation of gender employment growth using the shift-share decomposition. The summary of the decomposition results presented in Table 2.7, shows differential regional employment growth across gender. Regional employment growth of women in the median municipality has been consistently higher than that of men. In the period 1996-2001, female employment in the median municipality grew by 9.6% compared to employment growth for men of 6% exceeding the national growth effect of 9.4% and 5.2% respectively. This reinforces the importance of region-specific factors. The sources of this employment growth also differ across gender with the industry-mix reducing growth in female employment by 1% but contributing positively to the growth of male employment by 2.7%. Even though the regional competitive effect contributed positively to the employment of both men and women, the contribution was marginally stronger for male employment (1%) compared to women (0.8%).

The results for the municipalities in the 10th and 90th percentiles show substantial variation and the gap between male and female employment growth has been growing over the years. The municipality in the 10th percentile faced negative female (male) employment growth of -12.1% (-17.9%) which was in deficit of the national growth effect. The regional competitive effect considerably lowering the employment growth by 21.2% (23.7%) compared to the negative industry-mix effect of 4.2% (7.7%). Contrary, municipalities in the 90th percentile experienced employment growth that exceeded that national growth effect. Female regional employment growth was 37.5% compared to male regional employment growth of about 35%. This suggests that these municipalities benefitted from region-specific factors, particularly as a result of regional competitiveness. The regional competitive effect component contributed 28.9% to female employment and 28.5% to male employment while the industry-mix effect increased female and male employment by 3.9% and 7.9% respectively.

We find converse results for the period 2001-2011 for both male and female employment, suggesting that the national growth effect in the median municipality was higher than the employment growth. Furthermore, both the industry-mix and regional competitive effects had a negative effect on regional employment growth. The industry-mix had a stronger adverse effect compared to the regional competitive effect for both men and women. Municipalities in the 10th percentile experienced a larger contraction while municipalities in the 90th percentile faced a significantly positive growth for female and male employment compared to the period 1996-2001. The national growth effect had a positive contribution to male and female regional employment growth in the municipalities in the 10th and 90th percentiles. The regional competitive effect remains the most disadvantageous component for the municipalities in the 10th percentile but a positive contributor for municipalities in the 90th percentile for both male and female employment growth.

Looking at the entire period, 1996-2011, the results show that the national growth effect had a positive effect on regional employment growth for both male and female employment in the median municipality. The results also show that region-specific factors, particularly the industry-mix, had a strong negative effect on female employment. Our findings show that men benefitted from the 2.5% positive contribution from regional competitiveness. We find similar patterns as the period 2001-2011 for municipalities in the 10th and 90th percentiles where regional employment growth of both men and women was driven largely by regional-specific factors rather than the national growth effect. In addition, region-specific factors depressed

employment growth for both genders for municipalities in the 10th percentile but contributed positively to female (male) employment growth for municipalities in the 90th percentiles. These results further highlight the importance of both the industry composition and regional competitiveness to regional employment growth for men and women.

Table 2.7: Summary of the gendered dynamic industry shift-share decomposition results

		Female			Male		
Time period	Components	Median	P10	P90	Median	P10	P90
1996 - 2001	ΔE	9.6	-12.1	37.5	6.0	-17.9	35.0
	NE	9.4	9.4	9.4	5.2	5.2	5.2
	IM	-1.0	-4.2	3.9	2.7	-7.7	7.9
	CE	0.8	-21.2	28.9	1.0	-23.7	28.5
2001 - 2011	ΔE	39.4	-40.3	142.5	29.0	-41.4	117.7
	NE	58.0	58.0	58.0	46.7	46.7	46.7
	IM	-8.1	-23.9	5.6	-13.1	-39.6	18.4
	CE	-5.9	-88.4	100.3	-2.4	-81.5	64.1
1996 - 2011	ΔE	53.7	-31.8	184.8	40.0	-43.5	120.6
	NE	72.8	72.8	72.8	54.4	54.4	54.4
	IM	-13.0	-28.1	7.4	-13.5	-42.0	16.3
	CE	-7.7	-101.7	118.1	2.5	-80.7	76.1

Notes: Results are for the 234 local municipalities. Figures are expressed as percentages. ΔE is change in regional employment growth, NE is national growth effect, IM is industry-mix effect and CE is regional competitive effect.

Next, we evaluated the regional employment dynamics by gender and race. We include race because, in the context of South Africa, gender and race are intertwined. The interaction of gender and race is underpinned by historic policies which discriminated against females and Blacks. Table 2.8 contains the gendered employment decomposition results that are disaggregated by race. We find similar gendered results within Black and Whites with the Black and White female employment growth in the median municipality exceeding that of their male counterparts in all the three time periods. Our findings point to increasing absorption of women into the labour market. This finding corresponds to those found by Brox and Carvalho (2008) for Canada who found evidence of increased employment growth of women exceeding that of men across regions.

The contribution of the shift-share components also varies by gender and race. The national growth effect was larger than regional employment growth for all the population groups except for Black men in the period 1996-2001. This poses that regional employment growth for Black

women, White women and White men followed the national growth trajectory. Notwithstanding that the industry-mix effect reduced employment growth for both Black female and Black men, Black women faced a more robust industry-mix effect compared to Black men in the periods 1996-2001 and 1996-2011. The industry-mix slowed employed growth of Black women more than any other demographic across all the periods except for 2001-2011 when the effect was slightly more pronounced on Black men. Interestingly, the industry-mix effect had a positive effect on White women in all three periods, suggesting that White women were employed in industries that grew faster than the national average employment, and that the effect was negative for the other demographics.

The results for the municipalities in the 10^{th} and 90^{th} percentiles affirm that there is enormous variation in employment growth across regions for both Blacks and Whites. The regional competitive effect emerges as the predominant contributor to the gendered employment growth across race albeit the contribution differs for municipalities in the 10^{th} and 90^{th} percentiles. These findings imply that regional employment growth is driven by the industry-mix effect and the regional competitive effect reinforcing that region-specific factors play a crucial role in the growth of regional employment.

Table 2.8: Summary of the dynamic industry shift-share decomposition results disaggregated by gender and race

		Black Female			Black Male		
Time period	Components	Median	P10	P90	Median	P10	P90
1996 - 2001	ΔE	9.9	-12.0	39.3	8.6	-17.9	38.4
	NE	11.6	11.6	11.6	7.0	7.0	7.0
	IM	-1.2	-4.9	3.6	3.4	-7.9	7.9
	CE	-0.2	-22.8	30.0	1.0	-25.3	32.1
2001 - 2011	ΔE	38.7	-39.8	148.7	28.2	-40.1	120.5
	NE	62.0	62.0	62.0	49.4	49.4	49.4
	IM	-8.5	-28.2	8.4	-13.0	-44.6	20.4
	CE	-8.1	-91.8	96.2	-3.5	-83.2	61.0
1996 - 2011	ΔE	52.4	-31.2	189.0	45.2	-41.6	130.5
	NE	80.8	80.8	80.8	59.8	59.8	59.8
	IM	-15.5	-36.2	10.2	-13.9	-47.7	20.8
	CE	-11.6	-100.1	105.4	-2.9	-85.0	73.9
		White Female			White Male		
1996 - 2001	ΔE	5.9	-24.6	45.9	0.6	-26.7	42.1
	NE	6.0	6.0	6.0	2.5	2.5	2.5
	IM	1.5	-2.8	6.5	1.6	-8.2	6.8
	CE	-1.3	-32.6	36.1	-0.4	-29.0	36.8
2001 - 2011	ΔE	26.0	-83.7	152.1	2.0	-78.9	97.6
	NE	37.0	37.0	37.0	24.7	24.7	24.7
	IM	0.5	-3.6	7.1	-9.4	-22.2	5.1
	CE	-14.8	-126.4	115.1	-11.8	-98.4	85.6
1996 - 2011	ΔE	32.1	-74.7	153.8	6.0	-77.0	138.6
	NE	45.3	45.3	45.3	27.9	27.9	27.9
	IM	2.4	-2.6	7.7	-9.0	-25.6	7.6
	CE	-15.7	-124.9	100.8	-14.2	-98.8	109.3

Notes: Results are for the 234 local municipalities. Figures are expressed as percentages. ΔE is change in regional employment growth, NE is national growth effect, IM is industry-mix effect and CE is regional competitive effect.

2.6.3 An Analysis of the Industry-Mix Effects

A main observation from prior analysis is that there is substantial variation in regional employment growth, with the industry-mix emerging as an important source of this variation. This finding is relevant for the thesis, as the impact of tariff liberalisation on labour market outcomes is through changes in industry composition. Tariff liberalisation alters the price of manufacturing relative to other sectors, as well as between industries within manufacturing.

This section seeks to identify region-specific factors that are correlated with the industry mix effect.

Table 2.9 depicts estimation results for the correlations between initial municipality characteristics and the industry-mix effects over the period 1996-2011. We investigate whether the initial industry structure, denoted by the tradable to nontradable sector employment ratio, income (used as a proxy for GDP), gender, as well as gender and race combinations, are correlated with the industry-mix effects. These characteristics are likely to play a key role in mediating the effects of tariff liberalisation on labour market outcomes.

The results in Table 2.9 demonstrate that the industry-mix effect is negatively correlated with the initial tradable to nontradable sector employment ratio. This suggests that municipalities with a high ratio of tradable to nontradable sector employment are more adversely affected by the industry-mix decomposition component. This also means that any change in the industry structure from tradable to nontradable sectors, presumably due to tariff liberalisation, is beneficial to regional employment growth.

The estimates also show that municipalities with higher initial income as well as a higher initial share of female, initial share of Black female, initial share of Black male and initial share of White female workers experienced positive growth in employment through the industry-mix effect. The coefficient is higher for initial share of White females than for initial share of Black females. This demonstrates the differences in industry-mix effects across race. It also supports the idea of industry and regional specificities in employment that cross race and gender lines. Black female workers appear to be identified more specifically with certain regions and industries than their White counterparts. The *T-test* confirms that the difference between initial share of employed Black females and White females (difference in the coefficients for pooled data 1996-2011) is statistically significant at the 1% level and a T-statistic of 77.9405.

These findings imply that the initial share of tradable to nontradable sector is an important source of the industry-mix contribution to regional employment growth. This is consistent with the finding that the impact of tariff liberalisation altered the industry composition by growing the nontradable sector at the expense of the tradable sector, especially the manufacturing sector. Furthermore, the industry mix-effects are not gender and race-neutral, indicating that tariff liberalisation will have differential effects across gender and race.

Table 2.9: Factors correlated with the industry-mix

VARIABLES	(1) Model 1	(2) Model 2
Initial tradable/nontradable ratio	-0.257***	-0.258***
	(0.010)	(0.018)
Initial income	0.055***	0.046***
	(0.009)	(0.009)
Initial employed female share	0.621***	
	(0.086)	
Initial employed Black share	0.017	
	(0.070)	
Initial employed Black female share		1.522***
		(0.238)
Initial employed Black male share		1.298***
		(0.254)
Initial employed White female share		3.221***
		(0.598)
Constant	-0.680***	-1.694***
	(0.129)	(0.264)
Observations	234	234
R-squared	0.860	0.862
T-test		
T-statistic		77.9405
Degrees of freedom		701

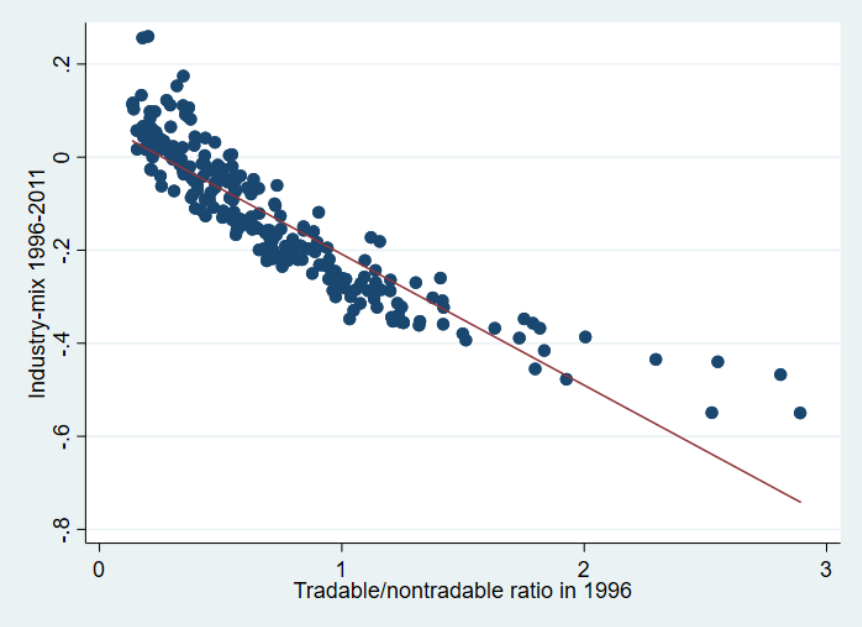
Robust standard errors in parentheses *** p<0.01. ** p<0.05. * p<0.1

Notes: All estimates are for the period 1996-2011, and the covariates are based on 1996 values. Initial employed female, Black, Black female and White female are shares in total employment. Omitted variables include initial employed male share, initial employed White share, and initial employed White male share. Income is averages income in each municipality.

2.6.3.1 Structural Change

In South Africa, economies of some regions experienced positive industry-mix effects and others negative industry-mix effects. From the above and the correlation of industry-mix effects with the initial industry structure, as shown in Figure 2.3, it is evident that much of this can be attributed to the general rise in the nontradable sector relative to the tradable sector. The scatter plot depicts a sharply negative correlation between the industry-mix effect and initial tradable to nontradable sector ratio, which suggests that the industry-mix effect fell disproportionately on those municipalities with a high initial ratio of tradable to nontradable sectors. The chapter proceeds by assessing the extent to which regions are adjusting to the national trend.

Figure 2.3: Correlation between the industry-mix effect (1996-2011) and industry structure



Notes: The industry-mix effect is for the period 1996 to 2011. Tradable industries included agriculture, mining and manufacturing in 1996.

Following Cochrane & Poot (2008), we decompose the industry-mix according to equation (2.16). The decomposition provides insight into the degree to which we see active structural change across regions.

$$SS_m = \sum_i (w_{im}^t - w_{im}^{t-1})(g_i^t - g^t) \tag{2.16}$$

where SS_{im} denotes structural change in municipality m and w_{im}^t is the end-period weights and reflects industry employment shares after the change in the economy's structure. The term of the right hand side therefore measures the effect of changing municipality industry composition. We refer to this term as the structural change effect. A positive value implies that the municipality followed the national trend of industry restructuring towards relatively fast growing industries. This is an example of structural shifts in line with national growth path.

Table 2.10 presents a summary of the results on structural change across regions. The results also reveal that on average municipalities experienced a positive structural effect, suggesting that the industry composition of employment shifted away from slow-growing industries towards fast-growing industries. However, the adjustment of regional industry composition was initially moderate, but over time has become rapid. This is shown by the increase in the structural change median value from 2.14% (an average for Mthonjaneni and Dihlabeng) in the

period 1996-2001 to 13.58% (an average for Ngwathe and Govan Mbeki) during the period 2001-2011 and 18.35 (an average for Nkonkobe and Ntambanana) for the entire period 1996-2011. The pace at which regions restructured industries varies considerably. The structural change value for the municipality in the 10th percentile (Big 5 False Bay) was 0.04%, while for the 90th percentile (Tsantsabane) the value was 4.14% in the period 1996-2001. The difference between the 10th and 90th percentiles also grew larger over time, from 4.1 percentage points (1996-2001) to 28.15 percentage points (2001-2011). For the period 1996-2011, the gap was 34.75%.

The disaggregated results shown in appendix Table 2.9A reveal that 221 of the 234 municipalities have positive structural effects, with large positive effects (50%) found for 13 of the municipalities. This suggests that the sector composition of employment for the vast majority of the municipalities followed that of the national trend. The 13 municipalities are located in the Western Cape (6), Gauteng (2), Kwa-Zulu Natal (2) and Free-State (3) provinces. The Western Cape, Gauteng, Kwa-Zulu Natal are relatively more urbanised and services-oriented than other provinces. These provinces also house the largest finance sectors, wholesale & trade, logistics and tourism sectors. It is therefore not surprising that the decomposition analysis shows that municipalities in these provinces followed the national trend and experienced significant growth in the nontradable sector. In contrast, 13 of the municipalities the employment composition shifted towards sectors experiencing relatively slow growth. The municipalities based in Limpopo (4), North-West (3), Eastern Cape (2), Kwa-Zulu Natal (2), Northern Cape (1) and Free-State (1). These provinces are relatively more isolated, rural and have smaller services sectors. The implication is that should these national trends in employment continue, these municipalities will experience disproportionately large negative industry-mix effects in the future.

The results are in line with those of Cochrane and Poot (2008), who find the structural change effect to be negative for all the states in New Zealand in their investigation. Matlaba et al. (2014) find a negative effect for 21 out of 27 states in Brazil. The distinct differences between the municipalities that experienced the highest and lowest positive structural change effects is largely underpinned by differences in comparative advantage in the services sector and the development of the provinces. It can be deduced that provinces that are more developed and urban are better able to change the regional industry composition towards expanding nontradable industries.

The positive structural change effect suggests that municipalities benefited from moving towards industries that were doing well nationally. The change towards a focus on the nontradable sector augmented growth in employment growth in these municipalities. These results emphasise the significant impact of structural change in the South African labour market during the period under study.

Table 2.10: Summary of the structural change effect

Period	Median	P10	P90
1996 - 2001	2.14	0.04	4.14
2001- 2011	13.58	3.84	31.99
1996 - 2011	18.35	6.59	41.34

Notes: Values reflect the regional average employment growth. Figures expressed as percentages

2.7 Concluding Remarks

The chapter set out to first explore the dynamics of regional employment growth by investigating the distribution and main drivers of employment growth across regions from 1996 to 2011 using the industry shift-share decomposition method. Furthermore, the chapter analysed the role of region-specific factors, in particular the industry-mix in regional employment and variation in employment growth.

The results of the industry shift-share decomposition reveal that there is employment growth variation across municipalities during this period. On average, the gap between rich and poor regions widened in the post-apartheid period, even though a few of the poorer regions managed to achieve impressive growth. We find that national employment growth had a positive effect on regional employment growth through economic growth and improvements in the national labour market. The results suggest that regional industry effects are more central. The industry-mix is shown to have a domineering yet negative effect on regional employment growth, as it reduced employment growth and counteracted the positive growth from the national growth effect. The regional competitive effect also made a significant contribution to regional employment growth. The impact and importance of industry composition on regional employment growth are consistent with tariff liberalisation effects on employment, as the latter is driven by the former. Tariff liberalisation changes the structure of industries (Rodrik, 2008), and as a result, it changes employment growth.

We also find that the main source of the contraction of manufacturing employment is regional competitiveness showing that regional manufacturing industries grew slower than national manufacturing industries. This suggests that majority of regions have factors that cripple the growth of local manufacturing industries. However, regions managed, to some degree, to restructure their industries and mirror the change in the national industry structure from the manufacturing sector towards the services sector.

The chapter also highlights that the industry-mix is negatively correlated with an industry employment divide, specifically the divide between the tradable and nontradable sectors. The chapter also demonstrates that the industry-mix effects are also positively correlated with other region-specific factors, namely: Initial income, initial share of female workers, initial share of Black female workers, initial share of Black male workers and initial share of White female workers. The chapter also finds that the positive influence of the industry-mix is greater in regions with a larger initial share of White females than Black females. These gender and race results poses that the gender employment disparities are more striking within a race. This shines the spotlight on the association of industry-effects with gender and race endowments that is consistent with the idea of industry and region specificity of employment. Additionally, the results imply that the structural change is not neutral in terms of gender and race.

However, regions managed, to some degree, to restructure their industries and mirror the change in the national industry structure from the manufacturing sector towards the services sector. The chapter concludes by showing that structural change took place between 1996 and 2011 and also that the adjustment of industry structure away from contracting tradable sectors towards the nontradable sector benefitted the economies of most regions. Tariff liberalisation may be the main driver of this observed structural change.

The implication of these results is that tariff liberalisation will have differential effects across regions, gender, and race. In the following chapter, we broaden the discussion of regional dynamics by identifying the specific factors that are likely drive the unequal distribution of industries across municipalities in South Africa, focusing on the role of tariff liberalisation on changes in regional manufacturing employment.

Chapter 3

3. Tariff Liberalisation Effects on Gendered Manufacturing Employment in South Africa

3.1 Introduction

The previous chapter finds evidence of substantial variation in regional employment growth in South Africa, with industry composition as a primary source of this heterogeneity in growth over the 1996-2011 period. This chapter expands on this evidence by analysing the role of tariff liberalisation in changes in regional employment patterns in South Africa. The analysis exploits regional differences in industry composition to identify how tariff liberalisation affects regions differently, and consequently, how it may contribute to changes in the regional composition of employment.

The standard theoretical framework used to analyse how economies respond to tariff liberalisation is the Heckscher-Ohlin model and Stopler-Samuelson theorem. These Neoclassical trade theories suggest that tariff reductions increase the relative price of capital and skilled labour-intensive goods in developing countries because they trade on a comparative advantage basis. According to the Heckscher-Ohlin model, developing countries import capital-intensive or skilled labour-intensive manufactured goods and export unskilled labour-intensive goods. This, according to the Stopler-Samuelson model, leads to a rise in the wages of unskilled workers, which is expected to reduce wage inequality. The predictions are based on the assumption of a national factor market with full mobility of factors across regions and industries. However, in the short term, factors of production are often immobile across regions and industries. Application of these models have also narrowly categorised factors of production into capital and labour or skilled and unskilled labour and thus ignore the potential gendered effects from trade.

Gendered effects arise through several channels. Extensions of the Heckscher-Ohlin model to allow for gendered effects suggest that tariff liberalisation benefits women in developing countries as they are generally unskilled and are disproportionately employed in the labour-intensive export-oriented sectors, such as the textile, clothing and footwear industry (Aguayo-Téllez et al., 2014; Ederington et al., 2009; Fontana & Wood, 2000). Alternative theories and applications, such as those of Black and Brainerd (2004) and Juhn et al. (2014), suggest that

international competition benefits women by reducing the option of firms to discriminate. Further, tariff liberalisation that induces the use of less brawn-intensive technology[12] may also contribute to narrow the gender employment gap (Galor & Weil, 1996; Juhn et al., 2014; Weinberg, 2000). Brawn-intensity is the share of workers in production occupations. Technological progress can also narrow the gender wage gap if women are more skilled than men (Arbache et al., 2004; Goldberg & Pavcnik, 2007; Robertson, 2000).

The empirical evidence on the gendered effects of tariff liberalisation on employment at the local level is expanding. Evidence from this literature is that the effects of tariff liberalisation on employment differ for men and women. The gendered effect is driven by the liberalisation pattern and gender intensities in industries. However, this literature remains limited in emerging economies. The impact of tariff liberalisation on employment in South Africa, a middle-income economy, may not necessarily conform to these patterns. This chapter augments the available literature by investigating the gendered effects of tariff liberalisation on regional employment in a SSA country. We argue that this analysis could provide additional and more nuanced evidence than is currently available.

The chapter focuses on South Africa for several reasons. Firstly, in Chapter 2, the thesis shows that in South Africa industry composition differs substantially across regions. The differences in the industry-mix across regions provide an important source of regional variation that can be used to identify the effect of tariff liberalisation on regional employment patterns.

Secondly, the South African economy has experienced a structural shift away from manufacturing to the services sector over the past few years (Bhorat & Hodge, 1999; Bhorat et al., 2014; Edwards, 2001; Rodrik, 2008; Tregenna, 2008). In this chapter, we assess whether, within regions, the structural shifts in employment, specifically the contraction of manufacturing employment, and the adoption of labour-saving technology can be attributed to the effects of tariff liberalisation.

Thirdly, South Africa may differ from other middle-income countries such as Vietnam, Indonesia and Brazil as it does not have a comparative advantage in labour-intensive

[12] Brawn is the term used to represent physical strength and brawn-intensive technology is technology that that require the use of physical strength more than the intelligence of workers.

manufacturing. We argue that this characteristic may provide new evidence about structural adjustments to tariff liberalisation.

Fourthly, it is expected that the effect of increased competition on the gender employment gap will be different in South Africa because the country is characterised by very high female unemployment and low labour force participation of women. The South African labour market is also rigid, with wages determined on a sectoral and regional basis for many manufacturing industries. Further, average skills levels of employed women are higher than those of men, possibly due to differential selection into employment (Statistics South Africa 2012). This suggests that tariff liberalisation could affect female and male labour differently through changes in demand for skilled relative to unskilled labour.

The rest of the chapter is structured as follows: Section 3.2 presents theoretical insights that inform the chapter and Section 3.3 discusses the empirical evidence. The section provides propositions on the gendered effects of tariff liberalisation. Sections 3.4 and Section 3.5 outline the construction of the trade protection measures and the empirical approach employed in the analysis. Section 3.6 presents the data sources and an overview of tariff liberalisation and the labour market in South Africa. Section 3.7 discusses the estimation results and robustness checks. Lastly, the chapter presents concluding remarks.

3.2 Theoretical Insights

The Specific-Factors model provides a useful theoretical framework for analysing the effects of tariff liberalisation on wages and employment across regions because it allows for labour market rigidities that are prevalent in emerging economies. These include rigidities to mobility across sectors and regions. More importantly, this thesis focuses on gender and race and the Specific-Factors model is able to incorporate specificity of labour by gender and population group. If differences in industry specificities vary by gender and race, then we may expect differences in the effects of tariff reduction across gender and population groups.

The Specific-factors model is a model for the national economy with n goods and $n+1$ factors of production. However, Kovak (2010) has extended the theoretical model by applying the Specific-Factors model to regional economies to explain the effect of tariff liberalisation on

wages and employment. This section presents the key elements of the Kovak (2010) model that leads to the Specific-Factors model being utilised in this chapter.

We use a stylised country that has two regions (r = 1, 2) and each region is a separate economy with two industries (i = A, B). We adapt the Kovak (2010) model by assuming that industry *A* is clothing and textiles while industry *B* is other manufacturing. There are two main factors of production: labour (*L*) and other inputs (*K*). *K* includes factors such as mineral resources, land, geography, weather, factor endowments, and industry-specific capital. The model assumes that *L* is mobile across industries but not across regions and *K* is both industry and region-specific even in the long-run. Regions differ in terms of industry shares based on regional comparative advantage because of different relative endowments. Region 1 is more endowed with industry *A* specific-factors than region *B.* An additional assumption is that technology is industry-specific but not region-specific, meaning that regions have access to the same technology for each industry (Kovak, 2010). Further assumptions include a constant returns to scale production function, a perfect competition market, and prices of goods, P_i, are the same across all regions. In the long-run labour is mobile across regions and industries and wages are therefore equalised across regions (Kovak, 2010). However, regional production composition differs based on initial endowments.

Kovak (2010) shows that the relationship between regional wages of the mobile-factor and goods prices when regional labour supply is held constant is as follows:

$$\dot{w}_r = \sum_i \beta_{ri} \dot{P}_i \qquad \forall r \tag{3.1}$$

$$\text{where } \dot{P}_i = P_{wi} * (1 + Tr_i) \text{ and} \tag{3.2}$$

$$\beta_{ri} = \frac{\lambda_{ri} \frac{\delta_{ri}}{\theta_{ri}}}{\sum_{i'} \lambda_{ri'} \frac{\delta_{ri'}}{\theta_{ri'}}} \tag{3.3}$$

r, P_{wi} and Tr_i denote regions, world prices and tariff rates respectively. $\dot{w}_r$ and $\dot{P}_i$ represent proportional changes in mobile-factor wages and prices respectively. $\lambda_{ri} = \frac{L_{ri}}{L_r}$ denotes regional employment share, δ_{ri} is the elasticity of substitution between *K* and *L*. θ_{ri} is the cost share of the industry-specific factor *K* in the production of good *i* in region *r*. β_{ri} is positive and the sum is equal to one i.e. $\sum_i \beta_{ri} = 1 \ \forall r$ indicating that the proportional change in each

industry mobile-factor wage is a weighted average of the proportional price change of both industries.

The implication of this wage relationship is that price changes that differ across industries, but not regions, give rise to differences in mobile-factor wage changes across regions due to differences in the regional industry composition of employment. If a region's workers are highly concentrated in a given industry, then the region's mobile factor wage will be heavily influenced by price changes in that region's dominant industry (Kovak, 2010). For example, in our model, if there is a decrease in tariffs on the clothing and textile industry, the regions with the largest share of this industry in total regional employment will face a stronger reduction in wages of the mobile-factor.

We employ Figure 3.1 (extracted from Kovak (2010) but adapting it to our stylized country with clothing and other manufacturing industries) to illustrate the effect of tariff liberalisation on wages, where the x-axis displays the total national labour supply to be allocated across the two regions, and the y-axis represents the wage in each region. Panel (a) shows the economy before tariff liberalisation. The marginal revenue product for labour[13] (MRPL) of the two industries is given as *XX* (industry *A* - clothing) and *YY* (industry *B* - other manufacturing), and the intersection determines regional wages, which in the long-run with *L* mobile across regions equalises at *w** in both regions. Employment in clothing in region 1 is given as L_{1A} and in region 2 by L_{2A} while L_{1B} and L_{2B} represent employment in other manufacturing in regions 1 and 2, respectively.

Panel (b) presents the outcome of tariff liberalisation where tariffs on industry *A* are reduced. The reduction in tariffs on industry *A* reduces the price of good *A* causing the MRPL curves of industry *A* to fall in both regions to XX_1 . However, given that region 1's workers are concentrated in *A* that region's wage will be more heavily influenced, as shown in panel (b). In the short-run, when labour is immobile across regions, this gives rise to new local equilibrium wages of w_1* and w_2* were w_1* < w_2*. The outcome of tariff reductions in the clothing industry leads to lower wages of the mobile factor in region 1 compared to region 2.

[13] Where $MRPL_i = P_i MPL_i$ and $MPL_i = {}^{w_i}/_{P_i}$

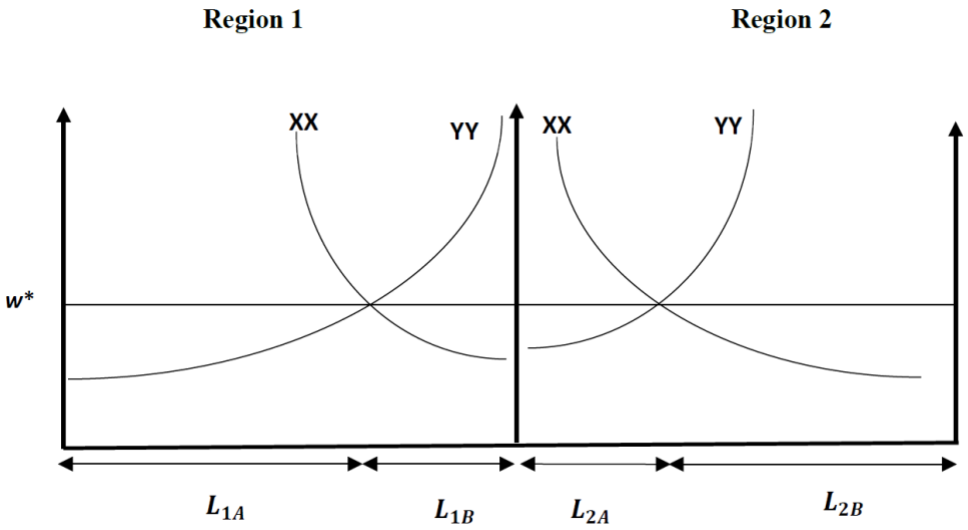
We extend the Kovak (2010) model by considering the effect of tariff in a country where wages are rigid. In such a country, tariff reductions will not have a wage effect; instead, there will be an employment effect. In the case of downward wage rigidities, wages remain the same at w^* and firms will respond by laying off workers because firms will be unable to compensate for the price drop. The level of unemployment is the distance between XX_1 and *YY*. In this scenario, unemployment will be higher in region 1 than in region *2*. As mentioned earlier, the differential impact on the mobile and specific-factor will be determined by the substitutability and the extent of the income effects.

The Specific-Factors model explains that if the specificity of labour is in clothing, then regions facing comparatively large reductions in tariffs, given their large clothing employment share in total manufacturing, will face a combination of (1) relatively large reductions in clothing real wages of the specific labour, and (2) relatively large contractions of clothing employment of both specific and mobile labour. However, if clothing wages are rigid downwards, the negative effect on employment will be intensified. It then follows those regions that have a relatively large share of the clothing industry face stronger exposure to tariffs and consequently a larger reduction in goods prices, wages, and employment.

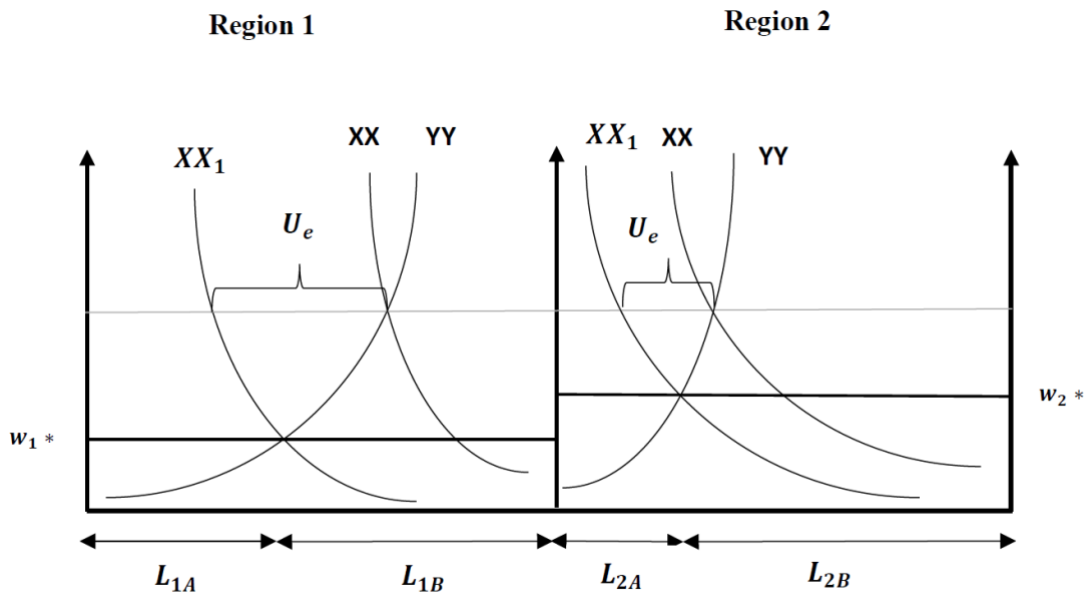
From the theory, we hypothesise that the effects of liberalisation in the South African economy may be: (1) differential regional wage and employment effects; (2) larger reductions in employment in import-competing manufacturing industries, particularly if wages are rigid; and (3) employment effects that differ by gender and race that will be more severe if labour within these groupings is specific to industries and if the substitution effect is greater than the income effect.

Figure 3.1: Graphic representation of labour market outcomes of tariff liberalisation

(a) Initial equilibrium



(b) Response to tariff liberalisation



where U_e is unemployment

3.2.1 Review of the Theoretical Literature: Gendered Effect of Tariff liberalisation

This section provides a review of the literature on theories explaining how the effects of tariff liberalisation may differ for men and women. Supply and demand-side factors contribute to the specificity of labour to industries, which in turn influence the gendered effect of tariff

liberalisation. The supply-side factor is skill while the demand-side factor is usually discrimination, which may also be influenced by substitutability. The effect of tariff liberalisation may be heterogeneous across genders if men and women are found to be imperfect substitutes in the production process (Do et al., 2016; Galor & Weil, 1996; Sauré & Zoabi, 2014; Wamboye & Seguino, 2015) and if liberalisation affects industries differently. Tariff liberalisation is expected to improve women's employment if a country has is unskilled labour abundant and has a comparative advantage in female-intensive sectors (Fontana, 2004, 2009). This applies to developing countries since women are generally unskilled.

The trade literature has posited transmission channels which help explain the differential wage and employment gendered effects of tariff liberalisation. These explanations are founded in existing trade theory. The first transmission channel presented is less discrimination. Neoclassical trade theory predicts that increased import competition reduces discrimination against women because of the pro-competitiveness of trade (Becker, 2010).

The second channel is technological progress. Liberalisation of tariffs may be associated with innovation and the adoption of new technologies that are more skill and less brawn-intensive (Galor & Weil, 1996; Juhn et al., 2014; Weinberg, 2000). If men and women have different skills or levels of educational attainment, this may have implications for gendered labour market outcomes (Acemoglu, 2003; Thoenig & Verdier, 2003; Wood, 1995). The gender group with the highest level of educational attainment, on average, will benefit from liberalisation. Technological change may also be gender-biased due to gender differences in endowments of intelligence versus physical strength - "brain versus brawn" (Galor & Weil, 1996; Juhn et al., 2014; Weinberg, 2000). This is based on the assumption by Juhn et al. (2014) that women are, on average, less-endowed with physical strength than men and or are more skilled. Based on this assumption, the effect on female employment would depend on the skills endowment among women relative to men (Acemoglu, 2003; Thoenig & Verdier, 2003; Wood, 1995).

Lastly, tariff liberalisation may have gendered effects through industrial segregation. Industrial segregation has been found to be persistent worldwide (Anker et al., 2003) and to be supported by societal norms. These societal norms range from discrimination, stigmatisation, stereotyping (Braunstein & Seguino, 2018; Elson & Pearson, 1981), and patriarchy, to differences in the production structure (Wamboye & Seguino, 2015) and technology across industries (Braunstein & Folbre, 2001). Societal norms tend to reduce the mobility of women

(Braunstein & Seguino, 2018) across industries, exposing those employed in sectors experiencing large tariff reductions to particularly severe employment changes. Women tend traditionally to be employed in certain industries, particularly textiles, clothing and footwear in the case of South Africa (Nattrass & Seekings, 2012). If the textiles, clothing and footwear industry faces a large reduction in tariffs, this will have a disproportionately negative effect on wages and employment of women relative to men in regions with a large share of the textiles, clothing and footwear manufacturing.

3.3 Related Empirical Evidence

This chapter relates to two strands of the international literature. The first strand employs a Bartik approach that involves interacting local industry shares with tariff rates to obtain a region's exposure to tariff liberalisation (Autor et al., 2015; Dix-Carneiro & Kovak, 2015; Gaddis & Pieters, 2017; Kovak, 2013; Topalova, 2010). This literature covers a wide range of topics, including the effect of trade on employment, poverty, and wages. The literature argues that the effects at the local labour market level may differ from national labour market effects due to differences in regional industry composition, factor endowment, and region-specific competitiveness. The regional analysis allows for sector-specific, region-specific, and other local labour market frictions in the economy. In terms of trade effects on employment, Autor et al. (2015) and Gaddis & Pieters (2017) find that local labour markets that faced strong international competition experienced a decline in employment in the manufacturing sector, in the US and the tradable sector in Brazil, respectively.

The second related strand of the international literature focuses on the trade effects on gendered manufacturing. Studies include those of Black and Brainerd (2004), Baliamoune-Lutz (2007), Bussmann (2009), Juhn et al. (2014). These studies are at a national level and cover a wide range of topics, including trade effects on employment, unemployment, labour force participation, wages, education, and life expectancy. They find that increased trade benefits women by reducing the ability of firms to discriminate against women, but increases wage inequality (Baliamoune-Lutz, 2007; Black & Brainerd, 2004; Juhn et al., 2014).

Using the Current Population Survey (CPS) data from 1977 to 1994 for US manufacturing industries, Black and Brainerd (2004) test the theory of discrimination in concentrated

industries and competitive industries. They find that trade contributes to reducing discrimination against women by improving the employment and wages of women.

Baliamoune-Lutz (2007) uses cross-sectional, 5-year averages data, and ordinary least-squared as well as three-stage least squares estimation, to examine the effect of globalisation on gender literacy inequality across developing countries. The study includes 30 SSA countries and 32 non-SSA developing countries and uses data from the World Development Indicators for 1990 – 1994 and 1995 - 1999. Baliamoune-Lutz (2007) find that globalisation does not have an impact on gender inequality in the non-SSA countries but widens gender inequality (the gap between men and women) in SSA countries.

Juhn et al. (2014) investigate the effect of the North American Free Trade Agreement (NAFTA) on the gender wage gap in Mexico, using establishment-level data from 1991 to 2000. The study extends the Melitz (2003) model by differentiating workers according to skills-level and gender-specific and occupation-specific skills. They find evidence of a reduction in gender wage and employment gaps among blue-collar occupations, and no effect on white-collar occupations. They conclude that growth in employment and wages in blue-collar occupations is driven by the adoption of computerised production processes, which lowers the demand for physical labour.

More relevant to this thesis is the literature on gendered trade effects at the regional level using the Bartik approach. Autor et al. (2015) point to an increase in the gender employment gap in the US in response to Chinese competition. Gaddis and Pieters (2017) examine the gendered effects of tariff liberalisation in Brazil, using a fixed-effects model and census data from 1991 and 2000. The study finds that tariff liberalisation reduces tradable employment and labour force participation of men and women, but the effect is larger for men. A study on gender-specific effects of globalisation in Indonesia was undertaken by Kis-Katos et al. (2018). The study covers 259 districts in Indonesia using household survey data and tariff data from United Nations Conference on Trade and Development (UNCTAD) - Trade Analysis Information System (TRAINS) for 1993, 1996, 1999, and 2002. Using first-difference estimation, the study shows that reduction of tariffs led to improved participation of women in the labour market, increased working hours, and a drop in domestic duties, particularly for women over 20 with lower levels of education.

3.3.1 South African Evidence

The empirical literature on the effects of trade on the labour market in South Africa has accumulated over the years (Dunne & Edwards, 2006; Fedderke et al., 2012; Jenkins & Edwards, 2015; Rodrik, 2008). A recent factor content study by Jenkins & Edwards (2015), suggests that Chinese competition had a net negative effect on employment in the South African manufacturing sector since 2001. Dunne & Edwards (2006) find that employment lost due to import penetration in the manufacturing sector from 1994 to 2003 was counteracted by employment gains through exports, although the net gains in employment were biased towards skilled labour-intensive industries (Edwards, 2001). Notwithstanding, the studies show that trade had profound effects in South Africa, it is based on industry-level data and focuses on the national labour market while imposing long-run models that implicitly assume full factor mobility within the country.

The first published study on the impact of tariff liberalisation on regional employment in South Africa was by Erten et al. (2019) who find large reductions in manufacturing employment compared to other sectors in districts that experienced relatively high tariff reductions. Although their study provides a gender dimension, it assesses the effect of tariff liberalisation on the percentage of the female population and finds the relationship to be insignificant. Our study differs from this literature by analysing the tariff liberalisation effects on gendered employment.

The literature on gender-biased effect of trade on employment in South Africa is limited. Bhorat (2000) analyses the impact of trade on sectoral employment between 1970 and 1995, using the Katz & Murphy (1992) decomposition technique to decompose employment by race, gender, and class. The study shows that trade contributes to a decrease in the share of male workers while increasing the share of female workers. Bhorat (2000) suggests that the increased preference for women over men in the workplace is a reflection of the rise in the service sector.

Using a computable general equilibrium (CGE) model, Cockburn et al. (2010) analyse the trade effects on poverty in South Africa by gender. The study finds gender-biased trade effects in terms of labour force participation and wages. They show that labour force participation and real wages of men (and their share of household income) increases, while that of women

decreases. This suggests that in South Africa women are concentrated in previously heavily protected sectors, which contracted during tariff liberalisation.

Thurlow (2006) examines the contribution of trade on female unemployment and poverty between 1993 and 2003, using a dynamic general equilibrium and microsimulation model. They find that trade reform is a contributing factor in the reduction of the gender wage gap, but this is driven mainly by rising employment of higher-skilled female workers. In contrast, Chitiga et al. (2010) argue that liberalisation led to a decline in labour force participation and employment of women in South Africa, pointing to the fact that women are concentrated in the previously heavily protected textile, clothing, and footwear industry. None of these South African studies explore the gendered employment effects of tariff liberalisation across regions.

This South African empirical literature provides some insight into the gender-specific trade effects on various labour market outcomes but shows mixed findings. The inconsistent results could be due to the fact that the studies have focused on the national labour market, assuming full mobility of labour. Perhaps a more disaggregated analysis could provide nuanced evidence by accounting for regional and industry rigidities. This chapter aims to fill this research gap by investigating the gender-specific effects of tariffs on employment for local labour markets across South Africa.

3.4 Empirical Framework

To assess the effects of tariff liberalisation on local labour markets, we follow the Bartik (1991) empirical framework that has been widely used (Autor et al., 2015; 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. We define local labour markets as municipalities, following Weir-Smith and Ahmed (2013). The trade protection measure is calculated using equation (3.4) as follows:

$$TPman_{mt} = \sum_i \frac{Emp_{im,initial}}{Emp_{m,initial}} * Tr_{it} \quad (3.4)$$

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

3.5 Econometric Model

To study the effects of tariff liberalisation on manufacturing employment at the regional level we employ a first-difference approach to estimate the change in manufacturing employment between 1996 and 2001, as well as the change between 2001 and 2011 as follows:

$$\Delta lnE_{mt}^{manuf} = \alpha + \beta_1 \Delta TPman_{mt} + \beta_2 \Delta X'_{mt} + \beta_3 Z'_{m,t-1} + \lambda_t + \Delta\varepsilon_{mt} \qquad (3.5)$$

where the dependent variable, ΔlnE_{mt}^{mauf}, is the change in log manufacturing employment. $\Delta TPman_{mt}$ represents a change in the municipality trade protection measure, which is estimated using equation (3.4). We control for period fixed effects (λ_t) to capture macroeconomic shocks or developments that affect all industries equally. In the first-difference model, time-invariant municipality effects are differenced out. The estimation thus uses the change in tariffs and employment across municipalities to identify the coefficient. Given differences in the initial industry composition and differences in tariff reductions across industries, we expect to obtain substantial variation in the change in tariffs across municipalities in the two periods 1996-2001 and 2001-2011.

To deal with potential threats to our identification strategy, we include two sets of control variables that may be correlated with the trade protection measure. The first set of controls includes the change in log working-age population, change in migration rate, and change in union-intensity, denoted by $\Delta X'_{mt}$[14]. Changes in employment may reflect changes in migration rates, which in turn, may be influenced by tariff liberalisation. Workers may move out of

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

regions that are highly exposed to tariff reductions to less exposed regions. An increase in employment will also be influenced by a growing working-age population (supply shock), which, as discussed, itself could be influenced by changes in protection as workers migrate across regions.

Union-intensity may mediate the effect of tariff liberalisation on employment and the gender gap because there is a positive relationship between union-intensity and employment. In situations where there exists the possibility to negotiate either for higher wages or employment, trade unions opt for retention of jobs on behalf of their members (Freeman & Katz, 1991; Shendy, 2009), especially in a country like South Africa where there is extremely high unemployment. In this context, union members enjoy more job protection than non-union members.

We also control for lagged municipality characteristics, including the share of skilled workers (number of skilled workers normalised by the skilled working-age population), number of unemployed individuals as a share of the working-age population, share of the manufacturing sector in employment, and infrastructure (indicators include electricity, flush toilet, piped water and regular collection of refuse), represented by $Z'_{m,t-1}$.

The main coefficient of interest in equation (3.5) is β_1 which reflects the effect of tariffs on manufacturing employment. A positive coefficient of β_1 suggests that higher tariffs are associated with higher manufacturing employment levels. Alternatively, tariff reductions will be associated with declining employment levels. We expect that the coefficient will be positive for aggregate manufacturing employment.

We estimate the specification for aggregate manufacturing employment as well as manufacturing employment disaggregated according to gender. Further, we test for the effect of tariff liberalisation on the gender employment gap in manufacturing using equation (3.6).

$$\Delta ln\left(\frac{m}{f}\right)_{mt} = \alpha + \beta_1 \Delta TPman_{mt} + \beta_2 \Delta X'_{mt} + \beta_3 Z_{m,t-1} + \lambda_t + \Delta\varepsilon_{mt} \quad (3.6)$$

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

A positive β_1 reflects the outcome that lower tariffs narrow the gender employment gap. This is expected if tariff liberalisation is associated with lower levels of discrimination, or if newly adopted technologies are less brawn-intensive, boosting the demand for female labour.

3.5.1 Endogeneity of Tariffs

A potential estimation issue is that tariffs themselves may be a function of employment. Endogeneity of tariff rates can arise from political interference and lobbying due to concerns about the employment effects arising from liberalisation. Unions and lobbyists demand protection from import competition, while politicians, motivated by their own self-interest, supply protection (Holden & Casale, 2002). Consequently, the change in tariffs may itself be influenced by the change in employment, particularly if unions or workers can lobby for increases (or slow-downs in the reduction) in tariffs in response to job losses.

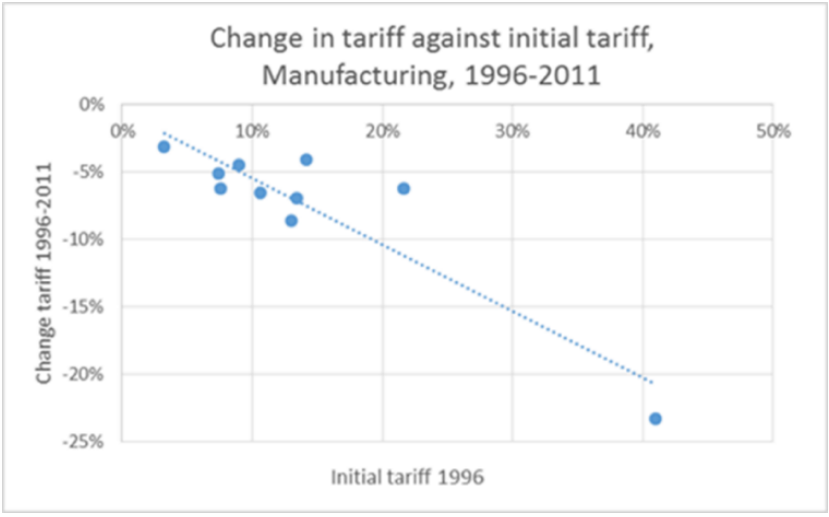
These pressures were prevalent in South Africa during the 1980s when the Board on Tariffs and Trade (BTT) weighted employment effects of tariff liberalisation more than capital investment when taking into account their considerations to grant protection (Holden & Casale, 2002). Holden and Casale (2002), for example, find support for the Grossman and Helpman (1994) endogenous tariff model and argue that the extent of an industry's tariff reduction was actually dependent on lobbying. However, it takes time for labour to adjust to tariff reduction because of high reallocation costs (Artuç et al., 2010; Kambourov, 2009) associated with search costs, industry-specific skills, and firing costs (Kambourov, 2009).

Nevertheless, during the 1990s, endogeneity concerns were less prevalent than in the 1980s as by then multi-lateral tariff reductions were guided by the phase down approach agreed upon during the Uruguay Round of the WTO in 1994. South Africa committed to reducing tariff categories from 100 to 6 groups in the five-year tariff reduction programme (Cassim et al., 2004; Erten et al., 2019). Moreover, there were also bilateral tariff reductions from 2000 in accordance with the Free Trade Agreements (FTA) with the European Union (EU) and SADC (Edwards & Behar, 2005).

Secondly, the primary concern of the democratically elected government was to demonstrate a commitment to a market-friendly economy to the rest of the world by lowering the levels of protection (Bella & Quintieri, 2000; Erten et al., 2019; Rangasamy & Harmse, 2005). This commitment was further demonstrated by the implementation of the GEAR strategy in 1996 which, among other objectives, promoted the use of tariff liberalisation as an instrument for achieving gains from openness and economic growth (Erten et al., 2019; Republic of South Africa, 1996). Therefore, commitment by the democratic government to drastically reduce protection across all industries, coupled with the limited influence of lobbyists, strengthen the possibility of exogeneity of tariff reductions.

Nevertheless, to deal with the potential endogeneity issue, we follow Ahsan (2013), Amiti and Konings (2007), Erten et al. (2019) and Goldberg and Pavcnik (2007) who use an instrumental variable (IV) estimation strategy that involves the use of the initial tariff level as an instrument for subsequent change. The validity of our IV strategy depends on two key assumptions. First, we assume 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). Industries with the highest initial tariffs had the largest cuts in tariff rates. Supportive evidence for this is provided in Figure 3.2, where a negative association between initial tariff and the change in tariff is evident. Second, we assume that initial tariffs are uncorrelated with changes in the error term. This does not seem to be an unrealistic assumption because the 1996 tariffs are likely to be far removed from current changes in the error term.

Figure 3.2: Correlation between initial tariff rates and change in tariff rates



Source: Updated annual nominal tariff data obtained from Edwards (2015)

The first stage results (provided in the appendix Table 3.2A) also show that there is a strong negative relationship between initial tariffs and a change in tariffs. We also use the Durbin-Wu-Hausman test to assess whether the change in trade protection measure is exogenous. The results are also presented in Table 3.2A in the appendix. The p-values are small, and therefore we reject the null hypothesis that the trade protection measure is exogenous. The results in the table also indicate that initial tariffs are a strong instrument for change in tariffs.

3.6 Data

3.6.1 Data Sources

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. They include a database of the full census, and a 10% census sample dataset with individual-level and household-level data. The individual-level data includes variables for education level, gender, income, industry, migration, occupation, race, and unemployment for the working-age population. Variables obtained from the full population census include gender, industry (at the one-digit SIC level), income, migration and unemployment, while education level, industry (at the two-digit SIC level), occupation and variables disaggregated by race (specifically education level, migration) are acquired from the census 10% sample. Variables from the census 10% sample are weighted using individual weights. The household-level census data provides us with infrastructure variables. Infrastructure data is defined as variables on households' access to electricity, piped water, a flush toilet, and at least weekly refuse removal by the local authority.

The third dataset is comprised of industry-level annual nominal tariff data, obtained and updated from Edwards (2005). Edwards (2005) sourced the raw tariff data from UNCTAD – TRAINS.

Finally, the study uses household survey data from Statistics South Africa. The fourth dataset is from year 1996 of the October Household Survey (OHS) series which was discontinued in 1999. A substitute survey, the Labour Force Survey (LFS) was introduced in 2000 and our last datasets are from the 2001 and 2011 years of the Labour Force Survey (LFS). A significant difference between these household surveys is that the OHS was published annually in October

while the LFS was conducted biannually (in March and September) and then quarterly from 2008 (the Quarterly Labour Force Survey (QLFS)). In an attempt to ensure the data is comparable, we utilise the September LFS for 2001 and the third Quarter QLFS for 2011. A drawback of these datasets is the lack of disaggregated geographical variables. The union membership variable is therefore only provided at the provincial level.

3.6.2 Construction of Variables

This section discusses how the variable utilised in the analyses are constructed. Since the census does not collect data on wages, we use the income of manufacturing 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 and the top end bracket is open-ended. 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 to construct an continuous income variable. Even though, this approach is reported to be provide noisy income date and exaggerate the income inequality (Wittenberg, 2017), it is found to presents similar findings to other techniques such as reweighting approach and mean imputation (Ardington et al., 2006; Von Fintel, 2007). This approach has commonly been used by Statistics South Africa (Mudiriza & Edwards, 2020; Statistics South Africa, 2000). We aggregate total income for manufacturing workers in each municipality and divide this total by the number of manufacturing workers in the respective municipality.

The employment variable contains data for individuals employed full time and within the working age population (15-65 years old). Unemployment is constructed as individuals who are unemployed and are within the ages of 15 to 65 years, following the strict or official definition of unemployment[15].

[15] 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).

The migration variable indicates individuals who moved since the last census. In the case of the 1996 census, the focus is on migration between 1991 and 1996 whereas the 2001 and 2011 censuses consider individuals who moved since 1996 and 2001 respectively.

In the chapter, we use the production[16]/non-production employment gap in heavy[17] manufacturing industries. This data is obtained from the occupation variable in the census 10% sample, as a proxy for brawn-intensity. Brawn-intensity is the share of workers in production occupations, including craft and trades workers, and plant and machine operators. The skills gap is the ratio between skilled workers (individuals with a matric or Grade 12 qualification and higher) and unskilled workers obtained from the full census.

With respect to other control variables, union-intensity is constructed at the provincial level as the share of trade union members out of total workers in a region. 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.

Constructing the local labour market trade protection measure requires that we map the tariff rates to initial employment shares in each municipality. However, the challenge with the full census is that industries are reported at the one-digit SIC level. To overcome this challenge, we use the 10% sample of 1996, which contains two-digit SIC level industries[18]. We first calculate the simple average of the 6-digit Harmonised System (HS) level tariff for each of the ten manufacturing industries[19] in each year, using the concordance table. South Africa has a complex set of trade measures, including ad-valorem, specific, and mixed tariffs, all of which pose a challenge for the calculation of tariff measures. We consider only the ad valorem tariffs and the ad valorem component of the mixed tariffs, and exclude specific tariffs. Second, we use the 10% sample of the 1996 census to calculate weighted manufacturing employment levels (total and by gender) for each of the ten industries. We use the employment data and the tariff data to calculate regional average tariffs in accordance with equation (3.4).

[16] Production employment incorporates craft and trades workers, as well as plant and machine operators

[17] For the purposes of the thesis, heavy manufacturing industries include: Wood products; Fuel, petroleum and chemical products; Non-metallic products; Metal products and machinery; Electrical machinery; Transport equipment; and Furniture & recycling.

[18] The 10% sample is however reported at the magisterial district level. 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.

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

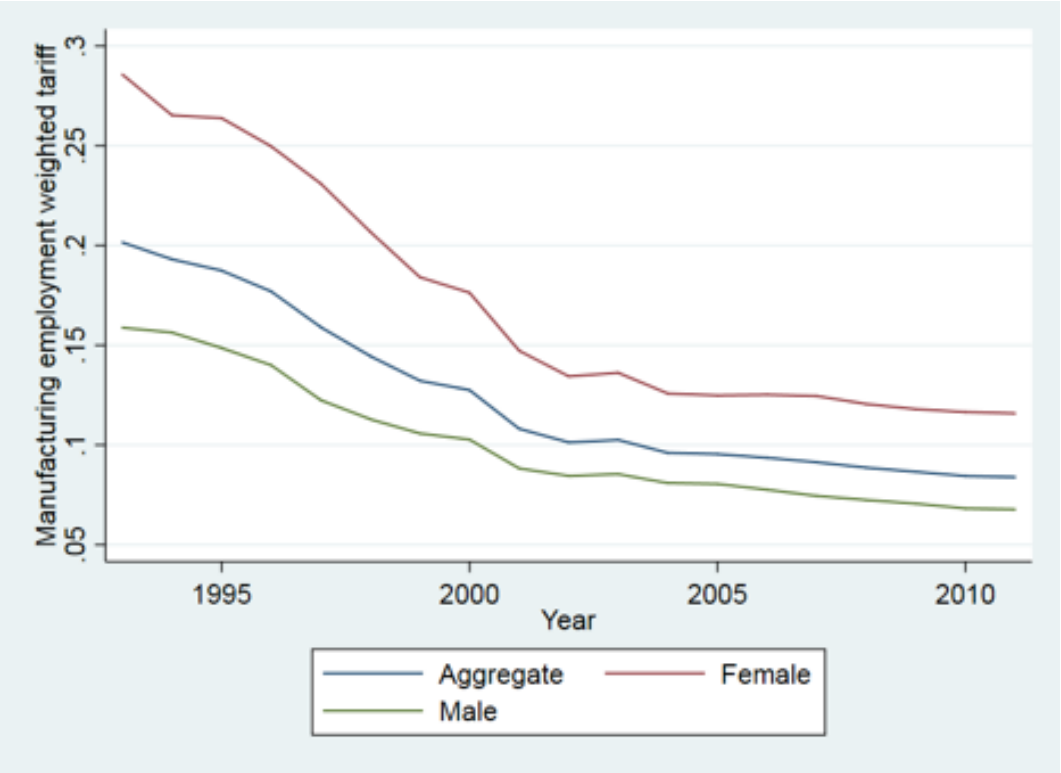
3.6.3 Tariff Liberalisation in South Africa in the Post-Apartheid Era

This section of the chapter shows the reduction of tariffs in the post-apartheid period. The employment-weighted tariffs are presented in Figure 3.3, which provides an overview of the level of liberalisation that took place between 1993 and 2011 for the ten manufacturing industries, as defined by International Standard Industrial Classification (ISIC) revision 3. The figure shows three different employment-weighted[20] tariff rates. The "Aggregate" measure uses total (male plus female) manufacturing employment to calculate employment shares. It thus reflects the average protection faced by all workers. The limitation of this aggregate measure is that the gender composition of employment differs across industries. Further, industry-specificity implies that male and female labour are not perfectly substitutable across industries. Consequently, with different levels of tariff reductions across industries, the aggregate measure may not reflect the change in protection faced by women relative to men. To account for this, a gender-specific tariff exposure measure is calculated where the employment share weights are derived using industry employment levels for men and women separately.

As can be seen in Figure 3.3, average tariffs declined dramatically over these years. On average, aggregate employment-weighted tariffs fell by 12 percentage points, from 20% in 1993 to 8% in 2011. Female (male) employment weighted tariffs fell from an average of 29% (16%) to about 12% (7%), translating into a 17 (9) percentage point cut between 1993 and 2011. An interesting feature revealed in the figure is that women workers are more concentrated in high tariff protection industries, as shown by the higher tariff curve for woman than for men.

[20] We used the 1996 manufacturing employment shares (aggregate, female and male employment shares) as weights for tariff rates.

Figure 3.3: Evolution of manufacturing employment-weighted tariff rates

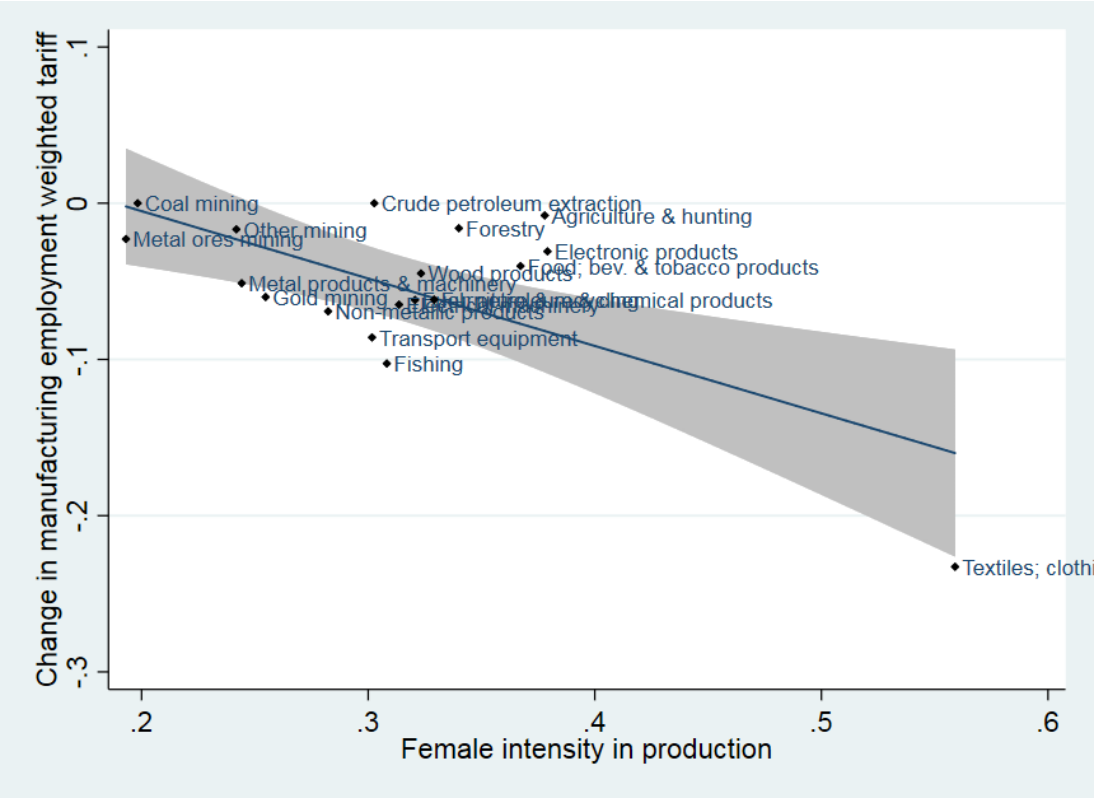


Notes: Employment weighted tariffs are constructed using the average of the regional tariff variable where regional tariffs are tariff rates weighted by 1996 regional manufacturing employment shares.
Sources: 10% weighted sample census data and updated tariff data obtained from Edwards (2015)

Industry-bias of tariff liberalisation is clearly reflected in Figure 3.4, where a negative relationship is found between the change in industry tariff and the share of women in total industry employment from 1996 and 2011[21]. The figure shows that the textile, clothing, and footwear industry experienced the largest tariff reduction. It is also the industry with the largest share of female workers. The textile and clothing industry faced drastic liberalisation over that period, which intensified trade exposure for women. The implication 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.

[21] The period covered is limited by the data, as census data for female employment is only available in 1996, 2001 and 2011.

Figure 3.4: Gender-biased tariff reductions between 1996 and 2011



Notes: Employment weighted tariffs are constructed using the average of the regional tariff variable where regional tariffs are tariff rates weighted by 1996 regional manufacturing employment shares.
Sources: 10% weighted sample census data and updated tariff data obtained from Edwards (2015)

3.6.4 The South African Labour Market

The South African labour market is characterised by slow employment growth. This is a central economic challenge facing South African policymakers. Over the past two decades, the economy has not generated enough jobs to employ all individuals who could be participating in the labour market. Table 3.1 highlights employment trends in the post-apartheid period. The table shows how employment as a share of the working-age population (employment rate) rose by six percentage points from 32.9% in 1996 to 38.9% in 2011.

Historically, the labour market has been dominated by men. Even though there has been a rise in female participation in the labour market in recent years, employment rates of men continue to exceed those of women. In 1996, employment rates of women and men were about 26% and 41%, respectively, and by 2011 the rates stood at 33.2% and 44.9%, respectively. This indicates a narrowing of the gender employment gap from 15.5 percentage points in 1996 to 11.7 percentage points in 2011.

Table 3.1: Total employment rates trend from 1996 to 2011

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

Notes: The data is for the national labour market. Employment rate reflects employment that is normalised by the working-age population (ages 15-64).
Source: Full census data

Of more relevance to the chapter is the employment trend in manufacturing, as exhibited in Table 3.2. The sector experienced sharp declines in employment growth compared to other sectors. Manufacturing employment as a share of total employment contracted by 4.2 percentage points, from 14% in 1996 to 9.8% in 2011. There are also differences in manufacturing employment trends across gender. It is observed that a higher proportion of men work in manufacturing than women. In 2011, approximately 11.6% of employed men were in manufacturing compared to 7.5% of women. Men are thus more exposed to manufacturing than women, although the industries in which they dominate experienced less of a reduction in tariffs, as shown by Figure 3.3. Additionally, manufacturing employment shares declined more for females if measured in percentage change (4.2 percentage points) relative to 4 percentage points for men. The empirical analysis that follows later will attempt to isolate the role that tariffs play in driving these employment changes.

Table 3.2: Manufacturing employment shares from 1996 to 2011

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

Notes: The data is for the national labour market. Manufacturing share is manufacturing employment as a share of total employment.
Source: Full census data

The census data also provides other relevant information on the employment composition. As shown in Table 3.3, the skill composition (measured as the share of skilled workers[22]) of workers in manufacturing has risen strongly over the period, rising from 27.8% in 1996 to 52% in 2011, with stronger increases for women than for men. We also characterise workers according to their occupational status. Production workers are defined as individuals working as craft and trades workers as well as plant and machine operators in heavy manufacturing

[22] Share of skilled workers is computed as skilled workers divided by the sum of skilled and unskilled workers.

industries. For the purposes of this chapter, the share of production workers reflects brawn-intensity. The proportion of manufacturing workers engaged in production work in heavy manufacturing industries decreased to 42.3% in 2011 from 53.5% in 1996. Declines in shares were experienced by men in production occupations remains high compared to that of women. The data shows that there has been a marginal increase in the brawn-intensity among women. The slight rise in brawn-intensity among women may be due to changes in employment policies in South Africa which promote the employment of women. It may also indicate that women are exercising their agency and tyring to not conform to social norms and stereotypes.

The sharp changes in the skill composition of employment in manufacturing points to the possible presence of technological change associated with tariff liberalisation. To the extent that production workers in heavy industries are a proxy for 'brawn', the trend is also consistent with a shift in the composition of workers away from brawn intensive tasks to non-brawn-intensive tasks over the period. In the empirical analysis, we test whether these trends are associated with tariff liberalisation and whether they give rise to gendered effects on employment.

Table 3.3: Skill and brawn employment shares in manufacturing from 1996 to 2011

		1996	2001	2011
Skill share	Aggregate	27.8	38.9	52.0
	Female	26.5	37.6	55.2
	Male	28.4	39.6	50.4
Production share	Aggregate	53.5	47.9	42.3
	Female	30.0	30.3	32.8
	Male	59.7	53.1	46.1

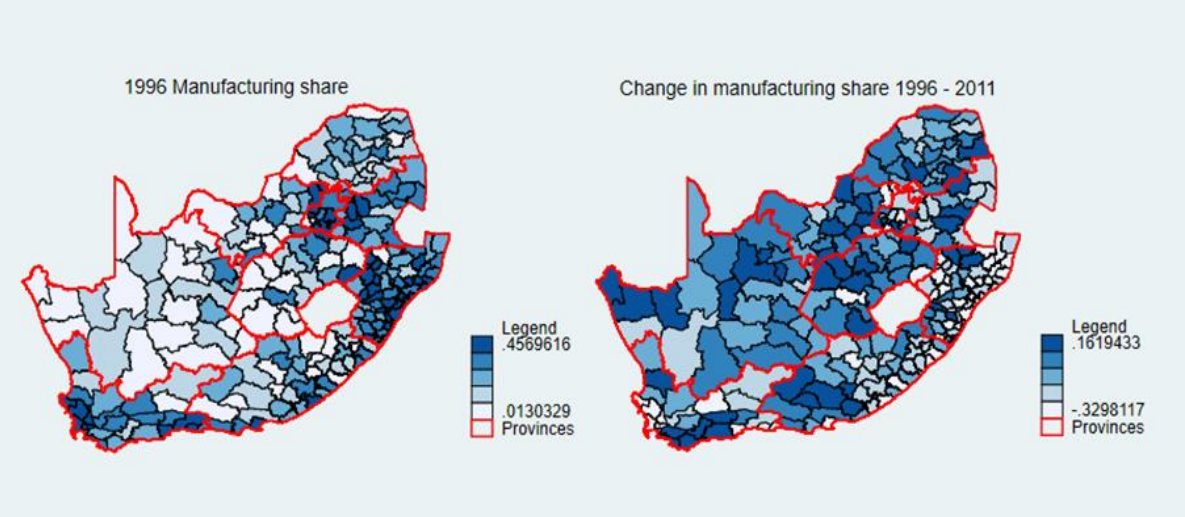
Notes: The figures are presented as a percentage. Skill share is calculated as the number of skilled workers divided by the sum of skilled and unskilled workers in all the manufacturing industries. Production share represents workers who are employed as craft and trade workers as a share of the sum of workers employed in all occupations (production/non-production occupations) in manufacturing industries excluding food & beverage, textile, clothing & footwear and electronics. We ran a t-test to determine whether the differences between men and women in terms of employment, manufacturing employment, skill share, and production share in manufacturing are statistically significant. The results are presented in Table 3.1A in the appendix. All the p-values are less than 0.05, indicating that the gender differences are significant.
Source: Full census data and the 10% weighted sample census data.

3.6.4.1 Spatial Variation in Manufacturing Employment Share

A spatial map of 1996 manufacturing share (left side) and changes in manufacturing employment share from 1996-2011 (right side) across municipalities in South Africa is presented in Figure 3.5. The darker shade reflects higher shares or larger changes in shares. The map shows significant variation in the level and change in manufacturing employment share across municipalities in South Africa. Municipalities in the Gauteng, KwaZulu-Natal,

Western Cape, and to a lesser extent Eastern Cape provinces had the highest employment share in manufacturing in 1996. This is not surprising as Gauteng, KwaZulu-Natal, and the Western Cape are the main economic hubs in South Africa. The municipalities in these provinces also experienced the largest declines in manufacturing employment share between 1996 and 2011. Not all municipalities experienced declining manufacturing employment shares, with several municipalities across the country experiencing marginal share increases over the period.

Figure 3.5: Spatial distribution manufacturing employment share



Notes: Manufacturing employment shares are calculated as manufacturing employment as a share of total employment in each municipality.
Source: Full census data

Summary statistics displayed in Table 3.4 show the change in the trade protection measure, wage (proxied by income) and employment across municipalities between 1996 and 2011. This table provides a more disaggregated lens through which to view regional dynamics. We observe substantial differences in exposure to international competition through tariff reductions. The average change in aggregate trade protection across municipalities is 8 percentage points; the median is about 7 percentage points, while the standard deviation is about 3 percentage points. The municipality in the 25th percentile experienced close to a 3 percentage point larger tariff reduction compared to a municipality in the 75th percentile.

Municipality-level manufacturing wage rose by an average of 110 log points, with a median of 101 log points and a standard deviation of 93 log points over the period, 1996-2011. In the same period, the data shows that South Africa experienced a reduction in the gender wage gap in the manufacturing sector, with the wage increase for women (129 log points) surpassing that for men (99 log points), on average.

On average, manufacturing employment rose by about 39 log points between 1996 and 2011. Female manufacturing employment increased by 38 log points, while the employment of men rose by 40 log points, resulting in a marginal increase in the gender employment gap of about 1 percentage point. However, the standard deviation of female manufacturing employment is higher than that of males, revealing greater variation in the change in female manufacturing employment levels relative to that of men across municipalities.

The number of Blacks (Africans, Coloureds and Indians/Asians) employed in the manufacturing sector increased by an average of 41 log points, while employment of Whites increased by 40 log points. The growth in manufacturing employment of Black women was an average of 42 log points compared to 43 log points for Black men, while for White women the average growth was 57 log points, compared to 38 log points for White men. Even though the gender gap declined for both Blacks and Whites, we see stronger convergence among Whites, highlighted by the 21 log point decline in the gender employment gap for this group compared to 6 log points for Blacks.

Overall, the data point to fairly large changes in tariffs and employment levels or shares across municipalities over the period. These changes also differ vastly across municipalities. This variation in the data over time and across municipalities provides a good basis to estimate the relationship between tariff changes and employment changes over the period.

Table 3.4: Summary statistics of the change in tariffs and manufacturing employment between 1996 and 2011

Variable	Mean	P50	SD	P75-P25
Δ*TPman*	-0.08	-0.07	0.03	0.03
Δln(Manufacturing wage)	1.10	1.01	0.93	0.87
Female	1.29	1.15	1.07	0.95
Male	0.99	0.95	1.01	0.97
Δln(Manufacturing employment)	0.39	0.44	0.67	0.85
Female	0.38	0.49	0.84	1.04
Male	0.40	0.43	0.63	0.79
Gender gap	0.01	-0.01	0.60	0.70
Δln(Manufacturing employment: Black)	0.41	0.41	0.72	0.90
Female	0.42	0.49	0.91	1.17
Male	0.43	0.46	0.66	0.84
Gender gap	-0.06	-0.01	0.76	0.88
Δln(Manufacturing employment: White)	0.40	0.31	1.04	0.85
Female	0.57	0.55	0.82	0.96
Male	0.38	0.31	1.07	0.85
Gender gap	-0.21	-0.23	0.70	0.86

Notes: ΔTPman is the change in trade protection measure (tariff rates weighted by manufacturing employment shares). Manufacturing employment share is manufacturing as a share of total employment in each municipality. The gender gap is male manufacturing employment divided by female manufacturing employment. Black includes Africans, Coloureds and Indians/Asians.
Source: Full census data

3.7 Estimation Results

3.7.1 The Effects of Tariff Liberalisation on Manufacturing Wages

The focus of the empirical specification and background data analysis in this study has been on employment changes. However, as outlined in the theoretical review in Section 3.2, changes in wages in response to tariff liberalisation are a critical channel driving labour market outcomes, including changes in the employment composition of industries (Feenstra, 2015). As the first step in our analysis, we study the relationship between tariff reductions and wages. We use the bracketed income variable as proxy for wage. We then construct continuous income variable using the midpoint approach following Mudiriza and Edwards (2020) and Statistics South Africa (2000). A detailed discussion about the wage variable is provided in Section 3.6.2. Given the imputed variable, findings from this analysis do not conclusively point to the wage effect. Nonetheless, it is critical to determine whether wages adjust to tariff changes in South Africa. This analysis provides a comprehensive analysis of the tariff liberalisation effects on men and women.

In Table 3.5, we present the estimation results for the analysis of tariff liberalisation on manufacturing wages. Columns (1) to (3) present estimates for aggregate wage, female wage and male wage, where we only control for the working-age population and period fixed effects. The models in columns (4) to (6) include other control variables such as the changes in the working-age population, migration rate, and change in trade union intensity. We also control for lagged variables, including skill rate, percent of unemployed individuals, infrastructure, and manufacturing share. The coefficient on the change in tariffs is insignificantly different from zero in all estimates. The interpretation is that there was no significant association between tariff reductions and average wages in municipalities over the period.

Table 3.5: The effects of tariff liberalisation on manufacturing wages

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variables: Change in log wages					
VARIABLES	Aggregate	Female	Male	Aggregate	Female	Male
ΔTariff	1.138	2.610	-4.936	-0.208	1.031	-6.583
	(2.237)	(2.325)	(6.008)	(2.274)	(2.309)	(6.575)
ΔWorking-age population	0.163	0.171	0.520*	0.128	0.091	0.438
	(0.264)	(0.334)	(0.301)	(0.277)	(0.336)	(0.318)
ΔMigration rate				0.455	0.454	0.163
				(0.343)	(0.454)	(0.344)
ΔUnion intensity				1.520**	2.049**	1.716**
				(0.738)	(0.901)	(0.707)
L.Skill rate				0.233	0.766	-0.166
				(0.586)	(0.743)	(0.642)
L.Unemployed rate				-1.257*	-1.316	-1.460
				(0.714)	(0.849)	(0.939)
L.Infrastructure				-0.003	-0.008	0.016
				(0.018)	(0.022)	(0.021)
L.Manufacturing share				0.254	0.095	0.190
				(0.421)	(0.572)	(0.545)
Constant	0.630***	0.924***	0.385**	0.532	0.775*	0.598*
	(0.082)	(0.097)	(0.155)	(0.332)	(0.466)	(0.315)
Observations	467	464	466	467	464	466
R-squared	0.011	0.054	0.023	0.036	0.074	0.046
Period FE	Yes	Yes	Yes	Yes	Yes	Yes
IV	No	No	No	No	No	No

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

Notes: Tariff variable is the manufacturing employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. The municipality wage variable is derived using the total income of manufactured workers calculated using the midpoints of the income brackets and dividing by the number of manufacturing workers in each municipality. 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 workers within the working-age population, and unemployed rates are the number of unemployed individuals as a share of the working-age population. Infrastructure represents number households with access to electricity (including solar), weekly refuse collection, a flush toilet and piped water, as a share of total households. Manufacturing share reflects manufacturing employment as a share of total employment, excluding the employment in the primary sector.

To deal with the issue of endogeneity, we follow Ahsan (2013), Amiti and Konings (2007) and Goldberg and Pavcnik (2007) and use an IV estimation strategy. We instrument the change in trade protection with lagged trade protection. The estimation results of tariff effects on manufacturing wages using the IV strategy are presented in Table 3.6, and we find that the coefficients remain statistically insignificant for aggregate labour, as well as for gender. This evidence suggests that wages did not respond to tariff shocks. This result corroborates the findings by Erten et al. (2019) who find that tariff liberalisation had no effect on regional average wages in South Africa. However, they are inconsistent with findings in the US by Autor et al. (2013) and evidence from research in Brazil by Benguria and Ederington (2018) that regional exposure to an increase in Chinese imports reduced wages and the gender wage gap.

Our results provide suggestive evidence of the presence of wage rigidities in the South African economy. An explanation for this is the wage-setting and the conditions of service processes determined by the Labour Relations Act and the Basic Conditions of Employment Act (BCEA) of 1997. Under these Acts, wages are set by centralised sector Bargaining Councils where unions and firms negotiate wages that can be extended to non-participants through ministerial agreements, or through Sectoral Determinations where the Ministry of Labour sets minimum wages for vulnerable sectors and occupations not covered by collective bargaining.

Studies in South Africa show that the wage-setting processes are more binding for small firms (Magruder, 2012) and low skilled low wage workers (Bhorat et al., 2014; Dinkelman & Ranchhod, 2012). Murray and Van Walbeeck (2007) argue that the implementation of the minimum wage policy in South Africa reduced the average number of hours of farmworkers. Furthermore, minimum wages led to a substitution of labour for capital, this had an undesirable effect on employment in agriculture.

The implications for our analysis are considerable. Our results indicate that adjustment to tariff liberalisation is likely to occur through employment changes. Since we find that manufacturing wages are unresponsive to tariff cuts, the thesis proceeds by studying the effect on manufacturing employment.

Table 3.6: The effects of tariff liberalisation on gendered manufacturing wages

	(1)	(2)	(3)
	Dependent variables: Change in log wage		
VARIABLES	Aggregate	Female	Male
ΔTariff	-0.006	1.232	-5.080
	(2.605)	(2.856)	(6.736)
ΔWorking-age population	0.126	0.089	0.426
	(0.277)	(0.336)	(0.315)
ΔMigration rate	0.455	0.454	0.163
	(0.343)	(0.454)	(0.345)
ΔUnion intensity	1.515**	2.044**	1.677**
	(0.740)	(0.903)	(0.710)
L.Skill rate	0.233	0.766	-0.165
	(0.586)	(0.742)	(0.641)
L.Unemployed rate	-1.244*	-1.304	-1.366
	(0.719)	(0.852)	(0.943)
L.Infrastructure	-0.003	-0.008	0.017
	(0.018)	(0.022)	(0.021)
L.Manufacturing share	0.260	0.101	0.234
	(0.422)	(0.577)	(0.547)
Constant	0.533	0.776*	0.605*
	(0.331)	(0.466)	(0.314)
Observations	467	464	466
R-squared	0.036	0.074	0.046
Period FE	Yes	Yes	Yes
IV	Yes	Yes	Yes

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

Notes: All the estimations are based on the 2SLS IV strategy. Tariff variable is the employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. The municipality wage variable is derived using the total income of manufacturing workers calculated using the midpoints of the income brackets and dividing by the number of manufacturing workers in each municipality. 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 rates are 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.

3.7.2 The Effects of Tariff Liberalisation on Aggregate Manufacturing Employment

Table 3.7 presents the IV estimation results from the manufacturing employment regressions. A positive coefficient on the tariff variable means that tariff reductions are associated with manufacturing employment declines. We find that changes in tariffs are positively and significantly associated with changes in employment levels. The results imply that 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).

On average, tariffs declined by 8 percentage points, as shown in Table 3.4. When using the estimated coefficients, these tariff reductions translate into a 38% decrease in manufacturing employment. The raw data reveals that manufacturing employment declined by 39 log points between 1996 and 2011, implying that tariff cuts can explain the full decline in employment over the period.

We are also interested in capturing the effect of both tariff reduction and imports on manufacturing employment to assess whether tariffs have additional effects over and above the import effect, because tariff liberalisation can affect employment through two channels. Firstly, it reduces the price of substitute products, leading to an increase in imports and a decline in domestically produced goods. Secondly, it reduces the price even of domestically produced substitutes. In much of the empirical literature, for example (Autor et al., 2015; Kis-Katos et al., 2018), consideration of the effect of international competition focuses solely on the import channel. To assess which of these channels drive the results, column (2) includes a measure of regional exposure to imports. Following Autor et al. (2015), the regional import exposure measure is constructed by weighing imports using regional employment shares.

From this, we find that imports are negatively correlated with manufacturing employment, suggesting that higher import volumes reduce manufacturing employment, implying that rising imports are an important channel through which tariffs have induced job losses. However, while the coefficient on tariffs falls (as expected through the inclusion of the import channel), it remains significant. The implication is that the full effect of tariff liberalisation on employment is not captured by imports alone. The price effect presents an additional important channel through which employment is affected.

Table 3.7: Effects of tariff liberalisation on aggregate manufacturing employment

	(1)	(2)
	Dependent variables: Change in log employment	
VARIABLES	Model 1	Model 2
ΔTariff	4.750**	4.213**
	(1.938)	(1.920)
ΔImports		-0.597**
		(0.301)
ΔWorking-age population	0.886***	0.891***
	(0.142)	(0.141)
ΔMigration rate	0.386*	0.374*
	(0.213)	(0.211)
ΔUnion intensity	0.249	0.373
	(0.422)	(0.416)
L.Skill rate	0.527	0.443
	(0.362)	(0.364)
L.Unemployed rate	-0.984**	-1.070***
	(0.399)	(0.399)
L.Infrastructure	-0.003	-0.001
	(0.010)	(0.010)
L.Manufacturing share	-2.393***	-2.397***
	(0.406)	(0.405)
Constant	0.511**	1.388***
	(0.217)	(0.500)
Observations	467	467
R-squared	0.297	0.307
Period FE	Yes	Yes
IV	Yes	Yes

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

Notes: All the estimations are based on the 2SLS IV strategy. Tariff variable is the employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. 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.

3.7.3 Tariff Liberalisation Effects on Gendered Employment in Manufacturing

This section unpacks the aggregate employment effect of tariff liberalisation by gender using the IV estimation strategy. Table 3.8 presents estimation results for the employment of men and women as well as the gender employment gap, as measured by the manufacturing employment ratio of men to women.

The results show that municipalities more exposed to tariff liberalisation experienced slower employment growth of both men and women compared to less exposed municipalities. However, the negative employment effect was more pronounced for women. A one percentage

point tariff cut is shown to be associated with a 7.3% decrease in female employment compared to a 3.0% decrease in male employment, revealing that the effect on women is double that on men. We utilised the Seemingly Unrelated Estimation (Suest) to test whether the difference of the two coefficients are statistically different using the lagged tariff protection measure[23]. The p-value (displayed in column (2)) is 0.003 which is less than 0.05 and this shows that the two coefficients are statistically different.

To further test the significance of the difference in effects by gender further, column (3) shows that tariff liberalisation widened the gender employment gap in manufacturing in municipalities that are more exposed to tariff liberalisation. Municipalities that faced a one percentage point cut in tariffs experienced a 4.3% increase in the gender employment gap. Even though the estimate may appear to be large, it is may not be an unrealistic estimate. It is highly likely that it is in line with the South African labour market given the fact that the country is characterised by huge gender inequalities particularly with regards to labour market outcomes. The gender employment gap is enormous and persistent over time, as shown in Table 3.1 and Table 3.2.

These results of the effects of tariff reductions on gendered employment differ from experience in other emerging countries, such as Brazil and Indonesia (Gaddis & Pieters, 2017; Kis-Katos et al., 2018). These studies find that tariff liberalisation reduced the gender employment gap in both countries. The channel that may explain the difference in results is identified in Section 3.7.5.2.

From the coefficients on the control variables, it is evident that municipalities with a growing working-age population experienced an increase in manufacturing employment of both men and women. Furthermore, we find that an increase in migration increased male employment but had no effect on female employment. Municipalities with a higher unemployed rate (unemployment divided by the working-age population) experienced a larger decline in manufacturing employment of women, while men were more negatively affected in municipalities with a larger share of the manufacturing sector.

[23] The Suest test is not ideal for IV estimations. To overcome this challenge, the estimation was performed using Ordinary Least squares (OLS) estimation and the lagged tariff protection measure as the main variable of interest. We also included all the control variables in equation (3.6). Nonetheless, performing this test of statistical difference does provide some insight to the differences that we observe in terms of gendered effects of tariff reductions. To this extent, we are not making conclusive arguments about the gendered effects of tariff liberalisation on statistical terms.

Table 3.8: Tariff liberalisation effects on gendered employment in manufacturing

	(1)	(2)	(3)
VARIABLES	Female	Male	Gender employment gap
ΔTariff	7.256***	3.048*	-4.280**
	(2.525)	(1.766)	(1.778)
ΔWorking-age population	0.712***	0.898***	0.207
	(0.188)	(0.141)	(0.156)
ΔMigration rate	-0.266	0.562***	0.847***
	(0.306)	(0.211)	(0.270)
ΔUnion intensity	0.677	0.309	-0.370
	(0.610)	(0.402)	(0.551)
L.Skill rate	0.655	0.473	-0.158
	(0.495)	(0.338)	(0.394)
L.Unemployed rate	-1.391**	-1.065***	0.412
	(0.540)	(0.406)	(0.499)
L.Infrastructure	-0.009	-0.007	0.002
	(0.017)	(0.010)	(0.015)
L.Manufacturing share	-1.905***	-2.456***	-0.547
	(0.490)	(0.387)	(0.360)
Constant	1.059***	0.404*	-0.699**
	(0.310)	(0.216)	(0.281)
Observations	465	466	464
R-squared	0.183	0.312	0.039
Period FE	Yes	Yes	Yes
IV	Yes	Yes	Yes
Suest Test			
Chi(2)		8.929	
Prob > (Chi2)		0.003	

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

Notes: All the estimations are based on the 2SLS IV strategy. Tariff variable is the employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. The dependent variables in the first two estimates are the change in log manufacturing employment, and in the third estimate, it is the change in log gender employment gap. 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.

3.7.4 Tariff Liberalisation and Gendered Manufacturing Employment across Race

The South African labour market is fragmented across race and gender. The effects of tariff liberalisation may, therefore, also differ across race and by race-gender combinations. To explore this further, we present estimates for manufacturing employment disaggregated by race and gender in Table 3.9.

The estimates show that the negative effects of tariff liberalisation on manufacturing employment were disproportionately borne by Blacks, while employment of Whites was not affected. This points to further heterogeneity of the effects of tariff liberalisation with Whites

cushioned from adverse tariff shocks. The effect on Black women was double that on Black men, resulting in a statistically significant widening of the gender employment gap. A one percentage point tariff cut widened the gender employment gap between Black men and Black women by about 4.6%. Among Whites, tariff liberalisation had no significant effect on manufacturing employment of males or females. Similarly to Section 3.7.3, we performed the Seemingly Unrelated Estimation (Suest) tests to test for the difference in the coefficients. The p-value from the test in columns (2) is 0.002 and is less than 0.05, indicating that the coefficients for Black women and Black men are statistically different. However, the p-value in column (5) of 0.950 shows that we cannot reject the hypothesis that the coefficients for White women and White men are the same.

These findings are interesting because they reveal that in segmented labour markets, the effects of tariff liberalisation can fall disproportionately on some groups rather than others. In the South African context, the results point to a disproportionate impact of tariff liberalisation on Blacks, and Black women, more precisely. The liberalisation process thus exacerbated a structure of employment that arose out of South Africa's racial and gender-biased policies that discriminated against Blacks.

Table 3.9: Tariff liberalisation gendered effects on manufacturing employment across race

	(1)	(2)	(3)	(4)	(5)	(6)
		Black			White	
VARIABLES	Female	Male	Gender gap	Female	Male	Gender gap
ΔTariff	7.926***	3.469*	-4.559**	3.837	4.840	-0.072
	(2.762)	(1.822)	(1.935)	(6.381)	(7.292)	(6.032)
ΔWorking-age population	0.692***	0.923***	0.247	0.910**	0.734**	-0.170
	(0.215)	(0.149)	(0.177)	(0.419)	(0.341)	(0.332)
ΔMigration rate	-0.367	0.525**	0.926***	1.627**	2.289***	0.565
	(0.364)	(0.224)	(0.318)	(0.720)	(0.805)	(0.557)
ΔUnion intensity	0.946	0.715*	-0.310	2.995*	-0.635	-2.499*
	(0.698)	(0.433)	(0.627)	(1.613)	(1.236)	(1.405)
L.Skill rate	0.666	0.545	-0.080	1.996	2.527*	0.315
	(0.545)	(0.354)	(0.440)	(1.553)	(1.461)	(1.118)
L.Unemployed rate	-1.511**	-1.023**	0.543	-1.408	-2.009	0.015
	(0.653)	(0.433)	(0.594)	(1.272)	(1.330)	(1.272)
L.Infrastructure	-0.016	-0.008	0.007	0.028	-0.030	-0.043*
	(0.018)	(0.011)	(0.015)	(0.025)	(0.019)	(0.024)
L.Manufacturing share	-1.898***	-2.414***	-0.489	-2.357*	-4.432***	-1.736**
	(0.516)	(0.401)	(0.392)	(1.272)	(1.245)	(0.827)
Constant	1.186***	0.438*	-0.808**	-0.271	0.210	-0.492
	(0.388)	(0.225)	(0.345)	(0.574)	(0.473)	(0.513)
Observations	463	466	462	387	416	376
R-squared	0.155	0.300	0.033	0.131	0.112	0.050
Period FE	Yes	Yes	Yes	Yes	Yes	Yes
IV	Yes	Yes	Yes	Yes	Yes	Yes
Suest Test						
Chi2		9.897			0.004	
Prob > (Chi2)		0.002			0.950	

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

Notes: All the estimations are based on the 2SLS IV strategy. Tariff variable is the manufacturing employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. The dependent variables in columns (1), (2), (4) and (5) is the change in log manufacturing employment and the dependent variable in columns (3) and (6) it is the change in log gender employment gap. Black includes Africans, Coloureds 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.

3.7.5 Determinants of Gendered Manufacturing Employment Effects

The disproportionately negative effect of tariff liberalisation on women runs contrary to experience in Indonesia and Brazil. In this section, the chapter broadly analyses three different channels that may explain the gendered effects in South Africa. First, we will control for the potential effects via skills and "brawn" channels. Second, we will analyse the role of industry segmentation. This channel is relevant for South Africa, given the vast difference in the industry composition of men and women.

3.7.5.1 Transmission channels: Skills and Brawn

Tariff liberalisation may be associated with innovation and the adoption of new technologies which may be (i) less brawn-intensive, boosting the relative demand for female labour (Galor and Weil, 1996; Juhn et al., 2014; Weinberg, 2000). This is under the assumption that women are less endowed with brawn, or (ii) more skill-intensive. The effect on female employment depends on the endowment of skills among women relative to men (Acemoglu, 2003; Thoenig & Verdier, 2003; Wood, 1995). The idea is that, if international competition induces firm to adopt less brawn-intensive technology, this will result in a decrease in employment of production workers relative to non-production workers who are seen to be complements to machines. Given that women are on average not as physically strong men (Juhn et al., 2014), the adoption of less brawn-intensive technology will reduce the relative demand for men, and narrow the gender employment gap.

To isolate the influence of these channels on the estimated tariff effects, we follow a two-stage approach. We first analyse the relationship between tariff liberalisation and the two transmission channels by regressing the change in the brawn and skills gap measures on the change in tariffs, plus other controls at the municipal level. This provides insight into the direct relationship between tariffs and the transmission channels. We then re-estimate the gender gap regressions, including the brawn and skills gap measures as controls. If tariffs only affect the gender gap via the brawn and skills transmission channels, then tariffs should not affect the gender gap once we control for these transmission channels. The coefficient on tariffs in these regressions thus reflects the conditional effects of tariff liberalisation on the gender gap, after controlling for the indirect effects via the transmission channels. Should the transmission channels explain the gendered effect of tariffs as shown in Table 3.8 and Table 3.9, we would expect the coefficient on the change in tariffs to diminish in importance (absolute size) and significance.

Table 3.10 presents the IV estimates where the change in the regional skills gap in the manufacturing-intensity of production (measured as skilled workers divided by unskilled workers) and the brawn-intensity of production (measured as a ratio of the number of workers in production[24] divided by the number of workers in non-production occupations in heavy

[24] Workers in production are those employed as craft and trade.

industries) is regressed on the change in regional exposure to tariffs plus several control variables[25]. The results show tariff increases are positively related to skills gaps and brawn-intensity. However, only the effect statistically insignificant.

Table 3.10: Tariff liberalisation effects on the skill gap and brawn-intensity

	(1)	(2)
VARIABLES	Skill gap	Brawn-intensity
ΔTariff	-3.263	4.464
	(3.673)	(5.386)
ΔWorking-age population	0.044	0.228
	(0.248)	(0.255)
ΔMigration rate	0.153	0.153
	(0.226)	(0.270)
ΔUnion intensity	-0.843	-1.468**
	(0.722)	(0.702)
L.Skill rate	-0.268	-1.171*
	(0.538)	(0.698)
L.Unemployed rate	0.002	0.099
	(0.079)	(0.072)
L.Infrastructure	-0.021	0.050**
	(0.014)	(0.023)
L.Manufacturing share	0.120	0.824*
	(0.377)	(0.494)
Constant	0.407***	-0.119
	(0.141)	(0.201)
Observations	466	460
R-squared	0.017	0.032
Period FE	Yes	Yes
IV	Yes	Yes

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

Notes: All the estimations are based on the 2SLS IV strategy. Tariff variable is the manufacturing employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. The dependent variables are the change in log skill gap in column (1) is measured as skilled workers/unskilled workers in manufacturing. In column (2) the dependent variable is the change in log brawn-intensity measured as production workers (those employed in craft and trade)/non-production workers in manufacturing industries excluding food & beverage, textile, clothing & footwear and electronics. Migration rate represents the number of individuals who migrated since the last census as a share of the working-age population. Union-intensity is the share of union members. Skilled rate denotes skilled workers as a share of skilled working within the working-age population, and unemployed rate is the number of unemployed individuals as a share of the working-age population. Infrastructure represents households with electricity (including solar), weekly refuse collection, flush toilet and piped water, as a share of the total number of households. Manufacturing share reflects manufacturing employment as a share of total employment, excluding the primary sector.

The next analyses assess whether the association with skills gap and brawn-intensity explain the relatively strong impact of tariff liberalisation on the employment of women compared to that of men found earlier. We expect that if tariffs reduce brawn-intensity, and brawn-intensive

[25] It should be noted that the non-production worker indicator captures a combination of skill-biased change and brawn-intensive change.

industries are male dominated, then the coefficient on the tariff will become even more negative. Table 3.11 presents results based on the IV estimation strategy where the manufacturing gender employment gap, measured as the change in the log ratio of male to female manufacturing employment at the municipal level, is regressed on tariffs while controlling for changes in the skills gap as well as brawn-intensity. Columns (1) and (2) of Table 3.11 separately include the skills gap and brawn-intensity channels, respectively, while column (3) includes both indicators for the skills gap and brawn-intensity. Columns (4) and (5) provide estimates for the extended (including skills and brawn-intensity gaps) gender employment gap for Blacks and Whites separately.

The coefficients for both the skills gap and brawn-intensity are negative but insignificant. Broadly, the results do not find support for the dominance of the skills and brawn-intensity transmission channels in explaining the tariff effects. In all estimates, the coefficient on the tariff variable remains negative and highly significant, except in the case of Whites, where it remains insignificant, as shown in Table 3.9. The direct effects of tariffs on the gender gap remain large, negative, and significant even after controlling for the skills gap and brawn-intensity channels.

Our findings are similar to a study in Brazil by Gaddis and Pieters (2017), which finds that the skills gap and brawn-intensity gap are not the channels through which tariff liberalisation influences the employment gap. However, in the case of Indonesia, Kis-Katos et al. (2018) show that the tariff-induced increase in the employment of women is through the reduced demand for brawn in production.

Table 3.11: The effects of tariff liberalisation and transmission channels on manufacturing employment

	(1)	(2)	(3)	(4)	(5)
	Dependent variables: Change in log gender employment gap				
VARIABLES	Model 1	Model 2	Model 3	Black	White
ΔTariff	-5.343***	-4.870***	-4.965***	-5.473***	-0.555
	(1.761)	(1.719)	(1.737)	(1.844)	(6.067)
ΔSkill gap	-0.035		-0.038	-0.049	0.099
	(0.036)		(0.037)	(0.040)	(0.140)
ΔBrawn-intensity		-0.026	-0.029	-0.028	0.118
		(0.035)	(0.036)	(0.041)	(0.145)
ΔWorking-age population	0.111	0.077	0.078	0.106	-0.259
	(0.151)	(0.154)	(0.153)	(0.168)	(0.322)
ΔMigration rate	-0.470**	-0.496**	-0.490**	-0.553**	-0.089
	(0.199)	(0.199)	(0.198)	(0.257)	(0.503)
ΔUnion intensity	-0.123	-0.072	-0.108	-0.033	-1.942
	(0.534)	(0.537)	(0.537)	(0.603)	(1.378)
L.Skill rate	-0.811*	-0.811*	-0.829*	-0.793*	0.594
	(0.446)	(0.444)	(0.445)	(0.478)	(1.282)
L.Unemployed rate	-0.047	-0.050	-0.050	-0.075	0.033
	(0.073)	(0.075)	(0.074)	(0.086)	(0.143)
L.Infrastructure	-0.012	-0.010	-0.011	-0.008	-0.055**
	(0.015)	(0.015)	(0.015)	(0.016)	(0.025)
L.Manufacturing share	-0.481	-0.450	-0.438	-0.358	-1.845**
	(0.364)	(0.363)	(0.362)	(0.398)	(0.852)
Constant	0.131	0.127	0.143	-0.249*	-0.166
	(0.099)	(0.097)	(0.099)	(0.130)	(0.375)
Observations	464	458	458	457	374
R-squared	0.036	0.039	0.041	0.032	0.057
Period FE	Yes	Yes	Yes	Yes	Yes
IV	Yes	Yes	Yes	Yes	Yes

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

Notes: All the estimations are based on the 2SLS IV strategy. Tariff variable is the manufacturing employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. The gender employment gap is derived as male employment/female employment in manufacturing. The change in log skill gap in column is measured as skilled workers/unskilled workers in manufacturing. The change in log brawn-intensity measured as production workers (those employed in craft and trade)/non-production workers in manufacturing industries excluding food & beverage, textile, clothing & footwear and electronics. Migration rate represents the number of individuals who migrated since the last census as a share of the working-age population. Union-intensity is the share of union members. Skilled rate denotes skilled workers as a share of skilled working within the working-age population, and unemployed rate is the number of unemployed individuals as a share of the working-age population. Infrastructure represents households with electricity (including solar), weekly refuse collection, flush toilet and piped water, as a share of the total number of households. Manufacturing share reflects manufacturing employment as a share of total employment, excluding the primary sector.

3.7.5.2 Industry Segregation

An explanation for the gendered effects of tariff liberalisation is the industry segmentation of employment. There is variation in terms of industry composition in the manufacturing sector. Women, in South Africa, often select into the textile, clothing & footwear industry. In their

analysis, Martin & Barnard (2013) find that even if women in South African initially select into male-dominated industries and occupations, they often change soon after into more female-dominated work environments. The challenges that women face in male-dominated industries emanate from societal norms and gender hierarchies which prevail both in the household and the society at large. Cha (2013) and Prescott & Bogg (2011) argue that these societal norms and hierarchies inform the stereotypes which eventually spill over to gender-biased organisational practices and become embedded into organisational culture. The sector segregation exposes men and women to varying degrees of import competition.

Race affects both the demand and supply side of the labour market. Empirical studies show that there is also racial and ethnic segregation among women in the workplace (Catanzarite, 2003; Reskin & Cassirer, 1996) demonstrating that racial and ethnic differences influence the labour market participation of women (Catanzarite, 2003). This informs us that races have their own biases which influence the sector or industry in which women select into. In support of this notion, Smith & Elliott (2005) argue that there is gender prejudice within race.

South African women are also affected by both educational and industrial rigidities which based on race. The apartheid government implemented a dualist education policy which provided Whites with superior education while for other races more especially for Blacks, it was below par. This form of education system provided different job opportunities to different races and Blacks were limited to jobs which required low skills. There was also deep racial discrimination in the workplace which intersected with a patriarchal social system. Black women were the most discriminated demographic. Mobility of Black women across industries was almost non-existent, they either remained in one industry indefinitely or became unemployed. Casale (2004) states that occupational segregation was racial.

We use the index of dissimilarity by Duncan and Duncan (1955) to highlight the initial gender segregation across industries using equation (3.7):

$$ID_i = 0.5 \sum_i \left| \frac{E_i^F}{E^F} - \frac{E_i^M}{E^M} \right| \qquad (3.7)$$

where ID_i is the index of dissimilarity for each manufacturing industry. $\frac{E_i^F}{E^F}$ and $\frac{E_i^M}{E^M}$ denote female and male employment shares of each manufacturing industry in total manufacturing employment, respectively.

The dissimilarity index takes values from 0 to 1 and the increase in the value indicating increasing industry segregation of men and women. A value of 1 indicates that industries are perfectly segregated by gender meaning that only women work in that industry, and a 0 value shows no segregation such that there are an equal number of men and women workers in the industry.

Table 3.12 displays the index of dissimilarity from 1996 to 2011 for manufacturing industries. The total *ID* figures are constructed as national industry employment shares within manufacturing, as industry employment as a share of manufacturing. There is differential gender segregation across industries, and this segregation is varied across race. We observe that the largest gender segregation is in the textile, clothing and footwear industry for the aggregate population, but the segregation is more prevalent among the Black population. This is persistent over the years, showing that more women, particularly Black women, are employed in this industry than their male counterparts. The *ID* in the textile, clothing and footwear industry for the aggregate (Black) population declined from 0.176 (0.204) in 1996 to 0.152 (0.179) in 2001 and eventually 0.043 (0.051) in 2011. There is less segregation in other industries, such as furniture and recycling, electrical machinery, and electronic products. Interestingly, the textile, clothing and footwear is not the most segregated industry for the White population. Whites have consistently been facing strong segregation in the metal products and machinery industry. The *ID* for Whites in the metal products and machinery industry was 0.067 in 1996, 0.070 in 2001 and 0.023 in 2011. The total *ID* also demonstrates that sector segregation is more prevalent among Blacks than Whites, revealing that Black women face more rigidities in the industry than their White counterparts. Even though total industry segregation remains relatively high, it is declining over time.

Table 3.12: Index of dissimilarity across industries from 1996 to 2011

	1996			2001			2011		
Industry	Aggregate	Black	White	Aggregate	Black	White	Aggregate	Black	White
Food etc.	0.010	0.016	0.013	0.001	0.004	0.016	0.017	0.018	0.015
Textiles etc.	0.176	0.204	0.044	0.152	0.179	0.033	0.043	0.051	0.008
Wood prods.	0.024	0.034	0.027	0.009	0.016	0.024	0.003	0.006	0.010
Fuel etc.	0.020	0.024	0.001	0.018	0.024	0.009	0.004	0.006	0.003
Non-metal	0.013	0.016	0.001	0.015	0.019	0.001	0.007	0.008	0.003
Metal prods.	0.075	0.076	0.067	0.087	0.090	0.070	0.040	0.044	0.023
Electrical	0.004	0.004	0.005	0.002	0.002	0.002	0.000	0.001	0.000
Electronics	0.001	0.001	0.002	0.001	0.001	0.000	0.001	0.001	0.001
Transport	0.026	0.026	0.022	0.025	0.025	0.021	0.006	0.006	0.011
Furniture	0.005	0.008	0.006	0.002	0.000	0.009	0.000	0.001	0.000
Total	0.355	0.410	0.189	0.310	0.359	0.186	0.121	0.142	0.073

Notes: The index of dissimilarity is constructed as fe(male) employment in industry *i* as a share of total manufacturing employment. The industries are: (1) Food, beverages and tobacco products; (2) Textiles, clothing, footwear and leather goods; (3) Wood products; (4) Fuel, petroleum; chemical and rubber products; (5) Other non-metallic mineral products; (6) Metal products, machinery and household appliances; (7) Electrical machinery and apparatus; (8) Electronics, sound/vision, medical and other appliances; (9) Transport equipment (10) Furniture and recycling.
Source: 10% weighted sample census data

Having established the extent of industry segmentation, we revert the focus back to the construction of the tariff protection measure. It is clear that the regional tariff indicator based on aggregate employment of both genders does not adequately control for industry segmentation. The aggregate tariff measure under-represents the reductions in tariffs faced by women relative to men. This could bias the tariff coefficient estimates for the employment of women upwards compared to men, leading to the large negative coefficient on the tariff variable in the gender gap estimates.[26]

We address the issue of industry segregation by using the gender-specific trade protection measures presented in Figure 3.3. We use equation (3.4), where TP_{mt} now represents the fe(male) municipal trade protection measure at time *t*. $Emp_{im,initial}$ is initial fe(male) employment in industry *i* in municipality *m*, while $Emp_{m,initial}$ is initial fe(male) employment in municipality *m*. Tr_{it} and denotes tariff rates in industry *i* at time *t*.

[26] Figure 3.4 shows that tariffs fell relatively strongly in female-intensive sectors. The change in regional tariff exposure, constructed using total employment will therefore under-represent the change in tariffs faced by female employees in the region. Assuming tariff changes within an industry have equivalent elasticity effects on employment of men and women, the effect will be a bias upwards in the estimated employment response to tariffs of women relative to men. Thus, industry composition effects could explain the larger estimated tariff coefficient for men relative to women, as well as the negative tariff coefficient in the gender gap regressions.

Table 3.13 shows a summary of the statistics of changes in various gender-specific trade protection measures between 1996 and 2011. We see that on average female-specific tariffs fell more than for their male counterparts, but the largest decline was for Black female employment weighted tariffs. Aggregate female-specific tariffs fell by an average of 10.9 percentage point compared to aggregate male-specific tariffs which fell by an average of 6.4 percentage points. Tariffs weighted by the employment of Black and White women declined by an average of 16.2 and 11.4 percentage points relative to Black men and White men tariffs which fell by an average of 10.3 and 9.4 percentage points. In addition, the female-specific tariffs are characterised by a wider dispersion of changes across municipalities than for men.

Table 3.13: Summary statistics for the change in gender-specific tariffs, 1996 to 2011

Tariffs	Mean	P50	SD	P75-P25
ΔTPman_female	-0.109	-0.100	0.040	0.056
ΔTPman_male	-0.064	-0.060	0.015	0.013
ΔTPman_black female	0.162	0.145	0.065	0.076
ΔTPman_black male	0.103	0.096	0.034	0.047
ΔTPman_white female	0.114	0.106	0.056	0.060
ΔTPman_white male	0.094	0.090	0.038	0.049

Notes: ΔTPman is the change in trade protection measure (tariff rates weighted by the respective manufacturing employment shares). Gender-specific trade protection measures are tariff rates weighted by female and male employment shares
Source: 10% weighted sample census data

We now examine the role of industry segregation and industry-bias tariff reduction in gendered tariff effects in two ways. The expectation is that the gender gap should fall away once controlling for industry segregation and industry-bias liberalisation.

First, we estimate the gender employment gap relationship in equation (3.6) using the gender-specific tariffs. Table 3.14 presents the IV estimation results. The main finding is that once we control for gender-specific tariffs, the tariff effects decline considerably and, in most cases, the effects fall away except in the case of male-specific tariffs and Black male-specific tariffs. In columns (2) and (4) the estimates show that male-specific tariffs and black male-specific tariffs are weakly associated with the aggregate gender employment gap and the gender employment gap for Blacks, respectively. The findings point to the industry segmentation in manufacturing as displayed in Table 3.12. The table highlights that the largest segmentation, and more pronounced among Blacks, is in the textile, clothing and footwear. This industry also experienced the largest tariff reductions.

These findings indicate three main points. First, tariff reduction is not gender-neutral as tariffs fall differently across male and female-intensive industries. Second, the gendered tariff effects found earlier are explained by the drastic tariff reductions in female-intensive industries. Once we control for industry segregation using our gendered tariff measure, we find no differential effect of tariff reductions on women compare to men. The effect of tariffs on men and women *within* industries are thus similar. Third, industry segregation also differs across race in South Africa, and this explains the differential tariff effects between Blacks and Whites.

Our findings are comparable with the findings in Brazil and Indonesia done by Gaddis and Pieters (2017) and Kis-Katos et al. (2018), respectively. These international studies find that the channel through which tariff liberalisation affects the gender employment gap is through industry segregation. However, in Indonesia and Brazil, industry segregation is in favour of women in a sense that tariff liberalisation contributed to the growth of female-intensive industries, contrary to the evidence we find in South Africa.

The finding that tariff liberalisation had a negative effect on female manufacturing employment as a result of industry segregation may seem at odds with the finding that the industry-mix is positively associated with the initial female share in Table 2.9 but this is not the case. The first point to keep in mind with the industry-mix effect is that the decomposition method does not include other factors that may account for the changes in regional employment growth. Hence, we include the regression analysis to control for those changes in Table 2.9. We are not making conclusive arguments about the association between the share of females in a region and the industry-mix effect. Secondly, the decomposition results reveal that the industry-mix effect had a negative contribution to regional employment growth of women. This is in line with the findings of the effects of tariff liberalisation on female employment. Thirdly, the initial share of employed female variable in Table 2.9 includes other sectors such as agriculture and mining, which are not accounted for in the analysis of tariff liberalisation effects on gendered employment.

Table 3.14: Gender-specific tariff effects on gendered manufacturing employment gap

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variables: Change in log gender employment gap					
VARIABLES	Aggregate	Aggregate	Black	Black	White	White
ΔTariff_female	-1.435					
	(1.217)					
ΔTariff_male		-6.182*				
		(3.734)				
ΔTariff_black_female			-0.653			
			(1.412)			
ΔTariff_black_male				-6.724*		
				(3.784)		
ΔTariff_white_female					-3.309	
					(3.720)	
ΔTariff_white_male						6.013
						(10.806)
ΔWorking-age population	0.192	0.202	0.221	0.244	-0.204	-0.178
	(0.155)	(0.155)	(0.175)	(0.176)	(0.349)	(0.350)
ΔMigration rate	0.854***	0.829***	0.930***	0.905***	0.515	0.638
	(0.270)	(0.270)	(0.317)	(0.319)	(0.553)	(0.594)
ΔUnion intensity	-0.429	-0.390	-0.402	-0.317	-2.424*	-2.494*
	(0.552)	(0.550)	(0.627)	(0.624)	(1.342)	(1.366)
L.Skill rate	-0.149	-0.196	-0.081	-0.135	0.304	0.411
	(0.395)	(0.399)	(0.444)	(0.446)	(1.113)	(1.137)
L.Unemployed rate	0.528	0.504	0.755	0.618	-0.065	0.059
	(0.515)	(0.503)	(0.615)	(0.592)	(1.230)	(1.209)
L.Infrastructure	0.003	0.002	0.008	0.007	-0.044*	-0.041*
	(0.015)	(0.015)	(0.015)	(0.015)	(0.025)	(0.025)
L.Manufacturing share	-0.479	-0.538	-0.380	-0.486	-1.756**	-1.674**
	(0.368)	(0.368)	(0.400)	(0.402)	(0.810)	(0.801)
Constant	-0.684**	-0.724**	-0.787**	-0.462**	-0.500	0.558
	(0.282)	(0.280)	(0.346)	(0.195)	(0.514)	(0.547)
Observations	464	464	462	462	376	376
R-squared	0.038	0.037	0.035	0.031	0.046	0.054
Period FE	Yes	Yes	Yes	Yes	Yes	Yes
IV	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 gender employment gap is derived as male employment/female employment in manufacturing. Tariff variable is the manufacturing employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. 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.

As a second check for the role of industry segregation and industry-biased tariff reduction in driving gendered tariff effect, we construct the trade protection measure, excluding the textile, clothing, and footwear industry, since it appears to be an outlier in Figure 3.4. We also exclude this industry in the construction of the dependent variable. The results provided in Table 3.15 shows that the effects of tariff reduction on gendered employment and the gender employment

gap disappears. These results confirm that it is the tariff reduction and the gender composition in the textile, clothing, and footwear industry that drives the strong effect on female employment and widens the gender employment gap.

Table 3.15: Tariff liberalisation and gendered manufacturing employment - excluding textile, clothing and footwear industry

	(1)	(2)	(3)
VARIABLES	Female	Male	Gender employment gap
ΔTariff	-83.936	23.416	102.418
	(80.319)	(63.943)	(69.424)
ΔWorking-age population	0.802**	0.422	-0.329
	(0.394)	(0.268)	(0.295)
ΔMigration rate	-0.684	-0.302	0.456
	(0.451)	(0.319)	(0.320)
ΔUnion-intensity	0.475	0.788	-0.013
	(1.024)	(0.764)	(0.783)
L.Skill rate	0.901	1.713**	0.803
	(1.023)	(0.726)	(0.750)
L.Unemployed rate	-0.710	-0.397	0.436
	(1.033)	(0.762)	(0.855)
L.Infrastructure	0.001	0.011	0.012
	(0.018)	(0.014)	(0.013)
L.Manufacturing share	-0.382	-1.715***	-1.294**
	(0.712)	(0.581)	(0.535)
Constant	-0.542	0.680	1.030
	(1.048)	(0.879)	(0.924)
Observations	463	466	462
R-squared	0.008	0.079	
Period FE	Yes	Yes	Yes
IV	Yes	Yes	Yes

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

Notes: All the estimations are based on the 2SLS IV strategy. Tariff variable is the manufacturing employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. The dependent variables in the first two estimates are the change in log manufacturing employment, and in the third estimate, it is the change in log gender employment gap. The skill gap is the ratio between skilled and unskilled, and brawn-intensity is production/non-production workers. Migration rate represents the number of individuals who migrated since the last census as a share of the working-age population. Union-intensity is the share of union members. Skilled rate denotes skilled workers as a share of skilled 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.

3.7.6 Robustness Check

To test the validity of the results and whether they are sensitive to different instruments, this section of the chapter performs a robustness check using an alternative instrument for the change in the trade protection measure. As an alternative instrument, we use the average tariffs for nine low and middle-income countries (Chile, China, India, Malawi, Malaysia, Mali,

Mauritius, Mexico and Nigeria) that have undergone tariff liberalisation over the same period and that have available tariff data. These are countries that have similar characteristics to South Africa in terms of the size of the economy (except for China and India), manufacturing sector, labour market, and regional wage and employment heterogeneity. We expect that tariff reductions in South Africa are correlated with tariff reductions in other low and middle-income countries underpinned by the Uruguay Round WTO Agreements.

We then follow Autor et al. (2015)[27] by weighting the average tariffs of these countries by the 1996 municipal manufacturing employment share to obtain regional tariffs using equation (3.4). The first-stage regression is performed to determine the correlation of the employment-weighted tariffs, and the results are presented in Table 3.3A in the appendix. The result shows a strong positive correlation between the change in tariffs in South Africa and tariffs in low and middle-income countries. This is largely driven by the common regional employment shares used as weights to construct both regional tariff measures[28].

Table 3.16 provides estimation results of the effect of tariff reduction (instrumented by alternative tariffs) on gendered manufacturing employment. The findings are consistent with the main results even though the coefficients are much larger. The estimates show that tariff reductions are unfavourable to the growth of manufacturing employment. In addition, the negative effect on manufacturing is more pronounced on the employment of women, particularly Black women, compared to their male counterparts, leading to a wider gender employment gap. The employment of Whites in manufacturing remains unaffected by reductions in tariffs.

Lastly, we test for the sensitivity of the main results using alternative control variables. For these tests, we categorise the control variables according to the sub-group. The results shown in Table 3.6A confirm that tariff reduction has an adverse effect on manufacturing employment, albeit the tariff coefficient is larger. The effect remains stronger for women, particularly Black women relative to men. Tariffs reduction also lower manufacturing employment of White men and White women, however, the effect is only significant at the 10% level.

[27] The difference between this method and Autor et al. (2015) is that in this thesis the method is used to instrument for regional tariffs in South Africa, while Autor et al. (2015) use the method as an instrument for regional imports in the US.
[28] To overcome this, we regressed South African employment-weighted tariffs on alternative employment-weighted tariffs and estimated the predicted values. In the second stage regressions we used the predicted tariff values to estimate the effect of tariffs on manufacturing employment.

Table 3.16: The effects of tariff liberalisation on manufacturing employment using alternative tariffs

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent variables: Change in log manufacturing employment						
VARIABLES	Aggregate	Female	Male	Black female	Black male	White female	White male
ΔTariff_alternative	18.569***	24.646***	15.145***	26.808***	14.337**	1.470	14.065
	(4.199)	(5.718)	(5.462)	(7.660)	(5.589)	(9.160)	(11.734)
ΔWorking-age population	0.774***	0.564**	0.801***	0.534*	0.835***	0.929**	0.666*
	(0.174)	(0.234)	(0.180)	(0.273)	(0.182)	(0.426)	(0.362)
ΔMigration rate	0.382*	-0.266	0.560**	-0.368	0.523**	1.639**	2.244***
	(0.226)	(0.302)	(0.223)	(0.383)	(0.232)	(0.726)	(0.809)
ΔUnion-intensity	-0.103	0.246	-0.001	0.486	0.436	3.067*	-0.914
	(0.488)	(0.651)	(0.463)	(0.763)	(0.485)	(1.676)	(1.332)
L.Skill rate	0.540	0.694	0.484	0.707	0.556	1.996	2.532*
	(0.443)	(0.593)	(0.383)	(0.607)	(0.390)	(1.553)	(1.465)
L.Unemployed rate	-0.124	-0.309	-0.309	-0.325	-0.344	-1.580	-1.381
	(0.551)	(0.741)	(0.543)	(0.866)	(0.574)	(1.404)	(1.502)
L.Infrastructure	0.001	-0.006	-0.004	-0.012	-0.005	0.027	-0.027
	(0.012)	(0.017)	(0.010)	(0.018)	(0.011)	(0.025)	(0.019)
L.Manufacturing share	-1.988***	-1.385***	-2.101***	-1.337**	-2.095***	-2.431*	-4.166***
	(0.379)	(0.508)	(0.411)	(0.592)	(0.420)	(1.339)	(1.277)
Constant	0.585**	1.476***	0.467*	1.276***	0.494**	-0.418	-0.557
	(0.232)	(0.306)	(0.240)	(0.410)	(0.244)	(0.571)	(0.514)
Observations	467	465	466	463	466	387	416
R-squared	0.091		0.161		0.184	0.130	0.101
Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IV	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. Alternative tariffs represents employment-weighted tariffs for low and middle-income countries in the initial period (1996 and 2001 respectively). 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.

3.8 Concluding Remarks

The first-difference model and IV estimation strategy are employed to estimate the effect of reduction in tariffs on gendered employment in manufacturing. The analysis is carried out by first constructing a local labour market trade protection measure, which involves weighting tariffs by the local labour market's initial employment share. Second, we use the local labour market trade protection measure to estimate the effects on manufacturing wages and gendered employment across local labour markets. Given the different initial employment composition by industry across local labour markets, and different tariff levels across industries, the chapter investigates the extent of the gendered effect between those local labour markets that faced greater exposure to tariff reduction against those that faced less exposure during the post-apartheid period.

One of the critical findings of the chapter is that tariff liberalisation has no effect on manufacturing wages in South Africa. This implies that tariff liberalisation rather impacts the manufacturing sector through changes in employment. The second critical finding is that the reduction of tariffs over the post-apartheid period is associated with slower manufacturing employment growth in South Africa from this time, and this result is in line with the existing literature. In the chapter, we show tariff reductions are the predominant drivers of slow manufacturing employment growth. We also control for imports and show that tariffs not only increase imports but also affect prices of domestic substitutes, which in turn has an effect on manufacturing employment. The chapter also examines the gendered effects of tariff liberalisation and find a sharp decline in women's employment compared to men's in manufacturing, suggesting strongly that the effects of tariff reductions differ between genders.

The disaggregated analysis by race reveals that tariff liberalisation has no effect on the gender employment gap of Whites, but has a particularly adverse effect on Blacks. The findings reflect how a history of racial and gender discrimination has led to the segmentation of labour markets by industry and gender. The implication is that the adverse employment effects of tariff liberalisation have been concentrated on specific categories of labour defined according to their gender, race, and industry of employment. A further implication is that the greater specificity in employment, the more concentrated the effects of shocks on particular groupings of workers. Overall, reductions in discrimination have not been sufficient to offset the gendered and racial composition effects of tariff liberalisation on manufacturing employment.

We further investigate the channels through which tariff liberalisation affects the gender employment gap. We find that the main contributing factor to gendered employment effects of tariff liberalisation is industrial segregation. We do not find evidence in support of less discrimination and trade-induced technological change benefitting the employment of women through reductions in the skills-gap and brawn-intensity of production. The results remain robust when we estimate the tariff liberalisation effect by excluding the textile, clothing, and footwear industry from manufacturing employment.

Our findings on gendered employment, and the channels through which tariff reductions affect gendered employment, diverge from and contradict evidence from other developing countries, particularly studies from Brazil and Indonesia, both of which show tariff liberalisation as benefitting women. This shows that the South African experience is different from those of other developing countries. Unlike other developing economies, tariff liberalisation in this country, is not accompanied by channels through which the gender employment gap is reduced, meaning that, for South Africa, tariff liberalisation has a more complex and nuanced outcome.

These findings also highlight the limitation of the theoretical channels, in the sense that the effects of the channels are country-specific and therefore cannot be generalised. The tariff liberalisation context of the country, specifically the industry-bias, drives the effects of the channels. For example, South Africa has experienced large reductions in tariffs in female-intensive industries. While a study in Brazil (Gaddis & Pieters, 2017) shows that tariff reductions are not systematically different for male and female-intensive industries, it is possible that the negative effects of tariff liberalisation in that country were more pronounced on men because they constituted the largest share of the employed in the tradable sector and the labour force as a whole. In Indonesia, the initial tariff structure was female-biased, and thus tariff cuts benefitted female-intensive sectors. This explains how our research outcomes could contradict the findings of studies done in Brazil and Indonesia.

The broad implication, both from the findings of this chapter, and from the literature, is that the combination of initial tariff protection, plus race and gender specificity of employment across industries, shapes employment outcomes from liberalisation. These influences differ across countries, leading to country-specific effects from liberalisation.

Chapter 4

4. Tariff Liberalisation Effects on Gendered Employment in South Africa: A Services Sector Analysis

4.1 Introduction

A key focus of the tariff liberalisation effects on labour market outcomes is the manufacturing sector. The econometric analysis in Chapter 3 reveals that tariff liberalisation has no significant effect on manufacturing wages. Yet, there a strong positive association between changes in tariff exposure and changes in manufacturing employment at the local labour market level. Furthermore, the chapter reveals that the adverse effect of tariff reductions falls disproportionately on the employment of women rather than men, thereby widening the gender employment gap. Chapter 3 also demonstrates the heterogeneous effect of tariff liberalisation by race with stronger effects on the employment of Blacks, and Black women in particular. In contrast, the reduction of tariffs has had no significant effects on employment of Whites in manufacturing.

This chapter extends the previous chapter's analysis by empirically investigating what happens to the jobs lost in manufacturing. The main focus is on whether the services sector absorbs, or is likely to absorb, the employment lost in manufacturing. This chapter has three main objectives. Firstly, it seeks to assess the extent to which tariff liberalisation that has occurred in South Africa since the early 1990s, prompted structural shifts in the employment of labour from manufacturing to services. Secondly, it studies three transmission channels through which the reduction in tariffs in manufacturing affects employment in the services sector: derived demand for services by manufacturing firms, income effect, and infrastructure investment. These indirect effects have not been widely considered in the existing literature. Thirdly, the chapter analyses the extent to which the employment effects differ across gender and race.

Theoretically, the Heckscher-Ohlin and Stopler-Samuelson theorems already mentioned suggest that tariff liberalisation induces a structural shift in production from manufacturing to services (Edwards, 1988; Leamer, 1995) through changes in wages relative to capital or changes in wages of skilled workers relative to unskilled workers. A discussion of these

structural shifts in response to liberalisation is provided in Section 1.1. The expected outcome is a change in the composition of employment from the manufacturing sector towards services. However, there are several limitations to this standard framework. Firstly, inter-sectoral production linkages between services and manufacturing imply 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; Wacziarg & Wallack, 2004). In this chapter, we focus on three spillover effects: (i) derived demand for services input by manufacturing; (ii) income effects from employment losses in manufacturing; and (iii) declines in regional investment linked to slower growth in manufacturing production.

Secondly, in the short to medium term, labour may be immobile across sectors or across regions. For example, as per the Specific-Factors model, labour may be specific to manufacturing, and therefore, reallocation to services would be restricted in the short to medium-run (Topalova, 2010). The implication is that the effect of tariff liberalisation on employment and wages will fall more heavily on those workers that are specific to industries facing relatively large cuts in tariffs. Given differences in the composition of industries across regions, we would also expect to find regional variation in the effects of tariffs on services employment arising from tariff liberalisation, in that there will be limited absorption into services for workers that are specific to the manufacturing industry as well as those who are facing high reallocation costs.

This chapter contributes towards a broader understanding of the effect of tariff liberalisation on the services sector in the context of SSA, using South Africa as a case study. The topic is of relevance to the broader literature on structural changes in the composition of employment in response to tariff liberalisation as few studies of this nature have been done on emerging economies.

The investigation in this chapter is also of relevance to the empirical literature on the effect of tariff liberalisation on employment in South Africa. Research conducted by Bell and Quintieri (2000) and Tregenna (2008) highlight that the relationship between manufacturing and services in South Africa is complementary. The implication is that manufacturing is a significant source of demand for the inputs from the service sector, implying that, as manufacturing contracts in response to tariff liberalisation, so too may services. This contrasts the strand of literature that argues that tariff liberalisation induces a structural shift in the composition of employment from

manufacturing to services (Bhorat & Hodge, 1999; Bhorat et al., 2014; Edwards, 2001; Rodrik, 2008; Tregenna, 2008).

The empirical literature on South Africa and other emerging economies does not explicitly investigate the channels through which tariff reductions faced by producers in the manufacturing sector affect employment in services. South Africa has a fairly well-developed manufacturing sector with strong linkages to services (Tregenna, 2008). Consequently, we would anticipate fairly strong spillover effects arising from the liberalisation of manufacturing.

The gendered effects of tariff liberalisation on structural change towards services is also under-explored.[29] Bhorat (2000), Ngai and Petrongolo (2012) and Olivetti and Petrongolo (2014) argue that there is a preference for skilled workers in services, and that growth in this sector on aggregate benefits women more than men, given the higher skills composition of the female labour force compared to men. Structural shifts in employment towards services from tariff liberalisation may thus improve the demand for women in services, as has been found in other emerging economies (Aguayo-Téllez et al., 2014; Ederington et al., 2009)[30]. This may offset the comparatively large decline in employment of women in manufacturing from tariff liberalisation shown in chapter 3.

The structure of the chapter is as follows: Sections 4.2 and 4.3 of the chapter present reviews of the theoretical and empirical literature, respectively. Section 4.4 presents the empirical model utilised, and Section 4.5 briefly previews the data. Section 4.6 provides an analysis of the empirical estimation results and discusses the sensitivity of the results. Section 4.7 concludes the chapter.

4.2 Review of the Theoretical Literature

This section of the chapter presents the theoretical model developed by Edwards (1988) to understand how tariff liberalisation in manufacturing affects the services sector. This model is an extension of the standard Heckscher-Ohlin model that incorporates exportables, importables and nontradable sectors.

[29] An exception is Thurlow (2006), who uses a CGE model to simulate the effect of tariff liberalisation on employment. The study illustrates that South African women in services benefit from tariff reductions.
[30] In Brazil, Gaddis and Pieters (Gaddis & Pieters, 2017) find that only low-skilled men are able to partly reallocate to services following liberalisation.

Consider a small open economy with three goods (importables, exportables and nontradables) and two factors (capital and labour). Importables is manufacturing, exportables represents the primary sector, and the nontradables represents the services sector. Capital is assumed to be sector-specific, while labour is mobile across the three sectors. The order of capital-labour ratio in production is assumed to be importables > nontradables > exportables. From this order, it is evident that exportables are the most labour-intensive sector. This is anticipated to be the case in emerging economies that are labour abundant. The model operates under perfect competition in product and factor markets. Further assumptions include incomplete specialisation within regions, fixed labour supply and flexible wages.

At the long-run equilibrium, factor prices in exportables are determined by world prices only and those in importables are determined by world prices plus tariffs. These prices, under perfect competition, determine factor prices and therefore the price of nontradables. According to Edwards (1988), production and factor allocation in the production of nontradables is determined by the demand for nontradables. The remaining factors are allocated to the production of exportables and importables on a comparative advantage basis, as described by the Heckscher-Ohlin model. The price of exportables is the numeraire (Px = 1).

Figure 4.1 illustrates the model taken from Edwards (1998) and the adjustment process to tariff reductions using a three-good Edgeworth-Bowley box. In the diagram, the isoquant for nontradables is drawn from the origin O_N, for exportables the origin is O_X and production of importables is the distance $O_M R$. The initial equilibrium is where the slope of the nontradables isoquant NN_O is equal to the slope of the exportables and importables isoquants (not drawn) and are tangent at point R. The capital-labour ratio for nontradables is given by the slope of the line $O_N O_M$.

Tariff liberalisation causes prices of importables to drop, and according to the Stolper-Samuelson theorem, this leads to lower capital rents and higher wages for workers. There will also be a shift in production from importables to nontradables and exportables for two main reasons. Firstly, capital intensity of production rises in nontradables and exportables in response to the decline in the rental rate relative to wage rates. Secondly, given the capital-labour intensity assumption, demand for nontradables will increase as a result of tariff reductions. This follows from the Stolper-Samuelson theorem because: (i) the price of

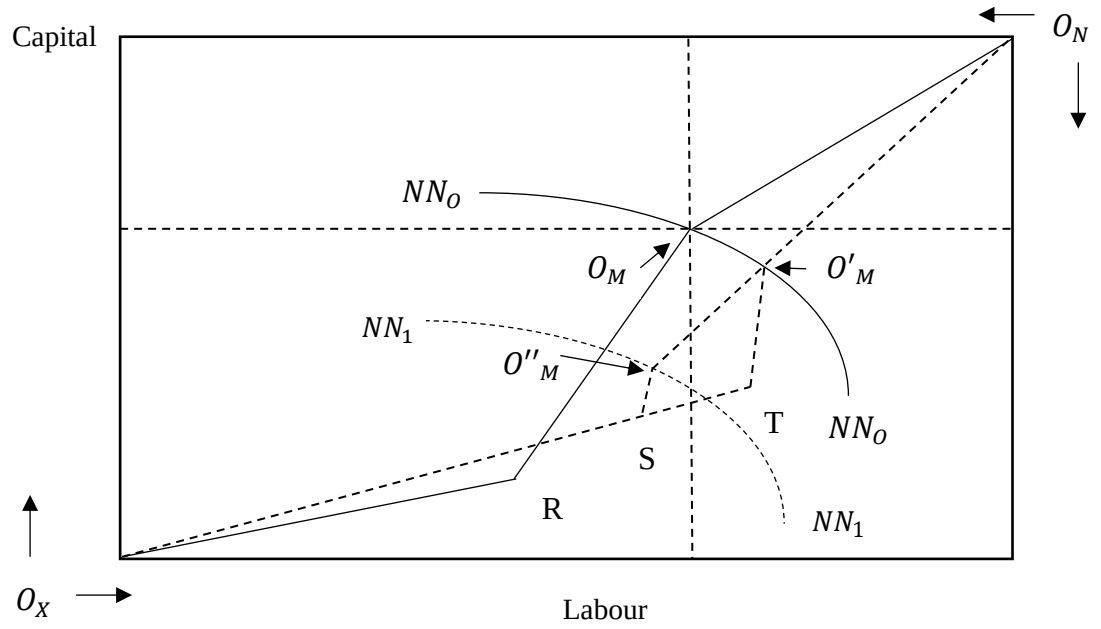
nontradables will decrease compared to the price of exportables, which will decrease as the prices for importables decline. This dynamic is a substitution effect and is underpinned by the higher capital-labour ratio and subsequent lower rental rate relative to the wage rate in nontradables vs exportables. (ii) The lower importables prices will have a positive aggregate income effect. Income increases because lower prices of importables translates to lower prices of final imported manufactured goods and lower intermediate input prices. The higher aggregate income will, in turn, have a positive effect on the demand for nontradables because (a) consumers can spend the excess income on nontradables, and (b) local exporting firms can expand (because of cheaper intermediate inputs[31]) and this will increase the demand for services.

In summary, the economy will adjust to tariff reduction in importables given the assumption of full mobility of labour and differences in capital intensities across sectors in the following manner: (i) the price of nontradables will fall relative to exportables; (ii) wages will increase; (iii) exportables and nontradables sectors will expand as production increases and (iv) the importables sector will contract as production decreases. The employment effect will, therefore, be an increase in employment in exportables and nontradables in comparison to the importables.

In Figure 4.1, the dashed lines show production at the new equilibrium following tariff reduction in importables. The resultant increase in demand for nontradables will shift the capital-labour ratio for nontradables to the left of the NN_O isoquant to a point such as O''_M. The dashed isoquant represents the new nontradables isoquant NN_1. Production of exportables is given by the distance $O_X S$ and the production of importables at a lower production line $O''_M S$ and the production of nontrables equal to $O_N O''_M$.

[31] This model does not incorporate intermediate inputs.

Figure 4.1: Long-run adjustment in production and factor allocation following tariff liberalisation



Source: Edwards (1988)

The model predicts a structural change in employment from manufacturing, the import competing good, to services in response to tariff reductions on manufacturing goods. The implication of the model for a regional analysis where factors are not mobile across regions in the short-term, but are mobile across sectors, is that we would expect to see structural shifts in employment and output towards services across all regions, with stronger shifts in those regions where manufacturing comprises a greater proportion of initial employment.

However, the theory as applied above faces several limitations that may affect the outcomes. The model does not fully account for inter-dependency between importables and nontradables (services). Consequently, tariff liberalisation may affect the services sector through additional channels to those discussed in the theoretical model. For example, tariff liberalisation may benefit the services sector through cheaper imported inputs. This is because capital intensive and business-related services require imported inputs (Dehejia & Panagariya, 2014; Eichengreen & Gupta, 2013). Examples are computer hardware and software for business and financial services as well as vehicles for courier companies. Reductions in tariffs also reduce the prices of domestically produced substitutes (Feenstra, 2015). Therefore, lower tariffs provide a wider variety of cheaper imported inputs allowing for the growth in services, which

will increase demand for workers in that sector. Structural shifts towards services would thus be more pronounced in this case.

On the other hand, spillovers between importables (manufacturing) and services are an additional form of inter-dependency that may diminish growth in the services sector. A key spillover channel is the derived demand in manufacturing for services. The services sector is a vital input in manufacturing. For example, 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). The implication is that reductions in manufacturing output, following tariff reductions, will have strong negative spillover effects on demand for services inputs, leading to less employment in services. Dasgupta and Singh (2005), Dehejia and Panagariya (2014) and Eichengreen and Gupta (2013), argue that the unfavourable tariff effects on the manufacturing sector may spill over to the services sector through this channel.

The second spillover channel is through the income effect, which has two opposing influences: Firstly, gains from trade in a form of increases in real income and welfare due to an increase in prices of exportables and a greater supply of cheaper imported manufacturing goods will raise demand for all products, including services, as is argued by Dehejia and Panagariya (2014) and Winters and Martuscelli (2014). This relationship is captured in the theoretical model of Edwards (1988). However, when looking at regional effects from liberalisation, lower aggregate incomes from employment in manufacturing also need to be considered as this could result in a net negative income effect on demand for products in regions where manufacturing is highly concentrated. Mian and Sufi (2014), for example, find that locations in the US that are exposed to trade have lower aggregate employment and earnings, and reduced spending on non-traded domestic services. Therefore, on aggregate, income effects may differ across regions depending on the employment share of import-competing manufacturing in each region. As such, regions that have a higher manufacturing employment share may see more adverse income effects dominate than positive gains from trade.

A third spillover channel through which tariff liberalisation flows to affect services is via manufacturing infrastructure investment. If liberalisation reduces demand for manufacturing, then there will be a decline in demand for manufacturing infrastructure such as roads, buildings, electricity provision to industrial estates or zones as well as housing infrastructure for manufacturing workers. It is also likely that there may be a decline in investment in

manufacturing which will adversely affect some services sectors, such as construction. For example, a study in Chile by Martincus and Blyde (2013) finds that manufacturing employment is directly related to road infrastructure. These negative effects will also be more pronounced in regions that specialise in the import competing manufacturing sector.

The Edwards (1988) theory also assumes that labour is perfectly mobile across industries. If workers' skills are specific to manufacturing, then it may not be possible for services to absorb all the labour that is released from manufacturing in the face of increased import competition. Services, for example, are on average more skill-intensive than manufacturing. Technological progress in services fuelled by imports of intermediate inputs in services that complement skilled labour would further diminish the capacity of services to absorb unskilled labour released by manufacturing (Autor et al., 2015). The implication is a diminished growth in the services sector, possibly combined with higher unemployment or more dramatic wage declines of labour with skills specific to manufacturing.

A further caveat relates to the measurement of services. Import competition in manufacturing can lead to the fragmentation of production and the outsourcing of the services related parts of the production process, e.g. catering, cleaning, and professional services such as accounting, and marketing. Evidence of this has been found abroad (Dasgupta & Singh, 2005; Eichengreen & Gupta, 2013). Expansion of outsourcing activities is supported by the growing need for manufacturing firms to focus on their core objective, which is the production of goods. The outcome is reflected in strong growth in services. This, however, is not 'real' growth in employment, but rather changes in the industrial classification of existing employment. Nevertheless, through this classification change, there will be a rise in employment in services and a decline in manufacturing, although the net employment effect is zero.

The structural shift in employment is also expected to have differential effects for men and women. The services sector, particularly business-related services, are skill-intensive in comparison to manufacturing. Structural shifts in employment towards services from manufacturing are consequently likely to raise the demand for skilled labour. Wood (1995), Acemoglu (2003) and Thoenig and Verdier (2003) argue that tariff effects on the employment of women depend on the relative skill endowment of women. If women in the labour force are more skilled than the men, then it is likely that there may be stronger growth in employment of women than men in services associated with liberalisation.

A second contributing factor to differential effects across gender is industry segregation within manufacturing. The gendered effects in manufacturing influence the supply of labour entering services. The previous chapter demonstrated that tariff liberalisation has profoundly negative effects on female employment in manufacturing, leading to a higher labour supply of women compared to that of men. If services are more female-intensive, the sector will absorb more women than men.

Four main hypotheses can be drawn from this theoretical overview.

- Firstly, trade liberalisation will see a rise in the services/manufacturing (the import competing sector) employment ratio across regions.
- Secondly, growth of the services sector in response to liberalisation will absorb jobs lost in manufacturing.
- Thirdly, derived demand, income and infrastructure spillover effects will attenuate the absorption by services of manufacturing jobs lost.
- Finally, gender and race specificities in employment across industries imply that the labour market effects of trade liberalisation will not be uniform across labour categories.

4.3 Related Empirical Literature

International empirical studies have investigated the effects of tariffs on services by drawing on the trade theories discussed in the previous section. One cluster in the literature finds that tariff liberalisation leads to a weak structural shift away from manufacturing to services (Dix-Carneiro & Kovak, 2015; Menezes-Filho & Muendler, 2011; Wacziarg & Wallack, 2004).

Among these studies, Wacziarg and Wallack (2004) analyse whether tariff liberalisation contributes to structural shifts in employment, using sectoral data for 25 developing countries from 1969 to 1997. The overall finding is that employment levels drop in all sectors in response to liberalisation and structural change does not occur at a 1-digit ILO industry level. However, the study does find modest movement across manufacturing industries (at a 3-digit level) in these countries. Wacziarg and Wallack (2004) suggest that the effects of liberalisation on labour reallocation can differ across countries, depending on the range and intensity of tariff reductions.

Menezes-Filho and Muendler (2011) utilise employer-employee data from Brazil from 1986 to 2001 to examine the reallocation of workers across sectors over time following trade reform in the 1990s. Multi-logit estimations reveal that reallocation of workers across sectors, including from manufacturing to services, in response to tariff liberalisation was slow due to high adjustment costs, resulting in the unemployment of many workers for periods of time.

Dix-Carneiro and Kovak (2015) develop a specific factors model of regional economies using an updated matched employer-employee dataset from 1986 to 2010 to analyse the dynamics of labour market adjustment to tariff liberalisation that occurred in the 1990s in Brazil. They use a simulation of inter-industry reallocation. The study finds evidence of rapid initial sector reallocation from the tradable sector to the nontradable sector in response to lower wages in the tradable sector, post-liberalisation. However, the reallocation into nontradable sector is not sufficient to cover the loss of employment in the tradable sector.

The other cluster of research focuses on the spillover effects on services from manufacturing (Acemoglu et al., 2016; Autor et al., 2015; Dehejia & Panagariya, 2014; Wacziarg & Wallack, 2004). Autor et al. (2015) use regional data from the US for the period 1990 to 2007 to study the effects of Chinese imports on the rates of employment. Their study proceeds by exploring the effect of trade and technology exposure on the share of the working-age population employed in the manufacturing and non-manufacturing (services) sectors and across three occupations, namely abstract, routine, and manual-task-intensive occupations. They instrument US imports from China with non-US country exposure to Chinese imports and construct a routine task exposure across occupations to identify the effects of trade and technology. Marginal spillover effects on the services are observed. While Autor et al. (2015) do not explicitly investigate the channels that explain the spillover effects, they speculate that weakened derived demand from manufacturing is a possible contributor to the lower employment levels in services across all occupations, except for abstract tasks.

In a later study Acemoglu et al. (2016) explore the effects of Chinese imports on US employment through input-output linkages for the period 2000 to 2007 and find similar evidence that spillover effects result in diminished reallocation effects towards services through demand spillover. Employment in the contracting manufacturing sector lowered the level of employment in services.

Dehejia and Panagariya (2014) use firm-level data from India to investigate the relationship between manufacturing and services following tariff liberalisation. They utilise the instrumental variable approach and analysed two periods, 2001-2002 and 2006-2007 and the input-output table to generate an index of reliance demand for services by manufacturing. Their main finding was that there are positive spillovers from manufacturing growth to services growth during these periods in India. They argue that the spillover effects arise from derived demand for services inputs from manufacturing. The study investigates the income spillover channel, and finds no evidence that the spillover is through the income effect.

There are a few studies that explore the differential employment effects of liberalisation across gender. One of the studies is by Gaddis and Pieters (2017) who use microregion data that disaggregates workers by gender and skills levels. These authors find weak reallocation of workers from tradable to nontradable sectors occurs only among low-skilled men. They find there to be no reallocation of women and high-skilled workers into services. The authors argue that these results are because low-skilled men face stronger negative effects of tariff reductions in the tradable sector relative to their highly skilled counterparts.

The South African literature shows similar inconsistent effects of liberalisation on services. The inclusive findings are swayed in part by the level of analysis. Existing studies focus on the effect of liberalisation in manufacturing on the services sector at either the national or industry level and thus ignore regional heterogeneity. Tariff effects may be more pronounced at the regional level because of differences in industry composition and tariff exposure at that level.

The first group of researchers, Bhorat and Hodge (1999), Edwards (2001) and Rodrik (2008), find that the liberalisation of tariffs induces a structural shift in employment away from the manufacturing sector towards the services sector. Their studies demonstrate that the employment lost in contracting manufacturing is absorbed in an expanding services sector.

Another branch of the literature shows the spillover effects of tariff reductions. Tregenna (2008) explores the extent to which employment in South Africa moves between the manufacturing and services sectors, with one of the channels being international trade. The study finds that there are backwards and forwards linkages between the manufacturing and services sectors. The study also highlights that manufacturing is a key source of demand for the services sector. Although the study provides some insight into inter-sectoral linkages

between manufacturing and services, it does not directly analyse the impact of international trade, especially tariffs, on services.

Erten et al. (2019) expand the South African literature by exploiting district heterogeneity. The study utilises Post-Apartheid Labour Market Series (PALMS) dataset, which harmonises labour market variables from household surveys of Statistics South Africa from 1993 to 2019, however this study covers the period 1994 to 2004. They adopt simple Ordinary Least Squares (OLS) econometric methods to study the effects of tariff liberalisation across sectors. Their very recent study finds no association between tariff reduction and services employment. In the study, there is no evidence of structural change or spillover effects on services.

Empirical literature in South Africa confirms the gendered employment effects of tariff liberalisation. Local studies show that female employment growth exceeds that of males in the services sector following tariff liberalisation from the early 1990s (Bhorat, 2000; Thurlow, 2006). Bhorat (2000) argues that trade and technological progress contributed to the growth of the services sector and more especially to female employment. This growth is fuelled by growth in the financial and business sectors as well as by widespread technological change towards computerisation in the sector. The expanding sectors are increasingly computerized, particularly for desktop occupations such as clerical occupations where most women are employed. The studies by Bhorat (2000) and Thurlow (2006) are based on the national labour market.

This chapter extends the South African literature by empirically evaluating the effect of import tariff cuts in manufacturing on service employment using disaggregated regional data. A particular contribution is its focus on estimating the spillover effects of manufacturing on the services sector. We base this exploration on the assumption that there is more heterogeneity across municipalities than is identified in analyses of aggregated data. Finally, the chapter provides insights into gendered tariff liberalisation effects in services.

4.4 Empirical Model

This chapter follows an empirical strategy similar to the one used in the previous chapter, where we employed a first-difference specification and IV estimation strategy. Given the similarity between the models, the discussion in this section is brief. The model is explained in great

detail in Section 3.5. We estimate the change in services employment at the regional level in South Africa from 1996 to 2001 and from 2001 to 2011, using the following specification:

$$\Delta lnE_{mt}^{serv} = \alpha + \beta_1 \Delta TPman_{mt} + \beta_2 \Delta X'_{mt} + \beta_3 Z'_{m,t-1} + \lambda_t + \Delta\varepsilon_{mt} \quad (4.1)$$

where the dependent variable, ΔlnE_{mt}^{serv}, is the change in log services employment and $\Delta TPmn_{mt}$ represents the change in the manufacturing tariff protection measure for municipality *m* at time *t*. Our model includes two sets of control variables denoted by $\Delta X'_{mt}$ and $Z'_{m,t-1}$ where $\Delta X'_{mt}$ reflects the time-varying log working-age population and migration rate. Lagged control variables are denoted by $Z'_{m,t-1}$, which represents the share of the skill rate, percentage of unemployed of the working-age population, the employment share of manufacturing, and indicators of infrastructure. We also account for period fixed effects (λ_t).

4.5 Data

To analyse the gendered effects of tariff liberalisation on services employment, we utilise data from two main sources, namely the South African Population Census (a database of full census records and a 10% sample census dataset) annual nominal tariff data obtained from Edwards (2015). We construct a panel dataset using the 10% sample datasets of the 1996, 2001, and 2011 censuses and merged these with the tariff data. We obtain the trade protection measure by applying municipality-level manufacturing employment shares to tariff rates. The datasets, as well as the construction of the variables, are discussed in detail in the previous chapter. The construction of the services wage variable is identical to the method used to construct the manufacturing wage. However, the focus of this chapter is on income per worker in services. Services employment includes employment in the following 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. Our unit of analysis is the municipality. The final dataset contains 234 municipalities for each census year, accumulating to 702 observations for the entire period.

4.5.1 A Preview of the Data

Table 4.1 presents an overview of the structural change from manufacturing to services using the manufacturing to services employment ratio from 1996 to 2011 as an indicator. The data reveal a dramatic shift in the composition of employment towards services. As shown in the table, employment in services was five times that of manufacturing in 1996, but this ratio rose to about 8.4 in 2011. This data corroborates the findings of other literature that argues that the South African economy has experienced a structural shift from manufacturing towards services (Bhorat & Hodge, 1999; Edwards, 2001; Rodrik, 2008).

The data also shows the variation in the intensity and reallocation of labour across gender. Services comprise a disproportionate share of employment of women. For example, the services to manufacturing employment ratio for women in 1996 was close to 7, compared to 4 for men. This ratio has risen for both males and females, but marginally more so for females. By 2011 the ratio for women was about 12 compared to almost 7 for men. Overall, the data reveals that services are more female-intensive than manufacturing.

When we decompose the services to manufacturing employment ratio by race, we see that in 1996 more Whites were employed in services relative to manufacturing than Blacks. The services to manufacturing ratio was about 6 for Whites and about 5 for Blacks in 1996. However, by 2011 the trend changed, and services absorbed more Blacks (with a ratio of approximately 8.5) than Whites (the ratio was approximately 8). There is a therefore a stronger restructuring in the sectoral composition of employment towards services for Blacks than Whites.

Reallocation of labour is also gendered within and across race groups. As with the aggregate data, the ratio is higher for women relative to men irrespective of race. South Africa has experienced a dramatic rise in the ratio for Black females compared to all other categories, 6.4 to 12.06 compared to 3.89 and 6.76 for Black men in 1996 and 2011, respectively. Whereas for White women, the ratio is high, above 8.7 compared to less than 6.40 for White men in all periods. Broadly, the data shows that the services sector absorbed much of the rapid increase in female labour force participation that the country has experienced since the early 1990s.

Table 4.1: Services to manufacturing employment ratios over time

	1996	2001	2011
Structural change			
Aggregate	4.96	5.12	8.37
Female	6.84	7.26	11.66
Male	4.00	4.04	6.73
Black	4.75	5.28	8.48
Female	6.40	7.22	12.06
Male	3.89	4.20	6.76
White	5.85	5.50	7.79
Female	9.02	8.70	10.09
Male	4.43	4.07	6.40

Notes: Structural change is services employment divided by manufacturing employment. The gap in gender composition is calculated as men/female. Black includes Africans, Coloureds and Indians/Asians.
Source: Full census data

Table 4.2 illustrates services employment as a share of total employment. Services are the dominant and rising source of employment for South African workers. Services as a share of total employment grew 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. Moreover, employment shares vary by race. The share of Whites working in services was initially higher than that of Blacks (78% vs 67.5% in 1996), but this difference was eliminated over the period (82.9% for Whites and 81.8% for Blacks in 2011). 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.

Table 4.2: 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: Full census data

The services sector is not homogenous. There are massive differences across the sub-sectors in terms of gender and skill composition. Table 4.3 shows the skill share across the sub-sectors from 1996 to 2011. The share of skilled workers has increased in all sub-sectors over the years. Finance and Community have consistently had the highest share of skilled workers while Construction and Private households had the lowest share. The implication is that unskilled workers from manufacturing may struggle to get absorbed in some of the sectors within services. In addition, spillovers from manufacturing may differ across the sub-sectors. For example, manufacturing firms' demand for professional and skill-intensive services such as Finance services may decline following the contraction of the manufacturing sector.

Table 4.3: Skill share in services sub-sectors

Sub-sectors	1996	2001	2011
Electricity	37.5	45.7	61.3
Construction	14.8	25.5	40.5
Wholesale	33.3	43.8	54.4
Transport	29.9	45.8	56.6
Finance	63.7	67.9	64.5
Community	63.6	66.9	68.8
Private households	4.5	9.3	30.7

Note: Sub-sector services skill shares are calculated as sub-sector services employment divided by the respective total employment (skilled plus unskilled). The values are expressed as percentages.
Source: Full census data

The gender composition of employment within services also differs across sectors. The initial gender composition across sub-sectors in 1996 is displayed in Table 4.4. 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. The community sub-sector employs about 32.9% of women and 24.7% 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 32.6% and 6.8% respectively, while in construction the share is 1.5% and 17.4% respectively.

Table 4.4: Services employment share by gender in 1996

Sub-sector	Female	Male
Electricity	0.6	3.2
Construction	1.5	17.4
Wholesale	18.5	20.9
Transport	2.7	13.9
Finance	11.2	13.2
Community	32.9	24.7
Private households	32.6	6.8

Note: Sub-sector shares are calculated as total sub-sector services employment divided by respective total services employment. The values are expressed as percentages.
Source: Full census data

Table 4.5 displays gender employment intensities by race across the services sub-sectors. Although the Community sub-sector is the largest employer of Blacks and Whites, we see considerable heterogeneity in terms of employment intensities across the other sub-sectors. Black women dominate in Private household (42%) and are also largely employed in Wholesale & Trade (30%) while Black men predominately employed in Wholesale & Trade (20.5%) and Construction (19.8%). On the other hand, White men and White women are disproportionally represented in Finance, 24.1% and 28.4% respectively. Wholesale & Trade is the second largest employer of Whites within the services sector. This sub-sector employs 17.7% of White women and 22.2% of White men.

The implication of these gendered intensities is that if spillover effects from liberalisation affect certain sectors more than others, this will give rise to differential employment impacts for men and women. For example, reductions in infrastructure investment would disproportionately affect construction and therefore have a greater impact on men in particular Black men.

Table 4.5: Services sub-sector gendered employment intensities by race in 1996

Sub-sector	Black Female	Black Male	White Female	White Male
Electricity	0.4	2.8	1.2	4.4
Construction	1.3	19.8	2.1	9.0
Wholesale	18.7	20.5	17.7	22.2
Transport	1.7	14.3	6.1	12.5
Finance	5.9	10.0	28.4	24.1
Community	30.0	24.1	42.1	26.3
Private household	42.0	8.4	2.4	1.5

Note: Sub-sector employment intensities are calculated as sub-sector services employment divided by the respective total services employment. The values are expressed as percentages. Black comprises of Africans, Coloured and Indians/Asians.
Source: Full census data

A summary of statistics for the change in the trade protection measure and employment variables between 1996 and 2011 is provided in Table 4.6. The summary statistics show a rise in the services to manufacturing employment ratio in the post-apartheid period of about 27.5 log points (approx. percentage points), on average. The standard deviation is 61 log points, suggesting enormous differences in the regional distribution of the change in the structural shift. Furthermore, the change in the structural shift of employment of men is shown to be larger than that of women. The ratio of services to manufacturing employment for women grew by 25.3 log points compared to 29.4 log points for men. 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 and persistent even in the post-apartheid period. 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.

Table 4.6: 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: ΔTPman is the change in trade protection measure (tariff rates weighted by manufacturing employment shares). 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: Full census data

4.6 Empirical Results

In this section, we apply the empirical model described in Section 4.4 to examine the effect of tariff liberalisation on services sector employment between 1996 and 2011. First, we assess whether tariff reductions influence wages in the services sector. This analysis is followed by an estimation of the effects of tariff shocks on structural change, as measured by the ratio of employment in services to that of manufacturing. Next, the chapter estimates the trade effect on aggregate employment in services and identifies the channels through which the relationship is defined. Fourth, the gendered effects of tariff liberalisation on employment in services are examined, together with the channels through which gendered effects arise.

4.6.1 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 services wages[32]. The estimation results are presented in Table

[32] Income per worker is used as a proxy for wage. A detailed explanation of the construction of the wage variable is provided in Section 3.6.2.

4.7. The models in columns (1) and (2) are estimated using the OLS estimation strategy. Column (1) is the baseline model that only controls for the working-age population. In column (2) the baseline model is extended to include other control variables, such as migration rate, skill rate, unemployed rate, infrastructure, and initial manufacturing share. One shortcoming of the OLS measure is that it does not control for potential endogeneity of tariffs. Consequently, in columns (3) to (4), we control for endogeneity by instrumenting 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, suggesting that wages in the services sector are unresponsive to tariff cuts in the manufacturing sector[33]. Consequently, the remainder of the chapter focuses on employment responses to liberalisation.

Table 4.7: The effects of tariff liberalisation on services wages

	(1)	(2)	(3)	(4)	(5)
	Dependent variables: Change in log services wage				
VARIABLES	Baseline	Extended	Extended Aggregate	Extended Female	Extended Male
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
Period FE	Yes	Yes	Yes	Yes	Yes
IV	No	No	Yes	Yes	Yes

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

Notes: Tariff variable is the manufacturing employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. 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

[33] The estimates are based on bracketed income variables and thus we are not able to make a conclusive argument about the wage effect.

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.

4.6.2 Tariff Liberalisation Effects on Structural Change

As outlined in the theoretical section, tariff liberalisation in net manufacturing importing countries such as South Africa could be expected to reduce the price of manufacturing relative to services, thus leading to a structural shift in employment away from manufacturing. In this section, we look at how changes in average manufacturing tariffs affect the services to manufacturing employment ratio across municipalities in South Africa to isolate whether this effect is present. A negative association with the tariff variable is expected, as this would signify that tariff reductions tend to induce shifts in the composition of local employment from manufacturing towards services.

Table 4.8 provides results for the model that estimates the effect of the change in regional tariffs (and other controls) on the change in log services to manufacturing employment ratio. The results indicate a weak negative effect of tariff protection on the services to manufacturing employment ratio. This is in line with the theory that tariff liberalisation leads to a rise in services to manufacturing employment ratio. 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 4.6, 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 4.6, the services to manufacturing employment ratio rose by 27.5 percentage points on average across municipalities. The results suggest that the predicted change in the services to manufacturing ratio that is due to tariff reductions is equivalent to the entire change for the mean municipality. The main implication is that tariff liberalisation appears to have had a substantive contribution towards structural shift in employment within municipalities.

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 75^{th} and 25^{th} 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 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 skilled workers are not losing as many jobs in manufacturing as unskilled workers because of increased demand for skills in manufacturing during this period, a demand driven mainly by technological progress. For this reason, the likelihood exists that there could be a reduced incentive for skilled workers to migrate from manufacturing to services.

Table 4.8: Tariff liberalisation effects on structural change in employment composition

	(1)
VARIABLES	Change in log services/manufacturing employment
ΔTariff	-3.539*
	(1.868)
ΔWorking-age population	0.177
	(0.145)
ΔMigration rate	-0.195
	(0.190)
L.Skill rate	-1.426***
	(0.357)
L.Unemployed rate	0.698*
	(0.394)
L.Infrastructure	0.007
	(0.010)
L.Manufacturing share	2.644***
	(0.401)
Constant	0.014
	(0.194)
Observations	467
R-squared	0.173
Period FE	Yes
IV	Yes

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

Notes: All the estimations are based on the 2SLS IV strategy. Tariff variable is the manufacturing employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. 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.

4.6.3 The Effects of Tariff Liberalisation on Services Sector Employment

In this section we estimate the employment effect within services associated with tariff liberalisation. The results showing the effect of tariff reduction on change in log services employment are presented in Table 4.9. We find a significant (5% level) positive association between the change in local tariff protection and the change in services employment across municipalities. The estimated coefficient of 1.29 implies that a 1 percentage point reduction in the municipal level tariff rate reduced employment in the services sector by 1.29% holding all other factors constant. Tariff liberalisation is thus shown to have *reduced* employment in services relative to its trend.

The negative effects on services employment from liberalisation, as shown by the results from the data is contrary to our theoretical expectations of a structural shift of employment from manufacturing to services. The results imply that the services sector did not absorb the 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 the results 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. 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.

Table 4.9: The effects of tariff liberalisation on services employment

VARIABLES	(1) Change in log services employment
ΔTariff	1.285**
	(0.583)
ΔWorking-age population	1.070***
	(0.052)
ΔMigration rate	0.211***
	(0.067)
L.Skill rate	-0.888***
	(0.133)
L.Unemployed rate	-0.256*
	(0.150)
L.Infrastructure	0.004
	(0.004)
L.Manufacturing share	0.227**
	(0.109)
Constant	0.501***
	(0.068)
Observations	468
R-squared	0.763
Period FE	Yes
IV	Yes

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

Notes: All the estimations are based on the 2SLS IV strategy. Tariff variable is the manufacturing employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. 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.

4.6.3.1 Spillover Effects on Services Sector Employment

In this section, we analyse the various channels through which tariff liberalisation in manufacturing affects services employment. As mentioned in the theoretical literature review, Section 4.2, 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. This section tests the effects of the three channels of services employment.

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

$$DD_{mt} = \sum_i c_i E_{mit} \quad (4.2)$$

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.[34] 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 midpoint and derive mean income per capita (calculated as the sum of income divided by the population) in each municipality. This variable will capture any change in income associated with a loss in employment in manufacturing.

For the infrastructure variable, we use electricity as a proxy for infrastructure investment, where the variable reflects the number of households with electricity as a share of total households. The decision to use electricity is based on the fact that reductions in manufacturing production and employment in response to tariff liberalisation will have reduced demand for infrastructure services, including electricity, by households and firms in those regions. These regions will, therefore, experience low increases in the provision of such services compared to other municipalities. Lower import tariffs affect demand for electricity by firms and consequently lower infrastructure investment by the government. Moreover, Garsous (2012) argues that electricity is a good measure of infrastructure because in that study, electricity produced robust results than any other infrastructure variables.

Table 4.1A in the appendix illustrates a positive correlation of change in tariffs with the channels, but the correlation with income levels is at the 5% significance level, and infrastructure investment is at the 10% significance level. We find an insignificant relationship for derived demand. This shows that change in municipality tariff exposure is weakly correlated with the spillover channels. This, however, does not negate the fact that these are important spillover channels to control for when determining the effect of tariff changes on services employment.

[34] The one implication is that the indicator will be biased upwards for regions that have high shares of labour-intensive manufacturing sectors.

Our empirical approach is to include the spillover channels into the services employment regressions sequentially. Support for our hypothesis that the indirect effects of tariff liberalisation through manufacturing are driving the positive tariff coefficient illustrated in Table 4.9 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 4.10 provides estimation results for the analysis of tariff reduction effect on services employment, controlling for derived demand, income effect, and investment effect. These channels are included separately in columns (1) to (3). Model (1) controls for derived demand, and we find that the tariff coefficient remains positive, but falls marginally and is now significant only at the 10% level. We also find that the derived demand coefficient is positive and significant, providing support for the derived demand spillover effect in driving services employment.

In column (2), we include the income variable and the tariff effect remains positive but is smaller and less significant (10% level). The income coefficient is also positive and significant, suggesting that higher average incomes produce more employment in services. These results suggest 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 effect of liberalisation diminishes, and infrastructure investment is associated with an increase in employment in services. 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 derived demand, income and our proxy for investment, while the trade 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. The results for spillover effects are in line with our expectations. Failure to include controls for the spillover effects bias 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, the insignificance of the tariff coefficient once spillover effects are accounted for still implies that we do not observe the anticipated increase in services employment arising from liberalisation. A significant negative coefficient on the tariff variable would signify this effect. This demonstrates that the theory by Edwards (1988) is lacking by not incorporating the spillover effects in the explanation of tariff effects on the nontradable sector.

There are various possible explanations for this result. Perfect mobility of workers across sectors, as proposed by the Heckscher-Ohlin theory, may be hampered by rigidities. These could include wage rigidities associated with the wage bargaining process (Bhorat et al., 2009). Under the Heckscher-Ohlin model, adjustment takes the form of relative price changes and through this wage 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.

Further, employment losses in manufacturing will also be greater. The previous chapter demonstrated that the liberalisation of tariffs has no significant effect on wages. Thus, the negative effects of liberalisation are disproportionately revealed through declining manufacturing employment[35].

A second explanation is that sector-specific skills impede the relocation of manufacturing workers into services. If services production is more skill-intensive than manufacturing, the less-skilled workers with manufacturing-specific skills may not be able to find jobs in services because they lack the requisite skills that are required in services. In addition, as illustrated in Section 3.2, sector specificity can reduce and make costly the adjustment of labour to tariff liberalisation. The implication is a much smaller increase in services employment than would

[35] Note that employment levels in manufacturing would still decline even if wages are flexible, but with fixed wages, the employment decline would be greater.

otherwise be the case. Our results broadly reflect a subdued structural shift in employment 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.

Table 4.10: 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
Period FE	Yes	Yes	Yes	Yes
IV	Yes	Yes	Yes	Yes

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

Notes: All the estimations are based on the 2SLS IV strategy. Tariff variable is the manufacturing employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. Derived demand is the share of services in cost weighted by employment shares. Income is calculated using the midpoint 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.

4.6.4 Gendered Tariff Liberalisation Effects on Services Sector Employment

The objective of this section is to assess whether tariff liberalisation in manufacturing has, or is likely to have, a gendered effect on services employment. Gender-specific rigidities and industry segregation in manufacturing and services may drive a gender-specific effect of tariff reductions on employment in services. Industry segregation produces gendered effects of tariffs on manufacturing employment, and these effects may influence the tariff effects on services employment. These contributing factors are discussed in greater detail in the theoretical review in Section 4.2.

First, the chapter seeks to determine if the tariff-induced structural change in the employment composition differs for men and women. The estimation results for the effect of tariff reduction on gendered structural change are displayed in Table 4.11. The estimates reveal that there are differences by gender in the structural change of employment from manufacturing to services in response to tariff liberalisation. The shift in the services/manufacturing employment ratio in response to tariff liberalisation is substantially larger for women than for men. We find that the tariff effect on sector reallocation from manufacturing to services is pronounced on Black women. There is no evidence of a structural change in response to tariff liberalisation for men (Black or White) and White women. Nonetheless, the gendered effects are statistically not different as shown by the p-values in columns (2), (4) and (6).

These findings on gendered tariff effects differ from those found for Brazil by Gaddis and Pieters (2017). They find modest sector reallocation of men, in particular, low-skilled men, but no sector movement of women. Our results may be facilitated by industry segregation in both manufacturing and services sectors coupled with industry-bias liberalisation that has been shown in the previous chapter to be sturdier for women, particularly Black women. However, manufacturing employment of White men and White women did not appear to be affected by tariff reductions. The heterogeneous results may also have benefitted women because services are female-intensive. In addition, the gendered effect (and of the race effect for Black women) of tariff reductions on structural change may be driven by gendered demand for labour in the services sector, as shown by the higher services to manufacturing employment ratios for Black women than for other population groups in Table 4.1. It is evident from that table that reallocation from manufacturing to services has been rapid among Black women.

Table 4.11: 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
Period FE	Yes	Yes	Yes	Yes	Yes	Yes
IV	Yes	Yes	Yes	Yes	Yes	Yes
Suest						
Chi(2)		2.389		2.463		0.248
Prob > (Chi2)		0.122		0.117		0.619

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

Notes: All the estimations are based on the 2SLS IV strategy. Tariff variable is the manufacturing employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. 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.

We also analyse the gendered effect of tariffs on services employment, and the results are presented in Table 4.12. While the estimates in columns (1) and (2) reveal that municipalities which are more exposed to tariff reductions experienced a decrease in female and male services employment, the effect is only significant for male employment. In column (3), we regress the change in the ratio of male to female employment in services (the gender employment gap) on tariffs, but the coefficient is insignificant. The models in columns (4) to (6) include the spillover effects from manufacturing, and we find that the magnitude of the coefficients falls, although tariffs remain (weakly) positively associated with the employment of men in services.

Our results suggest that tariff liberalisation is adversely associated with employment growth in the services sector for men, but not women, even after controlling for spillover effects. In neither case, we do not see evidence of rising employment in services following the liberalisation of manufacturing, as per the theory predictions. Rather, we find that those regions that faced relatively strong reductions in tariff protection are those that also experienced weaker growth in employment in services. A key contributing factor appears to be the presence of spillover effects.

Table 4.12: Tariff liberalisation effects on gendered services employment

	(1)	(2)	(3) Gender	(4)	(5)	(6) Gender
VARIABLES	Female	Male	Gap	Female	Male	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
Period FE	Yes	Yes	Yes	Yes	Yes	Yes
IV	Yes	Yes	Yes	Yes	Yes	Yes

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

Notes: All the estimations are based on the 2SLS IV strategy. Tariff variable is the manufacturing employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. The dependent 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.

The chapter extends the analysis by assessing whether the aggregate gendered effects hide differences across racial groups. In Table 4.13, we show the effect of tariff reductions on gendered services employment and the gender employment gap. Panel A shows the unconditional tariff estimates, meaning that in these regressions we are not controlling for spillover channels. However, Panel B shows results when we do control for them (conditional estimates). Behind the insignificant aggregate effect of tariffs on services employment (controlling and not controlling for spillover) is a positive association for White women and an insignificant association for Black women. The positive coefficient on tariffs for men (in Table 4.12) is driven by the association with Black men. The conditional estimates are lower than the unconditional estimates, which suggest that spillover effects are at play, although their effect is marginal. Underpinning these findings is segregation in the services sector in South Africa as will be discussed in Section 4.6.5.

Table 4.13: Tariff liberalisation and gendered services employment by race

	(1)	(2)	(3)
VARIABLES	Female	Male	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)
Period FE	Yes	Yes	Yes
IV	Yes	Yes	Yes

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

Notes: All the estimations are based on the 2SLS IV strategy. Tariff variable is the manufacturing employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. The dependent 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.

4.6.5 Sub-sector Services Gendered Employment Effects of Tariff Liberalisation

The observed differential effects across gender and race may be driven by varying spillover effects across the services sub-sectors[36] which have different gender and race intensities, as shown in Table 4.5. To determine this, we explore the tariff effect on employment across the services sub-sectors. The results for the effect of the reduction of tariffs across services sub-sectors are provided in Table 4.14. The conditional estimates[37] show that tariff liberalisation led to slower employment growth in Construction and Finance. The adverse tariff effect on employment of Black men in services shown earlier appears to be attributed to the concentration of Black men in the construction industry, while the results for White women reflect their concentration in the finance sector. As shown in Table 4.5, about 19.8% of Black men are employed in construction and 28.5% of White women are in Finance. The differential effects we find for men and women, and Blacks vs Whites are strongly associated with differences in spillover effects as well as racial and gender composition of employment across industries in South Africa.

[36] For example, infrastructure investment may affect the construction sector more than other sub-sectors, while the income effect may be more pronounced in finance, private households, and wholesale and trade. It is also possible that derived demand may affect all other sub-sectors but have a lesser impact on the community sub-sector.

[37] 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 4.14: Employment effects of tariff liberalisation on services sub-sectors

VARIABLES	(1) Electricity	(2) Construction	(3) Wholesale	(4) Transport	(5) Finance	(6) Community	(7) 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)
Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IV	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.

4.6.6 Robustness Check

In this section, we test for the sensitivity of the main results in several ways. First, we test by using regression weights and the 2SLS IV estimation approach. We use the 1996 working-age population as a share of the national working-age population as weights. This robustness check will allow us to determine whether the main results are sensitive to initial municipality conditions as pertaining to the working-age population. The results are presented in the appendix in Table 4.2A, Table 4.3A and Table 4.4A and the estimates confirm that the main results are robust.

We test for the robustness of the structural change results depicted in Table 4.2A, and find evidence of tariff-induced structural change for aggregate services with a higher rate of migration of women from manufacturing to services. Tariffs do not appear to affect the sectoral mobility of men. These results also hold for Blacks but not for Whites. The robustness check shows that tariff reduction spurred larger structural change among White men compared to White women. However, the significance of these estimates is weaker.

Table 4.3A shows that services employment declined with the reduction of tariffs in municipalities that are more exposed to tariffs. This would confirm our results that the services sector did not absorb all the labour that is released in manufacturing.

We also find differential effects of tariff liberalisation on services employment of men and women, as shown in Table 4.4A, and the effect remains sturdier for White men. The adverse effects of liberalisation are shown to be marginally stronger on White women compared to those on White men. This is consistent with the main results. Contrary to the main results, the test shows a significant tariff effect, where liberalisation reduces the gender employment gap, except in the case of Whites. The tariff effect on the gender employment gap is insignificant in the main results.

Second, we test the robustness of structural change results by examining the effect of tariff reductions on services employment rates and manufacturing employment rates. We construct employment rates as employment normalised by the working-age population. The results are presented in Table 4.5A for services employment rates and Table 4.6A for manufacturing employment rates. We continue to find that tariff reductions decreased employment in both sectors. The decline in manufacturing employment is larger relative to services employment for the aggregate population as well as across gender and race. The exception is for White women where the decline in services employment rate is stronger than for manufacturing (the effect was insignificant for manufacturing). The effect of reduction of tariffs remains statistically insignificant for White men. These results reveal that our main results on the tariff-induced structural change are robust and that the observed structural change is driven by the larger decline in manufacturing employment rather than a rise in services employment.

Third, we test whether the results on services employment are robust by using control variables which are differentiated according to sub-groups. The results for these robustness checks are

displayed in Table 4.7A. We find that tariff cuts have a negative effect on services employment for men and women, however, the effect is studier for men. The effect on female services employment is at the 10% significant level. We also find that tariff cuts have a gendered effect among Blacks with Black men being more disadvantaged relative to Black women (the coefficient for Black women is statistically insignificant). Lastly, the results show that tariff cuts have no effect on the employment of White men and White women. These results are comparable with the main findings and indicate that our results are robust.

4.7 Concluding Remarks

This chapter analyses the effect of liberalisation of manufacturing tariffs on service employment across local labour markets in South Africa from 1996 to 2011. For this analysis, we utilise census data for 1996, 2001, and 2011, together with annual tariff data obtained from Edwards (2015). A first-difference approach is used to analyse changes in tariffs and service employment from 1996 to 2001 and from 2001 to 2011. The 2SLS IV estimation technique is also employed to control for endogeneity of tariffs.

The chapter first probes the effects of tariff reduction on wages and finds that services wages are not responsive to tariff reductions. This exposes the fact that the response of the South African labour market to tariff liberalisation is limited to changes in employment because wages are unresponsive to liberalisation.

Second, the chapter examines whether liberalisation brings about a structural shift in employment composition from manufacturing to services during these periods. The main finding is that liberalisation contributed to a modest structural shift in the sectoral composition of employment in manufacturing relative to services during these periods. Simulations using the regression coefficients indicate that the structural shift in employment composition from manufacturing to services can be entirely explained by tariff liberalisation. These findings on tariff-induced structural shifts in the composition of employment are broadly consistent with those of Dix-Carneiro and Kovak (2015) and Menezes-Filho and Muendler (2011) who find similar evidence in Brazil.

Third, the chapter explored the effects of liberalisation on services employment and the channels that drive these effects. Our expectation is that tariff liberalisation through changes in

the relative price of manufactured goods would enhance the level of employment in services. Contrary to our expectations, the estimates reveal that regions that experienced higher tariff reductions also experienced slower growth in services employment. Within services sub-sectors, we find that these aggregate results can be attributed to the construction and finance industries. Our results are similar the findings by Autor et al. (2015) and Acemoglu et al. (2016) in the US, and Dehejia and Panagariya (2014) in India which show a decline in non-manufacturing or 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. The presence of spillover effects from manufacturing corroborates the findings for the US of Autor et al. (2015), Acemoglu et al. (2016) and for India of Dehejia and Panagariya (2014). Even after controlling for spillover effects, we do not find evidence of rising growth in employment in services. The services sector thus failed to absorb all the employment lost in manufacturing in response to liberalisation. Our results are 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.

Overall, the results suggest that while tariff liberalisation induced a structural shift in the composition of employment towards services, this is not driven by increases in services employment. The structural shifts shown reflects that the reduction in employment in manufacturing associated with liberalisation exceeds that in services. 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.

The results may also reflect the presence of industry-specific skills of those workers that lose jobs in manufacturing, industry segregation in manufacturing and services, as well as sector-specific spillover effects on services employment. These industry or sector-specific factors may compound the adverse effect of tariff liberalisation on employment across regions.

Moreover, we find the compositional shift in employment from manufacturing towards services from liberalisation is much stronger for women, in particular, Black women. This may be underpinned by the gendered tariff effects from manufacturing as well as gendered labour

demand in services. In terms of services employment, the adverse effects of tariff liberalisation are born by men rather than women (at the aggregate level), but also Black men and White women, due to the negative tariff effects on employment growth in construction and finance. The implication is an outcome that differs by gender and race because of distinctive industry, gender, race and spatial characteristics in the South African labour market.

The challenge in some countries, such as South Africa, is that tariff liberalisation may compound the prior distributional gaps. Differences in the gender and racial composition in employment are an outcome of South Africa's past policies of racial discrimination. These results reveal that tariff liberalisation in South Africa appears to have compounded some of the racial employment gaps. Broadly, it would also suggest that these rigidities hamper restructuring and can also give rise to resistance to liberalisation.

Since we do not find evidence that workers are reallocating to services, the possibility exists that the adverse effects of tariff liberalisation on local employment may be mitigated by internal migration. In the following chapter, we examine migration responses of workers to tariff liberalisation.

Chapter 5

5. Tariff Liberalisation and Gendered Internal Migration: Evidence for South Africa

5.1 Introduction

The effect of tariff liberalisation on the labour market depends critically on the degree of labour mobility across sectors and regions. Previous chapters showed stronger job displacement and losses in manufacturing employment in regions more exposed to reductions in tariff protection. Factor rigidities inhibiting the movement of workers across manufacturing and services, as well as spillover demand effects from manufacturing, amplified these effects such that services employment also declined in these regions. However, the net effect on local labour market outcomes and households is also influenced by the extent to which labour is able to migrate across regions to find new employment opportunities. Less mobile labour translates to more localised effects of tariff liberalisation on employment.

Migration effects are particularly important given that liberalisation has affected regions differently, giving rise to differences in labour market outcomes across regions. Employment opportunities declined in regions exposed to high reductions in tariff as shown by the findings in preceding chapters. The differences in employment opportunity (probability of finding a job) and wages across these regions present an incentive for migration to occur from those regions strongly affected by tariff reductions to those regions less affected. According to migration theory, together with empirical evidence from international studies, migration lowers regional disparities in terms of labour market outcomes, such as wages, employment, and regional economic growth (De Haas, 2010; Gamlen, 2014). This implies that the degree to which these differentials in local labour market conditions persist across regions is influenced by the mobility of workers. The less mobile workers are, the longer the regional disparities arising from liberalisation will persist.

This chapter completes the analysis of the effects of tariff liberalisation on local labour markets by examining the internal migration effects of tariff liberalisation across municipalities in post-apartheid South Africa. The chapter aims to answer the following research questions:

1. What is the effect of tariff liberalisation on internal migration?

2. How does tariff liberalisation affect gendered migration and does the effect differ across individual characteristics?

The chapter draws on the Specific-Factors model already discussed in Chapter 3 to provide a theoretical framework to analyse how tariff liberalisation drives internal migration. The model illustrates how differences in industry composition across regions, coupled with rigidities to the movement of workers across regions (e.g. male vs female, married vs single, and others) affects migration flows (Kovak, 2010). The model demonstrates how tariffs alter the relative price of goods, and through these, changes in wages and employment opportunities across regions. Differences in wage growth and employment opportunities serve as push or pull factors for migration. Workers are likely to migrate out of regions facing falling wages (or employment opportunities) to regions with stronger wage growth (or more employment opportunities).

The migration effects from liberalisation are also expected to differ by gender. As shown in earlier chapters, the effect of tariff reductions on regional employment differs for men and women because of differences in gender intensities across industries. For example, women are more numerous in the textile, clothing, and footwear industry. Men and women also face different rigidities to migration related to factors such as marital status, fertility, and societal norms. For example, married women and women with children experience stronger constraints to internal migration than married men and even single women, as well as women without children (Chort et al., 2017; Hoang, 2011; Jacobsen & Levin, 2000). Therefore, we can expect that tariff induced changes in relative prices across regions, coupled with the gendered effects from tariff changes, will interact with rigidities to migration. This will lead to distinctive migration effects from liberalisation across genders and other groups.

The effect of tariff liberalisation on internal migration has been studied for the United States (Autor et al., 2015) and several emerging economies, including India (Topalova, 2010), Brazil (Kovak, 2010) and Peru (Baldárrago & Salinas, 2017), but the evidence is mixed. Topalova (2010) finds no evidence that tariff liberalisation affects internal migration, while Baldárrago and Salinas (2017) and Kovak (2010), find strong effects for Brazil, Mexico, and Peru, respectively. Much of this international literature, however, focuses on aggregate migration and does not look at the effect by gender. An exception is Kovak (2010), who finds that in Brazil men are more spatially mobile in response to tariff liberalisation than women. This

chapter augments the literature by examining the gendered effects of tariff liberalisation on internal migration in South Africa.

South Africa provides an interesting case study in terms of tariff-induced gendered migration. First, the country has an interesting history of migration that restricted mobility of Blacks. Earlier migration was also intrinsically and consequently gender-biased because it occurred through the labour migrant system which favoured and controlled the movements of men, in particular, African men who worked in the mines in urban areas (Posel, 2004; Von Fintel & Moses, 2017). The low wages that African men received proved inadequate to sustain their families in the urban areas, and during apartheid, African women were also not legally allowed to live in hostels in urban areas. As a result, African women remained behind in the homelands (or rural areas) and engaged in poorly paid work or unpaid household work. Thus, migration rates have historically been higher among men than among women.

Second, South Africa experienced aggressive tariff liberalisation from the early 1990s. Third, the evidence from previous chapters shows that employment declined in both the manufacturing and services sectors in response to the liberalisation of tariffs between 1996 and 2011. The employment effects of tariff liberalisation were also gendered and are therefore likely to present different incentives for migration for men and women in South Africa.

This chapter's contribution to the existing literature is twofold. Firstly, the chapter provides insights into how tariff liberalisation affects the regional composition of labour and the population. Secondly, the chapter expands our understanding of the determinants of internal migration across different groups.

The rest of the chapter is organised as follows: Section 5.2 provides an overview of the theoretical foundation and theoretical literature review, while Section 5.3 discusses the related empirical literature. Section 5.4 presents the empirical strategy employed for the analysis. A description of the data and patterns of migration is provided in Section 5.5. Section 5.6 provides empirical evidence of the tariff liberalisation effects on internal migration in South Africa and Section 5.7 presents concluding comments.

5.2 Theoretical Foundation

This section presents and discusses the theoretical framework that explains how tariff liberalisation may induce internal migration. We apply the Specific-Factors model discussed in Section 3.2 and extend it to explain the effects of tariff liberalisation on internal migration as developed by Kovak (2010). This chapter presents the Kovak (2010) model. Essentially, in this model, the assumption of spatial immobility is relaxed, and it allows for movement across regions in the long-run. Similar to Section 3.2, there are 2 regions (r = 1, 2); 2 industries (i = A, B) and the 2 factors of production are mobile labour (L) and industry-specific capital (K). Industry A is assumed to be clothing and industry B is other manufacturing. In the short to medium run labour is mobile across industries but immobile across regions. However, in the long-run labour is mobile across industries and regions. Other assumptions in this model remain the same as in Section 3.2.

The mechanisms behind tariff liberalisation induced migration are demonstrated in Figure 5.1 where the x-axis displays the total national labour supply to be allocated across the two regions, and the y-axis represents the wage in each region. Panel (a) shows the economy at the initial equilibrium, before tariff liberalisation. At the initial equilibrium, there is wage equality across the two regions, which is denoted by w*. Panel (b) shows a situation in the economy when there is tariff liberalisation and in the short-run labour is restricted from moving across regions. The figure shows that tariff reductions in industry A will cause the MRPL curves of industry A to fall in both regions to XX_1 but the subsequent fall in wages in region 1 will be greater than in region 2 because employment in region 1 is more concentrated in industry A. This is shown by wage differentials across the two regions, $w_1^* < w_2^*$.

In the medium to long run, the differential aggregate wage across regions will incentivise workers to migrate to the relatively high wage region in the medium to long term. This process is depicted in panel (c), which shows that as L migrates from region 1 to region 2, the central axis moves to the left, indicating a greater labour supply allocated to region 2. The increase in labour in region 2 will cause the MRPL curves to shift to the left in accordance with the shift of the central axis. The effect is that wages in region 2 will eventually fall and equilibrate across both regions at a new equilibrium level w^{**}, as shown in panel (c). Internal migration thus serves to bring about wage equality across regions. At this point, there is no incentive for

internal migration. Further, we see structural shifts in production in both regions as *L* shifts from industry *A* to industry *B* in response to the fall in prices and wages in industry *A* fall.

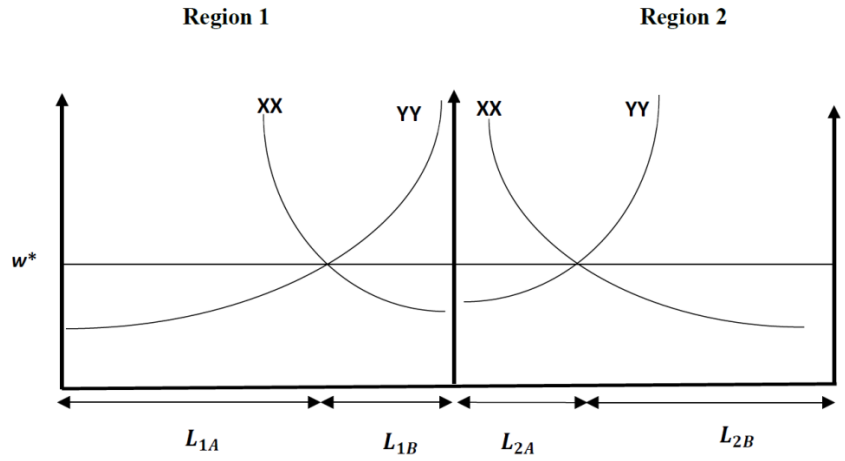
We extend the model to incorporate a country where wages are rigid. In this country, tariff reductions will not have a wage effect; instead, the effect will be felt on employment rates. We revert to panel (b) to explain this adjustment process. In the case of downward wage rigidities, wages remain the same at w^* (similar level to panel (a)), as denoted by the lighter wage line above w_1^* and w_2^*. Regions in such a country will face more unemployment. The level of unemployment is the distance between the XX_1 and *YY*. In this scenario, unemployment will be higher in region 1 than in region 2. This provides an incentive for *L* to migrate to region 2 because, assuming some churn in employment, unemployed workers will have a higher probability of finding employment in region 2 compared to region 1[38]. Migration will take place until the probability of finding a job equalises in both regions. There will be greater out-migration of workers used intensively in industry *A* in region 1. In the case of South Africa, where tariffs fell sharply in the clothing industry, which is female-intensive, the implication is that there is likely to be higher levels of internal migration of women in response to tariff liberalisation.

Unemployment will persist in both regions until wages adjust downwards. However, if wages are fixed or unresponsive to tariff liberalisation, migration will be less than expected because there will be no wage difference between regions, as wages are fixed to original levels. Likewise, if there are migration rigidities, there will be less migration than in a situation where there is full mobility of labour, and differences in wages across regions will persist for longer. It follows that local labour market outcomes for wages and employment are strongly influenced by migration rigidities. Migration attenuates differences in the local labour market outcomes of tariff liberalisation.

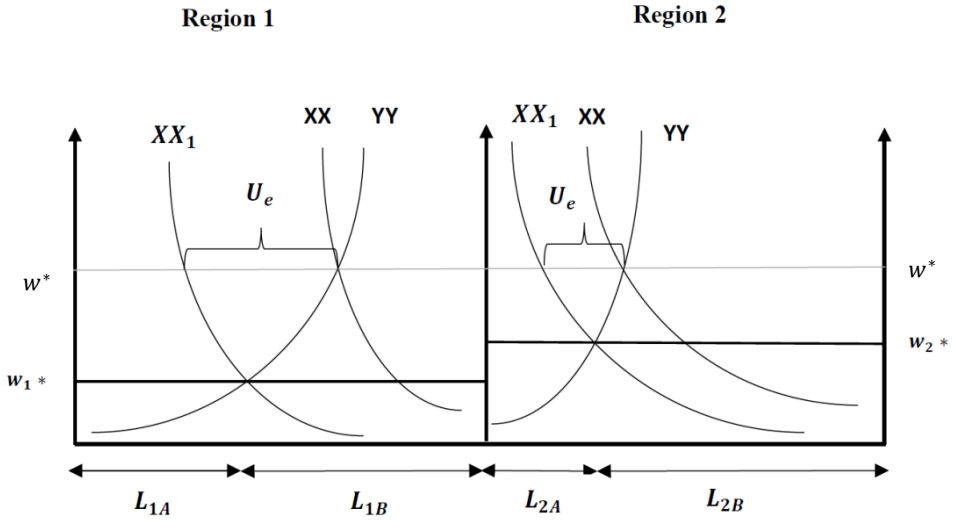
[38] The share of unemployed in total regional employment is a proxy for the probability of finding a job, assuming homogenous workers, *L*.

Figure 5.1: Graphical representation of internal migration

(a) Initial equilibrium

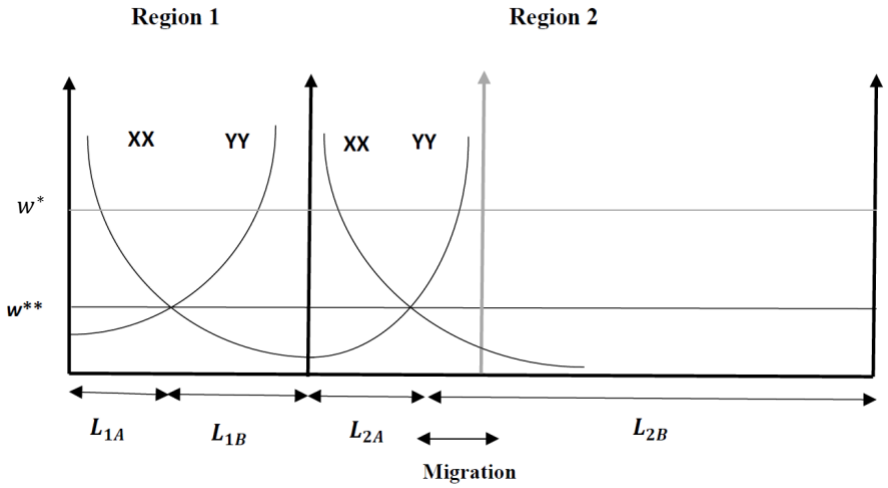


(b) Response to tariff liberalisation before migration



where U_e is unemployment

(c) Response to tariff liberalisation allowing for migration



5.2.1 Theoretical Literature Review on Tariff-induced Gendered Internal Migration

This section discusses the theoretical literature that provides further insights to tariff-induced internal migration. Tariff liberalisation induces migration through changes in wages and employment across regions. There are, however, several other channels through which tariff liberalisation may have a gendered effect on internal migration via employment.

The first channel is differences in industry composition across regions, coupled with differences in the gender composition of employment in those industries. For example, preceding chapters show that women are mostly employed in the textile and clothing industry and the services sector, while men are mainly employed in heavy industry and construction. The significant reduction of tariffs in South Africa in the textile, clothing, and footwear industry relative to other manufacturing industries, is a push factor for women to migrate from regions which are more exposed to trade in this industry to regions that are rather dominated by the services sector. On the other hand, given that trade exposure for men is distributed across several manufacturing industries, and may be the same across regions, men have less of an incentive to migrate. It is expected that regions that are dominated by manufacturing industries are likely to experience out-migration of both men and women. However, those regions with a greater share of female-intensive manufacturing industries may face stronger out-migration of women.

The second channel for a gendered effect on employment migration is family structure, namely marital status and fertility. Family structure may be more restrictive to the movement of women than men. International studies by Autor et al. (2018), Braga (2018) and Hoang (2011) find that marriage reduces spatial mobility, particularly for women[39]. Studies in South Africa (Gubhaju & De Jong, 2009; Posel, 2004) also find that marital status is an important contributing factor to the decision to migrate. Gubhaju & De Jong (2009) show that never married, divorced, or separated men and women have a higher likelihood of moving, compared to married

[39] However, marriage is itself endogenous as it is affected by tariff liberalisation. According to Mincer (Mincer, 1978) tariff liberalisation promotes the advancement of women in the workplace and this may deter couples from getting married. This is because tariff liberalisation has a direct positive effect on the export-oriented services sectors in those countries that have a comparative advantage in these sectors, providing employment opportunities which may be concentrated in particular regions. Single women are able to migrate more easily than married women in order to take advantage of the employment opportunities in these regions. Empirically, Heath and Mobarak (2015) find that the expansion of the garment industry in Bangladesh provided new jobs, particularly for females, and this delayed marriage among girls. In Indonesia, the reduction of input tariffs contributed to lower marriage rates among women (Kis-Katos et al., 2018). There is a general consensus in international literature that single women are more spatially mobile compared to married women (Fleury, 2016; Hoang, 2011; Jacobsen & Levin, 2000). Nevertheless, this is not the focus of this chapter.

individuals. Married women are constrained because they have to consider not only their own careers but also their spouses' careers (Jacobsen & Levin, 2000). Fleury (2016), Hoang (2011) and Jacobsen and Levin (2000) show that married women often sacrifice their careers for the family. A foundational study by Mincer (1978) termed this phenomenon "tied moving" and "tied staying". This suggests that movement of married women is dependent on that of her spouse. It follows that marital status determines migration, especially that of women, in response to tariff liberalisation.

Fertility is coupled with marital status as a factor restricting the mobility of women. Hoang (2011) states that childbearing is a deterrent for female migration but not for male migration because women are more often the primary caregivers of children. Having children may increase the migration costs of workers, and thus inhibit the probability of their migration (Autor et al., 2018; Braga, 2018; Hoang, 2011) due to the financial burden of moving. Is it probable that tariff-induced migration may be more prevalent among single women and men as well as among women without children[40].

Kinship provides the third channel for explaining the gendered tariff effects on internal migration. A study claims that men have stronger networks through kinship and other social networks than women (Massey et al., 2006). Nonetheless, other literature, such as studies by Matthei (1996) and Smith-Lovin and McPherson (1993) suggests that female migrants tend to find initial employment, albeit in female-intensive industries, in the destination location through other female kin or female contacts. However, Hondagneu-Sotelo (2000) argues that men migrate more easily than women because they are accorded stronger enabling social network resources. Thus, from these early studies, the narrative is that kinship benefits men more than women in terms of migration possibilities. The implication of this argument, accepted in many circles, is that men, because of kinship links, are more likely to be more responsive to changes in relative returns or employment opportunities across regions arising from tariff cuts.

[40] Some studies find that tariffs are positively associated with lower fertility rates because of the negative tariff effect on employment. Autor et al. (2018) find increased competition in the manufacturing sector to have a heterogeneous effect on men and women, reducing fertility for men and also increasing the proportion of unmarried mothers. A study in Brazil shows that tariff reduction had a negative effect on employment and also reduced the fertility rate of women (Braga, 2018).

5.3 Related Empirical Literature

Migration has been closely linked to international trade. Numerous international studies have investigated the two-way relationship between international trade and international migration. More relevant to this chapter is the link between tariff liberalisation and internal migration. The empirical literature on the effect of tariff liberalisation on migration is sparse. Lack of reliable data on internal migration and regional tariffs in developing countries is one of the core reasons for the narrow focus of migration to date.

International empirical studies that explore the relationship between tariff liberalisation and internal migration include Autor et al. (2014), Baldárrago and Salinas (2017), Hering and Paillcar (2015), Kovak (2010), Mendez (2015) and Topalova (2010). The evidence from these studies is inconsistent. Most of the studies find that tariff liberalisation induces migration from regions that are more exposed to regions less exposed to tariffs (Baldárrago & Salinas, 2017; Mendez, 2015), while Topalova (2010) finds no evidence of tariff-induced migration in India.

Evidence from the literature on the effects of tariff liberalisation on gendered internal migration is also limited. Some studies show that men are more mobile than women post tariff liberalisation (Aguayo-Téllez et al., 2010; Kovak, 2010). Aguayo-Téllez et al. (2010) use employer-employee data for Brazil from 1997 to 2001 to investigate the link between globalisation and internal migration of workers in the formal sector. The study uses multivariate analysis to study self-selection into the migration decision and migrants' choice between multiple destinations. The findings show that concentration of firms encourages internal migration through wage differentials across regions, particularly that of male workers. Female workers are found to comprise a small share of labour migration (Aguayo-Téllez et al., 2010). However, the driving forces behind the differential tariff-induced migration are not explored.

In another study on Brazil, Kovak (2010) applies the Specific-Factors model to measure the effects of tariff liberalisation between 1987 and 1995 on local labour market wages and internal migration. The study utilises a static model of location choices post-liberalisation and applies a first-order Taylor series approximation of migration. The analysis finds that men, younger individuals, Whites (as opposed to non-Whites), and those with smaller families are more mobile than their counterparts in response to tariff liberalisation.

Facchini et al. (2019) analyse the effect of trade policy uncertainty on internal migration in China. A trade policy uncertainty gap is used as the exogenous shock and is captured as the gap between Normal Trade Relations (NTR) with WTO members and non-NTR, which are usually higher tariff rates assigned to nonmarket economies. Nonmarket economies in China were established under the Smoot-Hawley Tariff in 1930. A difference-in-difference approach is used to study the effect before and after the change in trade policy, which took place in 2001. The study reveals that regions that face an average decline in tariff reduction uncertainty (measured as the gap between NTR and non-NTR) experience increased in-migration, driven mostly by skilled individuals. Moreover, the study finds that the effect of tariff liberalisation is gender-biased; in-migration of women lagged behind that of men. The study neglected to examine the drivers of the gendered in-migration.

5.3.1 South African evidence

This section presents the empirical literature on internal migration in South Africa. Internal migration patterns in South Africa have been driven by a number of factors, such as the systematic process of land dispossession and relocation to homeland areas, combined with policies that dictated the type of participation of Black (defined in this thesis as Africans, Coloured, Indian/Asian) people in the labour market and the economy as a whole. The history of internal migration dates back to colonisation. A list of South African migration laws is available in Table 5.1A in the appendix. The law that played a pivotal role in internal migration in South Africa was the 1913 Land Act. Under this law, Black people were prohibited from owning more than 7% of South Africa's land area, increased to 13% with the 1936 Native Trust and Land Act. The implementation of these law meant land was repossessed from Black people in order to keep to this limit. In addition, the colonial government(s) of South Africa levied heavy land taxes on African people, who constitute about 80% of the population, essentially forcing them to move from their native rural areas to cities in search of jobs to be able to pay the taxes. The apartheid system, which was formally in place from 1948 to 1991 (although land dispossession existed in practice before then), reinforced migration and settlement restriction of Black people through various laws. The apartheid government forced people to register their race under the Population Registration Act (1950–1991) as Black [41], White, Coloured, or Indian

[41] Black was the classification used during Apartheid for African. This classification changed post-apartheid where Black now represents Africans, Coloured and Indian/Asian.

and allocated land along racial lines through the implementation of the Group Areas Act (1950–1991).

Complementing these laws governing land ownership and residency of Black people were others that controlled the movement of Black people into urban areas. The Bantu Authorities Act (1951), Bantu Urban Areas Act (1953), Promotion of Bantu Self-government Act (1959), and Pass Law Act (1952-1986) were implemented to designate parts of rural areas for African people. These areas were called "homelands" and were located far from urban city centres. Former homelands included Transkei, Ciskei, Bophuthatswana, Lebowa, QwaQwa, Venda, KwaNdebele, KaNgwane, KwaZulu, and Gazankulu.

Labour migration mainly comprised men because they were not allowed to travel with their families to their workplace (Posel, 2004). Apartheid laws that restricted movement and settlement were gradually abolished between the late 1980s and early 1990s (Choe & Chrite, 2014; Posel, 2004). By the early 1990s, all South Africans were free to move and settle where they pleased, and families could be united in urban areas. This period saw a gradual increase in female migration. Von Fintel and Moses (2017) suggest that the rise in female migration could also have been driven, and continues to be driven, by an increase in labour market participation of women, changes in attitudes towards female migration, changes in male-female partnership arrangements, and reduction in fertility rates.

Several papers have studied the determinants of internal migration in South Africa (Ardington et al., 2009; Bouare, 2001; Clarke & Eyal, 2014; Gubhaju & De Jong, 2009; Posel & Casale, 2005; Von Fintel & Moses, 2017). Evidence from these empirical studies in South Africa is in line with the theory posited by Greenwood (1997). That is, much of the South African literature maintains that the decision to migrate is based on pull and push factors, such as regional differentials in wages, job opportunities, unemployment, kinship, crime, local public spending, and local amenities, as well as land and housing conditions (Bouare, 2001; Dodson, 1998; Von Fintel & Moses, 2017). Marital status is also thought to play an important role in the decision to migrate. The decline in marital rates has also been found to be a driving factor behind migration (Posel & Casale, 2005). Gubhaju and De Jong (2009) also reveal that never married, divorced, or separated men and women have a higher likelihood of moving compared to married individuals. Thus, their study shows unmarried women in South Africa to be relatively mobile.

Interestingly, pensions and other social transfers also emerge as determining factors for internal migration in South Africa (Ardington et al., 2016; Ardington et al., 2009; Clarke & Eyal, 2014). Social transfers, such as pensions, can be both a push and pull factor for migration. Clarke & Eyal (2014) demonstrate that the presence of a pensioner or recipient of a social grant in a household discourages mobility to other regions as the funds provide financial support for the family. In contrast to this finding, Ardington et al. (2009) and Ardington et al. (2016) find that pensions and social transfers allow migrants to overcome childcare constraints and other migration costs. This is an important finding because, since the advent of democracy, the South African government has consistently allocated a significant share of the fiscal budget to social transfers.

Migration patterns in South Africa have been found to differ by gender. The literature shows men to be more mobile than women, but that, migration of women has been on an upward trend since the late 1990s (Dodson, 1998; Posel, 2004; Von Fintel & Moses, 2017). Dodson (1998) reveals, at that time, that female migrants tend to be married, older, and more educated than their counterparts. Furthermore, the choice of destination has been found to differ for men and women. Camlin et al. (2014) document that South African women migrate to regions with a larger informal sector, while men are attracted to regions that have a larger share of mining and manufacturing sectors. A gap in this literature is it overlooks the role of trade liberation in stimulating internal migration.

Erten et al. (2019) fill this gap by examining the effects of tariff liberalisation on in-migration across districts in South Africa, using data from the October Household Surveys between 1994 to 1998 and a fixed-effects estimation model. The study finds no evidence of tariff-induced internal migration. The limitation with this study is it does not provide insight into the gendered effects of tariffs on internal migration.

This thesis supplements the South African literature on internal migration by investigating the effect of tariff liberalisation on gendered internal migration (and other associates) at the municipality level. The aim is to provide new evidence about tariff-induced internal migration at a disaggregated level to account for regional heterogeneity as well as heterogeneity across various individual categories.

5.4 Estimation Strategy

To perform a descriptive analysis[42] on the effect of tariff liberalisation on internal migration, we utilise a modified gravity model, which is a log-linear model. The long-standing gravity model has been used extensively in a voluminous body of literature in the last century, including Bergstrand (1985) and Greenwood (1975). One of the most important advantages of the gravity model is that it incorporates a theoretical foundation of gravity into economic estimation fairly well (Anderson, 2011). Anderson (2011) argues that the success of the gravity model is also because it is an empirical economic model that can handle an enormous variation of economic interactions across space of both trade and factor movements. The traditional gravity model adopted Newton's Law of Gravitation, where factors of production supplied in one location are attracted to demand for goods or labour in another location, and the potential flow is limited by the distance between the two locations (Anderson, 2011). However, since the model allows for the analysis of spatial relations and bilateral flows, it can also be applied to migration (Ramos, 2016; Von Fintel & Moses, 2017) and trade (UN, 2012).

We modify the standard gravity model applied to migration by including tariffs in the model. According to the Specific-Factors model, discussed in Section 5.2, workers move across regions when there are regional wage and employment differences. However, employment and wage differences are a function of tariffs, and the ability to migrate is a function of individual characteristics. We therefore employ a reduced-form estimation, where we estimate the effect of tariffs on migration. Tariffs provide us with region-specific exogenous shocks. These exogenous shocks will enable us to identify (a) how tariffs affect migration across municipalities (theoretically via relative wage or relative employment opportunity) and (b) how individual characteristics make it more or less difficult for workers to migrate. We provide a descriptive analysis of the effect of the change in tariff reductions, from 1996 to 2001 and from 2001 to 2011, on internal migration by employing the following equation:

$$lnmig_{ij,t} = \alpha + \beta_1 \Delta lnTPman_{it} + \beta_2 \Delta lnTPman_{jt} + \beta_3 lndistance_{ij} + \beta_4 lnX'_{it} + \beta_5 lnX'_{jt} + \beta_6 lnZ'_{i,1996} + \beta_7 lnZ'_{j,1996} + \gamma_t + \varepsilon_{ij,t} \quad (5.1)$$

[42] The chapter is a descriptive analysis and thus the chapters does not provide a causal effect of tariff reductions on internal migration.

where $lnmig_{ij,t}$ is log migration from origin municipality *i* to destination municipality *j* in time *t*. $lnTPman_{it}$ and $lnTPman_{jt}$ represent the regional trade protection measure in logs at the origin municipality and destination municipality, respectively. This is constructed, as in Chapter 3, as the initial employment weighted industry tariff, following Bartik (1991), Gaddis and Pieters (2017), Kovak (2010) and Topalova (2010).

Distance is a proxy for migration costs, such as relocation costs and transportation costs. The further the distance between origin and destination municipalities, the greater the cost of migration, and consequently, the lower the level of migration. To isolate the effect of tariff liberalisation we add several variables to control for push and pull factors. These are denoted by X'_{it} and X'_{jt} representing push factors at the origin, and pull factors at destination municipality respectively, and are transformed into natural logarithms. The push and pull factors include population density, employment, household income, night-time lights (a proxy for economic activity), infrastructure, manufacturing share, pensions, and language (a proxy for social networks). If destination municipalities have on average more employment opportunities, higher household income, more night-time lights, and better infrastructure, these municipalities will attract more migrants. The effect of population density is ambiguous as it can act as a push or pull factor. The signs for the coefficients for these control variables are expected to be negative for the origin municipality and positive for the destination municipality.

In addition, we include several variables to control for initial conditions. These are represented by $Z'_{i,1996}$ and $Z'_{j,1996}$ and include the share of the manufacturing sector in total employment (excluding the primary sector), the share of households that receive pension(s) and the share of mother tongue isiZulu speaking people (the most spoken language in South Africa) in logs. The share of employment in manufacturing is included to control for technological change in manufacturing that can independently affect employment and migration patterns. The reason for including pensions and home language is to control for factors that in the literature are determinants of migration in South Africa. Lastly, we control for year fixed effects[43] γ_t.

[43] The inclusion of year fixed effects provides a narrower perspective for the analysis of how tariff liberalisation may affect bilateral migration patterns. The shortcoming of this analysis, however, is the failure to cannot capture economy-wide changes in internal migration that may be associated with general structural shifts arising from liberalisation.

The main variables of interests are $\Delta lnTPman_{it}$ and $\Delta lnTPman_{jt}$. In the previous chapter, we find evidence that the reduction of tariffs reduces employment, particularly manufacturing employment, in municipalities with stronger exposure to tariffs. In this chapter, we work with the assumption that workers in municipalities where there are job losses will move out of those more exposed municipalities to less exposed municipalities. In terms of coefficients, we expect β_1 to be negative and β_2 positive, implying that tariff reductions in origin municipalities induce out-migration while tariff reductions in destination municipalities lower in-migration. The central idea is that tariff cuts increase international competition, which leads to lower rates of employment. Workers then respond to job losses by moving from municipalities that face high tariff exposure to less exposed municipalities.

5.4.1 Estimation Issues

To carry out the descriptive analysis, the chapter utilises the 2SLS IV econometric approach, where we instrument the change in the trade protection measure by its initial values. Equation (5.2) shows the first-stage estimation of the relationship between change in the trade protection measure and the initial trade protection measure. The subscript *r* denotes the region, either origin municipality or destination municipality. We include control variables: population, employment, income, night-time lights, infrastructure, initial manufacturing share, initial share of households with a pension recipient, and initial share of isiZulu speakers. Period-fixed effects are also included in the model as below:

$$\Delta lnTPman_{rt} = \alpha + \beta_1 lnTPman_{r,1996} + \beta_2 lndistance_{ij} + \beta_3 lnX'_{it} + \beta_4 lnX'_{jt} + \beta_5 lnZ'_{i,1996} + \beta_6 lnZ'_{j,1996} + \gamma_t + \varepsilon_{ij,t} \quad (5.2)$$

The second stage estimates the effects of tariff liberalisation, as measured by the predicted change in tariffs from the first stage regression, on bilateral migration. The following equation gives our final 2SLS IV estimation:

$$lnmig_{ij,t} = \alpha + \beta_1 \Delta ln\widehat{TPman}_{it} + \beta_2 \Delta ln\widehat{TPman}_{jt} + \beta_3 lndistance_{ij} + \beta_4 lnX'_{it} + \beta_5 lnX'_{jt} + \beta_6 lnZ'_{i,1996} + \beta_7 lnZ'_{j,1996} + \gamma_t + \varepsilon_{ij,t} \quad (5.3)$$

where $lnTPman_{it}$ and $lnTPman_{it}$ are initial trade protection measures for the origin municipality and the destination municipality, respectively. The 2SLS IV approach is also applied to relative tariffs.

The second potential estimation issue is dealing with many zero observations, since the gravity equation takes on the log-linearized form. This poses a potential problem for our estimation because of zero migration between several municipality-pairs, the dependent variable, in various years. In logging the migration data, these zero value observations fall away, potentially distorting the distance coefficient through selection bias effects. Silva and Tenreyro (2006) propose the Poisson Pseudo-Maximum Likelihood (PPML) econometric technique to resolve this problem. PPML is frequently used for count data, and it keeps all the observations, including zero-values. However, IV estimation using the PPML is complex when there are a large number of fixed effects. Consequently, this chapter applies the 2SLS IV approach. The effect on the coefficient of interest, namely, the tariff variable, is expected to be minor, as the exclusion of zero migration pairs primarily biases estimates of the distance coefficient. No systematic relationship between tariffs and bilateral distance is anticipated in the data, implying minimal sample selection bias on the tariff coefficients.

5.5 Data

5.5.1 Data Sources

We utilise panel data for the descriptive analysis on the effect of tariff liberalisation on internal bilateral migration from 1996 to 2011. The analysis is carried out by combining data from several sources. These include the South African population census (for migration data), tariff data obtained from Edwards (2015), and data provided by Quantec (a data consultancy firm), the (US) National Oceanic and Atmospheric Administration (NOAA), and Google maps, for the other control variables.

Population Census data

The population census data provides data on education, fertility, industry, language, marital status, migration, occupation, and race. Panel migration data is constructed using the weighted

10% sample[44] of the census for 2001 and 2011 by restricting the sample to the working-age population, that is, individuals who are aged between 15 and 64. Migrants are defined as those who answer "yes" to the question "have you moved since the last census". We then generate a bilateral migration variable using the current place of residence as the destination municipality and previous place of residence as the origin municipality. The total number of potential migration observations in our sample is 872 352[45] for the entire period, 1996-2011.

Migration is also disaggregated by gender (male or female), race (Black or White), current marital status (married or single), and fertility (children or no children). Marital status focuses only on married individuals, 'married' being defined as civil, traditional or polygamous marriages, and on single individuals, where the 'single' category refers to individuals who have never been married. We exclude individuals who are widowed, divorced, or separated. For the fertility variable, the sample focuses on the number of children ever born in the sample. This binary variable contains females either with children (one or more children) or without children (no children).

The census also provides information on the year an individual moved to their current residence since the last census. In cases where the respondent moved more than once during the two censuses, only the recent move is captured. Census 2001 records migrants between 1996 and 2001, while Census 2011 has migrants who moved between 2001 and 2011. Using this data, we can construct a panel of migration data over the period 1996 to 2001 using the 2001 Census, and for the 2002 to 2011 period using the 2011 Census. Our final sample includes annual bilateral migration, spanning the period 1996 to 2011, and the unit of analysis is 234 municipalities, as defined in the 2011 Census.

The 10% weighted sample of the population census was also used to obtain data on manufacturing share, pensions, and isiZulu speakers. Manufacturing, pension and isiZulu speaker variables are constructed as at 1996 to reflect initial conditions. Manufacturing is the share of manufacturing in total employment. Pension is the ratio of households that have a pension recipient present, to households without a pension recipient. isiZulu reflects the share of Zulu speaking individuals as a share of the 11 official languages in South Africa.

[44] Migration data is not available in the full census.
[45] There are 234 municipalities over the 16 years. Therefore, the maximum number of internal origin-destination municipality migration pairs between 1996 and 2011 is calculated as 234*233*16. In several origin-destination municipality pairs there is zero migration in some years.

Tariff data

A description of tariff data sources and the construction of the trade protection measure is provided in Chapter 3.

Quantec Easydata

Quantec provides data on gravity variables for South Africa, such as population density, employment, income, and infrastructure. Quantec is a consultancy firm that collects data for South Africa (De Klerk, 2012). Their annual regional data are disaggregated at a sub-national and regional level. The methodologies followed by Quantec to estimate the annual data are not publicly available (De Klerk, 2012), and thus we are unable in this chapter to explain how the data are derived. Nevertheless, in this chapter, we derive employment to include individuals who are within the working-age population and have full-time employment. Income is the average income per worker, derived as average income divided by average employment. The infrastructure variable is derived as a principal component of households with electricity, regular refuse collection, a flush toilet, and piped water as a share of total households.

Distance data

Distance is calculated using the Global Positioning System (GPS) coordinates for the census data from Statistics South Africa. We calculate distance as the straight-line distance from the centroid (centre point in a municipality) in kilometres between municipality *i* and municipality *j*.

National Oceanic and Atmospheric Administration (NOAA)

Following Henderson et al. (2012) and Von Fintel and Moses (2017), we use night-time lights data to identify differences in economic activity across municipalities. There is a high correlation between economic activity and night lights (Henderson et al., 2012). Night-time lights data is acquired from NOAA[46].

[46] The motivation for using night-time lights data is because of the concern of data quality and data availability. Regional GDP data that is provided by Quantec is inferred from more aggregated data and therefore do not necessarily reflect changes in economic activity at the level used in the analysis. Thus, the night-time lights data from NOAA is viewed as being more reliable data.

5.5.1.1 Data Issues

Table 5.1 displays the summary statistics for the constructed migration data. It is evident from the table that several quality issues arise concerning the data. The first issue is that our data contains large numbers of observations with zero values. This will affect the coefficient on distance because migration is negatively correlated with distance. Zero values may therefore reflect long distances between municipalities. If zero observations are excluded from the estimation, this can give rise to selection bias affecting the distance coefficient, but this is not a core variable of interest. The zero values are expected to be less of a problem for the coefficient on tariffs.

A second challenge with the data is the massive drop in bilateral migration from 2001 to 2002. This is due to two main factors. First, because the data only captures the most recent migration it may under-count migration in prior years for individuals that migrate frequently. The data also does not account for migrants who have moved back to the municipality of origin. A second, is the issue of recollection bias. We find more pairs with migration data closer to the Census date than prior to this. This is because it is easier to recall when one moved if the period since moving is shorter. 2001 is therefore biased upwards, and 2002 is underscored.

We overcome the possible selection bias due to recollection bias in the regressions by generating demeaned migration, where we take regional bilateral migration for each municipality pair and normalise it by annual average migration. In addition, we control for year fixed effects to eliminate the selection bias effects by year, assuming that the effects are the same across all municipalities. Relating this to the objective of the chapter, which is assessing tariff-induced migration, the hypothesis is that regions that face higher tariff reductions compared to average tariff reductions are likely to experience higher out-migration in origin municipalities than the annual average.

Table 5.1: Summary statistics for bilateral migration

Year	Sum	Mean	P50	P1	P10	P90	N
1996	77 278	1.417	0	0	0	0.004	54 522
1997	278 440	5.107	0	0	0	0.985	54 522
1998	330 737	6.066	0	0	0	8.205	54 522
1999	390 107	7.155	0	0	0	10.817	54 522
2000	476 491	8.739	0	0	0	11.521	54 522
2001	660 653	12.117	0	0	0	15.968	54 522
2002	105 924	1.943	0	0	0	0	54 522
2003	148 288	2.720	0	0	0	0	54 522
2004	172 271	3.160	0	0	0	0	54 522
2005	202 191	3.708	0	0	0	0	54 522
2006	225 342	4.133	0	0	0	0	54 522
2007	264 189	4.846	0	0	0	0	54 522
2008	302 225	5.543	0	0	0	0	54 522
2009	352 929	6.473	0	0	0	0	54 522
2010	472 189	8.661	0	0	0	11.571	54 522
2011	713 233	13.082	0	0	0	13.644	54 522
Total	5 172 487	5.929	0	0	0	0.278	872 352

Source: 10% weighted sample census data

In Table 5.2, we evaluate the extent to which the issue of extremely low migration flows is prevalent by excluding zero migration. The most striking feature of our bilateral migration data is that many municipality-pairs show extremely low migration values between 1996 and 2001. This poses a third challenge with our data. It is evident that there is some distortion in the data arising from the construction of the common spatial units where we convert the locations in the 2001 census to the 2011 municipalities. This is because the mapping is based on the share of area overlapping across regions, which explains the low values of bilateral migration, plus fractions of 1. A detailed explanation of the mapping process is provided in Appendix 2.1 We deal with the data challenge of the vast discrepancy of municipality-pairs over time by selecting the common set of municipality-pairs that are consistent over the entire period of analysis.

Table 5.2: Summary statistics for bilateral migration observations with values greater than zero

Year	Sum	Mean	P50	P1	P10	P90	N
1996	77 278	5.623	0.001	2.54E-11	3.55E-08	13.491	13 743
1997	278 440	12.778	0.003	8.77E-11	1.13E-07	25.802	21 791
1998	330 737	14.172	0.003	4.47E-11	1.02E-07	27.860	23 337
1999	390 107	15.520	0.003	3.92E-11	9.24E-08	30.883	25 135
2000	476 491	17.689	0.004	7.71E-11	2.06E-07	33.284	26 937
2001	660 653	21.457	0.005	9.24E-11	3.32E-07	36.829	30 790
2002	105 924	42.625	19.084	9.955	11.083	81.186	2 485
2003	148 288	50.114	21.728	9.963	11.149	91.273	2 959
2004	172 271	51.134	21.871	9.951	11.092	93.752	3 369
2005	202 191	54.163	22.264	9.961	11.219	96.916	3 733
2006	225 342	55.861	22.522	9.956	11.207	101.083	4 034
2007	264 189	58.722	22.871	9.956	11.219	100.286	4 499
2008	302 225	61.229	22.740	9.956	11.236	108.350	4 936
2009	352 929	64.913	22.750	9.957	11.209	117.304	5 437
2010	472 189	72.902	23.203	9.951	11.237	129.397	6 477
2011	713 233	86.874	23.981	9.947	11.370	149.045	8 210
Total	5 172 487	27.532	0.049	1.12E-10	9.38E-07	52.58141	187 872

Source: 10% weighted sample census data

Table 5.3 depicts summary statistics for demeaned bilateral migration for this restricted dataset[47]. The final sample size consists of 77 165 observations. The table also reveals that the huge drop in migration from 2001 and 2002 has been eliminated. We find that there is a marginal increase between these two years, as is expected in panel migration data.

[47] It should be noted that the mean demeaned bilateral migration for each is not equal to one because this dataset is only for municipality pairs that have bilateral migration equal to or greater than 10. Summary statistics for all the municipality pairs are provided in the appendix Table 5.2A. The table shows that the mean demeaned bilateral migration is equal to one, as expected. An additional observation is that the mean decreases over time. This is explained by the fact that the number of municipality pairs with bilateral migration greater or equal to 10 increase from 2 130 in 1996 to 8 056 in 2011. This has an effect on the mean, Nonetheless, it is important for the analysis to restrict accordingly and this is done by restricting the data to core municipality pairs with bilateral migration of 10 or more migrants.

Table 5.3: Summary statistics for demeaned bilateral migration for a common set of municipality-pairs with at least ten migrants

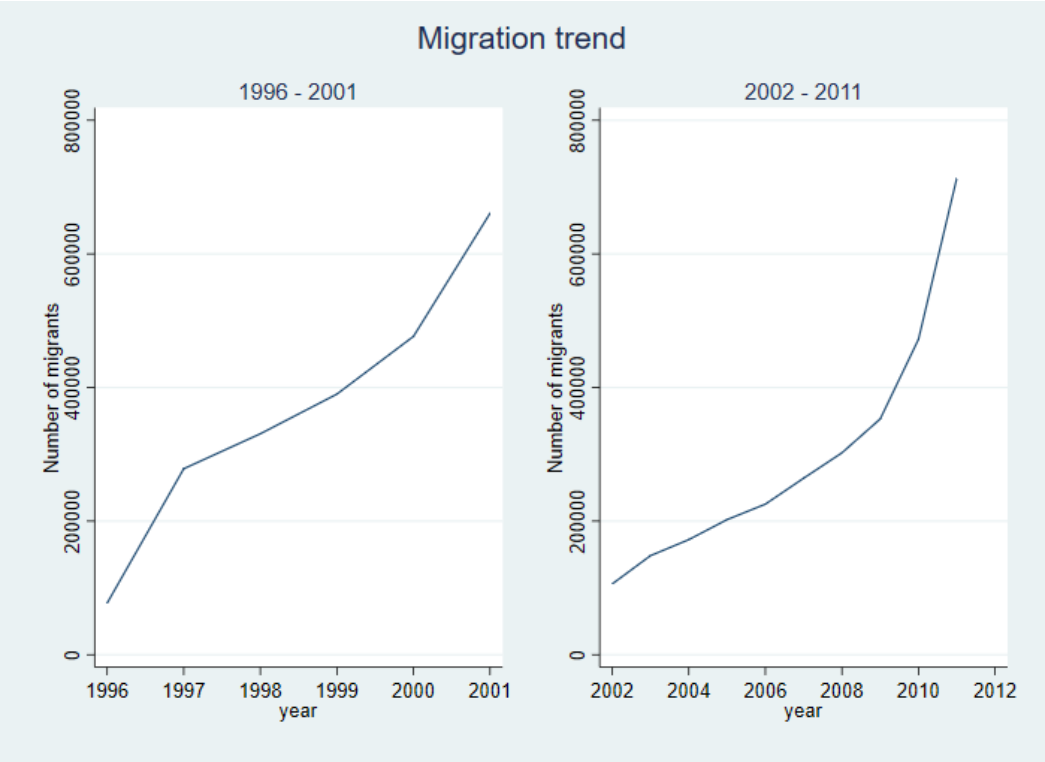
Year	Sum	Mean	P50	P1	P10	P90	N
1996	52 202	24.508	14.809	7.076	7.797	47.718	2 130
1997	53 594	11.454	4.724	1.979	2.192	21.961	4 679
1998	53 586	10.499	4.119	1.653	1.850	19.976	5 104
1999	53 631	9.391	3.531	1.401	1.566	18.160	5 711
2000	53 641	8.355	2.894	1.147	1.277	16.732	6 420
2001	53 689	6.852	2.203	0.827	0.927	13.719	7 836
2002	54 261	22.293	10.720	5.170	5.768	42.268	2 434
2003	54 351	18.664	8.078	3.700	4.148	33.798	2 912
2004	54 300	16.465	7.028	3.178	3.557	29.964	3 298
2005	54 352	14.814	6.078	2.714	3.056	26.825	3 669
2006	54 367	13.698	5.500	2.427	2.731	24.710	3 969
2007	54 343	12.320	4.770	2.071	2.343	20.959	4 411
2008	54 347	11.233	4.159	1.814	2.056	20.128	4 838
2009	54 380	10.176	3.551	1.550	1.756	18.357	5 344
2010	54 382	8.559	2.706	1.159	1.315	15.105	6 354
2011	54 406	6.753	1.852	0.767	0.876	11.586	8 056
Total	863 830	11.195	4.021	0.857	1.353	21.515	77 165

Source: 10% weighted sample census data

5.5.2 A Glimpse of the Data

This section of the chapter discusses the migration trend and characterises of South African migrants between 1996 and 2001, using the final sample. Figure 5.2 illustrates actual migration (not demeaned migration) over time, specifically between the two periods 1996-2001 and 2002-2011. In the first period observe that there is a sharp increase in the number of migrants from 1996 to 1997, this is followed by a gradual increase from 1997 to 2000 and another steep rise between 2000 and 2001. On the other hand, the figure shows that in the second period the increase in the number of migrants rose steadily in the former years (2002 to 2010) and that migrations rose sharply in the latter years (2010 to 2011). The exponential increase in migration in the former years in both periods points to recollection bias.

Figure 5.2: Migration trend: 1996-2001 and 2002-2011



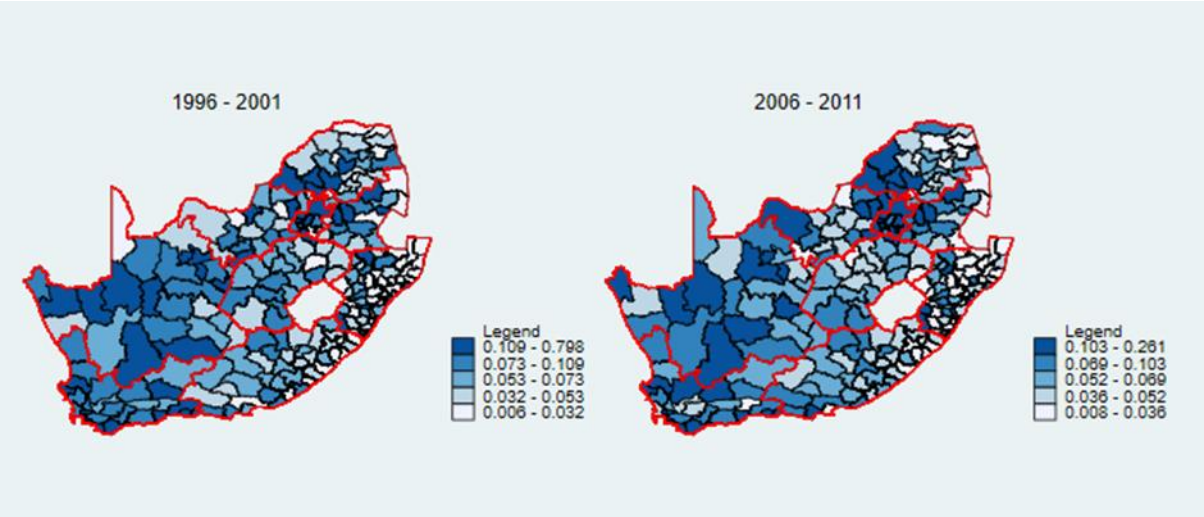
Source: 10% weighted sample census data

5.5.2.1 Spatial Patterns of Migration

To where do the migrants move? The answer to this question is provided in the map in Figure 5.3, which shows the distribution of in-migration between the two five-year periods 1996-2001 and 2006-2011. The darkly shaded municipalities represent municipalities with relatively high in-migration, while the lightly shaded municipalities experienced the least in-migration.

From the map, it is evident that in-migration is dispersed widely across municipalities. We also find that the choice of destination municipality appears to remain fairly constant over time, with municipalities in Gauteng, the Western Cape, and, to some extent, the Northern Cape, attracting more migrants than municipalities in other provinces. It is not surprising that migrants are moving into Gauteng and the Western Cape because these provinces have the highest level of economic activity in South Africa (Krugell, 2014) and the Northern Cape, in particular, Kimberley, is known for its diamond mining sector. On the opposite side of the spectrum, the Eastern Cape, Mpumalanga, North West, KwaZulu-Natal and Limpopo Provinces show low in-migration. The variation in rates of in-migration indicates that tariff-induced migration may vary across municipalities.

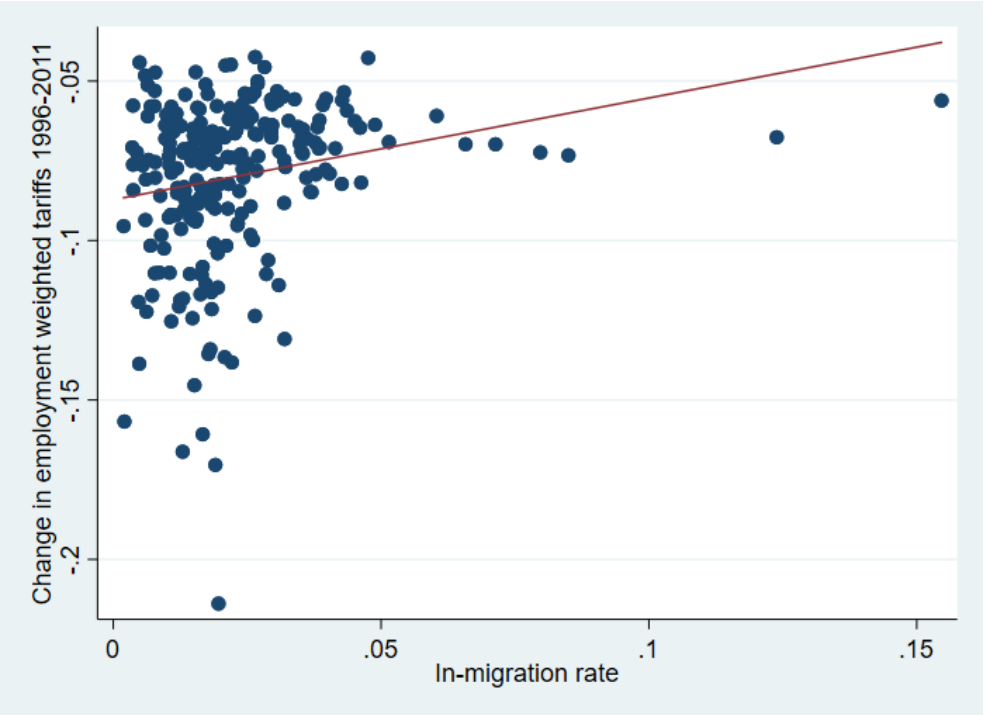
Figure 5.3: Spatial distribution of in-migration rates



Source: 10% weighted sample census data

In Figure 5.4, we depict the correlation between change in employment-weighted tariffs between 1996 and 2001 and in-migration in 2011, and we find a positive relationship, although this is strongly affected by the outliers. Nevertheless, the relationship is consistent with the idea that municipalities with larger tariff reductions have less in-migration, implying that destination tariffs influence where migrants go.

Figure 5.4: Correlation between change in employment-weighted tariffs and in-migration rates across municipalities in 2011



Notes: Tariffs are weighted by regional employment shares. The change is the difference between 1996 tariffs and 2011 tariffs.
Source: SA Full Census and Tariff data (Edwards 2015)

This section is a discussion of inter-provincial migration, as presented in Table 5.4 that occurred in South Africa in one year 2011. The table shows the origin of migrants (out-migration) and the destination province (in-migration). Gauteng and Eastern Cape are the main sources of migrants, while the Northern Cape has the least migrants leaving the province. About 54% of migrants in the Western Cape originate from the Eastern Cape and about 21% from Gauteng. KwaZulu-Natal attracts migrants from the Eastern Cape (47%) and Gauteng (27%). Migrants in the North West are predominantly from Gauteng. People from Limpopo (29%), KwaZulu-Natal (19%), Eastern Cape (14%) and Mpumalanga (12%) constitute the largest share of migrants in Gauteng. The inter-provincial migration pattern shows that migrants move to provinces, which are closest to their province of origin. The pattern of migration suggests that distance is a possible contributing factor to migration in South Africa.

In terms of the provincial in-migration as a share of total in-migration, we observe that Gauteng is overwhelmingly the most popular destination province, with 43.5% of migrants. The Western Cape has the second largest share of in-migrants, about 15%, followed by North West (8.4%), and KwaZulu-Natal (8.3%). This spatial distribution of in-migrants is consistent with economic activity in South Africa, which is clustered around Gauteng, Western Cape and KwaZulu-Natal. This spatial pattern of migration suggests that migration is driven by the likelihood of greater employment opportunities.

Table 5.4: Inter-provincial migration in 2011

	Destination Province								
Origin Province	**Western Cape**	**Eastern Cape**	**Northern Cape**	**Free State**	**KwaZulu-Natal**	**North West**	**Gauteng**	**Mpumalanga**	**Limpopo**
Western Cape	0%	29%	18%	6%	6%	3%	5%	3%	3%
Eastern Cape	54%	0%	11%	21%	47%	16%	14%	9%	9%
Northern Cape	6%	3%	0%	8%	2%	7%	2%	2%	2%
Free State	4%	8%	14%	0%	5%	13%	8%	6%	4%
KwaZulu-Natal	8%	19%	4%	12%	0%	5%	19%	17%	7%
North West	2%	4%	30%	11%	3%	0%	11%	5%	12%
Gauteng	21%	30%	16%	32%	27%	38%	0%	35%	44%
Mpumalanga	2%	4%	3%	5%	7%	6%	12%	0%	19%
Limpopo	2%	4%	4%	5%	3%	13%	29%	23%	0%
Total	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***
In-migration share	**15.4%**	**5.0%**	**2.6%**	**4.4%**	**8.3%**	**8.4%**	**43.5%**	**7.1%**	**5.4%**

Source: 10% weighted sample census data

5.5.2.2 Characterisation of Migration

Table 5.5 shows in-migration rates decomposed by gender, race, marital status, and fertility. In-migration rates are calculated as the sum of migrants over the period, divided by the population at the end period in the destination municipality. The data shows that there has been a marginal decline in in-migration for all demographics in the two periods, with aggregate in-migration falling from 8.1% (1996-2001) to 6.9% (2006-2011).

In addition, the table reinforces the finding that men are more spatially mobile than women. We see that a higher share of men migrates than women in both periods. Between 1996 and 2001, the migration rate of men was 8.7% while that of women was 7.7% compared to the period 2006-2011, where the rate of migration of men was 7.4% compared to 6.4% for women. The migration rate has fallen for both men and women, but the rate has fallen faster for women than for men. Migrants have thus become more male-intensive over the period.

The gendered migration rates are also evident across race and marital status, with men having higher rates of in-migration than women. The differences in migration rates suggest that rigidities to migration differ for men and women. Comparing other characteristics of men and women, the data shows that White women migrate more than Black women, with in-migration rates of 15.9% and 6.8% for the period 1996-2001 and 13.5% and 6.4% between 2006 and 2011, respectively. This is in line with empirical literature which shows that South African men migrate more than women.

In terms of family structure, married women are marginally more mobile than single women. Over the period 1996-2001 (2006-2011), the share of migrant women who are married is 7.7% (6.7%) compared to 7.2% (5.7%) for their single counterparts. This perhaps supports the explanation –previously mentioned - that married women move in association with their husbands, while single women face some discrimination and stigma when migrating. The migration pattern for men does not reveal the same pattern with married men migrating more than single men. In the former period, single men had a migration rate of 8.3% while married men had a migration rate of 8.9%. In the latter period, about 7% of single men migrated, a proportion slightly exceeded by that of married men, who had a migration rate of 7.6%.

Lastly, the fertility of women seems to play a significant role in migration ability and decisions. About 8.6% of women without children moved locations between 1996 and 2001, and about 6.5% of women with children. Between 2006 and 2011, the migration rates of mothers were 4.7% and 8.3% for women without children. This shows that women with children face tougher rigidities to migration.

Table 5.5: In-migration rates for the periods 1996-2001 and 2006-2011

In-migration rates	2001	2011	Change 2001 - 2011
Aggregate	8.1%	6.9%	-1.3%
Female	7.7%	6.4%	-1.3%
Male	8.7%	7.4%	-1.3%
Black female	6.8%	5.6%	-1.1%
Black male	7.8%	6.7%	-1.1%
White female	15.9%	13.5%	-2.4%
White male	16.4%	13.8%	-2.6%
Married female	7.7%	6.7%	-1.0%
Married male	8.9%	7.6%	-1.2%
Single female	7.2%	5.7%	-1.5%
Single male	8.3%	7.0%	-1.4%
Females with children	6.5%	4.7%	-1.9%
Females without children	8.6%	8.3%	-0.3%

Notes: The five-year period migration rates are computed as the sum of migrants during the period divided by the end of the period population.
Source: 10% weighted sample census data

5.6 Estimation Results

The objective of this chapter is to perform a descriptive analysis on the gendered effects of tariffs on internal migration in South Africa. The analysis is carried out by using restricted annual data on internal bilateral migration and the tariff protection measure spanning 1996 to 2011. We employ the restricted demeaned migration data for the core municipality-pairs that have bilateral migration of at least 10 migrants. We further restrict the analysis to municipality pairs that contain migration values for both men and women to obtain comparative estimates by gender. Given the data issues, estimation results in this study should be considered suggestive.

5.6.1 Tariff Liberalisation Effects on Internal Migration

The estimation results for the analysis of the effects of tariffs on aggregate internal migration are displayed in Table 5.6. A positive coefficient for tariffs suggests that tariff reductions discourages in-migration at the destination municipality. Likewise, a positive coefficient for tariffs at the origin municipality suggests that the reduction of tariffs lowers out-migration. Estimations in columns (1) and (2) are based on the OLS estimation approach. Column (1) is a baseline model where we control for distance, population density, economic activity, and infrastructure. The results show that the effect of tariff liberalisation on internal migration is not significantly different from zero. The estimates also show that internal migration decreases with distance. Moreover, internal migration is positively correlated with population density and infrastructure but negatively associated with economic activity at both the origin and destination municipalities.

We expand the model in column (2) by including other control variables, such as the manufacturing share, pensions, and kinship in the initial period (1996). We find that tariff reductions induces in-migration in the destination municipalities but has no effect on out-migration in the origin municipality. The effect at the destination municipality is unexpected. These peculiar estimates may be driven by the endogeneity of tariffs.

We follow the same techniques as in Chapter 3 by implementing the IV estimation strategy using the two-stage least squares estimation (2SLS), where we instrument the change in the trade protection measure with the initial trade protection measure in 1996. The IV estimation results are presented in column (3). The IV estimates reveal that the reduction of tariffs is associated with a rise in out-migration at the origin municipalities but the positive tariff coefficient for the destination municipalities is insignificant. Our findings also show, that in the IV model, the effect of tariffs on internal migration intensifies, suggesting that the baseline underestimates the tariff effect on migration. The results show that a 1% decrease in tariffs at the origin municipality is associated with an 11.3% increase in out-migration. Existing studies in other developing countries, such as those by Kovak (2010) in Brazil, Mendez (2015) in Mexico and Baldárrago and Salinas (2017) in Peru, find similar evidence. We find that the tariff effect on in-migration disappears. Conversely, the migration effects of economic activity and pension at the destination municipality fall away but the effect of pensions at the origin

municipality, which is insignificant in the OLS model, becomes weakly associated with internal migration.

Looking at some of the other variables, population density is positively related to both in-migration and out-migration. This is to be expected since population density captures the size of the population, and therefore increases the likelihood of migration from a region. In contrast, it is also that in-migration increase in regions with higher population density, possibly because those regions are likely to be in urban area, more developed and have better employment opportunities. We find that the shorter the distance between origin and destination municipalities, the more movement there is across the two locations. Economic activity, manufacturing share, and kinship discourage and limit migration out of the origin municipality. These results imply that migrants are less likely to leave regions with high levels of economic activity. Kinship at the origin municipality provides networks and support, and thus discourages out-migration. This is in line with expectations.

The effects of infrastructure on out-migration are peculiar. We expect that municipalities with adequate infrastructure face less out-migration, but we find more movement of migrants out of origin municipalities with relatively well-developed infrastructure. When comparing the infrastructure coefficient for the origin and destination municipalities, we see that the effect is stronger at destination municipalities. This suggests that even though infrastructure leads to both in and out-migration, in-migration exceeds out-migration. An additional unexpected result is the effect of manufacturing share on internal migration, which shows that municipalities with higher manufacturing share face low out-migration. A possible reason may be that workers in the manufacturing sector face rigidities to spatial migration. Perhaps in this instance, the lack of spatial migration by workers initially employed in manufacturing is mitigated by sectoral migration from manufacturing to services within these municipalities.

As expected, in-migration appears to be spurred by pull factors, such as population density and infrastructure, but destination municipalities with higher manufacturing share experience less in-migration. Yet, destination municipalities with stronger kinship ties seem to face reduced in-migration. This is contrary to our expectations. Nevertheless, the coefficient of kinship is stronger at the origin municipality than the destination municipality.

Table 5.6: Tariff liberalisation effects on internal migration

	(1)	(2)	(3)
	Dependent variables: Log demeaned bilateral migration		
VARIABLES	Baseline OLS	Extended OLS	Extended IV
ΔlnTariff_orig	0.148	-0.281	-11.314***
	(0.203)	(0.200)	(3.783)
ΔlnTariff_des	-0.028	-0.405**	9.997
	(0.174)	(0.173)	(6.491)
lnDistance	-0.340***	-0.395***	-0.403***
	(0.013)	(0.013)	(0.013)
lnPop_density_orig	0.248***	0.265***	0.283***
	(0.017)	(0.017)	(0.018)
lnPop_density_des	0.279***	0.271***	0.252***
	(0.018)	(0.017)	(0.021)
lnEcoact_orig	-0.105***	-0.056***	-0.100***
	(0.017)	(0.018)	(0.023)
lnEcoact_des	-0.088***	-0.030*	0.017
	(0.017)	(0.017)	(0.033)
lnInfrast_orig	0.055***	0.062***	0.072***
	(0.008)	(0.008)	(0.009)
lnInfrast_des	0.165***	0.167***	0.158***
	(0.008)	(0.008)	(0.010)
lnManuf_orig		-0.183***	-0.198***
		(0.021)	(0.022)
lnManuf_des		-0.075***	-0.071***
		(0.019)	(0.019)
lnPension_orig		0.005	0.012*
		(0.006)	(0.007)
lnPension_des		0.018***	0.008
		(0.005)	(0.008)
lnKinship_orig		-0.030***	-0.033***
		(0.004)	(0.004)
lnKinship_des		-0.025***	-0.020***
		(0.004)	(0.006)
Constant	1.544***	0.892***	
	(0.112)	(0.129)	
Observations	43,333	43,333	43,333
R-squared	0.427	0.452	0.169
Year FE	Yes	Yes	Yes
IV	No	No	Yes

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

Notes: Variables with orig and des suffixes are variable at the origin municipality and destination municipality respectively. All control variables are in natural logarithm. Tariff variables are employment weighted tariff rates. ΔlnTariff, change in log tariffs comprises the difference in log tariffs in the initial period and log tariffs in the final period. lnPop_density denotes population density. lnEcoact represents economic activity, which is proxied by night-time lights. lnInfrast denotes infrastructure which is the principal component of the log infrastructure variable and includes the share of households with electricity, regular refuse collection, flush toilets, and piped water. Manufacturing share, pension, and kinship are at the initial period in 1996. lnManuf represents manufacturing share, which is the share of manufacturing in total employment (excluding employment in the primary sector). lnPension is the number of households with a pension recipient compared to household without a recipient. lnKinship is the share of mother tongue isiZulu speaking people.

5.6.2 Gendered Tariff Liberalisation Effects on Internal Migration

The effects of tariff reduction are unlikely to be equal for men and women, given differences in rigidities between genders. Rigidities may include industry composition and segregation, family structure (in particular, marital status and fertility), and kinship or social networks. These factors are discussed in detail in Section 5.2.1. This part of the chapter evaluates the extent to which tariff-induced migration differs by gender and other demographic characteristics. The subsequent models are based on the IV strategy with year fixed effects[48].

The estimation results is displayed in Table 5.7. The full results are available in Table 5.3A in the appendix. The results in Table 5.7 suggest that tariff cuts have differential migration effects across gender. The estimates in columns (1) and (2) show that women tend to be more responsive to tariff reduction in the origin municipalities while the response of men is stronger at the destination municipalities. A 1% cut in tariffs increases out-migration of women by an average of 29% in the origin municipality and shows an average of 27% in-migration of men at the destination municipalities. These results suggest that men move to municipalities that experience relatively low tariff reductions, while women move out of municipalities that experience relatively large tariff cuts.

This evidence contradicts findings on Brazil by both Aguayo-Téllez et al. (2010) and Kovak (2010), and in China by Facchini et al. (2019), who show that male migration is more responsive to tariff reductions. We show that women in South Africa appear to be more responsive to the reduction of tariffs because employment of women is more adversely affected by liberalisation, which affects female intensive manufacturing industries more than male dominated industries. We also show stronger in-migration effects of tariffs on men than women, although note that the gender gap coefficient is not significant. This may be because women are more able to shift into services, which is a female-intensive sector. This points to country specificity of tariff liberalisation effects.

[48] We explored various estimations for the analyses. First, we aggregate the data by in-migration and out-migration separately. However, the results show that tariff coefficients are insignificant for both in-migration and out-migration. Erten et al. (2019) also employed the census data for 1996 and 2001 to test their main findings and found the relationship between tariff reductions and in-migration to be insignificant. Second, we use the control function approach using the IV Poisson method and including the residuals from the first-stage into the second-stage in the IV estimation and the results remain inconclusive. The IV PPML method is not valid for models with fixed effects hence we explored the IV Poisson method. Given the inconclusive results, we employed the estimation approach as presented in equation (5.2) and (5.3).

Columns (3) to (6) show gendered results by race, and the estimates show that Black and White women tend to be more responsive to tariff cuts at the origin municipalities than their male counterparts. It is also worth noting that the origin municipalities' tariff coefficients are larger than in columns (2) and (3), suggesting that the aggregate gendered effects are understated. Conversely, in-migration is not affected by tariff reductions in the destination municipalities. Broadly, these results are also robust across gender and race. However, in general, the effects appear to be sturdier on women, in particular Black women. This suggests that the disproportionate adverse effect of tariff liberalisation on manufacturing employment of women (especially Black women), as shown in Chapter 3, may be a driver of the stronger migration effect on women.

Table 5.7: The effects of tariff liberalisation on gendered internal migration

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variables: Log demeaned bilateral migration					
	Aggregate		Black		White	
VARIABLES	Female	Male	Female	Male	Female	Male
ΔlnTariff_orig	-28.640***	-4.600	-80.871***	-44.384***	-41.102**	-33.528*
	(7.629)	(8.203)	(14.703)	(13.726)	(17.219)	(17.512)
ΔlnTariff_des	-3.644	26.978**	-1.273	9.796	-22.825	-29.951
	(12.588)	(13.673)	(15.342)	(14.577)	(18.622)	(18.360)
lnDistance	-0.794***	-0.678***	-1.671***	-1.521***	-0.618***	-0.601***
	(0.022)	(0.023)	(0.058)	(0.057)	(0.068)	(0.067)
Observations	43,333	43,333	13,641	13,641	13,641	13,641
R-squared	0.051	0.030	0.004	0.079	0.140	0.142
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
IV	Yes	Yes	Yes	Yes	Yes	Yes

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

Notes: Variables with orig and des suffixes are variable at the origin municipality and destination municipality respectively. All control variables are in natural logarithm. Tariff variables are employment weighted tariff rates. ΔlnTariff, change in log tariffs comprises the difference in log tariffs in the initial period and log tariffs in the final period. lnPop_density denotes population density. lnEcoact represents economic activity which is proxied by night-time lights. lnInfrast denotes infrastructure which is the principal component of the log infrastructure variable and includes the share of households with electricity, regular refuse collection, flush toilets, and piped water. Manufacturing share, pension, and kinship are at the initial period in 1996. lnManuf represents manufacturing share, which is the share of manufacturing in total employment (excluding employment in the primary sector). lnPension is the number of households with a pension recipient compared to household without a recipient. lnKinship is the share of mother tongue isiZulu speaking people.

5.6.2.1 Gendered Tariff Liberalisation Effects and the Family Structure

This section explores the heterogeneity of tariff-induced internal migration according to the family structure. First, we probe the effects of tariffs on gendered migration by marital status, as shown in Table 5.8 (the full estimation results are presented in the appendix Table 5.4A).

The results suggest that tariff reductions increase out-migration of singles (men and women) and the effect is likely to be stronger on single women. Yet, tariff reductions seem to not encourage out-migration of married men. The likely effect of tariff reduction on out-migration of married women may be due to the tariff effect on the employment of women both in manufacturing an services sectors. Women, irrespective other marital status are likely to respond to the adverse effect of tariff reductions by seeking employment in other less exposed municipalities. Our results are dissimilar to those of Kovak (2010), who finds that spatial movement is more evident among unmarried individuals following tariff reductions. Nonetheless, we do find an indication that single women migrate more than married women. This suggests that married people face higher migration costs associated with a spouses desire to migrate, and their employment decisions.

We also find that the reduction of tariffs is likely to increase in-migration of single women in destination municipalities but have no effect on single men or married individuals. A possible explanation is that the financial responsibility within the household borne by single women may be a strong pull factor for these individuals to other municipalities, irrespective of tariff exposure in those municipalities. In addition, these coefficients point out that there are potentially other channels that allow for in-migration when tariffs at the destination municipalities are reduced.

In general, the results suggest that tariff liberalisation seems to have significantly stronger effect on out-migration than on in-migration. These results are also robust across marital status. Women appear to be more spatially mobile compared to me irrespective of their marital status.

Table 5.8: Tariff liberalisation effects on gendered internal migration by marital status

	(1)	(2)	(3)	(4)
	Dependent variables: Log demeaned bilateral migration			
VARIABLES	Married Female	Married Male	Single Female	Single Male
ΔlnTariff_orig	-26.126***	-13.143	-70.641***	-49.997***
	(9.708)	(9.929)	(10.084)	(9.314)
ΔlnTariff_des	-14.278	-23.974	-38.878***	-17.954
	(14.067)	(14.795)	(14.335)	(13.461)
lnDistance	-1.156***	-0.935***	-1.411***	-1.200***
	(0.047)	(0.046)	(0.048)	(0.045)
Observations	22,187	22,187	22,187	22,187
R-squared	0.079	0.082	-0.009	0.051
Year FE	Yes	Yes	Yes	Yes
IV	Yes	Yes	Yes	Yes

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

Notes: Variables with orig and des suffixes are variable at the origin municipality and destination municipality respectively. All control variables are in natural logarithm. Tariff variables are employment weighted tariff rates. ΔlnTariff, change in log tariffs comprises the difference in log tariffs in the initial period and log tariffs in the final period. lnPop_density denotes population density. lnEcoact represents economic activity which is proxied by night-time lights. lnInfrast denotes infrastructure which is the principal component of the log infrastructure variable and includes the share of households with electricity, regular refuse collection, flush toilets, and piped water. Manufacturing share, pension, and kinship are at the initial period in 1996. lnManuf represents manufacturing share, which is the share of manufacturing in total employment (excluding employment in the primary sector). lnPension is the number of households with a pension recipient compared to household without a recipient. lnKinship is the share of mother tongue isiZulu speaking people.

Lastly, we examine the tariff effect on internal migration of women with and without children, with the estimates for this effect shown in Table 5.9 (the full results are provided in Table 5.5A in the appendix). Even though tariff reduction appears to escalates internal migration of women generally, there seems to be higher levels of out-migration among women without children. There also appears to be an increase in in-migration of women without children following tariff reduction in the destination municipality. This is consistent with the idea that children impose rigidities on migration for women, thus making them less responsive to shocks. This evidence is in line with the evidence from Brazil that shows more movement across regions of individuals with smaller families, post-tariff liberalisation (Kovak, 2010).

Table 5.9: Tariff liberalisation effects on internal migration of women with and without children

	(1)	(2)
	Dependent variables: Log demeaned bilateral migration	
VARIABLES	With children	Without children
ΔlnTariff_orig	-39.597***	-70.004***
	(7.689)	(10.203)
ΔlnTariff_des	-6.172	-52.300***
	(12.000)	(15.074)
lnDistance	-1.059***	-1.165***
	(0.034)	(0.045)
Observations	27,458	27,458
R-squared	0.054	-0.048
Year FE	Yes	Yes
IV	Yes	Yes

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

Notes: Variables with orig and des suffixes are variable at the origin municipality and destination municipality respectively. All control variables are in natural logarithm. Tariff variables are employment weighted tariff rates. ΔlnTariff, change in log tariffs comprises the difference in log tariffs in the initial period and log tariffs in the final period. lnPop_density denotes population density. lnEcoact represents economic activity which is proxied by night-time lights. lnInfrast denotes infrastructure which is the principal component of the log infrastructure variable and includes the share of households with electricity, regular refuse collection, flush toilets, and piped water. Manufacturing share, pension, and kinship are at the initial period in 1996. lnManuf represents manufacturing share, which is the share of manufacturing in total employment (excluding employment in the primary sector). lnPension is the number of households with a pension recipient compared to household without a recipient. lnKinship is the share of mother tongue isiZulu speaking people.

5.6.3 Sensitivity Tests

Since we restricted the migration data to core municipalities that have at least ten migrants, in this section, we test the sensitivity of the effect of tariff reductions on the aggregate migration and gendered migration IV results using alternative bilateral migration thresholds. The estimates confirm that the main results are robust and are not sensitive to changes in the thresholds.

As depicted in Table 5.6A in the appendix, we make use of bilateral data for the core municipalities with a value of 5 or more migrants. We find that tariff reductions are likely to induce out-migration. Tariffs appear to have less effect on in-migration. The estimates of gendered tariff reduction effects are similar to the main results, in that tariff cuts are associated with a rise in out-migration of women but less migration of men in both origin and destination municipalities.

In the appendix, Table 5.7A displays the estimation results where the data is restricted to core municipalities with a bilateral migration value of 50 or more. The estimates show that our results are robust and not sensitive to changes in the migration threshold.

5.7 Concluding Comments

The chapter examines the gendered internal migration effects of tariff liberalisation in South Africa between 1996 and 2011. The gravity model and the 2SLS IV estimation strategy are employed in the descriptive analysis. The focus is on annual internal bilateral migration and the main variable of interest is the change in tariffs.

The main findings suggest that trade openness has varying migration effects in the origin and destination municipalities. Tariff reductions in the origin municipality is likely induce out-migration, while tariff reductions at the destination municipality may have no effect on migration. Our finding on tariff-induced internal migration is comparable with findings of studies in Brazil (Kovak, 2010), Mexico (Mendez, 2015) and Peru (Baldárrago & Salinas, 2017). These studies show that tariff liberalisation encourages spatial movement. The tariff-induced migration out of the origin municipality is underpinned by the destructive effect on employment.

We also find that the tariff effect on migration is likely to differ by gender in different locations. Tariff shocks may raise the out-migration of women and in-migration of men. The out-migration effects on women relative to men are robust, even across race. We show that tariffs are likely to have a larger effect on women, particularly Black women, driven by the adverse tariff effects on manufacturing employment. This suggests that tariff liberalisation influence women more through the direct effect of tariffs on employment. This finding on gendered migration is unique to South Africa. Findings from other developing countries point to men being more mobile and thus more responsive to tariff shocks, for example, studies in countries such as Brazil (Aguayo-Téllez et al., 2010; Kovak, 2010) and China (Facchini et al., 2019).

The effect of tariff reductions on gendered migration may differ from other emerging countries for several reasons. First, the labour force participation of women has been growing consistently over the year. However, unlike other emerging countries, labour force participation of women is driven by unemployment rather than employment. Thus, South

African women may be more motivated to migrate for better job prospects. Second, South Africa is characterised by high levels of female-headed household (Casale & Posel, 2002). This may serve as a contributing factor to the spatial movement of women to counteract the negative tariff effects on employment by seeking job opportunities in less exposed regions because they are the breadwinners in the household. Third, the apartheid history of South Africa that limited the movement of women may also be at play with women now enjoying the liberty to move. South African woman may not necessarily require a strong motivation to move.

A contributing factor to the increase in migration of Black women is the adverse employment effect of tariffs that is heavier on them. Women in South Africa appear to be reallocating towards less tariff exposed regions and it is likely that they are reallocating to services where more absorption is taking place. We find that tariff reductions may have no effect on in-migration across race.

The chapter also teases out the complexities of gendered migration by identifying the migration effect on married and single individuals. We discover from our descriptive analysis that there seem to be more movement in terms of out-migration of singles and married women in response to tariff reductions while there is no effect of tariffs on migration of married men. The effect appears to however be larger for single women than for single women. Singles are potentially more able to relocate to find alternative job opportunities. This finding that marriage reduces labour mobility, especially for women, is in line with findings in other studies. In addition, the chapter confirms that having children restricts the movement of women. We find that women without children are more likely to be responsive to tariff reductions than women with children. This finding is consistent with that of Kovak (2010) in Brazil, which shows that smaller families are more mobile than bigger families.

Although the chapter presents descriptive analysis and thus not making causality inferences, the chapter does however provide the insight that the effect of tariff liberalisation on the migration of women is country specific. In addition, the chapter highlights that rigidities affect the responsiveness of men and women to tariff shocks. Finally, the chapter shows that it is possible that the ability of women to migrate has diminished the adverse tariff effects on employment of women in the manufacturing sector.

The results from research conducted in South Africa demonstrates that industry-bias tariff liberalisation is associated with internal migration patterns that vary by gender, with women more likely to migrate in response to liberalisation. The results for South Africa differ from the experience of Brazil and China, where tariff liberalisation has had a stronger effect on migration of men. In South Africa, the results appear to be linked closely to the effect of tariff liberalisation on employment. Relatively large reductions in employment of women compared to men in response to liberalisation may have given rise to greater responsiveness of women to liberalisation than men in relation to migration. In addition, the results also point to the characteristics of South Africa wherein tariff liberalisation is not a significant contributor to internal migration. Other social and cultural factors may play a more dominant role in inducing internal migration.

Chapter 6

6.1 Summary of Key Findings

Improving the rate at which new job opportunities are created is a central economic challenge facing South African policymakers. Over the past two decades, the economy has not generated enough jobs to employ all work-eligible individuals in the country. Extensive empirical research on the causes of poor employment creation in South Africa has pointed to the supply-side and demand-side factors.

The main focus of this thesis is on the demand side of the labour market, the relationship between international trade and labour. The effect of trade on production and employment is through two channels. The first is trade liberalisation from the early 1990s (multilateral trade liberalisation from 1994 and preferential trade liberalisation from 2000). The second is increased competition from China, subsequent to its membership of the World Trade Organization in 2001, which saw China quickly become one of South Africa's main trading partners.

The effects of tariff liberalisation on the labour market is a contested issue globally. This is because liberalisation creates winners and losers in an economy. The standard endowment-based trade theory suggests that openness is beneficial to all countries in terms of production, employment, and wages. Yet, a Specific-Factors model provides a nuanced explanation by taking into consideration rigidities that play a vital role in the distributional effects of tariff liberalisation. International empirical evidence shows that factor rigidities influence the benefits of liberalisation. One of the most profound and under-researched differential distributional tariff effects is gendered effects. There is insufficient knowledge about the gendered effects of tariff liberalisation in a SSA context, which has resulted in imperfect conclusions about the gendered effects of tariff liberalisation in the research field of international trade.

The unique apartheid history of South Africa makes the country an interesting case study. One of the legacies of apartheid is high and persistent unemployment, particularly for women. Despite government initiatives to increase employment of women in the formal labour market,

South Africa still lags behind other developed and emerging countries in reaching gender convergence.

The primary objective of the thesis is to examine the gendered effects of liberalisation in the South African labour market, a middle-income country that has a unique labour market and history. The research identifies the relationship using region-specific variations in labour market outcomes and exposure to tariffs, focusing specifically on the gendered effects, as is now more common in the literature (Autor et al., 2015; Gaddis & Pieters, 2017; Kis-Katos et al., 2018). Using population census and tariff data, the analysis covers the post-apartheid period (1996 – 2011) when the economy opened up to international trade through liberalisation of its import tariffs. The two datasets enable us to document the gendered effects of tariff liberalisation at a local labour market level. The thesis contributes to the existing body of literature by applying a local and gendered lens to examine the distributional effects of tariff liberalisation on labour market outcomes in South Africa.

The thesis is comprised of four related chapters. Chapter 2 provides a descriptive analysis of the dynamics of regional employment growth. The chapter uses a decomposition approach to isolate the importance of region-specific factors driving employment growth. The chapter demonstrates substantial variation in regional employment growth across local labour markets between 1996 and 2011. The chapter also finds that industry-specific factor namely the industry composition of employment and the regional competitiveness is key determinants of variations in employment growth across regions. Lastly, regions with a high initial share of employment in nontradable sectors, experience relatively fast employment growth (or positive industry-mix effects). These outcomes are compatible with the anticipated effects arising from tariff liberalisation. By altering the relative price of goods across industries (also manufacturing relative to services), tariff liberalisation alters the structure of production and employment. The remainder of the thesis tests for this association more rigorously.

Chapter 3 estimates econometrically the association between changes in regional exposure to tariffs and labour market outcomes across regions in South Africa. To identify the causal relationship, it makes use of IV estimation techniques. The main findings of the chapter are that reduced tariffs over the period in review had no effect on manufacturing wages. Secondly, the reduction of tariffs lowered employment in the manufacturing sector, similar to findings in the international literature. Thirdly, the investigation across gender exposes that the adverse

effects of tariff liberalisation are disproportionately on the employment of women and widen the gender employment gap. The analysis by gender and race indicates that tariff liberalisation had no effect on the gender employment gap of Whites (men and women), but had a particularly negative effect on Blacks, especially Black women. This is as a result of the apartheid history of South Africa because Blacks were discriminated against, in terms of participation in the labour market. In the chapter, we discover that the key driver of gendered effects of tariff liberalisation is industrial segregation. Societal norms provide different opportunities and adjustment costs for men and women. Men are able to find employment in a range of numerous industries, while women are confined to only a few. The norms, stereotypes, discrimination and patriarchy (Braunstein & Folbre, 2001; Elson & Pearson, 1981; Fontana & Wood, 2000) make it harder for women, particularly Black women, to enter male-dominated industries when female-dominated industries collapse due to tariff liberalisation. This new evidence presenting in chapter 3 contributes to existing knowledge by highlighting that tariff effects are country-specific, relying predominately on the gender intensity across industries. Countries where tariff liberalisation is industry-biased against female-intensive industries will experience a dramatic decline in female employment after trade liberalisation, as is the case in South Africa.

Chapter 4 extends the analysis of the effects of tariff liberalisation on employment by looking at how liberalisation affected employment in the services sector. Its primary aim is to establish whether tariff liberalisation induced structural shifts in employment towards services. The chapter shows that tariff reductions had no effect on services sector wages. This provides further evidence that services sector wages in South Africa are not responsive to tariff liberalisation because of the strong presence of wage bargaining councils that prohibit the lowering of wages. Consistent with expectations and existing literature, the data reveals stronger shifts in employment from manufacturing towards services, particularly for women, in regions exposed to relatively large reductions in tariffs, but these shifts are almost entirely due to reductions in employment of workers in manufacturing. In fact, regions exposed to tariff reductions experienced relatively large declines in employment in *both* manufacturing and services. The study did not find evidence of structural shifts for men. The adverse effect on services employment was through spillover effects, including lower demand for services inputs, lower incomes and subdued manufacturing infrastructure investments associated with the contracting manufacturing sector. The chapter also illustrates that tariff liberalisation had heterogeneous effects for men and women driven mainly by differential gender intensities and employment changes in the construction and finance industries.

Trade theory states that benefits from trade are reliant on the extent of sectoral and or regional reallocation. Since the analyses discussed in Chapter 4 finds limited sectoral reallocation, in Chapter 5 we aim to determine if workers are instead reallocating spatially in response to increased international competition. The main objective for Chapter 5 was to provide a descriptive analysis on the effects of tariff liberalisation on internal migration using the gravity model and the 2SLS IV estimation approach. By altering relative employment opportunities across regions, liberalisation is expected to induce migration of workers in search of alternative employment options. The chapter finds that there is a positive relationship between the reduction of tariffs and out-migration in the origin municipality. The results also indicate that tariff reduction has a weak effect on in-migration. Secondly, the chapter teases out the gendered effects to assess whether internal migration in response to tariff liberalisation is the same for men and women workers. In contrast to the literature, the evidence in the chapter shows differential tariff effects on internal migration across gender, with women being more responsive to tariff reductions than men. Thirdly, the chapter shows more movement of women than their male counterparts. This is underpinned by the disproportionately negative effect of tariffs on manufacturing employment of women compared to men. The evidence from the chapter also shows stronger movement of singles in response to tariff reductions than married individuals, especially single women compared to married women. We also observe that tariff reductions have a stronger impact on the mobility of women without children compared to those with children. These findings corroborate the literature that highlights that internal migration diminishes the negative effects of tariffs on employment.

In sum, the findings of this thesis reveal heterogeneous and gendered effects associated with tariff liberalisation in South Africa. The results presented in the thesis differ in several ways from other international empirical studies on emerging economies. This is because tariff liberalisation in these emerging economies favoured female-intensive industries, unlike in South Africa. The thesis points to the relevance of country-specific characteristics and institutions in mediating the impact of tariff liberalisation on labour market outcomes. Industry segregation and spatial rigidities emergence as key underlying factors to the gendered effects.

In South Africa, the adverse effects of liberalisation are particularly pronounced on female workers. The thesis contributes to empirical research on the gendered effects of tariff liberalisation. The findings in the thesis reflect the industry bias of liberalisation, namely the extensive reductions in tariffs on clothing and textiles. Policies need to be tailored around the

gender-specific outcomes to attenuate the adjustment costs associated with liberalisation. Consistent with the results, these will necessarily need to be country-specific.

The thesis also supports the view that industry-bias tariff liberalisation leads to gendered distributional effects and that these effects are country-specific. The thesis in this manner advances existing knowledge on the distributional effects of tariffs in middle-income countries and SSA countries with similar characteristics to South Africa. Where there are wage bargaining councils or rigid wages, tariff liberalisation will have an impact on employment. A lesson for policymakers in other countries is that where tariff reductions are disproportionately in female-intensive industries, those countries are likely to experience unfavourable employment effects on women. In addition, specificity to industries and regions plays a vital role in workers' ability to migrate across industries and regions. This is because rigidities to industries intensify the adverse employment effects of trade liberalisation while lower spatial rigidities may reduce these negative effects.

6.2 Policy Implications of the Findings

The thesis set out to examine the gendered effects of tariff liberalisation on the labour market, focusing specifically on wages, employment, and internal migration in post-apartheid South Africa. Although the thesis has theoretical contributions, the results have policy relevance.

Firstly, the results from the shift-share decomposition in Chapter 2 suggest that both national and regional factors contribute to regional employment growth. However, given the dynamics in South Africa, with most regions lagging behind national growth, the regional industrial structure and regional competitiveness are dominant. The results suggest that since national growth is an accumulation of regional growth, it is important for policymakers to be intentional about achieving balance growth because failure to do so will have a detrimental effect on the national labour market. The evidence also implies that policy decisions by both the national and local government affect regional industrial and economic development. Accordingly, it is recommended that policymakers take into consideration regional dynamics when formulating policies that are targeting at improving social infrastructure, physical infrastructure and institutions, particularly in marginalised regions. Improvements in infrastructure and institutions will attract industries to the peripheral regions, which is likely to bring about balanced growth. This will also change migration patterns away from urban areas towards rural

areas and will benefit urban areas by reducing the over-population and strained public services in these areas.

Secondly, the key observation in Chapter 3 and 4 is that policies can have unintended gender-differentiated impacts. Trade policies, macroeconomic policies, labour market policies, and education policies may all generate differentiated impacts on men and women. The thesis establishes that disproportionate tariff reduction in female-intensive industries intensifies the unfavourable employment effects of tariff liberalisation despite moderate absorption into services and regional internal migration, which have mitigated the adverse effects in manufacturing. The policy implication of these findings is that there are different employment opportunities and adjustment costs for men and women. Men may be able to find employment in a range of industries, while women may be confined to a few. These findings show that limited labour demand is not the only factor contributing to unemployment, but that labour supply of women due to sector segregation is another factor. This would indicate that there is a need for policymakers, in the face of sectoral shocks such as tariff liberalisation, to pay close attention to the employment intensities and industry segregation. A trade policy that does not take into consideration industry-bias which is often associated with gender-bias tariff liberalisation is likely to widen the gender wage and employment gap. The solution is not to increase tariffs but rather to develop industry-specific policies that seek to find a balance between trade openness and achieving gender equality.

Industry segregation and limited movement across industries and regions of women are perpetuated and enforced by social norms, stereotypes, patriarchy and discrimination (Braunstein & Folbre, 2001; Elson & Pearson, 1981). These social norms play out in both the demand and supply side of the labour market. Gender-focused initiatives are necessary to help women overcome the constrains to industry and regional mobility. The main objective of such initiatives would be to improve the employability of women across various sectors. The absorption and retention of women into the labour market is imperative for the development of economies. This is especially relevant for South Africa because women constitute the largest share of the population. The initiatives can include improving on the implementation and enforceability of the Broad-Based Black Economic Empowerment (BBBEE) Act 53 of 2003 and the Employment Equity Act, 55 of 1998 which already have a particular focus on women. For example, a public works programme can consider gender disparity when sourcing workers. Policymakers may consider introducing strict anti-discrimination policies for example. This

can be a policy that all employers would be expected to abide by. Such laws will boost women's confidence in knowing that there is a government body that they can approach if they experience discrimination in the workplace.

The thesis also supports policy initiatives aimed at addressing the social norms that act as constraints for women. One of the initiatives could be aimed at empowering women. Women can be empowered first and foremost through the provision and better access to education and training to improve their skills levels. Other initiatives can include wage compensation for the unemployed, relocation assistance, child-care services and better job search resources to facilitate the movement of working and employable women across sectors and regions for better job opportunities.

Finally, the findings in chapter 5 of tariff-induced internal migration over the period 1996 – 2001 period offer an encouraging message about the adjustment to tariff liberalisation. The evidence shows that workers, particularly female workers, respond to the adverse effects of tariff liberalisation by migrating to regions with better job prospects. This has implications for the free movement of labour, particularly important for a country such as South Africa where there was a restricted movement of Blacks. The thesis has illustrated that the inability to move spatially has the potential to exacerbate the unfavourable and unintended consequences of tariff liberalisation.

6.3 Limitations and Suggestions for Future Research

There are several limitations in the empirical methods and analysis of the results and that we would like to highlight. These open up areas for further research in various ways. While the industry shift-share decomposition analysis in Chapter 2, provides useful and new insights about regional employment growth dynamics, our knowledge of regional dynamics can be improved by exploring the spatial distribution of the industry shift-share components, namely the industry-mix and regional competitiveness components, using disaggregated industry data (data that is currently not available to inform this thesis). The objective should be to identify whether there is spatial dependence in industry composition and regional competitiveness. In addition, since the study is descriptive, future research can focus on investigating potential identification properties of the shift-share approach. Such an empirical analysis will provide a deeper understanding of contributing factors to regional employment dynamics.

In Chapter 3 the thesis has highlighted the gendered employment effects of the liberalisation on tariffs, which are more adverse for women than men as a result of industry-biased tariff reductions and unequal gender intensities in industries. However, the thesis did not investigate the causes of gender industry segregation. The concentration of women in, and their immobility out of, female-intensive industries is a major concern because of huge job losses in these industries following tariff liberalisation. The findings in the thesis can be extended by exploring potential contributing factors to the segregation of men and women in the manufacturing industry. These factors include societal norms, such as stigmatisation, stereotypes, and patriarchal systems. We were not able to study these effects directly for this thesis due to the unavailability of data.

Chapter 3 and 4 revealed substantial employment changes in the local labour market, particularly manufacturing employment. It also highlights shifts between manufacturing and services, albeit the structural shift is limited. The modest sectoral reallocation provides an opportunity for further research that explores the responses of those workers that are unable to find alternative employment. The research can investigate tariff effects on unemployment and labour force participation. This analysis requires more detailed data, preferably panel data, to properly identify the dynamics of adjustment. Thus, it is not feasible for the thesis given the data limitations.

In these two chapters, we also examine the effects of tariff liberalisation on sectoral wages using income data. The thesis demonstrated that tariff liberalisation has no effect on sectoral wages. The use of income data influences the interpretation of the thesis results and assessment of the overall impact, including the channels through which tariffs affect employment. For example, the results in the thesis may be interpreted as suggesting that there were inconsistencies in the adoption of policies. It may be interpreted that tariff liberalisation and the imposing labour laws prevented firms and employees from adjusting to international competitive forces. Future research using actual wage data can build on the evidence in the thesis.

A further limitation in Chapter 3 and 4 is that we use the Bartik (1991) approach to generate tariffs at the local labour market level. The constructed tariff measure is not a true reflection of the local labour market's tariff exposure because we use employment shares as weights for tariffs in order to obtain the local tariff measure. Hence it is not possible to assess the causal

relationship between tariff reductions and changes in employment at the local labour market level. A new strand of literature that investigates the identification properties of the approach is emerging. The literature includes Borusyak et al. (2018), Adão et al. (2019) and Goldsmith-Pinkham et al. (2020). These studies propose several tests that identify causality. This research provides an avenue for further research that explores the causal relationship between tariff reductions and local labour market employment changes.

While Chapter 5 provides some insight to tariff-induced internal migration, there are a number of challenges with the data and these are discussed in the chapter. Extensions of the analysis include utilising individual-level data which will control for individual characteristics. Furthermore, the findings on tariff-induced internal migration presented in this thesis also suggest that further research is required to explicitly identify the combined effect of tariff reductions and internal migration on labour market outcomes.

Finally, since the thesis shows striking results on gendered effects of tariff liberalisation at a local labour market level using the municipality as the unit of analysis, new research can delve deeper into local labour markets by using the main place. From this level of analysis, we can determine whether the tariff impact differs by the level of analysis.

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Appendices

Table 1.1A: Chronology of tariff liberalisation in South Africa from the early 1990s

1990	General Export Incentive Scheme (GEIS) introduced. Provided a tax-free financial export subsidy to exporters based on the value of exports, degree of processing, and local content of the exported product.
1990-1991	Reduction of import surcharges to 40%, 5%, 15% and 5% for Luxury, Capital, Motor vehicles and Intermediate goods, respectively.
1994	Import surcharges abolished for Capital and Intermediate goods.
1995	Remaining import surcharges abolished.
1994	South African government's GATT offer during the Uruguay Round of multilateral trade negotiations within the framework of the General Agreement on Tariffs and Trade (GATT). The offer: (1) Bound about 98% of all tariff lines at the Harmonised System (HS) eight-digit level as against 18% before the round. (2) Reduced the number of tariff rates to six: 0%, 5%, 10%, 15%, 20% and 30%. (3) Rationalised over 12000 tariff lines. (4) Tariffied quantitative restrictions (QRs) on agricultural products. (5) Provided for special provisions (extensions of the adjustment period and raised maximum tariff rates) for textile, clothing and motor vehicle industries. (6) Agreed to phase out GEIS. Adoption of anti-dumping and countervailing duties legislation.
1995	Payments under GEIS became taxable, and the range of eligible products reduced.
1994-1997	Deregulation of agricultural marketing and control boards established under the Agricultural Marketing Act of 1968. Import control on agricultural products removed.
1996	New Tariff Rationalisation Process (TRP) formulated. These were: (1) Tariff lines and peaks to be reduced, (2) Formula and specific duties to be converted into ad valorem rates, (3) Imports that have no "suitable substitutes" to be duty-free, ad valorem rates of 30% on final products, 20% on intermediate goods and 10% on primary goods are generally not to be exceeded. (4) GEIS limited to manufacturing goods.
1996	Signing of the SADC Free Trade Protocol (implemented in September 2000)
1997	Termination of export subsidies provided under GEIS.
2000	Implementation of SA-EU Trade, Development and Cooperation Agreement (TDCA)
2000	Preferential access to the US for some products under the African Growth and Opportunity Act (AGOA)

2002	2002 Southern Africa Customs Union (SACU) Agreement introduces a new institutional structure, which included: (1) A dispute settlement mechanism; The requirement to have common policies on industrial development, agriculture, competition, and unfair trade practices; A new system regarding the common revenue pool and sharing formula (WTO, 2003: viii)
2004	Preferential Trade Agreement signed between SACU and MERCOSUR

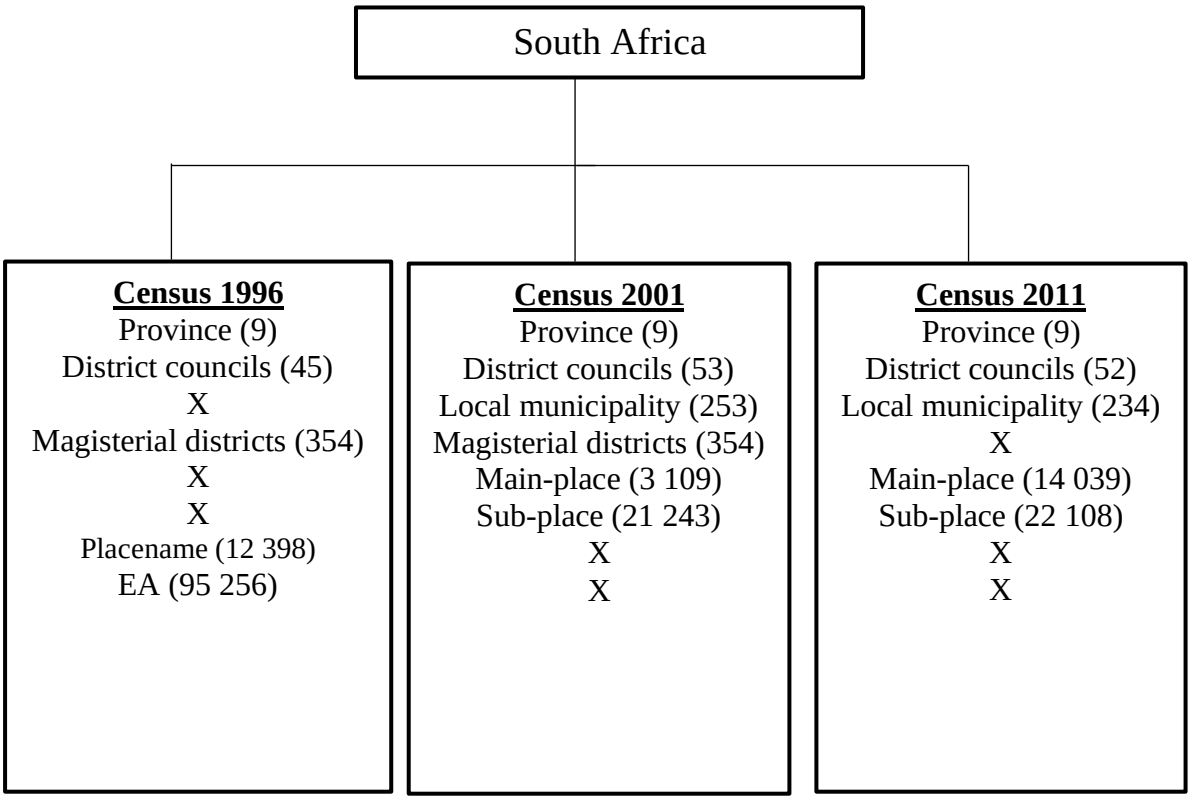
Notes: Extract from Edwards (2005)

Appendix for Chapter 2

Appendix 2.1: Constructing a census dataset for a comparable level of analysis

Municipal demarcations in South Africa changed from 253 municipalities in 2001 to 234 in 2011. There are nine provinces, 52 district municipalities (or district councils), eight metropolitan municipalities, 234 local municipalities in South Africa. The country is also divided into 354 magisterial districts, which are areas of jurisdiction of district courts, some of which are now aligned to municipalities. From the 2011 Census, the latter are no longer a geographical unit of the census. Figure 2.1A highlights the changes in geographical units across the three censuses.

Figure 2.1A: Hierarchical geographical units over time



As mentioned before, we construct a consistent level of analysis by using ArcGIS geographic software. Based on the assumption that data is evenly distributed across the source areas (Weir-Smith, 2017), areal-weighted interpolation techniques superimpose and intersect two incomparable geographical boundaries (polygons) to create a set of intersection polygons (Reibel & Agrawal, 2007).

From the resulting mapping, the area of each target polygon is weighted by the area of the source polygon of interest to create an areal-weighted ratio, which is then applied to all variables of interest in the source polygon to get the variable values in the target polygon. The literature on the applicability of the areal-weighted interpolation technique includes works by Gregory et al. (2010) and Martin et al. (2002). For South Africa, the technique has been applied by Weir-Smith (2017), who used it to aggregate 1991 and 1996 magisterial district data to 2005 municipal boundaries.

The thesis utilises the ArcGIS software overlay tools that combine two source polygons to produce a new target polygon, using either the union or the intersect overlay tools. While the union tool completely retains all parts of the source polygon in the target polygon, mapped and not mapped, the intersect tool allows for only the overlapping and common portions of the two source polygons to be retained in the target polygon. The thesis employs the union overlay tool. The next challenge is deciding on the target geographic unit.

This decision relies on the thesis definition of local labour market. However, there is no official definition of local labour market in the literature. According to Von Fintel (2014), the definition is often dictated by demarcations in the data employed. We have to consider the most appropriate sub-provincial geographic unit for this thesis to be able to provide adequate variation across local labour markets.

A study of the spatial distribution of unemployment in South Africa by Weir-Smith and Ahmed (2013) uses census data and defines local labour markets according to municipal demarcations. The thesis follows the study and defines local labour markets as local municipalities. These municipalities thus become the target unit in the union overlay and thus the unit of analysis. The advantage of using municipalities include (a) the census data contains with 253 and 234 municipalities in the 2001 and 2011 census respectively, (b) municipalities are large enough to reduce the chance of having few industries but also small enough to provide us with the spatial variation of employment, (c) aggregating lower geographical levels using the full census to a municipal level will result in fewer measurement errors than disaggregating municipalities in the 2011 census to lower levels. The disadvantages of defining local labour markets according to municipal boundaries is that some variation of labour market outcomes may be lost, as some local municipalities are large. We also need to take into account changes in municipal

demarcations between 2001 and 2011. Nonetheless, this level of analysis appears to provide adequate examples of regional heterogeneity.

The lowest unit of analysis in the 10% sample of the 1996 and 2001 censuses is magisterial district. Accordingly, using the ArcGIS union overlay tool and the 10% weighted sample, the 2011 municipality polygon is intersected with the 1996/2001 magisterial district polygon to derive a simple areal-weighted ratio, since magisterial districts defined in the 1996 and 2001 censuses have the exact demarcations. The ratio gives the proportion of a given 1996/2001 magisterial district area content in the new target polygon, which consists of the union area between the magisterial district and municipality polygons. The ratio is given as follows:

$$\text{Union\_ratio} = \text{unionarea\_mnmd}/\text{md\_area} \qquad (2.1A)$$

where unionarea_mnmd is the union area is for 1996/2001 magisterial district polygon and 2011 municipality polygon, while md_area is the area of a given 1996/2001 magisterial area. Thus, union_ratio gives the proportion of a given 1996/200 magisterial area contained in the union area. Given this ratio, we can proportionally assign the 1996/2001 magisterial district-based variables to their corresponding union area values. Finally, we sum up and aggregate the union area values by the municipality to get the 1996/2001 variables at the municipality level. The same process is applied to the Full census dataset using place-names in 1996 and sub-places in 2001.

A glimpse of the results of the areal-weighting interpolation process of the full census is presented in Table 2.1A. Here we map (or interpolate) the 1996 place-names to the 2011 municipalities using the employment variable. The first challenge with this is the discrepancy between the number of place-names in the shapefiles and those in the full census. The full census has 12 851 places while the shapefile has 12 404. In addition, we cannot map 6 of the 12 404 place-names in the shapefile to the municipalities. These six unmapped places do not have employment data and are therefore dropped. Our final sample has 12 398 place-names, giving us 96% precision (12 398/12 851). The 453 missing place-names in the shapefile have total employment of 182 974, which is about 2% of national employment (9 099 422).

5 038 place-names fall entirely into municipalities, the union ratio of 1. These comprise 30% of total place-names. The second union ratio category is that of place-names with a union ratio of between 0.9 and 0.9999. There are 6 816 place-names in this category, constituting 40% of place-names, with a cumulative percentage of 70%. This shows that two-thirds of the place-names are mapped completely to municipalities. However, imputed employment in these places is quite error-prone (error is the difference between actual employment and imputed employment) for 5 120. We lose data on 7 953 places due to the mapping process. Although the employment error is highest for the first two union ratio categories, the last union ratio category (union ratio between 0 and 10%) has the highest share of imputed employment (47% compared to 43% for the first two categories).

Table 2.1A: Interpolation of 1996 place-names to 2011 municipalities

Union ratio	Obs	Perc.	Cum. %	Total area (sq km)	Actual Employed	Imputed Employment	Imputed Employment (%)	Error
1	5 038	30	30	31 874	3 422 552	3 422 552	18	0
0.9 to 0.9999	6 816	40	70	522 048	4 626 694	4 621 574	25	-5 120
0.8 to 0.9	159	1	71	183 584	234 230	234 194	1	-36
0.7 to 0.8	126	1	72	57 980	163 536	163 514	1	-22
0.6 to 0.7	106	1	72	50 438	166 101	165 827	1	-274
0.5 to 0.6	120	1	73	51 058	176 935	176 515	1	-420
0.4 to 0.5	118	1	74	42 485	169 377	169 358	1	-19
0.3 to 0.4	126	1	74	94 225	224 977	224 942	1	-35
0.2 to 0.3	155	1	75	66 142	316 950	316 901	2	-49
0.1 to 0.2	234	1	77	79 613	483 444	483 367	3	-77
0 to 0.1	3 980	23	100	39 194	8 768 855	8 766 954	47	-1 901
Total	16 978	100		1 218 641	18 753 651	18 745 698	100	-7 953

Notes: Obs is observations. Perc. reflects percentage. Cum (%) is cumulative percentage. Imputed Emp. and Imputed Emp. (%) represent imputed employment and share of imputed employment, respectively. There are 12 398 place-names in 1996, and 234 municipalities in 2011 generating 16 978 union zones.
Source: Full census data

Table 2.2A shows the error statistics for employment and land area. The actual area is the total land area in South Africa, as provided by Statistics South Africa in 2011. Place-names are not mapped completely to municipalities, and as a result, we lose 2 172 square kilometres in land area. This difference in land area explains the difference between actual employment and imputed employment. The table also shows that the mean absolute error (absolute error divided by the number of union zones) is 46.8% and 12.8% respectively. The employment data lost for 7 953 places is only 0.04% of actual employment.

Table 2.2A: Error analysis of the interpolation process of the 1996 place-names

	Actual	Imputed	Absolute Error	Mean absolute error	Mean absolute % error
Employment	18 753 651	18 745 698	7 953	0.468	0.04%
Total area (sq km)	1 220 813	1 218 641	2 172	0.128	0.18%

Notes: There are 12 398 place-names in 1996, 234 municipalities in 2011, which form 16 978 union zones.
Source: Full census data

For 2001, the smallest unit of analysis is sub-place and sub-places are mapped to the 2011 municipalities. The results are presented in Table 2.3A and Table 2.4A. Sub-places with a union ratio of 1 are 8 779 (34% of total sub-places), and those that have a union ratio of between 0.9 and 0.9999 are 12 309 (48%). Sub-places in these two union ratio categories have a cumulative percentage of 81.4% and an error of 587. The total difference between actual and imputed employment is 1 670. Mean absolute percentage error (total error divided by actual employment) is 0.01%. The total land area lost is 1 318 square kilometres.

Table 2.3A: Interpolation of the 2001 sub-places to 2011 municipalities

Union ratio	Obs	Perc.	Cum. (%)	Total area (sq km)	Actual Employment	Imputed Employment	Imputed Employment (%)	Error
1	8 779	33.89	33.89	44 442	3 868 387	3 868 387	26.87	0
0.9 to 0.99999	12 309	47.52	81.41	1 042 019	5 648 923	5 648 336	39.24	-587
0.8 to 0.9	76	0.29	81.7	12 926	20 590	20 154	0.14	-436
0.7 to 0.8	25	0.1	81.8	24 541	9 811	9 810	0.07	-1
0.6 to 0.7	26	0.1	81.9	34 007	11 973	11 945	0.08	-28
0.5 to 0.6	25	0.1	81.99	6 273	3 937	3 705	0.03	-232
0.4 to 0.5	26	0.1	82.09	9 524	3 614	3 614	0.03	0
0.3 to 0.4	26	0.1	82.19	14 446	10 848	10 843	0.08	-5
0.2 to 0.3	26	0.1	82.29	12 406	10 063	10 061	0.07	-2
0.1 to 0.2	74	0.29	82.58	15 607	22 297	22 293	0.15	-4
0 to 0.1	4 513	17.42	100	3 303	4 787 317	4 786 942	33.25	-375
Total	25 905	100		1 219 495	14 397 760	14 396 090	100	-1670

Notes: Obs is observations. Perc. reflects percentage. Cum (%) is cumulative percentage. Imputed Emp. and Imputed Emp. (%) represent imputed employment and share of imputed employment, respectively. There are 21 243 sub-places in 2001 mapped to 234 municipalities in 2011, generating 25 905 union zones.
Source: Full census data

Table 2.4A: Error analysis of the interpolation process of the 2001 sub-places

	Actual	Imputed	Absolute Error	Mean absolute error	Mean absolute % error
Employment	14 397 760	14 396 090	1 670	0.06	0.01%
Total area (sq kms)	1 220 813	1 219 495	1 318	0.05	0.11%

Notes: There are 21 243 sub-places in 2001 mapped to 234 municipalities in 2011, generating 25 905 union zones.
Source: Full census data

Second, we map the 1996 magisterial districts to municipalities. The results are presented in Table 2.5A and Table 2.6A. First, the main difference between place-names and magisterial

districts is that only 2 magisterial districts have a union ratio of 1 and 191 have a union of between 0.9 and 0.9999 with a cumulative percentage of about 12%. The error incurred when we use magisterial districts is higher compared to when we use sub-place. This suggests that the smaller the source area, the more precise the imputation. Nevertheless, the advantage of using magisterial districts is that there are no discrepancies between the shapefile and the places listed in the Full census database. Furthermore, a smaller land area is lost with magisterial districts compared to place-names. The difference is actual and imputed is 1 732 square kilometres. The error as a percentage of actual employment is 0.08% (32 126/38 354 585).

Table 2.5A: Interpolation of 1996 magisterial districts to 2011 municipalities

Union ratio	Obs	Perc.	Cum. (%)	Total area (sq km)	Actual Employment	Imputed employment	Imputed employment (%)	Error
1	2	0.12	0.12	308	170 532	170 532	0.44	0
0.9 to 0.99999	191	11.43	11.55	462 350	5 276 953	5 261 850	13.73	-15 103
0.8 to 0.9	44	2.63	14.18	182 043	1 003 559	1 003 389	2.62	-170
0.7 to 0.8	40	2.39	16.58	100 546	917 686	917 338	2.39	-348
0.6 to 0.7	33	1.97	18.55	55 494	678 943	678 702	1.77	-241
0.5 to 0.6	25	1.50	20.05	51 754	515 164	514 774	1.34	-390
0.4 to 0.5	27	1.62	21.66	77 955	658 087	657 628	1.72	-459
0.3 to 0.4	34	2.03	23.70	75 939	677 405	677 057	1.77	-348
0.2 to 0.3	53	3.17	26.87	65 945	1 091 515	1 090 463	2.85	-1 052
0.1 to 0.2	101	6.04	32.91	100 415	2 771 864	2 771 259	7.23	-605
0 to 0.1	1 121	67.09	100.00	46 333	24 592 877	24 579 467	64.14	-13 410
Total	1 671	100		1 219 081	38 354 585	38 322 459	100	-32 126

Notes: Obs is observations. Perc. reflects percentage. Cum (%) is cumulative percentage. Imputed Emp. and Imputed Emp. (%) represent imputed employment and share of imputed employment, respectively. There are 354 magisterial districts in 1996, 234 municipalities in 2011, generating 1 671 union zones.
Source: Full census data

Table 2.6A: Error analysis of the interpolation process of the 1996 magisterial districts

	Actual	Imputed	Absolute Error	Mean absolute error	Mean absolute % error
Employment	38 354 585	38 322 459	32 126	19.23	0.08%
Total area (sq km)	1 220 813	1 219 081	1 732	1.04	0.14%

Notes: There are 354 magisterial districts in 1996, 234 municipalities in 2011, generating 1 671 union zones.
Source: Full census data

While the interpolation process is not without error, it is the best solution available to the problem of inconsistent geographic units over time. Furthermore, the most appropriate interpolation to use is the data from the Full census dataset (where possible) because we have smaller error - 96% precision – with this data despite the discrepancy between the number of place-names in the shapefiles and the Full census data.

Table 2.7A: Provincial location quotients in 2011

	Agriculture	Mining	Manufacturing	Utilities	Construction	Wholesale & Trade	Logistics	Finance	Other services
Western Cape	48%	0%	56%	32%	40%	72%	48%	44%	16%
Eastern Cape	59%	0%	15%	33%	59%	26%	10%	0%	90%
Northern Cape	93%	48%	11%	48%	59%	22%	22%	4%	44%
Free State	70%	25%	10%	35%	50%	40%	5%	0%	90%
KwaZulu-Natal	73%	4%	49%	22%	65%	24%	27%	6%	61%
North West	74%	58%	21%	16%	0%	11%	0%	5%	79%
Gauteng	0%	10%	80%	50%	10%	90%	90%	80%	10%
Mpumalanga	61%	61%	44%	50%	94%	22%	28%	0%	39%
Limpopo	68%	44%	4%	44%	48%	12%	0%	0%	76%

Source: 10% weighted sample census data

Table 2.8A: Dynamic industry shift-share decomposition of employment growth in South African municipalities

		1996 - 2001				2001 - 2011				1996 - 2011			
Code	**Municipality name**	**ΔE**	**NE**	**IM**	**CE**	**ΔE**	**NE**	**IM**	**CE**	**ΔE**	**NE**	**IM**	**CE**
362	Gamagara	-4.9	7.0	-9.0	-2.9	928.1	51.5	-13.0	889.6	877.4	62.0	-32.3	847.7
361	Ga-Segonyane	-10.6	7.0	-7.0	-10.6	678.8	51.5	-8.6	636.0	596.5	62.0	-27.5	562.1
538	uMhlathuze	29.3	7.0	-0.2	22.5	399.5	51.5	-6.6	354.6	545.7	62.0	-4.8	488.5
974	Polokwane	32.7	7.0	0.1	25.7	325.1	51.5	3.3	270.4	464.0	62.0	3.9	398.1
662	Rustenburg	30.4	7.0	-12.1	35.6	229.1	51.5	-18.5	196.1	329.2	62.0	-35.9	303.2
561	Umdoni	5.1	7.0	2.9	-4.8	302.1	51.5	-11.7	262.3	322.5	62.0	-7.9	268.4
667	Mafikeng	12.7	7.0	-0.1	5.8	208.0	51.5	4.8	151.7	247.0	62.0	9.8	175.2
378	Kai !Garib	32.4	7.0	7.1	18.3	159.9	51.5	-46.2	154.7	244.2	62.0	-28.7	210.9
987	Greater Tubatse	16.8	7.0	-6.0	15.8	188.4	51.5	-8.5	145.4	236.8	62.0	-10.8	185.6
873	Thaba Chweu	50.0	7.0	5.3	37.8	116.0	51.5	-20.2	84.8	224.1	62.0	-19.1	181.2
868	Emalahleni-MP	11.4	7.0	-10.1	14.5	161.1	51.5	-8.4	118.0	190.8	62.0	-19.9	148.7
869	Steve Tshwete	-2.7	7.0	-4.0	-5.7	196.0	51.5	-8.6	153.2	188.0	62.0	-15.3	141.4
382	Kgatelopele	-0.8	7.0	-10.9	3.1	172.6	51.5	-13.7	134.8	170.4	62.0	-30.0	138.4
506	Hibiscus Coast	1.8	7.0	2.2	-7.4	163.3	51.5	-2.7	114.6	168.1	62.0	-1.4	107.5
580	Nongoma	-14.2	7.0	-5.9	-15.3	207.2	51.5	12.3	143.4	163.5	62.0	4.4	97.1
583	Jozini	2.1	7.0	-1.6	-3.3	150.0	51.5	7.0	91.6	155.3	62.0	1.8	91.5
591	Mandeni	19.7	7.0	1.9	10.9	111.3	51.5	-13.9	73.8	153.0	62.0	-15.7	106.8
574	Endumeni	9.1	7.0	0.3	1.8	131.9	51.5	-6.7	87.1	153.0	62.0	-4.1	95.1
542	Nkandla	29.6	7.0	-5.0	27.7	92.9	51.5	6.8	34.6	150.0	62.0	-2.6	90.6
586	Mtubatuba	11.9	7.0	2.6	2.4	122.7	51.5	-1.3	72.6	149.3	62.0	-12.1	99.4
764	Randfontein	-2.8	7.0	-4.1	-5.6	154.3	51.5	-1.3	104.1	147.2	62.0	-6.7	91.9
590	Mthonjaneni	73.7	7.0	3.9	62.8	38.0	51.5	-26.3	12.8	139.7	62.0	-22.2	99.9
268	Kouga	5.9	7.0	4.7	-5.8	124.7	51.5	-20.9	94.2	138.0	62.0	-18.3	94.3
504	Umuziwabantu	45.5	7.0	1.2	37.4	63.2	51.5	-10.2	21.9	137.5	62.0	-12.8	88.3
566	The Msunduzi	0.3	7.0	1.1	-7.8	132.8	51.5	6.7	74.6	133.4	62.0	11.2	60.2
799	City of Tshwane	15.9	7.0	3.0	5.9	101.2	51.5	15.6	34.2	133.1	62.0	25.6	45.5

		1996 - 2001				2001 - 2011				1996 - 2011			
Code	**Municipality name**	**ΔE**	**NE**	**IM**	**CE**	**ΔE**	**NE**	**IM**	**CE**	**ΔE**	**NE**	**IM**	**CE**
297	Mbizana	0.8	7.0	-0.7	-5.5	125.8	51.5	10.0	64.4	127.6	62.0	6.6	59.0
265	Ndlambe	30.1	7.0	5.0	18.2	74.0	51.5	-0.2	22.7	126.4	62.0	-15.8	80.2
296	Umzimvubu	21.8	7.0	-4.0	18.8	81.3	51.5	7.6	22.2	120.8	62.0	1.7	57.1
866	Govan Mbeki	17.6	7.0	-6.3	17.0	85.5	51.5	-11.3	45.4	118.2	62.0	-20.3	76.5
270	Mbhashe	-7.9	7.0	-3.2	-11.6	136.5	51.5	13.0	72.0	117.9	62.0	1.9	54.0
290	Ngquza Hill	19.3	7.0	-2.9	15.3	82.4	51.5	4.5	26.5	117.7	62.0	-9.1	64.8
596	Greater Kokstad	59.1	7.0	6.3	45.8	36.8	51.5	-12.4	-2.3	117.5	62.0	-6.7	62.3
592	KwaDukuza	5.8	7.0	5.4	-6.6	105.7	51.5	-18.6	72.8	117.5	62.0	-26.0	81.5
292	Nyandeni	-3.2	7.0	-3.9	-6.2	121.6	51.5	11.8	58.3	114.6	62.0	1.9	50.7
570	Umtshezi	19.1	7.0	1.7	10.4	79.6	51.5	-9.2	37.3	113.9	62.0	-4.2	56.1
798	City of Johannesburg	14.5	7.0	3.0	4.5	85.7	51.5	18.2	16.0	112.6	62.0	25.9	24.6
982	Mogalakwena	36.1	7.0	-2.4	31.5	55.9	51.5	-2.4	6.9	112.2	62.0	3.0	47.2
981	Bela-Bela	16.7	7.0	1.7	8.0	79.4	51.5	-6.1	34.0	109.4	62.0	-7.6	55.0
979	Mookgopong	82.2	7.0	5.3	70.0	14.4	51.5	-32.8	-4.2	108.6	62.0	-27.1	73.6
285	Sakhisizwe	17.6	7.0	-1.8	12.4	77.0	51.5	-0.8	26.2	108.0	62.0	-7.3	53.3
180	Knysna	25.3	7.0	4.0	14.4	64.5	51.5	9.3	3.7	106.2	62.0	8.9	35.4
295	Matatiele	8.8	7.0	0.9	0.9	89.3	51.5	-2.2	40.1	105.9	62.0	0.2	43.7
968	Makhado	10.1	7.0	0.6	2.5	86.2	51.5	-2.5	37.3	105.0	62.0	-1.7	44.7
177	George	25.3	7.0	5.0	13.4	61.8	51.5	-3.0	13.4	102.8	62.0	0.4	40.4
594	Ingwe	9.8	7.0	2.5	0.3	84.4	51.5	-13.5	46.5	102.4	62.0	-14.9	55.4
797	Ekurhuleni	18.5	7.0	1.3	10.3	70.4	51.5	9.4	9.5	101.9	62.0	15.3	24.6
298	Ntabankulu	12.0	7.0	-8.1	13.1	78.8	51.5	10.0	17.3	100.4	62.0	-6.2	44.6
284	Engcobo	1.7	7.0	-3.0	-2.2	96.5	51.5	14.7	30.4	100.0	62.0	1.6	36.4
597	Ubuhlebezwe	18.6	7.0	5.0	6.7	68.1	51.5	-16.0	32.6	99.4	62.0	-19.5	57.0
281	Lukanji	24.6	7.0	0.3	17.4	59.2	51.5	9.2	-1.5	98.4	62.0	6.2	30.2
529	Abaqulusi	-17.5	7.0	-0.5	-24.0	138.9	51.5	-3.8	91.3	97.2	62.0	-20.2	55.4
760	Emfuleni	-22.1	7.0	-0.1	-28.9	152.0	51.5	2.5	98.0	96.3	62.0	4.1	30.2
287	Senqu	14.5	7.0	-0.7	8.3	70.6	51.5	-5.9	25.1	95.5	62.0	-12.6	46.1

		1996 - 2001				2001 - 2011				1996 - 2011			
Code	**Municipality name**	**ΔE**	**NE**	**IM**	**CE**	**ΔE**	**NE**	**IM**	**CE**	**ΔE**	**NE**	**IM**	**CE**
980	Modimolle	42.1	7.0	5.3	29.8	35.2	51.5	-21.5	5.2	92.0	62.0	-28.6	58.7
514	Emnambithi/Ladysmith	23.5	7.0	-0.5	17.1	55.4	51.5	-5.6	9.6	91.9	62.0	-4.8	34.6
582	Umhlabuyalingana	1.1	7.0	-2.3	-3.5	88.8	51.5	8.0	29.4	91.0	62.0	1.7	27.3
961	Greater Letaba	49.1	7.0	3.3	38.8	28.1	51.5	-24.3	0.9	90.9	62.0	-13.9	42.8
876	Nkomazi	42.0	7.0	3.0	32.1	32.3	51.5	-27.4	8.2	87.8	62.0	-22.0	47.8
966	Thulamela	6.9	7.0	-0.8	0.8	75.4	51.5	7.2	16.7	87.5	62.0	3.5	22.1
874	Mbombela	12.6	7.0	2.4	3.2	66.4	51.5	-1.3	16.3	87.4	62.0	2.5	22.9
669	Ramotshere Moiloa	13.6	7.0	0.4	6.2	63.7	51.5	-15.9	28.1	86.0	62.0	-16.7	40.7
172	Overstrand	23.2	7.0	4.5	11.8	49.9	51.5	-5.7	4.2	84.7	62.0	-2.0	24.7
179	Bitou	25.4	7.0	4.0	14.5	44.6	51.5	10.0	-16.8	81.4	62.0	9.2	10.2
525	Emadlangeni	29.7	7.0	-0.4	23.2	38.1	51.5	-28.1	14.8	79.2	62.0	-41.6	58.7
985	Makhuduthamaga	7.9	7.0	-4.3	5.3	65.8	51.5	8.5	5.9	78.9	62.0	1.4	15.5
986	Fetakgomo	0.3	7.0	-9.4	2.8	78.2	51.5	0.6	26.1	78.7	62.0	-8.7	25.4
763	Mogale City	34.3	7.0	1.9	25.4	32.2	51.5	4.5	-23.8	77.5	62.0	11.1	4.5
163	Saldanha Bay	11.8	7.0	2.7	2.2	58.6	51.5	-19.4	26.5	77.4	62.0	-11.8	27.2
963	Ba-Phalaborwa	42.4	7.0	-4.8	40.3	24.5	51.5	-17.1	-9.8	77.3	62.0	-20.4	35.7
598	Umzimkhulu	-6.0	7.0	-2.0	-11.0	88.2	51.5	0.8	35.9	76.8	62.0	-11.3	26.1
260	Buffalo City	-8.9	7.0	0.5	-16.4	93.2	51.5	5.9	35.8	76.1	62.0	4.1	10.0
166	Drakenstein	-6.1	7.0	5.1	-18.2	86.5	51.5	-20.7	55.7	75.2	62.0	-17.3	30.5
169	Langeberg	22.1	7.0	8.1	7.1	43.1	51.5	-41.4	33.0	74.7	62.0	-38.6	51.4
383	Sol Plaatjie	-9.2	7.0	-2.1	-14.0	91.2	51.5	7.4	32.3	73.6	62.0	8.4	3.3
983	Ephraim Mogale	15.1	7.0	1.4	6.8	50.5	51.5	-9.1	8.2	73.2	62.0	-6.0	17.2
293	Mhlontlo	-1.8	7.0	-4.8	-4.0	76.1	51.5	7.8	16.8	72.9	62.0	-4.1	14.9
299	Nelson Mandela Bay	-0.8	7.0	1.3	-9.1	73.2	51.5	6.0	15.8	71.8	62.0	8.1	1.6
861	Msukaligwa	5.3	7.0	1.7	-3.3	62.8	51.5	-19.8	31.1	71.4	62.0	-16.7	26.1
875	Umjindi	73.1	7.0	6.9	59.2	-1.1	51.5	-46.0	-6.5	71.2	62.0	-46.7	56.0
162	Bergrivier	38.1	7.0	7.8	23.3	23.6	51.5	-44.1	16.3	70.7	62.0	-35.7	44.3
962	Greater Tzaneen	21.1	7.0	3.0	11.1	40.4	51.5	-19.9	8.8	69.9	62.0	-9.2	17.1

		1996 - 2001				2001 - 2011				1996 - 2011			
Code	**Municipality name**	**ΔE**	**NE**	**IM**	**CE**	**ΔE**	**NE**	**IM**	**CE**	**ΔE**	**NE**	**IM**	**CE**
173	Cape Agulhas	8.6	7.0	6.8	-5.2	55.2	51.5	-14.7	18.4	68.5	62.0	-16.0	22.5
171	Theewaterskloof	13.8	7.0	8.5	-1.7	47.9	51.5	-36.8	33.3	68.3	62.0	-36.8	43.1
294	King Sabata Dalindyebo	-14.3	7.0	-1.5	-19.8	96.3	51.5	16.6	28.3	68.3	62.0	11.4	-5.1
573	Imbabazane	23.6	7.0	1.9	14.7	35.5	51.5	-9.9	-6.0	67.5	62.0	-4.0	9.5
282	Intsika Yethu	-25.3	7.0	-2.5	-29.8	122.3	51.5	4.7	66.1	65.9	62.0	0.0	3.9
564	Mpofana	55.7	7.0	6.6	42.1	6.4	51.5	-31.3	-13.7	65.7	62.0	-30.9	34.6
576	Msinga	26.0	7.0	0.5	18.6	30.7	51.5	-1.4	-19.4	64.7	62.0	4.3	-1.7
984	Elias Motsoaledi	15.0	7.0	1.3	6.7	42.8	51.5	-16.5	7.8	64.2	62.0	-14.1	16.3
379	//Khara Hais	9.4	7.0	4.0	-1.6	49.4	51.5	-29.9	27.9	63.5	62.0	-17.6	19.1
199	City of Cape Town	4.1	7.0	3.9	-6.7	56.4	51.5	12.2	-7.3	62.8	62.0	17.4	-16.7
286	Elundini	21.8	7.0	-1.1	16.0	33.5	51.5	-6.4	-11.5	62.6	62.0	-11.0	11.6
960	Greater Giyani	24.7	7.0	-0.8	18.5	30.3	51.5	2.4	-23.5	62.5	62.0	5.4	-4.9
181	Laingsburg	2.3	7.0	7.7	-12.4	58.6	51.5	-37.3	44.4	62.2	62.0	-28.5	28.7
499	Mangaung	-3.7	7.0	-0.2	-10.5	68.5	51.5	8.9	8.1	62.1	62.0	9.8	-9.6
978	Lephalale	39.7	7.0	-3.3	36.0	14.7	51.5	-17.7	-19.0	60.3	62.0	-22.3	20.6
175	Hessequa	29.8	7.0	4.1	18.7	22.7	51.5	-16.0	-12.8	59.3	62.0	-19.0	16.3
289	Gariep	20.8	7.0	3.8	10.1	31.2	51.5	-25.8	5.5	58.5	62.0	-25.0	21.5
160	Matzikama	21.4	7.0	6.3	8.1	30.5	51.5	-33.0	12.0	58.4	62.0	-32.3	28.7
862	Mkhondo	11.3	7.0	4.6	-0.3	41.6	51.5	-27.8	18.0	57.7	62.0	-26.4	22.1
478	Metsimaholo	2.6	7.0	-2.8	-1.6	53.5	51.5	-5.0	7.0	57.4	62.0	-6.6	2.0
380	!Kheis	46.5	7.0	8.2	31.3	7.1	51.5	-54.1	9.7	56.8	62.0	-38.9	33.7
599	eThekwini	5.9	7.0	1.6	-2.7	47.9	51.5	8.2	-11.7	56.6	62.0	10.7	-16.1
165	Witzenberg	7.3	7.0	9.5	-9.1	45.5	51.5	-50.6	44.7	56.2	62.0	-44.0	38.1
671	Mamusa	2.8	7.0	3.2	-7.4	51.2	51.5	-25.7	25.4	55.4	62.0	-34.4	27.8
967	Musina	26.0	7.0	2.8	16.2	23.0	51.5	-28.2	-0.3	55.0	62.0	-19.1	12.1
291	Port St Johns	15.9	7.0	-2.9	11.8	33.1	51.5	2.3	-20.6	54.4	62.0	-8.0	0.4
364	Nama Khoi	-12.0	7.0	-12.1	-6.9	71.2	51.5	-18.4	38.1	50.6	62.0	-35.6	24.2
271	Mnquma	4.6	7.0	-2.0	-0.4	43.6	51.5	9.6	-17.4	50.3	62.0	2.1	-13.8

		1996 - 2001				2001 - 2011				1996 - 2011			
Code	**Municipality name**	**ΔE**	**NE**	**IM**	**CE**	**ΔE**	**NE**	**IM**	**CE**	**ΔE**	**NE**	**IM**	**CE**
176	Mossel Bay	24.6	7.0	1.6	16.1	19.7	51.5	3.7	-35.5	49.2	62.0	0.6	-13.3
167	Stellenbosch	17.7	7.0	5.1	5.6	26.6	51.5	-12.0	-12.8	49.0	62.0	-6.1	-6.9
280	Inkwanca	17.8	7.0	3.6	7.3	26.4	51.5	-18.1	-7.0	48.9	62.0	-24.5	11.4
288	Maletswai	28.1	7.0	1.3	19.8	16.3	51.5	-8.0	-27.2	48.9	62.0	-13.4	0.3
670	Naledi-NW	-14.5	7.0	5.9	-27.3	72.2	51.5	-19.5	40.2	47.3	62.0	-23.2	8.5
168	Breede Valley	4.9	7.0	6.7	-8.8	39.0	51.5	-36.8	24.4	45.8	62.0	-27.0	10.8
524	Newcastle	-0.6	7.0	-0.9	-6.7	46.4	51.5	-4.8	-0.2	45.5	62.0	-4.1	-12.3
579	Uphongolo	16.6	7.0	2.3	7.3	23.8	51.5	-30.6	3.0	44.4	62.0	-26.2	8.6
575	Nqutu	10.8	7.0	-3.0	6.9	29.6	51.5	14.1	-36.0	43.6	62.0	5.7	-24.1
661	Madibeng	6.8	7.0	0.1	-0.3	31.2	51.5	-5.9	-14.3	40.1	62.0	-2.8	-19.1
182	Prince Albert	-2.4	7.0	6.2	-15.6	42.6	51.5	-36.6	27.8	39.2	62.0	-28.7	5.9
161	Cederberg	26.2	7.0	9.4	9.9	9.6	51.5	-44.1	2.3	38.3	62.0	-34.8	11.1
277	Nxuba	14.3	7.0	4.5	2.9	20.0	51.5	-17.8	-13.6	37.3	62.0	-21.7	-3.1
595	Kwa Sani	-19.1	7.0	7.4	-33.5	69.7	51.5	-12.5	30.8	37.3	62.0	-26.9	2.2
864	Lekwa	1.3	7.0	0.7	-6.4	35.5	51.5	-22.2	6.3	37.2	62.0	-22.0	-2.7
563	uMngeni	28.8	7.0	1.9	19.9	6.6	51.5	-10.0	-34.9	37.2	62.0	0.3	-25.1
581	Ulundi	19.5	7.0	-3.5	16.0	14.6	51.5	10.9	-47.8	36.9	62.0	-2.8	-22.3
366	Hantam	15.8	7.0	6.4	2.5	16.2	51.5	-35.4	0.1	34.6	62.0	-19.7	-7.7
860	Albert Luthuli	-0.6	7.0	0.6	-8.1	35.0	51.5	-19.5	3.0	34.2	62.0	-21.9	-5.9
370	Umsobomvu	-16.4	7.0	3.6	-27.0	60.2	51.5	-14.1	22.8	33.9	62.0	-13.0	-15.2
676	Tlokwe City Council	18.2	7.0	-5.0	16.2	13.2	51.5	-10.7	-27.5	33.8	62.0	-13.9	-14.3
278	Inxuba Yethemba	4.1	7.0	1.9	-4.8	28.0	51.5	-15.3	-8.2	33.2	62.0	-11.5	-17.2
872	Dr JS Moroka	-29.6	7.0	-3.0	-33.6	88.9	51.5	14.6	22.8	32.9	62.0	10.3	-39.4
577	Umvoti	-3.3	7.0	5.0	-15.2	36.4	51.5	-27.9	12.8	31.9	62.0	-25.8	-4.3
470	Dihlabeng	4.5	7.0	4.1	-6.5	25.2	51.5	-19.4	-6.9	30.8	62.0	-16.3	-14.8
472	Maluti a Phofung	3.4	7.0	-0.4	-3.2	26.4	51.5	-4.5	-20.6	30.6	62.0	2.1	-33.4
674	Kagisano/Molopo	14.2	7.0	3.2	4.1	13.3	51.5	-22.6	-15.5	29.5	62.0	-31.4	-1.1
578	eDumbe	7.7	7.0	1.5	-0.9	20.1	51.5	-14.1	-17.2	29.3	62.0	-28.5	-4.2

		1996 - 2001				2001 - 2011				1996 - 2011			
Code	**Municipality name**	**ΔE**	**NE**	**IM**	**CE**	**ΔE**	**NE**	**IM**	**CE**	**ΔE**	**NE**	**IM**	**CE**
668	Ditsobotla	15.0	7.0	-2.1	10.1	10.5	51.5	-15.9	-25.0	27.1	62.0	-18.0	-16.9
276	Nkonkobe	-20.4	7.0	-3.4	-24.0	59.4	51.5	0.5	7.4	26.8	62.0	-2.8	-32.4
678	Maquassi Hills	16.0	7.0	3.2	5.8	9.1	51.5	-27.9	-14.5	26.6	62.0	-33.9	-1.5
871	Thembisile	-1.3	7.0	-3.6	-4.7	25.7	51.5	6.4	-32.1	24.1	62.0	2.3	-40.2
877	Bushbuckridge	-5.2	7.0	-0.3	-11.8	29.7	51.5	-2.6	-19.2	23.0	62.0	-1.5	-37.4
373	Renosterberg	-7.7	7.0	3.3	-17.9	32.2	51.5	-23.2	3.9	22.0	62.0	-34.8	-5.2
673	Lekwa-Teemane	12.7	7.0	3.4	2.4	7.6	51.5	-20.9	-22.9	21.3	62.0	-16.3	-24.4
479	Mafube	-18.9	7.0	3.3	-29.2	47.9	51.5	-15.7	12.2	19.9	62.0	-20.0	-22.1
264	Makana	-18.0	7.0	2.0	-27.0	44.7	51.5	-1.6	-5.1	18.6	62.0	-9.2	-34.2
170	Swellendam	-10.7	7.0	6.4	-24.0	29.3	51.5	-34.3	12.1	15.4	62.0	-30.2	-16.3
368	Khâi-Ma	5.3	7.0	-5.6	3.9	8.8	51.5	-32.5	-10.2	14.6	62.0	-35.3	-12.1
977	Thabazimbi	3.2	7.0	-14.0	10.2	10.5	51.5	-25.6	-15.4	14.0	62.0	-45.5	-2.5
174	Kannaland	12.2	7.0	9.1	-3.9	1.0	51.5	-44.1	-6.4	13.4	62.0	-43.5	-5.2
363	Richtersveld	-12.0	7.0	-12.1	-6.9	28.3	51.5	-18.4	-4.7	12.9	62.0	-35.6	-13.5
973	Molemole	80.8	7.0	3.3	70.6	-37.7	51.5	-5.4	-83.7	12.7	62.0	-5.4	-43.9
374	Thembelihle	101.7	7.0	5.8	89.0	-44.6	51.5	-29.0	-67.1	11.8	62.0	-26.6	-23.6
571	Okhahlamba	31.1	7.0	1.3	22.8	-15.2	51.5	-2.5	-64.2	11.2	62.0	-4.3	-46.5
867	Victor Khanye	15.0	7.0	-2.2	10.3	-3.5	51.5	-10.8	-44.2	10.9	62.0	-15.7	-35.3
664	Moses Kotane	-7.3	7.0	-7.5	-6.8	19.0	51.5	-12.3	-20.1	10.3	62.0	-17.6	-34.1
386	Phokwane	1.3	7.0	6.1	-11.8	8.6	51.5	-33.5	-9.4	9.9	62.0	-23.6	-28.4
371	Emthanjeni	-16.8	7.0	0.3	-24.1	31.0	51.5	-0.7	-19.7	9.0	62.0	-0.4	-52.5
178	Oudtshoorn	-7.6	7.0	4.3	-18.9	16.4	51.5	-5.8	-29.2	7.5	62.0	-3.3	-51.1
460	Letsemeng	31.2	7.0	-0.9	25.1	-19.0	51.5	-32.6	-37.9	6.3	62.0	-32.9	-22.7
164	Swartland	7.1	7.0	4.4	-4.2	-0.8	51.5	-20.4	-31.8	6.3	62.0	-18.1	-37.6
666	Tswaing	-6.7	7.0	1.9	-15.6	13.6	51.5	-22.4	-15.5	6.0	62.0	-21.0	-35.0
375	Siyathemba	-20.9	7.0	5.9	-33.8	33.0	51.5	-26.5	8.1	5.2	62.0	-28.8	-27.9
865	Dipaleseng	-6.9	7.0	2.7	-16.6	12.0	51.5	-14.8	-24.6	4.3	62.0	-21.8	-35.9
269	Kou-Kamma	18.9	7.0	6.5	5.5	-12.7	51.5	-24.4	-39.8	3.8	62.0	-24.3	-33.9

		1996 - 2001				2001 - 2011				1996 - 2011			
Code	**Municipality name**	**ΔE**	**NE**	**IM**	**CE**	**ΔE**	**NE**	**IM**	**CE**	**ΔE**	**NE**	**IM**	**CE**
468	Nala	5.5	7.0	1.8	-3.3	-1.7	51.5	-33.5	-19.6	3.7	62.0	-30.0	-28.3
863	Pixley Ka Seme	1.1	7.0	0.6	-6.4	2.2	51.5	-15.1	-34.1	3.4	62.0	-19.9	-38.7
677	City of Matlosana	-15.0	7.0	-15.5	-6.4	20.2	51.5	-10.9	-20.3	2.2	62.0	-35.4	-24.3
279	Tsolwana	16.2	7.0	2.0	7.3	-12.6	51.5	-9.2	-54.8	1.6	62.0	-15.5	-44.9
474	Mantsopa	4.4	7.0	4.5	-7.1	-4.9	51.5	-25.0	-31.3	-0.7	62.0	-26.2	-36.5
587	Mfolozi	28.3	7.0	-0.4	21.8	-25.3	51.5	-4.2	-72.6	-4.2	62.0	-1.7	-64.5
463	Naledi-FS	-4.3	7.0	1.6	-12.9	-2.1	51.5	-22.4	-31.2	-6.3	62.0	-23.5	-44.8
369	Ubuntu	-25.5	7.0	5.2	-37.7	24.8	51.5	-21.9	-4.8	-7.1	62.0	-22.0	-47.0
546	Maphumulo	-25.2	7.0	-0.4	-31.7	23.9	51.5	-7.6	-20.0	-7.3	62.0	-3.7	-65.6
283	Emalahleni-EC	-47.6	7.0	-2.5	-52.1	75.3	51.5	2.1	21.7	-8.2	62.0	2.3	-72.4
465	Tokologo	17.9	7.0	4.1	6.8	-23.0	51.5	-37.2	-37.2	-9.3	62.0	-39.3	-31.9
262	Blue Crane Route	4.8	7.0	4.7	-6.8	-13.5	51.5	-22.9	-42.1	-9.3	62.0	-23.2	-48.2
477	Ngwathe	-11.5	7.0	1.8	-20.2	2.2	51.5	-11.9	-37.3	-9.5	62.0	-11.8	-59.7
584	The Big 5 False Bay	7.5	7.0	2.8	-2.3	-17.1	51.5	0.6	-69.2	-10.9	62.0	-8.8	-64.1
976	Lepele-Nkumpi	16.7	7.0	-1.7	11.5	-23.8	51.5	2.8	-78.0	-11.1	62.0	4.6	-77.7
273	Amahlathi	-9.1	7.0	0.9	-17.0	-2.2	51.5	-5.2	-48.5	-11.1	62.0	-5.2	-68.0
964	Maruleng	36.5	7.0	-1.0	30.6	-35.6	51.5	-16.6	-70.5	-12.1	62.0	-13.3	-60.8
870	Emakhazeni	4.2	7.0	-1.7	-1.0	-17.3	51.5	-11.2	-57.6	-13.9	62.0	-17.9	-58.0
672	Greater Taung	-11.7	7.0	-2.1	-16.6	-2.9	51.5	-1.6	-52.8	-14.3	62.0	-7.0	-69.3
372	Kareeberg	-28.2	7.0	4.7	-39.9	17.5	51.5	-25.9	-8.1	-15.7	62.0	-22.2	-55.4
466	Tswelopele	-1.6	7.0	4.2	-12.7	-15.4	51.5	-33.6	-33.3	-16.8	62.0	-35.3	-43.5
462	Mohokare	-1.7	7.0	1.8	-10.5	-16.0	51.5	-29.2	-38.2	-17.4	62.0	-21.5	-57.9
675	Ventersdorp	25.3	7.0	-0.9	19.2	-34.1	51.5	-24.0	-61.6	-17.5	62.0	-28.1	-51.3
267	Baviaans	4.0	7.0	6.7	-9.7	-20.8	51.5	-40.8	-31.4	-17.7	62.0	-32.2	-47.4
473	Phumelela	21.4	7.0	1.3	13.1	-32.6	51.5	-26.9	-57.1	-18.1	62.0	-15.8	-64.4
568	Richmond	5.1	7.0	5.0	-6.8	-22.4	51.5	-20.8	-53.1	-18.4	62.0	-19.5	-60.9
969	Blouberg	43.7	7.0	1.5	35.2	-44.2	51.5	-10.4	-85.2	-19.8	62.0	-5.1	-76.7
469	Setsoto	-17.6	7.0	6.5	-31.0	-3.0	51.5	-25.7	-28.7	-20.0	62.0	-31.4	-50.6

		1996 - 2001				2001 - 2011				1996 - 2011			
Code	**Municipality name**	**ΔE**	**NE**	**IM**	**CE**	**ΔE**	**NE**	**IM**	**CE**	**ΔE**	**NE**	**IM**	**CE**
381	Tsantsabane	0.2	7.0	-8.6	1.9	-20.4	51.5	-16.4	-55.4	-20.2	62.0	-28.7	-53.6
471	Nketoana	-12.1	7.0	2.6	-21.7	-10.0	51.5	-24.2	-37.3	-20.9	62.0	-19.7	-63.3
475	Moqhaka	-25.2	7.0	-8.0	-24.1	1.6	51.5	-17.6	-32.2	-24.0	62.0	-36.1	-49.8
569	Indaka	20.4	7.0	0.2	13.2	-37.9	51.5	-5.9	-83.5	-25.3	62.0	-2.4	-84.9
263	Ikwezi	6.9	7.0	1.8	-1.9	-31.4	51.5	-18.0	-64.8	-26.7	62.0	-16.6	-72.1
562	uMshwathi	12.3	7.0	3.0	2.3	-35.8	51.5	-14.2	-73.1	-27.9	62.0	-10.4	-79.4
589	uMlalazi	19.6	7.0	0.7	12.0	-39.8	51.5	-16.6	-74.6	-27.9	62.0	-14.9	-75.0
384	Dikgatlong	-5.9	7.0	-4.2	-8.6	-25.0	51.5	-15.9	-60.5	-29.4	62.0	-15.5	-75.9
588	Ntambanana	35.7	7.0	0.3	28.4	-48.5	51.5	-8.7	-91.3	-30.1	62.0	-4.9	-87.2
762	Lesedi	-7.9	7.0	0.4	-15.3	-25.8	51.5	-0.6	-76.6	-31.7	62.0	3.2	-96.8
385	Magareng	-9.1	7.0	0.0	-16.0	-26.3	51.5	-16.4	-61.4	-32.9	62.0	-14.8	-80.1
565	Impendle	-47.7	7.0	3.9	-58.5	27.2	51.5	-18.0	-6.3	-33.4	62.0	-26.1	-69.4
965	Mutale	12.9	7.0	-1.5	7.4	-42.2	51.5	2.6	-96.2	-34.7	62.0	-0.4	-96.3
526	Dannhauser	-16.9	7.0	-7.5	-16.4	-29.9	51.5	-4.8	-76.5	-41.7	62.0	-19.5	-84.3
503	Umzumbe	4.3	7.0	2.7	-5.4	-44.6	51.5	-7.6	-88.4	-42.2	62.0	-5.4	-98.8
467	Matjhabeng	-47.5	7.0	-20.7	-33.8	9.5	51.5	-11.7	-30.3	-42.5	62.0	-47.7	-56.8
505	Ezingoleni	8.1	7.0	2.1	-0.9	-47.4	51.5	-4.0	-94.8	-43.1	62.0	-2.9	-102.2
766	Merafong City	-28.3	7.0	-23.0	-12.3	-23.1	51.5	-20.6	-54.0	-44.9	62.0	-55.0	-51.9
660	Moretele	-1.1	7.0	0.1	-8.2	-46.2	51.5	5.5	-103.1	-46.8	62.0	6.5	-115.3
970	Aganang	7.7	7.0	-1.1	1.8	-51.1	51.5	11.3	-113.9	-47.4	62.0	11.7	-121.1
593	Ndwedwe	-5.6	7.0	2.7	-15.2	-45.5	51.5	-9.6	-87.4	-48.5	62.0	-12.6	-97.9
585	Hlabisa	19.4	7.0	1.1	11.3	-57.3	51.5	-1.2	-107.5	-49.0	62.0	-7.4	-103.6
376	Siyancuma	-16.9	7.0	1.5	-25.4	-39.8	51.5	-17.5	-73.7	-49.9	62.0	-13.6	-98.4
360	Joe Morolong	-7.6	7.0	-6.8	-7.9	-46.0	51.5	-7.6	-89.8	-50.1	62.0	-21.8	-90.3
765	Westonaria	-20.4	7.0	-16.7	-10.7	-39.1	51.5	-7.8	-82.8	-51.5	62.0	-36.8	-76.8
274	Ngqushwa	-15.0	7.0	-0.4	-21.5	-43.0	51.5	6.6	-101.1	-51.6	62.0	-1.6	-111.9
761	Midvaal	41.6	7.0	0.6	34.0	-66.6	51.5	7.7	-125.8	-52.7	62.0	12.2	-127.0
464	Masilonyana	-41.6	7.0	-15.5	-33.0	-20.3	51.5	-26.0	-45.8	-53.4	62.0	-54.9	-60.5

		1996 - 2001				2001 - 2011				1996 - 2011			
Code	**Municipality name**	**ΔE**	**NE**	**IM**	**CE**	**ΔE**	**NE**	**IM**	**CE**	**ΔE**	**NE**	**IM**	**CE**
461	Kopanong	3.9	7.0	1.0	-4.1	-57.3	51.5	-2.5	-106.2	-55.6	62.0	0.7	-118.3
266	Sundays River Valley	7.9	7.0	2.7	-1.7	-59.9	51.5	-10.7	-100.7	-56.7	62.0	-10.0	-108.7
567	Mkhambathini	14.2	7.0	1.3	6.0	-64.4	51.5	-9.8	-106.0	-59.3	62.0	-6.6	-114.7
665	Ratlou	13.5	7.0	-0.2	6.8	-65.1	51.5	7.5	-124.1	-60.4	62.0	13.3	-135.8
272	Great Kei	3.6	7.0	2.1	-5.5	-65.5	51.5	4.3	-121.2	-64.3	62.0	4.4	-130.6
365	Kamiesberg	-12.0	7.0	-12.0	-6.9	-63.8	51.5	-18.4	-96.9	-68.2	62.0	-35.6	-94.6
560	Vulamehlo	8.5	7.0	1.5	0.1	-72.0	51.5	-6.7	-116.7	-69.6	62.0	-5.0	-126.5
663	Kgetlengrivier	33.4	7.0	-14.4	40.8	-78.3	51.5	-17.9	-111.9	-71.1	62.0	-37.9	-95.2
377	Mier	11.7	7.0	5.7	-1.0	-93.0	51.5	-31.9	-112.5	-92.2	62.0	-15.4	-138.7
183	Beaufort West		7.0	3.1		26.5	51.5	-7.8	-17.1		62.0	-2.05	
261	Camdeboo		7.0	1.6		50.9	51.5	-15.7	15.2		62.0	-4.5	
367	Karoo Hoogland		7.0	6.7		30.5	51.5	-35.8	14.8		62.0	-30.5	

Source: 10% weighted sample census data. ΔE is change in regional employment growth, NE is national growth effect, IM is industry-mix effect and CE is regional competitive effect.

Table 2.9A: Structural change effects across regions

Code	Municipality name	1996 - 2001	2001 - 2011	1996 - 2011
160	Matzikama	-1.46%	8.68%	11.66%
161	Cederberg	0.07%	39.86%	37.74%
162	Bergrivier	1.63%	10.54%	7.33%
163	Saldanha Bay	3.94%	18.20%	19.77%
164	Swartland	1.81%	7.78%	12.39%
165	Witzenberg	1.52%	54.64%	55.02%
166	Drakenstein	1.93%	37.43%	44.94%
167	Stellenbosch	1.97%	31.11%	39.30%
168	Breede Valley	2.54%	56.16%	59.76%
169	Langeberg	1.48%	58.91%	70.42%
170	Swellendam	1.87%	55.40%	67.76%
171	Theewaterskloof	0.24%	55.39%	66.61%
172	Overstrand	1.34%	22.07%	31.42%
173	Cape Agulhas	-0.17%	30.03%	43.03%
174	Kannaland	-0.60%	66.94%	79.78%
175	Hessequa	0.81%	32.33%	49.32%
176	Mossel Bay	2.88%	17.56%	37.66%
177	George	1.83%	23.16%	35.08%
178	Oudtshoorn	2.01%	16.05%	22.84%
179	Bitou	0.55%	8.64%	18.22%
180	Knysna	0.67%	8.30%	17.00%
181	Laingsburg	1.76%	31.44%	24.25%
182	Prince Albert	1.57%	31.04%	23.68%
183	Beaufort West	3.04%	10.40%	11.78%
199	City of Cape Town	2.09%	6.59%	13.68%
260	Buffalo City	2.80%	5.63%	14.26%
261	Camdeboo	3.35%	25.44%	22.51%
262	Blue Crane Route	0.28%	37.32%	47.11%
263	Ikwezi	3.52%	31.73%	36.01%
264	Makana	-0.04%	14.64%	28.72%
265	Ndlambe	-2.83%	8.10%	27.41%
266	Sundays River Valley	1.92%	-24.45%	-21.30%
267	Baviaans	0.97%	35.19%	29.41%
268	Kouga	2.33%	18.45%	22.10%
269	Kou-Kamma	1.81%	-0.21%	3.33%
270	Mbhashe	0.44%	3.84%	17.50%
271	Mnquma	1.40%	9.13%	19.57%
272	Great Kei	2.18%	-13.26%	-11.29%
273	Amahlathi	2.04%	0.30%	3.12%
274	Ngqushwa	1.67%	6.62%	15.40%
276	Nkonkobe	4.05%	12.27%	18.38%
277	Nxuba	0.61%	11.79%	18.84%
278	Inxuba Yethemba	3.21%	17.12%	16.22%

Code	Municipality name	1996 - 2001	2001 - 2011	1996 - 2011
279	Tsolwana	2.27%	9.48%	16.80%
280	Inkwanca	-0.04%	3.75%	11.43%
281	Lukanji	1.73%	6.56%	15.01%
282	Intsika Yethu	1.95%	11.43%	14.12%
283	Emalahleni	0.67%	7.90%	7.33%
284	Engcobo	1.16%	3.63%	16.13%
285	Sakhisizwe	1.89%	7.02%	13.89%
286	Elundini	2.76%	15.17%	20.33%
287	Senqu	1.71%	12.45%	18.98%
288	Maletswai	3.18%	10.37%	19.06%
289	Gariep	0.11%	25.44%	31.53%
290	Ngquza Hill	1.56%	10.16%	23.66%
291	Port St Johns	2.74%	12.04%	22.13%
292	Nyandeni	1.49%	7.32%	18.78%
293	Mhlontlo	2.94%	4.10%	15.78%
294	King Sabata Dalindyebo	0.74%	3.25%	14.30%
295	Matatiele	2.92%	16.54%	13.06%
296	Umzimvubu	2.52%	12.15%	18.20%
297	Mbizana	-0.16%	9.59%	13.96%
298	Ntabankulu	3.48%	10.97%	25.78%
299	Nelson Mandela Bay	2.87%	7.77%	14.73%
360	Joe Morolong	4.98%	14.30%	26.48%
361	Ga-Segonyana	6.46%	-2.06%	19.74%
362	Gamagara	5.53%	19.71%	43.60%
363	Richtersveld	4.35%	20.39%	36.16%
364	Nama Khoi	4.35%	28.24%	48.12%
365	Kamiesberg	4.35%	21.46%	39.40%
366	Hantam	0.62%	31.65%	17.73%
367	Karoo Hoogland	0.00%	18.37%	19.03%
368	Khâi-Ma	5.15%	5.84%	7.12%
369	Ubuntu	-0.03%	12.31%	15.94%
370	Umsobomvu	1.58%	23.57%	26.14%
371	Emthanjeni	4.50%	14.54%	17.87%
372	Kareeberg	0.15%	10.08%	11.33%
373	Renosterberg	-0.90%	21.16%	37.57%
374	Thembelihle	-0.60%	26.32%	26.18%
375	Siyathemba	-1.80%	25.56%	32.58%
376	Siyancuma	0.37%	9.39%	7.23%
377	Mier	2.65%	34.77%	22.20%
378	Kai !Garib	2.31%	6.27%	-7.58%
379	//Khara Hais	3.29%	38.36%	33.68%
380	!Kheis	1.79%	31.99%	20.01%
381	Tsantsabane	4.14%	16.57%	25.05%
382	Kgatelopele	4.13%	9.34%	17.72%
383	Sol Plaatjie	2.33%	11.41%	18.88%

Code	Municipality name	1996 - 2001	2001 - 2011	1996 - 2011
384	Dikgatlong	0.94%	9.42%	8.36%
385	Magareng	1.37%	24.07%	22.82%
386	Phokwane	2.04%	37.34%	34.37%
460	Letsemeng	2.85%	30.96%	33.99%
461	Kopanong	2.38%	-1.77%	-8.77%
462	Mohokare	3.67%	36.41%	29.18%
463	Naledi	1.74%	22.25%	20.51%
464	Masilonyana	9.49%	24.10%	58.56%
465	Tokologo	-0.33%	46.52%	54.78%
466	Tswelopele	1.51%	37.46%	44.85%
467	Matjhabeng	10.67%	21.57%	61.17%
468	Nala	4.32%	21.53%	21.79%
469	Setsoto	0.01%	22.28%	32.00%
470	Dihlabeng	2.13%	25.30%	29.68%
471	Nketoana	2.81%	19.16%	15.87%
472	Maluti a Phofung	3.58%	16.94%	16.76%
473	Phumelela	4.89%	16.64%	7.85%
474	Mantsopa	0.93%	30.69%	35.83%
475	Moqhaka	10.75%	22.30%	43.66%
477	Ngwathe	2.34%	13.59%	17.31%
478	Metsimaholo	2.28%	14.75%	17.70%
479	Mafube	2.26%	15.61%	21.37%
499	Mangaung	2.98%	10.68%	17.40%
503	Umzumbe	1.99%	17.59%	23.79%
504	UMuziwabantu	2.39%	19.22%	23.65%
505	Ezingoleni	1.84%	14.64%	17.85%
506	Hibiscus Coast	1.78%	8.63%	14.06%
514	Emnambithi/Ladysmith	3.80%	10.62%	15.52%
524	Newcastle	3.76%	17.01%	25.03%
525	Emadlangeni	4.51%	43.71%	69.93%
526	Dannhauser	10.26%	21.84%	47.15%
529	Abaqulusi	4.70%	23.99%	51.41%
538	uMhlathuze	3.06%	20.45%	24.72%
542	Nkandla	3.94%	16.08%	23.41%
546	Maphumulo	2.18%	30.56%	25.60%
560	Vulamehlo	2.65%	7.61%	5.65%
561	Umdoni	2.32%	16.44%	20.26%
562	uMshwathi	2.30%	-14.24%	-14.94%
563	uMngeni	2.69%	11.17%	6.59%
564	Mpofana	1.88%	14.05%	15.27%
565	Impendle	2.11%	22.74%	35.71%
566	The Msunduzi	2.33%	8.95%	11.79%
567	Mkhambathini	3.12%	-16.49%	-15.75%
568	Richmond	1.33%	11.94%	15.21%
569	Indaka	3.10%	20.09%	15.67%

Code	Municipality name	1996 - 2001	2001 - 2011	1996 - 2011
570	Umtshezi	1.92%	15.42%	15.23%
571	Okhahlamba	1.58%	4.82%	10.93%
573	Imbabazane	2.60%	19.69%	17.82%
574	Endumeni	3.01%	19.91%	20.88%
575	Nqutu	2.05%	4.31%	11.68%
576	Msinga	2.73%	17.52%	15.65%
577	Umvoti	1.58%	19.64%	22.64%
578	eDumbe	2.07%	1.31%	17.31%
579	UPhongolo	2.90%	26.11%	24.57%
580	Nongoma	3.30%	7.12%	17.59%
581	Ulundi	3.26%	10.60%	29.88%
582	Umhlabuyalingana	2.45%	11.21%	20.14%
583	Jozini	2.08%	8.53%	15.55%
584	The Big 5 False Bay	0.04%	5.26%	19.20%
585	Hlabisa	1.43%	18.62%	21.77%
586	Mtubatuba	0.54%	9.65%	24.76%
587	Mfolozi	2.89%	13.55%	14.54%
588	Ntambanana	2.93%	17.87%	18.33%
589	uMlalazi	3.10%	13.10%	15.60%
590	Mthonjaneni	2.16%	9.38%	9.96%
591	Mandeni	2.38%	2.52%	12.02%
592	KwaDukuza	0.92%	27.15%	40.16%
593	Ndwedwe	2.16%	1.30%	8.00%
594	Ingwe	2.44%	12.68%	15.70%
595	Kwa Sani	-2.98%	0.18%	17.75%
596	Greater Kokstad	1.85%	16.61%	20.99%
597	Ubuhlebezwe	1.10%	13.95%	19.99%
598	Umzimkhulu	0.05%	11.42%	22.28%
599	eThekwini	3.00%	9.09%	16.76%
660	Moretele	2.47%	-7.03%	-9.75%
661	Madibeng	0.65%	3.11%	-4.45%
662	Rustenburg	1.14%	8.14%	14.52%
663	Kgetlengrivier	1.96%	9.70%	31.17%
664	Moses Kotane	-2.59%	4.70%	2.99%
665	Ratlou	2.42%	-14.83%	-18.84%
666	Tswaing	2.26%	11.18%	12.27%
667	Mafikeng	2.43%	15.00%	18.39%
668	Ditsobotla	1.86%	13.15%	19.94%
669	Ramotshere Moiloa	2.46%	21.42%	24.99%
670	Naledi	-0.30%	25.23%	37.41%
671	Mamusa	-3.31%	13.68%	23.59%
672	Greater Taung	1.55%	10.69%	17.95%
673	Lekwa-Teemane	-2.01%	19.54%	17.78%
674	Kagisano/Molopo	0.40%	4.60%	14.03%
675	Ventersdorp	0.17%	6.49%	10.12%

Code	Municipality name	1996 - 2001	2001 - 2011	1996 - 2011
676	Tlokwe City Council	-1.06%	22.24%	32.46%
677	City of Matlosana	5.92%	14.22%	37.49%
678	Maquassi Hills	-2.07%	21.66%	29.56%
760	Emfuleni	3.06%	5.76%	8.85%
761	Midvaal	2.77%	0.88%	4.99%
762	Lesedi	2.31%	13.38%	18.99%
763	Mogale City	2.61%	10.73%	13.93%
764	Randfontein	4.75%	20.10%	35.12%
765	Westonaria	8.51%	24.31%	64.56%
766	Merafong City	7.35%	40.54%	87.69%
797	Ekurhuleni	2.92%	12.10%	18.68%
798	City of Johannesburg	3.18%	5.58%	12.61%
799	City of Tshwane	1.81%	6.66%	8.36%
860	Albert Luthuli	2.41%	22.03%	24.90%
861	Msukaligwa	2.44%	20.29%	11.84%
862	Mkhondo	0.70%	35.80%	33.68%
863	Pixley Ka Seme	1.03%	28.74%	34.97%
864	Lekwa	1.06%	36.38%	44.11%
865	Dipaleseng	0.89%	25.48%	41.34%
866	Govan Mbeki	2.03%	13.56%	24.63%
867	Victor Khanye	0.68%	8.14%	14.46%
868	Emalahleni	0.40%	9.76%	13.32%
869	Steve Tshwete	0.61%	10.97%	13.65%
870	Emakhazeni	2.17%	6.70%	12.89%
871	Thembisile	1.30%	12.62%	16.16%
872	Dr JS Moroka	3.95%	4.04%	10.01%
873	Thaba Chweu	-0.57%	13.19%	13.45%
874	Mbombela	2.04%	13.46%	17.32%
875	Umjindi	1.01%	40.27%	40.95%
876	Nkomazi	2.54%	17.10%	14.20%
877	Bushbuckridge	2.71%	16.72%	18.02%
960	Greater Giyani	1.99%	4.98%	5.18%
961	Greater Letaba	3.15%	37.47%	31.16%
962	Greater Tzaneen	2.98%	22.40%	12.10%
963	Ba-Phalaborwa	4.45%	18.72%	19.88%
964	Maruleng	3.92%	9.76%	12.48%
965	Mutale	2.07%	11.16%	10.54%
966	Thulamela	1.43%	11.51%	16.51%
967	Musina	2.89%	7.14%	3.81%
968	Makhado	2.41%	7.35%	9.58%
969	Blouberg	2.69%	5.21%	1.14%
970	Aganang	4.89%	4.86%	3.53%
973	Molemole	1.67%	-3.31%	-1.21%
974	Polokwane	3.23%	14.02%	19.85%
976	Lepele-Nkumpi	3.40%	7.68%	6.23%

Code	Municipality name	1996 - 2001	2001 - 2011	1996 - 2011
977	Thabazimbi	6.69%	10.24%	16.00%
978	Lephalale	3.48%	25.08%	22.15%
979	Mookgopong	0.91%	18.89%	17.96%
980	Modimolle	-0.51%	29.93%	40.42%
981	Bela-Bela	2.74%	11.56%	20.82%
982	Mogalakwena	3.50%	12.90%	9.36%
983	Ephraim Mogale	1.84%	-3.57%	-2.56%
984	Elias Motsoaledi	1.28%	16.80%	17.59%
985	Makhuduthamaga	2.87%	7.29%	15.74%
986	Fetakgomo	2.59%	-3.22%	-6.94%
987	Greater Tubatse	2.44%	0.49%	-5.45%

Appendix for Chapter 3

Table 3.1A: Significance test of differences between employment of men and women

Variables	t-statistic	p-value
Total employment	222.52	0.0000
Black	-219.70	0.0000
White	-205.14	0.0000
Manufacturing employment	-314.42	0.0000
Black	-236.87	0.0000
White	-100.42	0.0000
Skill share	2.44	0.0151
Brawn share	-87.01	0.0000

Notes: Employment rates are normalised by the respective working-age population (ages 15-64). Manufacturing share is manufacturing employment as a share of total employment. Skill share is calculated as the number of skilled workers divided by the sum of skilled and unskilled workers in all the manufacturing industries. Production share represents workers who are employed as craft and trade workers as a share of the sum of workers employed in all occupations (production/non-production occupations) in manufacturing industries excluding food & beverage, textile, clothing & footwear and electronics.
Source: Full census and the 10% weighted sample census data

Table 3.2A: First-stage IV results

	(1)
VARIABLES	Change in Tariff
L.Tariff	-0.406***
	(0.018)
ΔWorking-age population	0.000
	(0.002)
ΔMigration rate	0.003
	(0.003)
ΔUnion-intensity	0.007
	(0.005)
L.Skill rate	-0.019***
	(0.005)
L.Unemployed rate	-0.023***
	(0.006)
L.Infrastructure	0.000***
	(0.000)
L.Manufacturing share	-0.008
	(0.005)
Constant	0.017***
	(0.003)
Observations	468
R-squared	0.924
Period FE	Yes
Durbin Test	
Chi(2)	27.089***
Wu-Hausman Test	
F-statistics	35.565***

Robust standard errors in parentheses *** p<0.01. ** p<0.05. * p<0.1
Notes: Lagged alternative tariff protection measure represents employment-weighted tariffs in the initial period (1996 and 2001 respectively). 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 3.3A: First-stage alternative IV results

	(1)
VARIABLES	Change in tariffs
ΔTariff_alternative	0.764***
	(0.126)
ΔWorking-age population	0.006
	(0.005)
ΔMigration rate	0.004
	(0.004)
ΔUnion-intensity	0.031***
	(0.010)
L.Skill rate	-0.014
	(0.011)
L.Unemployed rate	-0.059***
	(0.013)
L.Infrastructure	-0.000
	(0.000)
L.Manufacturing share	-0.015
	(0.011)
Constant	-0.007
	(0.006)
Observations	468
R-squared	0.691
Period FE	Yes
Durbin Test	
Chi(2)	21.151***
Wu-Hausman Test	
F-statistics	25.225***

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

Notes: Alternative tariffs represents employment-weighted tariffs for low and middle-income countries in the initial period (1996 and 2001 respectively). 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 3.4A: Tariff liberalisation effects on wages using alternative IV measure

	(1)	(2)	(3)
	Dependent variables: Change in log wages		
VARIABLES	Aggregate	Female	Male
ΔTariff_alternative	4.392	6.759	0.709
	(7.077)	(8.836)	(9.461)
ΔWorking-age population	0.090	0.042	0.379
	(0.282)	(0.350)	(0.310)
ΔMigration rate	0.454	0.455	0.162
	(0.345)	(0.457)	(0.348)
ΔUnion-intensity	1.403*	1.906**	1.529**
	(0.751)	(0.925)	(0.730)
L.Skill rate	0.237	0.779	-0.159
	(0.588)	(0.743)	(0.640)
L.Unemployed rate	-0.971	-0.960	-1.004
	(0.876)	(0.985)	(1.039)
L.Infrastructure	-0.002	-0.006	0.018
	(0.018)	(0.023)	(0.021)
L.Manufacturing share	0.389	0.266	0.404
	(0.452)	(0.605)	(0.585)
Constant	0.557*	0.802*	0.636**
	(0.332)	(0.476)	(0.314)
Observations	467	464	466
R-squared	0.028	0.067	0.030
Period FE	Yes	Yes	Yes
IV	Yes	Yes	Yes

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

Notes: Alternative tariffs represents employment-weighted tariffs for low and middle-income countries in the initial period (1996 and 2001). 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 3.5A: Gendered effects of tariff liberalisation controlling for an initial share in the textile, clothing and footwear industry

VARIABLES	(1) Female employment	(2) Male employment	(3) Gender employment gap
ΔTariff	8.365***	3.878*	-4.571**
	(2.808)	(1.986)	(2.003)
ΔWorking-age population	0.744***	0.923***	0.199
	(0.190)	(0.141)	(0.157)
ΔMigration rate	-0.266	0.561***	0.847***
	(0.306)	(0.212)	(0.270)
ΔUnion-intensity	0.628	0.272	-0.357
	(0.614)	(0.405)	(0.555)
L.Skill rate	0.752	0.545	-0.183
	(0.514)	(0.349)	(0.408)
L.Unemployed rate	-1.398**	-1.070***	0.413
	(0.544)	(0.407)	(0.500)
L.Infrastructure	-0.009	-0.006	0.002
	(0.017)	(0.010)	(0.015)
L.Manufacturing share	-2.081***	-2.591***	-0.501
	(0.529)	(0.437)	(0.383)
L.Textiles_share	0.823	0.625	-0.216
	(0.652)	(0.503)	(0.553)
Constant	1.060***	0.405*	-0.699**
	(0.311)	(0.217)	(0.282)
Observations	465	466	464
R-squared	0.180	0.310	0.038
Period FE	Yes	Yes	Yes
IV	Yes	Yes	Yes

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

Notes: All the estimations are based on the 2SLS IV strategy. Tariff variable is the employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. Dependent variables in columns (1) and (2) denotes the change in log manufacturing employment. The dependent variable for column (3) is the change in log male manufacturing employment denoted by female manufacturing 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 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 3.6A: Tariff Liberalisation and Gendered Effects in manufacturing with alternative controls

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variables: Change in log manufacturing employment					
VARIABLES	Female	Male	Black Female	Black Male	White Female	White Male
ΔTariff	48.796***	6.651***	44.654***	7.706***	31.691*	13.164*
	(13.924)	(2.245)	(15.276)	(1.816)	(16.935)	(6.717)
ΔWorking-age population	0.022	-0.105***	0.031	-0.116***	-0.156	-0.255**
	(0.089)	(0.039)	(0.102)	(0.029)	(0.202)	(0.106)
ΔMigration rate	0.252	-0.385**	0.550	-0.190	0.068	-0.125
	(0.328)	(0.158)	(0.362)	(0.162)	(0.660)	(0.391)
ΔUnion-intensity	1.127	0.263	0.651	0.622**	1.106	-1.205*
	(1.049)	(0.293)	(1.456)	(0.269)	(0.736)	(0.629)
L.Skill rate	1.398	1.080**	0.689	0.628	1.568	-0.699
	(0.967)	(0.419)	(1.291)	(0.490)	(2.144)	(0.883)
L.Unemployed rate	-2.182	0.058	-1.875	0.833***	7.069	0.697**
	(1.450)	(0.433)	(1.592)	(0.267)	(15.938)	(0.287)
L.Infrastructure	-0.009	0.003	-0.005	0.006	0.010	-0.045**
	(0.017)	(0.010)	(0.018)	(0.010)	(0.021)	(0.023)
L.Manufacturing share	-2.963***	-1.939***	-2.903***	-1.971***	-10.207***	-4.928***
	(0.859)	(0.336)	(0.825)	(0.308)	(3.680)	(1.239)
Constant	1.510***	0.561***	1.514***	0.601***	0.744	1.848**
	(0.333)	(0.111)	(0.350)	(0.102)	(1.659)	(0.751)
Observations	231	466	229	466	162	416
R-squared	0.208	0.245	0.179	0.259	0.160	0.231
Period FE	Yes	Yes	Yes	Yes	Yes	Yes
IV	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 the control variables are differentiated by sub-group. 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.

Appendix for Chapter 4

Table 4.1A: Effects of tariff liberalisation on derived demand, income and investment

VARIABLES	(1) Derived demand	(2) Income	(3) Electricity
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
Period FE	Yes	Yes	Yes
IV	Yes	Yes	Yes

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

Notes: All the estimations are based on the 2SLS IV strategy. Tariff variable is the employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. The dependent variables 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 midpoint 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 4.2A: 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
Period 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. Tariff variable is the employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. 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 4.3A: Tariff liberalisation and services employment (weighted)

	(1)	(2)
	Dependent variables: Change in log services employment	
VARIABLES	Model 1	Model 2
ΔTariff	0.896**	0.854*
	(0.449)	(0.442)
ΔLog Derived demand		0.017
		(0.012)
ΔLog Income		0.123***
		(0.039)
ΔLog Electricity		0.043**
		(0.022)
ΔWorking-age population	1.043***	0.945***
	(0.058)	(0.063)
ΔMigration rate	0.152***	0.156***
	(0.047)	(0.047)
L.Skill rate	-0.626***	-0.483***
	(0.083)	(0.096)
L.Unemployed rate	-0.208	-0.343**
	(0.136)	(0.140)
L.Infrastructure	0.005	0.007
	(0.004)	(0.004)
L.Manufacturing share	0.150*	0.284***
	(0.090)	(0.095)
Constant	0.495***	0.346***
	(0.055)	(0.065)
Observations	468	467
R-squared	0.813	0.821
Period FE	Yes	Yes
IV	Yes	Yes

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

Notes: All the estimations are based on the 2SLS IV strategy. Tariff variable is the employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. 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 4.4A: Tariff liberalisation and gendered employment in services (weighted)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Aggregate			Black			White		
VARIABLES	Female	Male	Gender gap	Female	Male	Gender gap	Female	Male	Gender gap
ΔTariff	-0.262	1.842***	2.103***	-0.441	2.221***	2.662***	5.866***	5.664*	-0.944
	(0.465)	(0.548)	(0.510)	(0.512)	(0.583)	(0.555)	(2.267)	(3.367)	(2.372)
ΔWorking-age population	1.183***	0.921***	-0.262***	1.132***	0.858***	-0.274***	0.900***	0.863*	0.035
	(0.060)	(0.071)	(0.066)	(0.067)	(0.076)	(0.072)	(0.299)	(0.441)	(0.314)
ΔMigration rate	0.245***	0.084	-0.161***	0.148***	0.054	-0.093	0.605**	0.900**	0.180
	(0.049)	(0.058)	(0.054)	(0.054)	(0.061)	(0.058)	(0.244)	(0.359)	(0.257)
L.Skill rate	-0.602***	-0.631***	-0.030	-0.389***	-0.392***	-0.003	-0.118	-0.227	-0.092
	(0.086)	(0.101)	(0.095)	(0.095)	(0.108)	(0.103)	(0.423)	(0.627)	(0.444)
L.Unemployed rate	-0.138	-0.264	-0.127	-0.272*	-0.305*	-0.034	-0.624	-0.745	0.030
	(0.141)	(0.167)	(0.155)	(0.156)	(0.177)	(0.169)	(0.693)	(1.029)	(0.727)
L.Infrastructure	-0.001	0.011**	0.012**	0.001	0.012**	0.011**	-0.008	-0.009	0.001
	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.021)	(0.031)	(0.022)
L.Manufacturing share	0.050	0.224**	0.174*	0.083	0.240**	0.157	-0.075	-0.080	0.040
	(0.093)	(0.110)	(0.102)	(0.103)	(0.117)	(0.111)	(0.458)	(0.678)	(0.480)
Constant	0.363***	0.594***	0.232***	0.447***	0.618***	0.171**	0.293	0.074	-0.080
	(0.057)	(0.067)	(0.063)	(0.063)	(0.071)	(0.068)	(0.213)	(0.414)	(0.292)
Observations	468	468	468	468	468	468	457	459	453
R-squared	0.784	0.763	0.121	0.769	0.753	0.099	0.115	0.088	0.009
Period 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. Tariff variable is the employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. Dependent variable in columns (1), (2), (4), (5), (7) and (8) denote the change in log services employment while in columns (3), (6) and (9) is 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 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 4.5A: Tariff Liberalisation Effects on Services Employment Rates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent variables: Change in log services employment rates						
VARIABLES	Aggregate	Female	Male	Black Female	Black Male	White Female	White Male
ΔTariff	1.260**	0.520	1.831**	0.408	0.835	6.674*	4.908
	(0.623)	(0.629)	(0.740)	(0.680)	(0.719)	(3.632)	(4.587)
ΔWorking-age population	0.056	0.171**	-0.057	0.176**	0.004	0.070	0.063
	(0.061)	(0.069)	(0.077)	(0.079)	(0.079)	(0.131)	(0.173)
ΔMigration rate	0.150***	0.199***	0.101*	0.239***	0.203***	-0.241	-0.047
	(0.046)	(0.064)	(0.057)	(0.079)	(0.076)	(0.155)	(0.147)
L.Skill rate	-1.008***	-1.206***	-0.787***	-1.251***	-0.927***	0.316	0.045
	(0.130)	(0.144)	(0.141)	(0.153)	(0.149)	(0.640)	(0.896)
L.Unemployed rate	-0.326**	-0.014	-0.618***	-0.008	-0.234	-0.125	-0.704
	(0.164)	(0.175)	(0.195)	(0.192)	(0.196)	(0.430)	(0.621)
L.Infrastructure	0.001	-0.007	0.010*	-0.005	-0.002	0.001	-0.003
	(0.005)	(0.006)	(0.005)	(0.006)	(0.006)	(0.007)	(0.013)
L.Manufacturing share	0.230*	0.276**	0.187	0.335**	0.394***	-0.112	-0.372
	(0.123)	(0.138)	(0.130)	(0.147)	(0.147)	(0.658)	(0.821)
Constant	0.685***	0.589***	0.758***	0.603***	0.579***	0.383***	0.653**
	(0.046)	(0.051)	(0.056)	(0.057)	(0.058)	(0.134)	(0.296)
Observations	468	468	468	468	468	457	459
R-squared	0.693	0.593	0.649	0.584	0.516	0.065	0.057
Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IV	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. Services employment rates are constructed as services employment denoted by the respective working-age population (individuals aged between 15 and 65 years). Tariff variable is the employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. 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 4.6A: Tariff Liberalisation Effects on Manufacturing Employment Rates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent variables: Change in log manufacturing employment rates						
VARIABLES	Aggregate	Female	Male	Black Female	Black Male	White Female	White Male
ΔTariff	4.667**	7.122***	3.018*	7.711***	8.157***	3.524	2.961
	(1.959)	(2.506)	(1.821)	(2.728)	(2.759)	(5.739)	(7.381)
ΔWorking-age population	-0.181	-0.189	-0.329**	-0.183	-0.360*	-0.290	-0.604**
	(0.142)	(0.185)	(0.137)	(0.207)	(0.207)	(0.423)	(0.299)
ΔMigration rate	-0.156	-0.199	-0.625***	-0.236	-0.269	-0.517	-0.835*
	(0.283)	(0.153)	(0.186)	(0.210)	(0.227)	(0.345)	(0.495)
ΔUnion-intensity	0.348	0.488	0.518	0.618	0.698	3.689**	0.973
	(0.416)	(0.595)	(0.409)	(0.669)	(0.674)	(1.544)	(1.146)
L.Skill rate	0.433	0.671	0.618*	0.561	0.887*	1.802	2.388*
	(0.371)	(0.485)	(0.350)	(0.528)	(0.529)	(1.413)	(1.372)
L.Unemployed rate	-1.010***	-1.185**	-1.188***	-1.112*	-1.360**	-1.299	-2.392*
	(0.384)	(0.532)	(0.403)	(0.637)	(0.638)	(1.288)	(1.338)
L.Infrastructure	-0.008	-0.006	-0.012	-0.012	-0.009	0.039	-0.030
	(0.010)	(0.017)	(0.010)	(0.019)	(0.018)	(0.025)	(0.023)
L.Manufacturing share	-2.390***	-1.960***	-2.438***	-1.970***	-1.895***	-1.615	-3.692***
	(0.411)	(0.486)	(0.396)	(0.510)	(0.512)	(1.176)	(1.164)
Constant	0.811***	0.833***	0.810***	0.858***	0.840***	-0.006	1.066***
	(0.114)	(0.161)	(0.115)	(0.189)	(0.189)	(0.422)	(0.389)
Observations	467	465	466	463	463	387	416
R-squared	0.268	0.165	0.291	0.142	0.135	0.107	0.083
Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IV	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. Manufacturing employment rates are constructed as services employment denoted by the respective working-age population (individuals aged between 15 and 65 years).Tariff variable is the employment weighted tariff rates. ΔTariff, change in tariffs comprises the difference in tariffs in the initial period and tariffs in the final period. 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.

Table 4.7A: Tariff Liberalisation and Gendered Effects in services with alternative controls

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variables: Change in log services employment					
VARIABLES	Female	Male	Black Female	Black Male	White Female	White Male
ΔTariff	8.451*	2.332**	5.876	5.132***	13.454	8.024
	(4.805)	(1.009)	(4.498)	(0.987)	(8.386)	(5.612)
ΔWorking-age population	0.050**	0.030	0.023	-0.070***	0.032	-0.016
	(0.024)	(0.022)	(0.025)	(0.011)	(0.040)	(0.097)
ΔMigration rate	0.073	-0.023	0.104*	0.013	-0.033***	-0.023
	(0.065)	(0.089)	(0.055)	(0.077)	(0.009)	(0.020)
ΔUnion-intensity	-0.496	-0.226	-0.232	-0.202	-0.463*	-0.457
	(0.305)	(0.152)	(0.384)	(0.148)	(0.265)	(0.376)
L.Skill rate	-0.524**	-0.564***	0.712*	-0.419	-0.490	-0.943
	(0.218)	(0.215)	(0.422)	(0.270)	(0.394)	(1.495)
L.Unemployed rate	-0.607**	-0.703***	-0.985***	-0.233	2.227	3.466
	(0.273)	(0.260)	(0.287)	(0.190)	(1.570)	(2.155)
L.Infrastructure	-0.002	0.014**	0.002	0.024***	-0.014	-0.007
	(0.005)	(0.006)	(0.006)	(0.006)	(0.009)	(0.014)
L.Manufacturing share	0.796***	0.592***	0.606**	0.743***	1.398	1.339**
	(0.267)	(0.154)	(0.248)	(0.192)	(0.900)	(0.628)
Constant	0.957***	0.862***	0.788***	0.581***	0.761**	0.778
	(0.132)	(0.083)	(0.126)	(0.057)	(0.348)	(1.144)
Observations	234	468	234	468	223	459
R-squared	0.079	0.566	0.110	0.484	0.132	0.183
Period FE	Yes	Yes	Yes	Yes	Yes	Yes
IV	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 the control variables are differentiated by sub-group. 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.

Appendix for Chapter 5

Table 5.1A: Apartheid laws that restricted the migration of Black people

Name of laws	Description
1923 Natives (Urban Areas) Act	Empowered urban local authorities to set aside land for Blacks in separate areas.
1937 Native Law Amendment Act	Allowed Blacks a maximum of only 14 days to find work in an urban area (reduced to three days in 1945).
1945 Natives (Urban Areas) Consolidation Act	Made it very difficult for Blacks to claim permanent residence in an urban area.
1952 Native Laws Amendment Act	Laid the basis for the entire state intervention to control the distribution of black labour.
1950 Population Registration Act (repealed 1991)	Required all citizens to be registered as Black, White, Coloured or Indian.
1950 Group Areas Act (repealed 1991)	Partitioned the country into different areas, allocated to different racial groups. This law represented the very heart of Apartheid because it was the basis upon which political and social separation was to be constructed.
1951 Bantu Authorities Act	Created separate government structures for the Black population.
1952 Native Services Levy Act	Imposes monthly taxes on employers of urban Blacks.
1952 Pass Laws Act (1952–1986)	Made it compulsory for all Black South Africans over the age 16 to carry a passbook.
1952, 1955, 1957 Amendments to the Native Consolidation Act	Restrictions on Blacks in urban areas who could only remain without a pass under special Conditions.
1953 Bantu Urban Areas Act	Curtailed Black migration to the cities.
1956 Native Administration Amendment Act	Permitted government to send Africans into exile in remote parts of the country.
1959 Promotion of Black Self-Government Act (repealed 1993)	Set up separate territorial governments in the "homelands", designated lands for African people where they could have a vote. The aim was that these Bantustans would eventually become independent of South Africa.
1959 Bantu Investment Corporation Act	Set up a mechanism to transfer capital to the homelands to create jobs in the African Homelands.
1959 Physical Planning and Utilisation of Resources Act	Allowed the government to stop industrial development in "white" cities and redirect such development to homeland border areas. The aim was to speed up the relocation of Africans to the homelands by relocating jobs to homeland areas.
1970 Bantu Laws Amendment Act	Introduced job reservation, which made possible the prohibition of the employment of Blacks in any job, in any area or the service of any employer.

Name of laws	Description
1970 Black Homeland Citizenship Act	Changed the status of the inhabitants of the "homeland" so that they were no longer citizens of South Africa. The aim was to ensure whites became the demographic majority in South Africa.

Table 5.2A: Summary statistics for demeaned bilateral migration for a common set of municipality-pairs

Year	Sum	Mean	P50	P1	P10	P90	N
1996	54 522	1	0	0	0	0.003	54522
1997	54 522	1	0	0	0	0.193	54522
1998	54 522	1	0	0	0	1.353	54522
1999	54 522	1	0	0	0	1.512	54522
2000	54 522	1	0	0	0	1.318	54522
2001	54 522	1	0	0	0	1.318	54522
2002	54 522	1	0	0	0	0.000	54522
2003	54 522	1	0	0	0	0.000	54522
2004	54 522	1	0	0	0	0.000	54522
2005	54 522	1	0	0	0	0.000	54522
2006	54 522	1	0	0	0	0.000	54522
2007	54 522	1	0	0	0	0.000	54522
2008	54 522	1	0	0	0	0.000	54522
2009	54 522	1	0	0	0	0.000	54522
2010	54 522	1	0	0	0	1.336	54522
2011	54 522	1	0	0	0	1.043	54522
Total	872 352	1	0	0	0	0.042	872 352

Source: 10% weighted sample census data

Table 5.3A: Tariff liberalisation effects on gendered internal migration

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variables: Log demeaned bilateral migration					
	Aggregate		Black		White	
VARIABLES	Female	Male	Female	Male	Female	Male
ΔlnTariff_orig	-28.640***	-4.600	-80.871***	-44.384***	-41.102**	-33.528*
	(7.629)	(8.203)	(14.703)	(13.726)	(17.219)	(17.512)
ΔlnTariff_des	-3.644	26.978**	-1.273	9.796	-22.825	-29.951
	(12.588)	(13.673)	(15.342)	(14.577)	(18.622)	(18.360)
lnDistance	-0.794***	-0.678***	-1.671***	-1.521***	-0.618***	-0.601***
	(0.022)	(0.023)	(0.058)	(0.057)	(0.068)	(0.067)
lnPop_density_orig	0.601***	0.438***	1.481***	1.254***	0.571***	0.534***
	(0.037)	(0.038)	(0.090)	(0.085)	(0.113)	(0.114)
lnPop_density_des	0.519***	0.298***	1.129***	0.699***	0.426***	0.523***
	(0.041)	(0.042)	(0.088)	(0.083)	(0.110)	(0.107)
lnEcoact_orig	-0.360***	-0.073	-1.157***	-0.781***	-0.164	-0.063
	(0.049)	(0.051)	(0.113)	(0.105)	(0.140)	(0.141)
lnEcoact_des	-0.099	0.127*	-0.121	0.109	0.005	-0.141
	(0.067)	(0.070)	(0.115)	(0.108)	(0.146)	(0.142)
lnInfrast_orig	0.148***	0.162***	0.080*	0.058	1.120***	1.099***
	(0.018)	(0.019)	(0.049)	(0.046)	(0.070)	(0.071)
lnInfrast_des	0.277***	0.270***	0.055	0.091**	1.177***	1.127***
	(0.021)	(0.021)	(0.048)	(0.044)	(0.063)	(0.063)
lnManuf_orig	-0.246***	-0.403***	-0.952***	-0.966***	-0.449***	-0.382**
	(0.045)	(0.046)	(0.148)	(0.136)	(0.171)	(0.174)
lnManuf_des	-0.075*	-0.042	-0.435***	-0.189*	0.682***	0.776***
	(0.042)	(0.044)	(0.118)	(0.110)	(0.151)	(0.151)
lnPension_orig	0.019	0.022	0.140***	0.087**	0.118***	0.066
	(0.014)	(0.014)	(0.039)	(0.035)	(0.043)	(0.042)
lnPension_des	0.044**	0.021	0.050	0.080**	0.213***	0.231***
	(0.018)	(0.018)	(0.038)	(0.035)	(0.041)	(0.042)
lnKinship_orig	-0.077***	-0.043***	-0.218***	-0.142***	-0.049*	-0.054*
	(0.008)	(0.009)	(0.024)	(0.024)	(0.029)	(0.029)
lnKinship_des	-0.072***	-0.049***	-0.117***	-0.074***	-0.154***	-0.162***
	(0.011)	(0.012)	(0.028)	(0.027)	(0.033)	(0.033)
Observations	43,333	43,333	13,641	13,641	13,641	13,641
R-squared	0.051	0.030	0.004	0.079	0.140	0.142
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
IV	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 Variables with orig and des suffixes are variable at the origin municipality and destination municipality respectively. All control variables are in natural logarithm. Tariff variables are employment weighted tariff rates.

Table 5.4A: Effects of tariff liberalisation on gendered internal migration by marital status

	(1)	(2)	(3)	(4)
	Dependent variables: Log demeaned bilateral migration			
VARIABLES	Married Female	Married Male	Single Female	Single Male
ΔlnTariff_orig	-26.126***	-13.143	-70.641***	-49.997***
	(9.708)	(9.929)	(10.084)	(9.314)
ΔlnTariff_des	-14.278	-23.974	-38.878***	-17.954
	(14.067)	(14.795)	(14.335)	(13.461)
lnDistance	-1.156***	-0.935***	-1.411***	-1.200***
	(0.047)	(0.046)	(0.048)	(0.045)
lnPop_density_orig	0.782***	0.560***	1.160***	1.059***
	(0.075)	(0.075)	(0.076)	(0.069)
lnPop_density_des	0.776***	0.632***	1.277***	0.797***
	(0.071)	(0.074)	(0.071)	(0.066)
lnEcoact_orig	-0.190**	0.150	-0.952***	-0.695***
	(0.092)	(0.093)	(0.093)	(0.085)
lnEcoact_des	-0.075	-0.031	-0.463***	-0.077
	(0.100)	(0.105)	(0.100)	(0.093)
lnInfrast_orig	0.317***	0.319***	0.228***	0.224***
	(0.040)	(0.042)	(0.039)	(0.037)
lnInfrast_des	0.428***	0.443***	0.341***	0.388***
	(0.042)	(0.042)	(0.041)	(0.038)
lnManuf_orig	-0.578***	-0.573***	-0.549***	-0.596***
	(0.097)	(0.103)	(0.097)	(0.092)
lnManuf_des	-0.126	-0.119	-0.052	0.044
	(0.096)	(0.101)	(0.095)	(0.092)
lnPension_orig	0.027	0.053*	0.113***	0.114***
	(0.030)	(0.031)	(0.031)	(0.029)
lnPension_des	0.172***	0.170***	0.160***	0.162***
	(0.031)	(0.030)	(0.031)	(0.030)
lnKinship_orig	-0.121***	-0.078***	-0.131***	-0.118***
	(0.018)	(0.020)	(0.019)	(0.018)
lnKinship_des	-0.205***	-0.229***	-0.166***	-0.113***
	(0.023)	(0.024)	(0.023)	(0.021)
Observations	22,187	22,187	22,187	22,187
R-squared	0.079	0.082	-0.009	0.051
Year FE	Yes	Yes	Yes	Yes
IV	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 Variables with orig and des suffixes are variable at the origin municipality and destination municipality respectively. All control variables are in natural logarithm. Tariff variables are employment weighted tariff rates.

Table 5.5A: Tariff liberalisation effects on internal migration of women with and without children

	(1)	(2)
	Dependent variables: Log demeaned bilateral migration	
VARIABLES	With children	Without children
ΔlnTariff_orig	-39.597***	-70.004***
	(7.689)	(10.203)
ΔlnTariff_des	-6.172	-52.300***
	(12.000)	(15.074)
lnDistance	-1.059***	-1.165***
	(0.034)	(0.045)
lnPop_density_orig	0.841***	0.930***
	(0.055)	(0.072)
lnPop_density_des	0.671***	1.142***
	(0.053)	(0.069)
lnEcoact_orig	-0.536***	-0.727***
	(0.068)	(0.088)
lnEcoact_des	-0.029	-0.421***
	(0.078)	(0.099)
lnInfrast_orig	0.185***	0.273***
	(0.028)	(0.035)
lnInfrast_des	0.275***	0.427***
	(0.030)	(0.039)
lnManuf_orig	-0.429***	-0.405***
	(0.071)	(0.090)
lnManuf_des	-0.201***	0.110
	(0.069)	(0.088)
lnPension_orig	0.055**	0.095***
	(0.022)	(0.028)
lnPension_des	0.093***	0.166***
	(0.025)	(0.031)
lnKinship_orig	-0.077***	-0.147***
	(0.013)	(0.016)
lnKinship_des	-0.097***	-0.203***
	(0.016)	(0.020)
Observations	27,458	27,458
R-squared	0.054	-0.048
Year FE	Yes	Yes
IV	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 Variables with orig and des suffixes are variable at the origin municipality and destination municipality respectively. All control variables are in natural logarithm. Tariff variables are employment weighted tariff rates.

Table 5.6A: Tariff liberalisation effects on internal migration using alternative migration data (bilateral migration greater or equal to 5)

	(1)	(2)	(3)
	Dependent variables: Log demeaned bilateral migration		
VARIABLES	Aggregate	Female	Male
ΔlnTariff_orig	-10.076***	-28.352***	-1.806
	(3.435)	(7.449)	(7.685)
ΔlnTariff_des	7.640	-5.345	25.505**
	(5.878)	(12.195)	(12.677)
lnDistance	-0.413***	-0.901***	-0.697***
	(0.013)	(0.023)	(0.023)
lnPop_density_orig	0.286***	0.663***	0.465***
	(0.017)	(0.038)	(0.038)
lnPop_density_des	0.249***	0.540***	0.286***
	(0.020)	(0.042)	(0.041)
lnEcoact_orig	-0.099***	-0.396***	-0.082*
	(0.022)	(0.050)	(0.049)
lnEcoact_des	0.024	-0.074	0.140**
	(0.031)	(0.067)	(0.066)
lnInfrast_orig	0.074***	0.167***	0.167***
	(0.009)	(0.019)	(0.019)
lnInfrast_des	0.159***	0.285***	0.269***
	(0.009)	(0.022)	(0.021)
lnManuf_orig	-0.197***	-0.259***	-0.401***
	(0.021)	(0.047)	(0.046)
lnManuf_des	-0.072***	-0.046	-0.020
	(0.019)	(0.044)	(0.044)
lnPension_orig	0.010	0.017	0.016
	(0.006)	(0.014)	(0.014)
lnPension_des	0.011	0.050***	0.027
	(0.007)	(0.018)	(0.017)
lnKinship_orig	-0.033***	-0.085***	-0.045***
	(0.004)	(0.008)	(0.009)
lnKinship_des	-0.021***	-0.081***	-0.045***
	(0.005)	(0.011)	(0.012)
Observations	45,018	45,018	45,018
R-squared	0.209	0.060	0.037
Year FE	Yes	Yes	Yes
IV	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 Variables with orig and des suffixes are variable at the origin municipality and destination municipality respectively. All control variables are in natural logarithm. Tariff variables are employment weighted tariff rates. ΔlnTariff, change in log tariffs comprises the difference in log tariffs in the initial period and log tariffs in the final period. lnPop_density denotes population density. lnEcoact represents economic activity, which is proxied by night-time lights. lnInfrast denotes infrastructure, which is the principal component of the log infrastructure variable and includes the share of households with electricity, regular refuse collection, flush toilets, and piped water. Manufacturing share, pension, and kinship are at the initial period in 1996. lnManuf represents manufacturing share, which is the share of manufacturing in total employment (excluding employment in the primary sector). lnPension is the number of households with a pension recipient compared to household without a recipient. lnKinship is the share of mother tongue isiZulu speaking people.

Table 5.7A: Tariff liberalisation effects on internal migration using alternative migration data (bilateral migration greater or equal to 50)

	(1)	(2)	(3)
	Dependent variables: Log demeaned bilateral migration		
VARIABLES	Aggregate	Female	Male
ΔlnTariff_orig	-34.328**	-36.247**	-30.431
	(15.926)	(14.561)	(20.352)
ΔlnTariff_des	57.182	16.856	91.253*
	(36.097)	(32.592)	(47.558)
lnDistance	-0.263***	-0.338***	-0.228***
	(0.024)	(0.023)	(0.029)
lnPop_density_orig	0.230***	0.248***	0.230***
	(0.043)	(0.041)	(0.053)
lnPop_density_des	0.163**	0.313***	0.048
	(0.064)	(0.057)	(0.083)
lnEcoact_orig	-0.109	-0.123*	-0.083
	(0.069)	(0.064)	(0.087)
lnEcoact_des	0.153	-0.036	0.341**
	(0.130)	(0.116)	(0.170)
lnInfrast_orig	0.068**	0.059**	0.085**
	(0.027)	(0.025)	(0.035)
lnInfrast_des	0.073**	0.109***	0.071
	(0.034)	(0.030)	(0.045)
lnManuf_orig	-0.219***	-0.211***	-0.236***
	(0.048)	(0.046)	(0.059)
lnManuf_des	0.020	-0.098	0.070
	(0.077)	(0.067)	(0.106)
lnPension_orig	0.027	0.030*	0.028
	(0.018)	(0.018)	(0.022)
lnPension_des	-0.069	-0.023	-0.112*
	(0.048)	(0.042)	(0.065)
lnKinship_orig	-0.041***	-0.047***	-0.039***
	(0.008)	(0.008)	(0.011)
lnKinship_des	0.009	-0.021	0.022
	(0.018)	(0.017)	(0.023)
Observations	17,947	17,947	17,947
R-squared	-2.379	-0.268	-3.231
Year FE	Yes	Yes	Yes
IV	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. Variables with orig and des suffixes are variable at the origin municipality and destination municipality respectively. All control variables are in natural logarithm. Tariff variables are employment weighted tariff rates. ΔlnTariff, change in log tariffs comprises the difference in log tariffs in the initial period and log tariffs in the final period. lnPop_density denotes population density. lnEcoact represents economic activity, which is proxied by night-time lights. lnInfrast denotes infrastructure, which is the principal component of the log infrastructure variable and includes the share of households with electricity, regular refuse collection, flush toilets, and piped water. Manufacturing share, pension, and kinship are at the initial period in 1996. lnManuf represents manufacturing share, which is the share of manufacturing in total employment (excluding employment in the primary sector). lnPension is the number of households with a pension recipient compared to household without a recipient. lnKinship is the share of mother tongue isiZulu speaking people.