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ABSTRACT

Trade and the Gender Wage Gap in South Africa: A Comparative Analysis of Cape Town and eThekwini*

This study examines the relationship between trade, measured by export propensity, and the gender wage gap in two major South African cities with contrasting industrial structures: Cape Town and eThekwini. Using spatially disaggregated administrative data from the Cities Support Programme (CSP) and applying the Oaxaca-Blinder decomposition, we quantify how trade influences wage disparities between men and women in each city. The findings show that in Cape Town, where the economy is predominantly services-based, higher export propensity is associated with a wider gender wage gap, whereas in eThekwini, with its manufacturing-oriented economy, greater export propensity correlates with a narrower gender wage gap. These contrasting outcomes underscore the role of local industrial composition in mediating the gendered impacts of trade. The results suggest that treating trade as both location-neutral and gender-neutral risks exacerbating inequalities in some contexts while reducing them in others, and that policy interventions should be sensitive to local economic structures to ensure that trade integration advances, rather than undermines, gender equity.

JEL Classification:
F16, J16, J31, R12

Keywords:
Cape Town; eThekwini; Trade; Gender Wage Gap; Cities Support Programme; Oaxaca-Blinder Decomposition

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1. Introduction

Despite advances in gender equality globally, women in South Africa still earn substantially less than men. Studies examining the factors that determine the gender wage gap have largely focused on the national level (Blau & Kahn, 2017; Terada-Hagiwara, Camingue & Zveglich, 2018), including research conducted in South Africa (Bezuidenhout *et al.,* 2019; Mosomi, 2019). Preliminary evidence suggests that gender wage gaps differ not only between provinces but even within cities (Fuchs *et al.,* 2021). Yet little is known about how local trade exposure, influenced by port access, special economic zones, and sectoral specializations, shapes these city-level disparities. There is a dearth of empirical studies on the regional gender wage gap, most likely because of the unavailability of geocoded employment and wage data (Fuchs *et al.,* 2019). However, knowing the reasons behind these variations may have strong implications for local responses. Regional studies on the gender wage gap are important to uncover heterogeneity across regions, which national studies tend to mask (Fuchs *et al.,* 2019).

One explanation for geographic variation in the gender wage gaps could relate to demographic and industrial differences in various locations. While extensive research has revealed individual as well as industry-related gender earnings gap determinants, research on the role of trade on the gender wage gap has been inconclusive (Bonfiglioli & De Pace, 2021). One explanation for sub-national differences in the gender wage gap is local variations in exposure to international trade, which could in turn be determined by access to infrastructure (such as sea or airports) and regional comparative advantage for producing export products or services.

This paper's main goal is to show that there is a heterogeneous sub-national and within-city association between trade and the gender wage gap due to differences in sectoral compositions between and within two cities in the same country, that share the same external environment (such as international trade agreements). Policy addressing the gender wage gap should therefore be responsive to local industrial and demographic conditions. Our results show that local industrial composition does not have the expected association with the gender wage gap, but local exposure to trade has sector-specific influences. We can study within-city wage gaps because of data availability, which is rare in international literature. Furthermore, spatial data allows the monitoring of sectoral and spatial shifts over time (Harrison *et al.*, 2023).

Although trade policy is designed to be gender-neutral, it has heterogeneous impacts on men and women (World Bank, 2020; Bonfiglioli & De Pace, 2021). Therefore, the role of trade on

the gender wage gap is an important empirical question. There have been mixed findings about the impact of trade on the gender earnings gap (Baliamoune-Lutz, 2020). For this reason, this paper explores whether location-specific conditions can explain why literature remains inconclusive. By exploring two cities with different economic structures, we contribute to understanding when exposure to trade widens the gender wage gap, and when it does not.

In the emerging literature, there has been an inconclusive debate about which type of skills is more suited to earn higher wages in firms that export. For instance, Ngai and Petrongolo (2017) in their marketization and structural transformation theory, argue that women have a comparative advantage in white-collar tasks, especially those intensive in interpersonal interactions, while they have a comparative disadvantage in blue-collar tasks, which tend to be intensive in physical strength. The theory predicts that trade widens the gender wage gap in blue-collar sectors and narrows the gender wage gap in white-collar sectors since the returns to trade would reward more the factor-intensive in each sector. By implication, cities and suburbs with specific sectoral composition could have very different local gender inequalities. On the other hand, Juhn *et al.* (2014) underscore the role of technology in their trade liberalization and gender model. Their theory assumes that male and female employees have heterogeneous skills, with women having a comparative advantage in less physically intense jobs as compared to men. The theory predicts that trade lowers the gender wage gap in blue-collar sectors, while its impact on the gender wage gap in white-collar sectors is theoretically ambiguous, and hence an empirical question. Another theory by Ben Yahmed (2017) predicts that concentrated exporting industries widen the gender earnings gap as women gain less from the export premium as compared to men because such firms are prejudiced against women. Due to a lack of competition, such firms can afford to unequally distribute rents between women and men. Ben Yahmed (2017) cautiously argues that competition only partially reduces the unexplained component of the gender wage gap.

This paper complements the current literature by investigating the role of trade and agglomeration economies in explaining the gender wage gap in Cape Town and eThekwini, important coastal metropoles in South Africa that have different industry specializations, but both have large harbours, airports, and special economic zones (SEZs) that promote exports. Cape Town's economy is diversified, but it has a bias towards tertiary sectors such as tourism, retailing, and financial services, while eThekwini's economy is mainly based on manufacturing

logistics (Visagie & Turok, 2023). We anticipate different findings in these locations based on sectoral structure, despite many other commonalities.

To answer these questions, we use within-municipal administrative spatial data and decompose earnings using the Oaxaca-Blinder approach. This paper contributes to existing literature in several ways. To the best of our knowledge, this paper is the first to investigate the differences in the association between trade and the gender wage gap between and within two cities where international trade agreements are identical, but where there are differences in sectoral and socio-economic compositions. Furthermore, to the best of our knowledge, the paper is the first to analyze the gender wage gap using the rich location-specific Cities Support Programme (CSP) data.

This paper is structured as follows. Section 2 reviews the theoretical and empirical literature on trade and the gender wage gap. Section 3 provides background on South Africa's export sector, differentiating between Cape Town and eThekwini. Section 4 describes the data and Section 5 sets out the empirical strategy. Section 6 discusses the study's limitations. Section 7 presents descriptive statistics and Section 8 reports the regression results. Section 9 presents robustness checks, and Section 10 concludes.

2. Literature Review

To better understand the research gap, this section reviews the theoretical underpinnings to trade and the gender wage gap as well as empirical studies. The related empirical literature is limited and provides contradictory views, resulting in differences in methodological approaches, context, and scope.

2.1 Theoretical Literature Review

2.1.1 "Brain" versus "Brawn" Comparative Advantage Theory

Juhn *et al.* (2014)'s trade liberalization and gender model predicts employee outcomes distinguished by gender and occupation. Firms select between traditional and modern technologies. Traditional technology involves relatively more manual blue-collar tasks, for instance, heavy machinery operations, while modern technology comprises computerized production tasks, which yield greater total factor productivity. Furthermore, there is differentiation of labour as blue or white collar as well as by gender. In relative terms, white

collar employees and female blue-collar employees have greater productivity when they utilize modern technology.

Trade liberalization

Proposition 1

A decrease in tariff reduces the export threshold, which reduces the technology adoption threshold. This raises women's relative wages in the blue-collar sector and leads to a rise in the relative number of female employees in the blue-collar category for firms that have switched to advanced technology.

When trade has been liberalized, exporting becomes more appealing, and this reduces the export threshold. Given that advanced technology has greater efficiency in producing an increased volume of exports, more firms switch to modern technology. Since blue-collar female employees realize greater productivity when advanced technology is employed, firms that migrate from traditional technology to modern technology will recruit more female employees. Subsequently, the relative wage of females in the blue-collar sector increases.

Therefore, proposition 1 predicts that technological upgrading in the blue-collar sector benefits female employees. In the context of this paper, the a priori expectation is that trade should lower the gender wage gap in the eThekwini municipality, which is mainly based on the blue-collar industry (Visagie & Turok, 2023) as the relative wage of women to men is expected to rise.

Proposition 2

A fall in the tariff (i) has no effect on the female relative wage or employment in the white-collar sector, and (ii) when there is differentiation of labour by gender and occupation-specific skills, prediction on the changes in the aggregate categories, such as the wages of all skilled employees, tends to be theoretically vague.

Component (i) of the proposition expresses that when technology choice has no effect on white collar tasks performed by male and female employees, trade does not affect wage and employment relative outcomes of female employees in the services sector. Component (ii) of the proposition demonstrates that even though the productivity of doing white-collar tasks improves when using new technology, whether aggregate wages paid in this category increase

or decrease relies on the model parameters and the relative wages of various inputs that existed before the adoption of modern technology. The proposition predicts that the impact of trade liberalization on white to blue-collar wages is an empirical issue (Juhn *et al.,* 2014).

2.1.2 Marketization and Structural Transformation Theory

Ngai and Petrongolo (2017) hypothesize that there is a gender-neutral transmission channel that improves female employment and earnings through marketization and structural transformation. According to the theory, there are two sectors: the market sector that produces both goods and services, and the home sector that produces services. In both sectors, women have a comparative advantage in the production of services associated with the more intense use of interpersonal skills, whereas men have a comparative advantage in the blue-collar sector associated with physically demanding skills. The theory assumes that marketization of home production is associated with a lower gender wage gap as it attracts female labour into the market, correlates with a fall in participation of men in the labour market, and an increase in the relative wages of women. In contrast to Juhn *et al.* (2014), the theory suggests that trade widens the gender wage gap in blue-collar sectors and narrows the gender wage gap in white-collar sectors since the returns to trade would reward more the factor-intensive in each sector. In the context of this study, the theory implies that trade should be correlated with a lower gender wage gap in Cape Town, which is mainly based on the services sector, and a higher gender wage gap in eThekwini, which is mainly based on the blue-collar sector, where women have a comparative disadvantage.

2.1.3 Taste Discrimination Theory

Becker's (1957) theory of employer discrimination suggests that in sectors where supernormal profits are made, some employers' dislike of female employees produces a gender earnings gap despite similar endowments across men and women. The pro-competitive effect of international trade results in intense competition, and this should eliminate the male wage premium that men used to earn as discriminating firms seek to be competitive, thus eliminating the gender earnings gap (Becker, 1957). Becker (1957) predicts that trade eliminates the gender wage gap.

On the other hand, Ben Yahmed's (2017) taste discrimination model concurs with Becker (1957) that trade has a pro-competitive impact, which is a result of the selection of the least discriminatory establishments but contends that trade also has a market-size or profit-inducing

impact that enables trading firms with market power to discriminate against women. Ben Yahmed's (2017) theory predicts that if only the least discriminatory establishments can export, trade appears to lower the gender wage gap, though the result reflects selection bias rather than a causal link between trade and discrimination. However, if discriminatory firms are also able to export and get profits, the selection effect is neutralized, and trade then appears to be associated with a wider gender wage gap.

2.1.4 Statistical Discrimination Theory

Ben Yahmed's (2012) theory hypothesizes that employee characteristics differ by skills and job commitment. On average, women are paid less because they choose job flexibility between jobs and families, and some firms pay less to females to counteract the loss in the likelihood of them choosing more job flexibility, for instance, due to maternity leave and rearing children (Ben Yahmed, 2012). The theory further hypothesizes that skills complement technological upgrading. Furthermore, firms that export have greater skill-intensity and give greater wages, with an assumption that a worker's demand for job flexibility complements technological upgrading. The theory predicts that trade lowers the gender earnings gap among unskilled employees but widens it among highly skilled workers. This is because trade incentivizes firms to adopt advanced technologies to gain from bigger markets. The new investment in technology increases the demand for skilled and highly committed employees (Ben Yahmed, 2012). Since demand for commitment is more intense, trade widens the gender wage gap in the upper segment than in the lower segment of the income distribution. Statistical discrimination theory hypothesizes that the gender wage gap should decrease as age increases, as female employees would over time, have revealed their true productivity and job flexibility to employers (Sin *et al.,* 2020).

2.2 Empirical Literature Review

The related empirical literature is limited and provides contradictory views, resulting in differences in methodological approaches, context, and scope. Juhn *et al.* (2014) investigated the impact of tariff reduction as an external shock on gender-specific labour market outcomes in firms that exported in Mexico. They found that trade liberalization narrowed the gender earnings gap and improved employment of women in blue-collar occupations. This was due to newly exporting firms that had adopted automated production processes, which lowered the demand for physically intense tasks. However, they did not find evidence of the gender wage gap narrowing in white-collar occupations.

Some studies investigated the role of gender-specific social skills in the gender wage gap among trading firms. In Germany, Bonfiglioli and De Pace (2021) explored the impact of firms' export propensity on the gender earnings gap. Unlike Juhn *et al.* (2014), they found that exposure to trade widened the gender wage gap in blue-collar occupations, especially among employees who performed labour-intensive tasks, and narrowed it in white collar occupations where employees performed interactive tasks. Bonfiglioli and De Pace (2021) suggested that male employees had a comparative advantage in labour-intensive export tasks, whereas female employees had a comparative advantage in interaction-intensive export tasks. In Sweden, Halvarsson *et al.* (2022) examined how demand for interpersonal skills in trade and differences in bargaining skills were associated with the gender wage gap. They found that trade widened the gender earnings gap in the white-collar sector, and the finding was more pronounced in high contract-intensive industries where buyer and seller interaction was needed for trade to occur. In contrast to Bonfiglioli and De Pace (2021), Halvarsson *et al.* (2022) highlighted the role of male comparative advantage in trade bargaining skills in white-collar occupations.

Other studies traced the gender wage gap over the life course and found that it follows a life-course profile and is not constant across ages (Costa Dias *et al.,* 2018; Joshi *et al.,* 2020). Wage differences between male and female employees were found to be due to the time taken off the labour market by women to rear families (Kleven *et al.,* 2019), and women had less likelihood to apply for promotion and faced discrimination in appointments to high-paying jobs (Blau & Kahn, 2017). Building on Goldin's (2014) account of how disproportionate rewards to long and inflexible working hours widen the gender wage gap, Goldin and Katz (2016) show the motherhood wage penalty heterogeneity across industries. They argued that the production structure varies across sectors. In some occupations, increasing monthly working hours had a large impact on earnings, showing a nonlinear earning structure. One of the plausible reasons was that some of the tasks in the tertiary sector could not be perfectly substituted due to their personalized services and physical interaction required, hence the highly non-linear wage structure (Goldin & Katz, 2016).

If mothers choose more flexibility and shorter workdays, such sectors with a highly non-linear wage structure become less appealing, and mothers might be willing to sacrifice higher wages for more flexible working hours (Goldin & Katz, 2016). Therefore, the gender earnings gap associated with the motherhood penalty would be wider (Bütikofer *et al.,* 2018). In contrast, there is less personalization of roles in sectors such as the manufacturing sector, and the wage

structure is linear (Goldin & Katz, 2016). Therefore, the motherhood wage penalty in those professions might be lower or negative (Bütikofer *et al.,* 2018). If commitment is difficult to observe and women are perceived to be less flexible than men, exporting firms tend to discriminate against female workers since they require greater flexibility than non-exporting firms (Bøler *et al.,* 2015). Therefore, we expect the motherhood penalty associated with exporting firms in Cape Town, which is mainly based on the tertiary industry, to be associated with a wider gender wage gap. On the other hand, the motherhood penalty in eThekwini, which is mainly based on the manufacturing sector, would be associated with a lower or negative gender wage gap.

To summarize, there is a mixed theoretical prediction and empirical findings about the role of trade on the gender wage gap, and they tend to be industry and gender specific. On one hand, the Brawn vs Brain theory underscores that trade incentivizes blue-collar firms to automate. This increases the productivity and wages of female employees, thus narrowing the gender wage gap in the blue-collar sector, while the impact of new technology on the white-collar sector is theoretically ambiguous. On the other hand, the statistical discrimination theory links trade, age, and the gender wage gap. According to the theory, trade incentivizes firms to adopt new technologies. The new investment in technology increases the demand for skilled and more flexible employees, who are usually males. Statistical discrimination theory hypothesizes that the gender wage gap should decrease as age increases, as female employees would over time, have revealed their true productivity and job flexibility to employers (Sin *et al.,* 2020). Statistical discrimination tends to be more prevalent in the tertiary sector than in the blue-collar sector because there is more personalization of roles in the tertiary sector than in the blue-collar sector. If commitment is difficult to observe, exporting firms tend to discriminate against female workers since they require greater flexibility than non-exporting firms (Bøler *et al.,* 2015). Therefore, we expect the motherhood penalty in Cape Town, which is mainly based on the tertiary industry, to be associated with a wider gender wage gap. On the other hand, the motherhood penalty in eThekwini, which is mainly based on the manufacturing sector, would be associated with a lower or negative gender wage gap. There is also the role of gender specific social skills with male employees in exporting tertiary firms, having a comparative advantage in interpersonal skills.

We predict that trade is associated with a wider gender wage gap in Cape Town, whose economy is mainly based on the tertiary industry, and a lower gender wage gap in eThekwini, whose economy is mainly based on the manufacturing sector.

All these studies focused on the national level while overlooking the dynamics at the sub-geographical level, although the gender wage gap varies within a country (Fuchs *et al.,* 2019). Moreover, literature has focused mainly on developed countries, whose context differs from developing countries, and evidence from Sub-Saharan Africa suggests that structural transformation does not consistently narrow the gender pay gap (Van den Broeck, Kilic & Pieters, 2023). We sought to exploit the research gap by investigating the association between trade and the gender wage gap in Cape Town and eThekwini, which are coastal metropoles that have different contextual and sectoral compositions in South Africa.

3 Background

South Africa's exports are heavily skewed towards lowly beneficiated products and are mainly mineral and mining products (Stern & Ramkolowan, 2021). The competitiveness of the country's exports has suffered, largely because of a shortage of critical skills and ongoing electricity supply issues (Stern & Ramkolowan, 2021). Over the period 2016-2020, South Africa mainly exported mineral products, precious metals, vehicles, aircraft and vessels, iron and steel products, and machinery, in descending order. The export value of precious metals rose by 58.13 percentage points, while the mineral products and machinery export revenue increased by 45.50 and 2.33 percentage points, respectively (South African Revenue Service, SARS 2024).

South Africa also exports services such as transport, government services, and computers. Over the period 2016-2020, service exports fell by 39.16 percent (O'Neill, 2023). Cape Town's economy is mainly based on the tertiary sector. In 2019 alone, the sector comprised 78.2 percent of the metropole's entire economy. Cape Town is also one of the country's major exporters of services, such as tourism and transport, in South Africa (Wesgro, 2021). Due to its strategic geo-location (such as proximity to harbour and airport), Cape Town is also one of the major beneficiaries of the preferential and duty-free access Economic Partnership Agreement (EPA) that was signed in 2016 between a group of Southern African Development Community (SADC) countries and the European Union (Wesgro, 2021).

Figure 1 is plotted using SARS (2024) data and shows that the average export share of South Africa's top five export products over the period was 74 percent. Between 2016 and 2020, the export shares of mineral products and precious metals increased by 16.77 and 26.90 percentage points. During that same period, the relative importance of vehicles, aircraft, and vessels, iron and steel products, and machinery exports fell by 21.10, 23.50, and 17.88 percentage points, respectively. South Africa's main exports are also the main exports in Cape Town and eThekwini, as highlighted below.

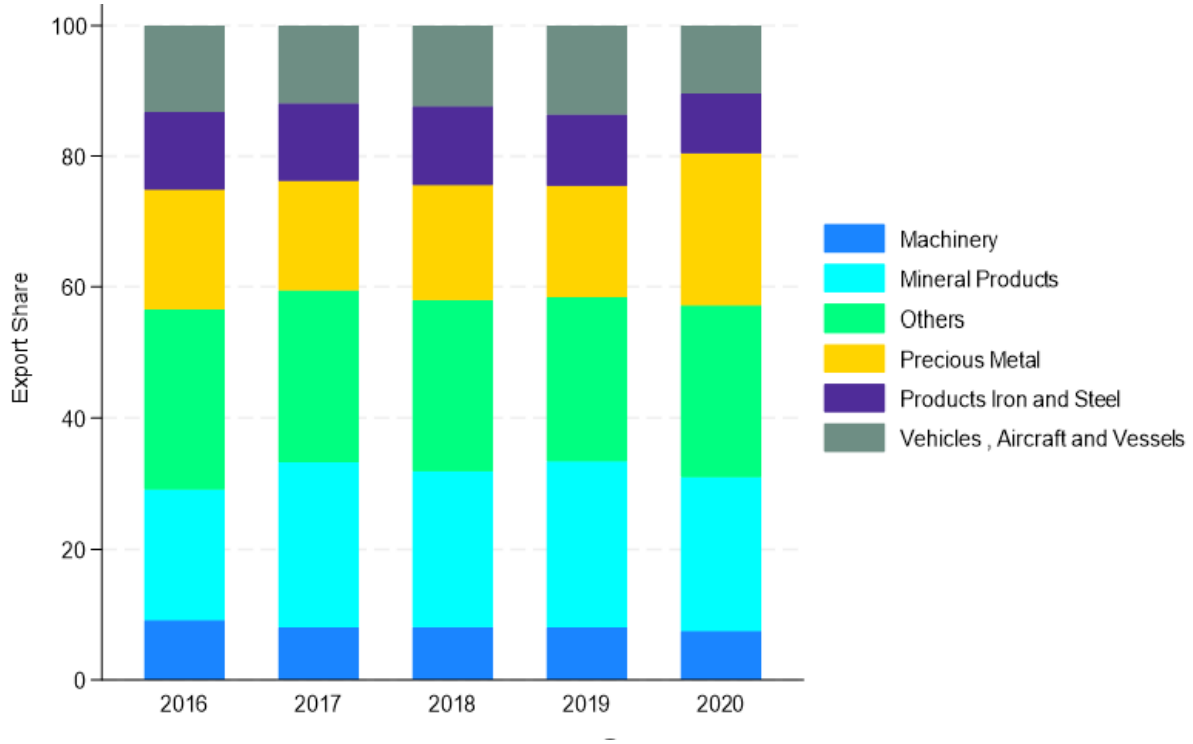

Figure 1: Export Shares of Top 5 South African Exports between 2016 and 2020

Source: Author's own calculations using data from SARS (2024)

Figure 2 shows percentage point changes in shares of export revenues in Cape Town and eThekwini and highlights that Cape Town mainly exports mineral products, machinery, and agricultural products, whereas eThekwini mainly exports mineral products, iron and steel, chemicals, vehicles, aircraft, and vessels.

Between 2016 and 2020, mineral products' export revenue in Cape Town fell by 4.66 percentage points, whereas in eThekwini, it rose by 14.71 percentage points, although the export revenue fell from 2017 to 2020. In Cape Town, vegetable products' export revenue rose by 53.12 percentage points while revenue from Live animals and animal products and Prepared Foodstuffs rose by 6.85 and 6.41 percentage points, respectively. Export revenue from Iron and

Steel products, Vehicles, Aircraft and Vessels, and Machinery, respectively, fell by 23.50, 21.10, and 17.88 percentage points. In eThekwini, chemical export receipts rose by 58.13 percentage points while Vehicles, Aircraft, and Vessels rose by 14.05 percentage points. On the other hand, Wood Pulp and Paper and Iron and Steel products fell by 15.63 and 8.98 percentage points, respectively.

However, the data source reports exports by port of exit, rather than by the geographic location of the firm or the site of production. As a result, the exporting firm could be located anywhere in the country and may simply use the port as a logistical hub. This implies that the data do not necessarily reflect where the goods were manufactured or where export-related employment is concentrated.

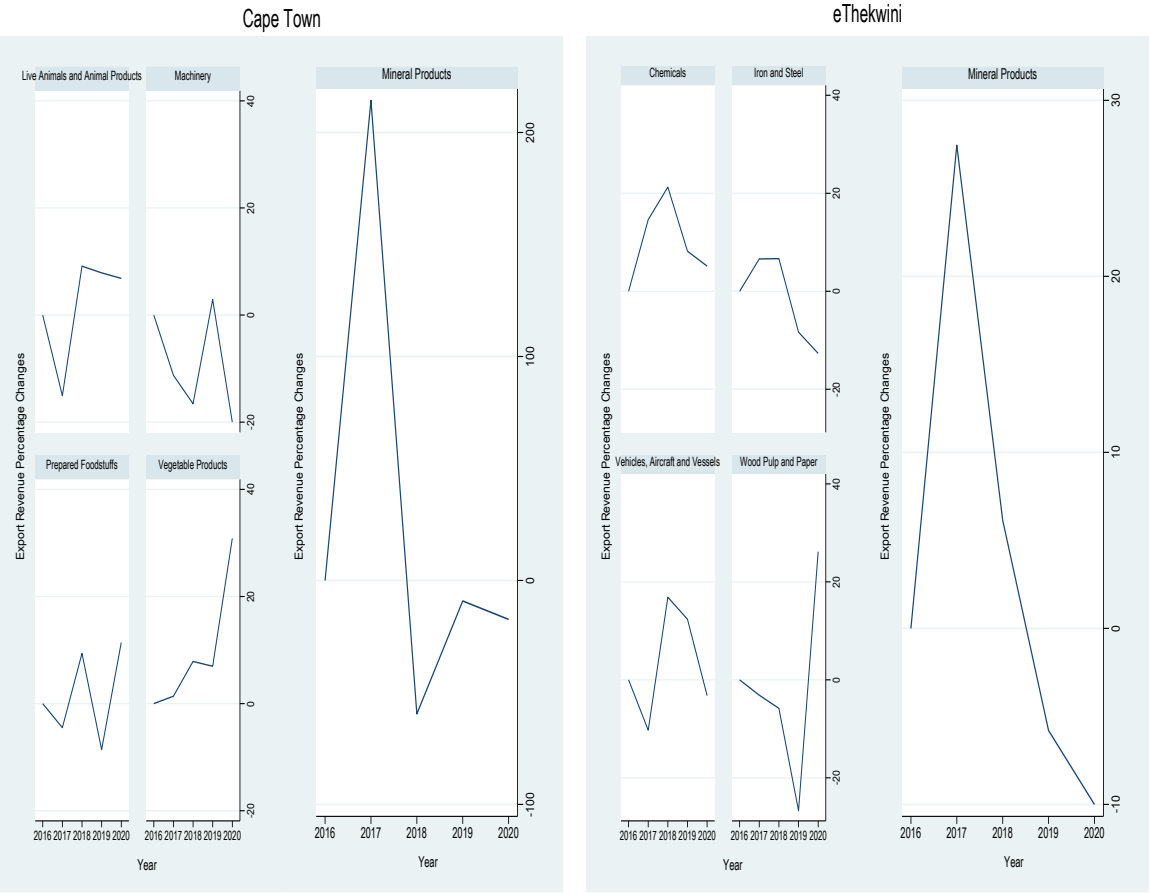

Figure 2: Percentage Changes in Export Revenue in Cape Town and eThekwini

Source: Author's own calculations using data from Statistics South Africa (2023)

Regional variations in collective bargaining between male and female employees might also explain the gender wage gap. Males and female employees in South African provinces have different unionization rates, thus suggesting regional variations in bargaining power between male and female employees. Table 1 shows unionization rates for the Western Cape (where Cape Town is) and KwaZulu-Natal (where eThekwini is).

Table 1: Unionization rates in Western Cape and KwaZulu-Natal

Year	Western Cape Female	Western Cape Male	KwaZulu-Natal Female	KwaZulu-Natal Male
2016	31.05%	33.33%	28.05%	24.85%
2017	30.59%	29.58%	29.75%	27.60%
2020	31.28%	33.56%	26.92%	26.30%
Average	30.97%	32.16%	28.24%	26.25%

Source: Author's own calculations from Kerr et al. (2020)

In the Western Cape province, males were more unionized than females in every year except for 2017. In the KwaZulu-Natal province, females were more unionized than males in 2016 and 2017, while males were more unionized than females in 2020. In the Western Cape, on average, male employees were 1.19 percentage points more unionized than female employees, whereas in KwaZulu-Natal, female employees were 1.99 percentage points more unionized than their male counterparts. This suggests that the gender union gap is more intense in the Western Cape than in KwaZulu-Natal. The gender union gap may lead to a wider gender wage gap (Farber *et al.,* 2021). Trade would be expected to lower the gender wage gap in eThekwini and increase it in Cape Town if exporting firms are unionized.

4 Data and Conceptual Framework

The paper used the Cities Support Programme (CSP) panel data for the tax years 2016 to 2020 (Nell & Visagie, 2022). The original data source was confidential firm- and employee-level data that was reworked to sub-municipal aggregates. The spatial unit of analysis used was the Uber H3 hexagon identifier. It was derived by leveraging partial shapefiles of postal codes in South Africa, data from the South African Post Office that is in the public domain, and the South African National Landcover dataset to disaggregate data into smaller hexagons of identical area (Nell & Visagie, 2022). This data has been anonymized and is in the public domain. Where there are privacy concerns about being able to identify individual firms (fewer than 10 observations), data have been masked. Data containing establishments by sector, exporting establishments, median income, full-time employment, and age categories were

compiled for further analysis. Since the paper focused only on Cape Town and eThekwini, other metropoles were dropped. To mitigate the effect of small employment hexagons, all regressions were weighted by total formal employment in each hexagon, thus giving larger labour markets greater influence on the overall estimates, while down-weighting locations with few employees.

The following variables were used:

The determinants of the gender wage gap in Cape Town and eThekwini that will be investigated by the study are export propensity, nightlights, industry concentration, textile share, manufacturing share, age, and distance. The description of the variables and how they were generated is explained below.

Gender Wage Gap: defined as the difference between the logarithms of monthly median earnings of male and female employees in a local hexagon, was the outcome variable.

Export propensity: Trade is captured by export propensity, which measures the degree to which firms are exporting. The variable was generated by computing the proportion of all firms in a hexagon that were exporting any product or service. We expect a negative correlation between export propensity and the gender wage gap in eThekwini (where blue-collar sectors dominate) and an a priori indeterminant relationship between export propensity and the gender wage gap in Cape Town (where the white-collar sector dominates).

Industrial composition: industrial composition is defined as the spatial concentration of people and establishments (Posada & García, 2017). "Localization economies" refers to a cluster of establishments within the same industrial sector that are in the same part of a city. This study used the manufacturing and tertiary industry share as localization economy variables. The concentration of employees was captured using the proportion of employees in various age groups. A high employee spatial concentration is potentially a source of increasing returns due to knowledge spillovers (García, 2019). The industrial composition variables are discussed below:

$$\textbf{Manufacturing Share} = \frac{Number\ of\ manufacturing\ firms\ in\ hexagon\ j}{Number\ of\ all\ firms\ in\ hexagon\ j}$$

$$\textbf{Tertiary Share} = \frac{Number\ of\ tertiary\ firms\ in\ hexagon\ j}{Number\ of\ all\ firms\ in\ hexagon\ j}$$

Industry share captures industrial differences in various locations. The proposition is that spatial concentration of manufacturing firms is positively correlated with the local gender wage gap, and the spatial concentration of tertiary firms is negatively associated with the local gender wage gap.

Herfindahl Hirschman Index (HHI): This measure captures hexagon-level industrial concentration and was generated by summing the square of the primary, manufacturing, other secondary, and tertiary industry shares in each location.

HHI Spatial lag: This measure captures concentration in the neighboring hexagons and was generated by combining the row-standardized contiguous spatial weighting matrix with HHI (Behr *et al.,* 2022).

Industry concentration captures the market power of dominant industries. We expect a positive association between market power concentration and the gender wage gap in Cape Town and eThekwini.

Age Proportions: was generated as the proportion of male and female employees in each hexagon that were in each age category. The age categories were 15-25 years and 35 years and above. These variables were included to account for local differences in the levels of experience of the employed, consistent with the human capital framework (Mincer, 1974; Zveglich *et al.,* 2019). The gender wage gap is expected to decrease as age increases, as female employees would, over time, demand less flexibility to care for their families.

Nightlights: data was extracted from the Earth Observation Group (2023) website. The log of the mean of the aggregate local nightlights for the years 2016 to 2020 was used. Visible Infrared Imaging Radiometer Suite (VIIRS) nightlights are an accurate proxy of local economic activity (Gibson, 2020). Nightlights capture variations in local productivity.

Distance Variables: Measured distance between a hexagon and a trade-facilitating location. In Cape Town, trade facilitating locations were Cape Town Harbour, Cape Town International Airport, and Atlantis Special Economic Zone, while in eThekwini, they were the Dube Trade Port (a SEZ which includes King Shaka International Airport) and the Port of Durban. The distance variable was generated by computing the shortest distance between the latitude and longitude coordinates of a trade-facilitating location and the latitude and longitude coordinates of every hexagon's centroid.

Distances to harbours, airports, and special economic zones capture regional comparative advantage for producing export products or services. The proposition is that women disproportionately bear the burden of trade transaction costs; therefore, in both metropoles, we expect a positive association between distance and the gender wage gap.

5 Empirical Strategy

To investigate the association between trade and the gender wage gap in Cape Town and eThekwini, this paper adopted the aggregate-level wage determination framework of Combes *et al.* (2008)'s methodology as follows:

$$w_r = x'_{rj}\beta + \varepsilon_r \quad (1)$$

Where w_r is the logarithm of the average wage in hexagon r, x_r is a vector of hexagon-level characteristics: trade exposure, age-composition, industry shares, nightlights, and distance to port. β measures how those local attributes influence the average wage and ε_r captures unobserved factors affecting local wages (Groizard *et al.,* 2022).

We decompose the mean difference of earnings across hexagons' median male and female employees into its determinants. This paper employed the pooled Oaxaca-Blinder decomposition technique, which separates the observed gender wage gap into two components: the explained and the unexplained components (Rahimi & Hashemi Nazari, 2021). The explained component reflects the portion of the wage gap that can be attributed to differences in observable characteristics between men and women, for example, years of experience, which in our context is captured by age proportions. This part answers the question: How much of the wage gap is due to men and women having different work experience? On the other hand, the unexplained component captures the portion of the wage gap that remains after controlling for the observable characteristics. This may indicate potential labour market discrimination or omitted variables such as education level, which may not be observed in the data.

The paper modelled the hexagon-level logarithm of pooled median earnings as a function of the export propensity, nightlights, manufacturing sector share, textile sector share, age proportions, and distance. The paper focuses on unexplained components. Except for age proportions, where there were differences in endowments across gender, the expected explained coefficients were zero since the endowments were the same for both males and females in the data. For instance, export propensity was not recorded to vary by gender. Despite

the lack of variation in some data across genders, the returns on each of these attributes differ by gender. Our focus is therefore on how trade and other factors affect male and female wages differently. However, in some cases, the models estimated differences in endowments. This occurs in cases where data were missing in different locations for men and women.

Drawing from Razavi and Habibi (2014), this paper also considered separate wage functions for male and female employees with w_m and w_f being the respective earnings of the median worker for each group in each hexagon.

$$lnw_m = \sum \beta_m \cdot X_m + \mu_m \tag{2}$$

$$lnw_f = \sum \beta_f \cdot X_f + \mu_f \tag{3}$$

In this case, X_m and X_f are the 15 to 25 years and 35 years and above age proportions of males and females, export propensity, manufacturing share, tertiary share, logarithm of nightlights, and distance variables. μ_m and μ_f are the error terms while β_m and β_f are the coefficients of the age proportions, industrial characteristics, local economic activity, and distances. Estimating equations (2) and (3) above give:

$$ln\bar{w}_m = \hat{\beta}_m \cdot \bar{X}_m \tag{4}$$

$$ln\bar{w}_f = \hat{\beta}_f \cdot \bar{X}_f \tag{5}$$

Equations (4) and (5) show the across-location mean of the logarithms of the hexagon-level median incomes as functions of the average age proportions, industrial characteristics, local economic activity, and distance variables.

The gender wage gap between male and female employees is then estimated as:

$$ln\bar{w}_m - ln\bar{w}_f = \hat{\beta}_m \cdot \bar{X}_m - \hat{\beta}_f \cdot \bar{X}_f \tag{6}$$

The decomposition of the earnings gap into explained (E) and unexplained (U) components is attained by adding and subtracting $\hat{\beta}_m \cdot \bar{X}_f$ from equation (6)

$$ln\bar{w}_m - ln\bar{w}_f = \hat{\beta}_m \cdot \bar{X}_m - \hat{\beta}_m \cdot \bar{X}_f + \hat{\beta}_m \cdot \bar{X}_f - \hat{\beta}_f \cdot \bar{X}_f$$

$$= \hat{\beta}_m \cdot (\bar{X}_m - \bar{X}_f) + (\hat{\beta}_m - \hat{\beta}_f)\bar{X}_f = \mathrm{E} + \mathrm{U} \tag{7}$$

E = $\hat{\beta}_m \cdot(\bar{X}_m - \bar{X}_f)$ gives the gender wage gap component due to differences in endowments between male and female employees, thus giving differences in their respective productivity.

U = $(\hat{\beta}_m - \hat{\beta}_f)\bar{X}_f$ gives the gender wage component that is due to discrimination and/or omitted variables.

This paper used equation 7 to estimate the gender wage gap models for Cape Town and eThekwini.

6 Study Limitations

This paper used publicly available administrative data aggregated at the suburb level, which might have affected the precision of results. The administrative data was aggregated by single variables (for instance, grouping all manufacturing firms within each location rather than categorizing them by sub-sectors), thus minimizing the masking of observations less than 10 (Nell & Visagie, 2022). Jacob (2016) suggests that data accuracy improves when it is disaggregated by only the most important sub-groups, which is what the administrative tax data did.

Furthermore, the data's spatial element currently relies on the rough location of establishments as given by the business address postal codes that the respective data originates from, and this might have compromised spatial accuracy. Nonetheless, a general indication of where firms and workers were located was provided, and regional concentrations could be distinctly identified (Nell & Visagie, 2022). Moreover, the administrative data did not have human capital variables such as education and experience, although suburb-level age structures can partially account for this deficiency, given the high correlation between generation and education, and age and experience in South Africa. Therefore, the unexplained component should be cautiously interpreted as an upper bound to discrimination, as it may reflect not only potential discrimination but also omitted variable bias arising from unobserved characteristics.

Given these highlighted shortcomings, our results should be interpreted with caution, suggesting associations rather than definitive causation. Nevertheless, the results are important as they show the changes in the unexplained component over time, which could indicate the extent and dynamics of discrimination over time.

7 Results

7.1 Descriptive Statistics for Cape Town and eThekwini

Tables 2, 3, and 4 describe statistics for the pooled sample and for Cape Town and eThekwini, respectively.

Table 2 shows statistics for Cape Town and eThekwini pooled across time. In Cape Town, on average, men earn R1,715.10 more than women. On the other hand, in eThekwini, on average, males earn R2,267.20 more than females at the hexagon level. The hexagon-level median gender wage gap in eThekwini exceeded the gender wage gap in Cape Town by R552.10, and this is significant at the 1% level. Trade is more intense in Cape Town than in eThekwini by 0.7 percentage points, and this is significant at the 1% level. Average hexagon-level economic activity, as proxied by nightlights, is denser in Cape Town than in eThekwini by 8.3 units, and this is highly significant at the 1% level. Average hexagon-level employment is greater in Cape Town than in eThekwini by 1811.61 full-time employees, and this is significant at the 1% level. Also, on average, there are 93.04 more establishments per hexagon in Cape Town than in eThekwini, and this is significant at the 1% level. This suggests that industrial composition is denser in Cape Town than in eThekwini.

Table 3 shows that the gender wage gap in Cape Town increased every year and rose by 3.59 percentage points between 2016 and 2020. Export propensity fell by 50 percentage points between 2016 and 2020. Between 2016 and 2020, the average number of establishments per hexagon rose by 15.2 percent while the average number of full-time employees rose by 9.5 percent. These findings suggest a positive time correlation between industrial composition and the gender wage gap, as well as a positive time series association between exports and the gender wage gap.

Table 4 shows that the gender wage gap in eThekwini fell by 2.88 percentage points between 2016 and 2020. Export propensity remained unchanged over time. Between 2016 and 2020, the average number of full-time employees per hexagon rose by 9 percent while the average number of establishments per hexagon rose by 14.9 percent. These findings suggest a negative time correlation between industrial composition variables and the gender wage gap in eThekwini.

Table 2: Pooled descriptive statistics for Cape Town and eThekwini

Variables	Pooled Cape Town (N = 1,655)	Standard deviation	Pooled eThekwini (N = 1,865)	Standard deviation	Differences
Hexagon-level Median Wage (Male)	9784.255	2630.403	10868.370	5326.509	-1084.115***
Hexagon-level Median Wage (Female)	7446.252	2887.771	7671.094	5225.913	-224.842
Hexagon-level Gender Wage Gap	1715.100	1897.821	2267.203	3534.123	-552.104***
Export Propensity	0.023	0.042	0.016	0.037	0.007***
Nightlights	17.576	16.500	9.290	11.152	8.286***
Employment	4446.301	9048.074	2634.687	7681.879	1811.614***
Establishments	201.291	280.805	108.246	207.357	93.044***
Distance to Cape Town Harbour	23.025	11.564			
Distance to Atlantis SEZ	51.568	17.481			
Distance to Cape Town Airport	19.091	10.653			

Distance to Durban Port	26.643	11.302
Distance to Dube Trade Port	34.152	18.419
Distance to King Shaka Airport	36.307	18.882

Source: Author's own calculations from the CSP data

Table 3: Descriptive Statistics for Cape Town

Variables	**2016**	**2017**	**2018**	**2019**	**2020**
	(N = 332)	**(N = 332)**	**(N = 331)**	**(N = 331)**	**(N = 329)**
Hexagon-level Median Wage (Male)	9165.08 (2476.03)	9657.06 (2612.67)	9910.95 (2708.96)	9961.93 (2582.79)	10221.73 (2660.56)
Hexagon-level Median Wage (Female)	7114.62 (2863.65)	7335.14 (2884.63)	7515.16 (2948.26)	7488.08 (2988.18)	7785.49 (2718.29)
Hexagon-level Gender Wage Gap	1449.05 (1594.92)	1650.88 (1822.16)	1711.03 (2352.50)	1786.73 (1924.04)	1983.38 (1666.89)
Wage Gap (% of Male Wages)	15.81%	17.10%	17.26%	17.94%	19.40%
Export Propensity	0.02 (0.04)	0.03 (0.05)	0.03 (0.05)	0.03 (0.04)	0.01 (0.03)
Nightlights	17.94 (17.56)	17.94 (17.27)	17.89 (16.55)	17.36 (15.90)	16.75 (15.15)
Establishments	190.75 (269.18)	190.52 (270.11)	198.61 (280.70)	206.64 (285.25)	219.81 (298.36)
Employment	4247.82 (8819.65)	4382.67 (8989.15)	4447.25 (9012.83)	4497.80 (9086.62)	4653.37 (9374.06)
Distance to Cape Town Harbour	23.00 (11.56)	22.98 (11.57)	23.06 (11.59)	23.03 (11.59)	23.05 (11.58)
Distance to Atlantis SEZ	51.63 (17.40)	51.64 (17.43)	51.49 (17.56)	51.54 (17.57)	51.53 (17.55)
Distance to CPT Int Airport	19.03 (10.60)	19.04 (10.62)	19.12 (10.71)	19.14 (10.71)	19.13 (10.69)

Source: Author's own calculations from the CSP data

Table 4: Descriptive Statistics for eThekwini

Variables	2016 (N = 370)	2017 (N = 370)	2018 (N = 373)	2019 (N = 376)	2020 (N = 376)
Hexagon-level Median Wage (Male)	10398.72 (4487.50)	10928.77 (5403.06)	11120.82 (5806.02)	10847.83 (5580.60)	11047.51 (5267.69)
Hexagon-level Median Wage (Female)	7203.99 (4248.23)	7860.07 (5267.05)	7884.41 (5636.15)	7587.09 (5503.26)	7813.69 (5337.73)
Hexagon-level Gender Wage Gap	2355.49 (3573.19)	2212.90 (3380.89)	2320.41 (3822.60)	2264.50 (3692.00)	2184.50 (3182.96)
Wage Gap as (% of Male Wages)	22.65%	20.25%	20.87%	20.88%	19.77%
Export Propensity	0.01 (0.03)	0.02 (0.04)	0.02 (0.04)	0.02 (0.04)	0.01 (0.03)
Nightlights	9.27 (11.53)	9.26 (11.48)	9.34 (11.24)	9.32 (11.05)	9.27 (10.51)
Establishments	103.50 (201.14)	102.77 (199.97)	106.11 (203.18)	109.77 (208.49)	118.93 (223.70)
Employment	2503.48 (7246.08)	2486.24 (6385.72)	2757.30 (9050.23)	2697.12 (7889.62)	2729.22 (7633.31)
Distance to Port of Durban	26.51 (11.31)	26.65 (11.38)	26.69 (11.34)	26.74 (11.32)	26.62 (11.23)
Distance to Dube Trade Port	33.92 (18.43)	34.18 (18.53)	34.27 (18.48)	34.23 (18.37)	34.15 (18.39)
Distance to K. Shaka Int Airport	36.07 (18.90)	36.34 (18.99)	36.43 (18.94)	36.38 (18.83)	36.31 (18.86)

Figures 3 and 4 show spatial concentrations and associations of the gender wage gap, export propensity, and full-time employment in Cape Town and eThekwini.

Figure 3 suggests that export propensity, full-time employment, and the gender wage gap are more concentrated around Cape Town Harbour and Airport, and that relationship has generally

remained constant over the years. This suggests that locations with greater access to trade also have a larger gender wage gap in Cape Town.

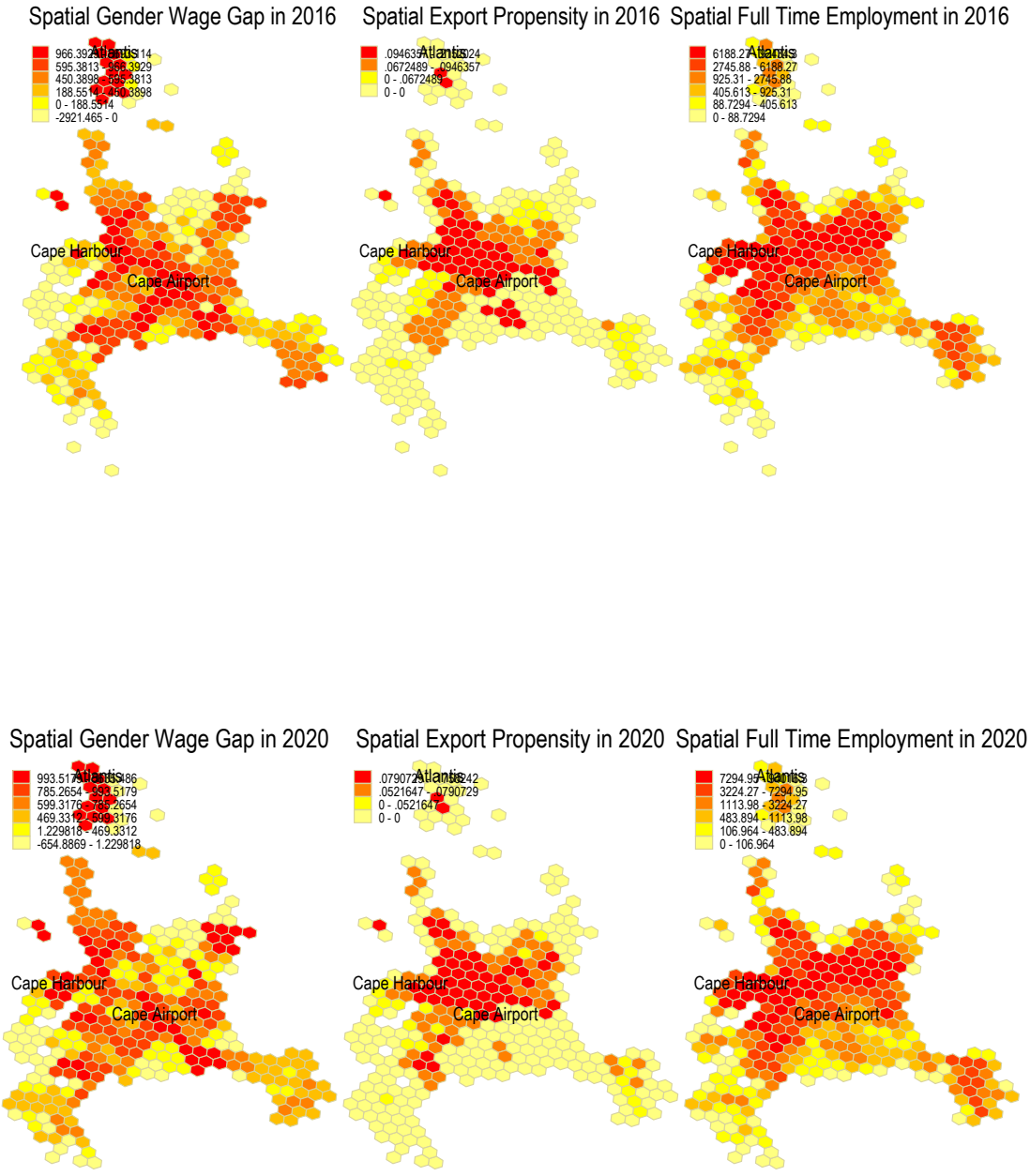

Figure 3: Export Propensity, Full Time Employment, and the Gender Wage Gap in Cape Town in 2016 and 2020

Source: Author's own calculations from the CSP data

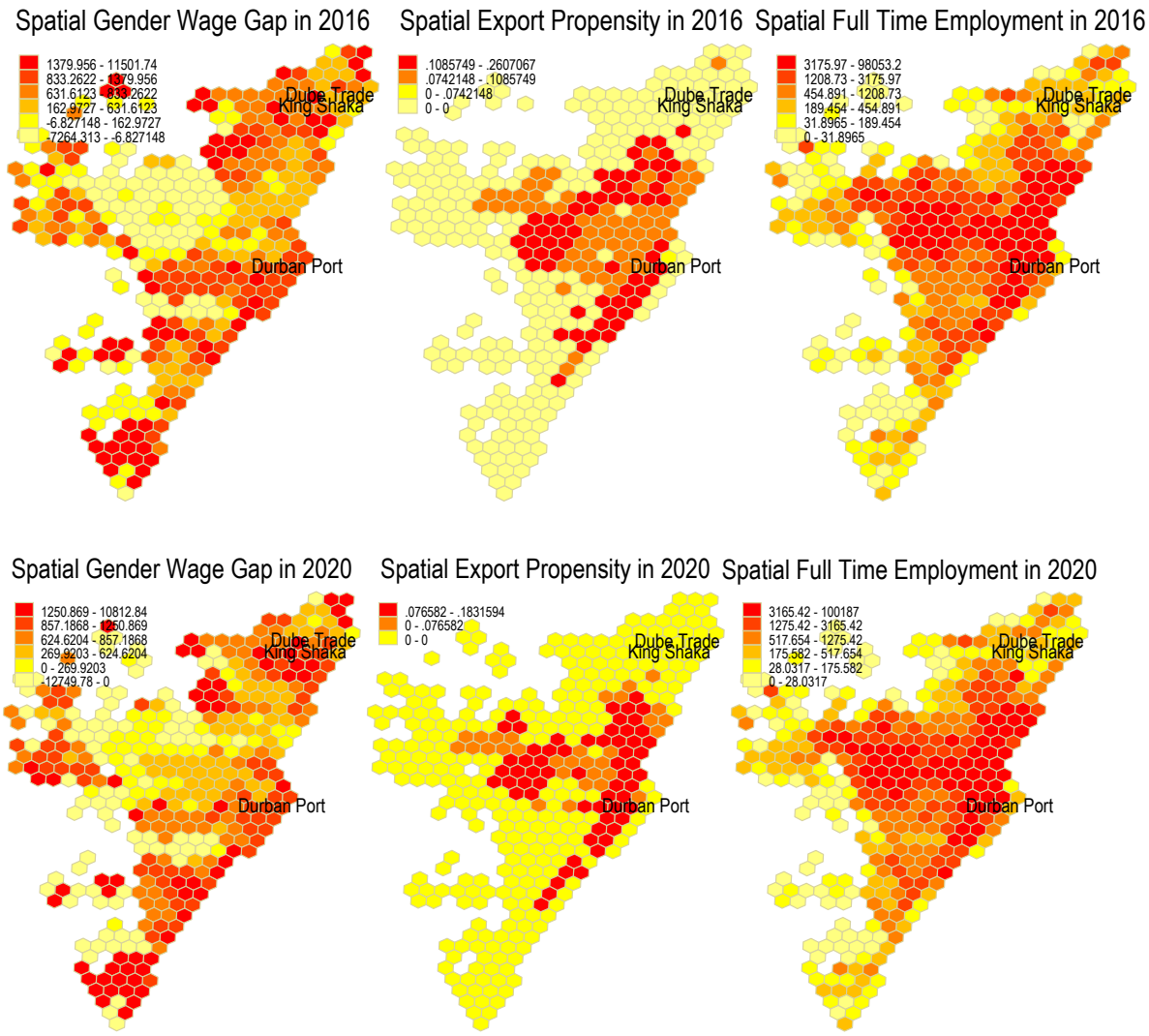

Figure 4: Export Propensity, Full Time Employment, and the Gender Wage Gap in eThekwini in 2016 and 2020

Source: Author's own calculations from the CSP data

Figure 4 shows that export propensity is concentrated around the Durban Port and towards King Shaka Airport and Dube Trade Port. However, there appears to be a negative association between export propensity and full-time employees and the gender wage gap.

8 Regression Results

This section first presents Tables 5 which shows the Oaxaca-Blinder decomposition of male and female median wages, pooled across years in Cape Town and eThekwini. Tables 6 and 7 show the decomposition of the gender wage gap in Cape Town and eThekwini, respectively, between 2016 and 2020, highlighting trends in explained and unexplained differences. The patterns revealed in these decompositions motivate the subsequent summary discussion of the log-median wage decomposition across both cities. These results imply associations, and not

causal effects. Due to a lack of key human capital variables such as education and direct measures of experience (although age proportions serve as a partial proxy), the unexplained component should be cautiously interpreted, as it may reflect not only potential discrimination but also omitted variable bias arising from unobserved characteristics.

Table 5: Oaxaca-Blinder Regression in Cape Town and eThekwini, Pooled Across Years

	(1)	(2)
Variables	**Cape Town**	**eThekwini**
Male	9.293***	9.145***
	(0.053)	(0.034)
Female	9.088***	8.969***
	(0.068)	(0.025)
difference	0.205***	0.175***
	(0.023)	(0.018)
explained	0.065***	0.029*
	(0.022)	(0.015)
unexplained	0.140***	0.146***
	(0.023)	(0.012)
Explained		
Export Propensity	-0.001	0.000
	(0.001)	(0.001)
Nightlights	-0.000	0.001
	(0.001)	(0.001)
Manufacturing	0.000	0.012
	(0.001)	(0.009)
Tertiary	-0.005***	-0.005**
	(0.001)	(0.002)
Employees (15-25 years)	0.001	0.036**
	(0.003)	(0.018)
Employees (35+ years)	0.073***	-0.013
	(0.018)	(0.023)
Dist.: CPT Harbour	-0.002	
	(0.004)	
Dist.: Atlantis SEZ	-0.000	
	(0.000)	
Dist.: CPT Airport	-0.001	
	(0.002)	
Dist.: DBN Harbour		-0.003
		(0.002)
Dist.: Dube Trade		-0.000
		(0.001)

Unexplained		
Export Propensity	0.100***	-0.031*
	(0.025)	(0.017)
Nightlights	-0.049	0.006
	(0.080)	(0.095)
Manufacturing	-0.017*	-0.005
	(0.010)	(0.009)
Tertiary	-0.019	-0.021
	(0.025)	(0.019)
Employees (15-25 years)	0.460	-0.064
	(0.315)	(0.178)
Employees (35+ years)	1.183*	-0.052
	(0.605)	(0.463)
Dist.: CPT Harbour	0.088***	
	(0.023)	
Dist.: Atlantis SEZ	0.020	
	(0.080)	
Dist.: CPT Airport	-0.015	
	(0.038)	
Dist.: DBN Harbour		0.023
		(0.033)
Dist.: Dube Trade		0.088
		(0.056)
Constant	-1.611*	0.203
	(0.848)	(0.621)
Observations	1,432	996

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: Table 5 shows the Oaxaca-Blinder decomposition for the male and female median wages in Cape Town pooled across years.

Source: Author's own calculations from the CSP data

Table 6: Oaxaca-Blinder Decomposition for Female and Male Wage in Cape Town in 2016- 2020

Variables	**(1)** **2016**	**(2)** **2017**	**(3)** **2018**	**(4)** **2019**	**(5)** **2020**
Male	9.246***	9.282***	9.295***	9.304***	9.334***
	(0.052)	(0.054)	(0.055)	(0.055)	(0.054)

Female	9.053***	9.074***	9.094***	9.099***	9.115***
	(0.071)	(0.071)	(0.073)	(0.068)	(0.061)
difference	0.194***	0.208***	0.201***	0.205***	0.219***
	(0.030)	(0.028)	(0.026)	(0.022)	(0.017)
explained	0.086***	0.072***	0.057**	0.065**	0.071***
	(0.026)	(0.025)	(0.027)	(0.027)	(0.021)
unexplained	0.108***	0.136***	0.144***	0.140***	0.148***
	(0.027)	(0.028)	(0.029)	(0.028)	(0.019)
Explained					
Export Propensity	0.000	-0.001	-0.002	-0.001	-0.001
	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Nightlights	-0.001	-0.001	-0.001	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Manufacturing	0.001	0.000	0.000	0.000	0.001
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)
Tertiary	-0.003	-0.002	-0.002	-0.001	-0.002
	(0.003)	(0.002)	(0.002)	(0.001)	(0.002)
Employees (15 – 25 years)	-0.001	-0.000	0.001	0.004	0.004
	(0.003)	(0.001)	(0.006)	(0.007)	(0.005)
Employees (35+ years)	0.090***	0.077***	0.066***	0.069***	0.075***
	(0.025)	(0.023)	(0.020)	(0.021)	(0.016)
Dist.: CPT Harbour	-0.000	-0.001	-0.004	-0.004	-0.005
	(0.004)	(0.004)	(0.005)	(0.005)	(0.004)
Dist.: Atlantis SEZ	-0.000	-0.000	-0.000	0.000	-0.000
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Dist.: CPT Airport	-0.001	-0.001	-0.001	-0.000	-0.001
	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)
Unexplained					
Export Propensity	0.148***	0.180***	0.125***	0.084**	0.068***
	(0.032)	(0.035)	(0.033)	(0.034)	(0.025)
Nightlights	-0.103	-0.134	-0.086	-0.023	0.027
	(0.119)	(0.084)	(0.086)	(0.089)	(0.065)
Manufacturing	-0.036**	-0.025**	-0.018	-0.026**	-0.030**
	(0.015)	(0.012)	(0.012)	(0.013)	(0.012)
Tertiary	-0.420***	-0.319**	-0.148	-0.120	0.024
	(0.161)	(0.151)	(0.107)	(0.093)	(0.104)
Employees (15 – 25 years)	1.142**	1.496***	0.934	0.365	0.596**
	(0.534)	(0.562)	(0.602)	(0.393)	(0.288)
Employees (35+ years)	3.058***	3.487***	2.089*	1.028	1.350**
	(0.967)	(1.032)	(1.137)	(0.816)	(0.649)
Dist.: CPT Harbour	0.145***	0.144***	0.083***	0.065***	0.054***
	(0.042)	(0.042)	(0.031)	(0.025)	(0.019)
Dist.: Atlantis SEZ	-0.107	-0.198	-0.081	0.059	0.050
	(0.116)	(0.141)	(0.163)	(0.106)	(0.059)

Dist.: CPT Airport	-0.012 (0.063)	0.030 (0.048)	0.031 (0.034)	0.001 (0.028)	0.009 (0.033)
Constant	-3.708*** (1.424)	-4.526*** (1.535)	-2.785* (1.612)	-1.293 (1.145)	-2.001** (0.947)
Observations	288	280	278	288	298

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

Note: Table 6 shows the Oaxaca-Blinder decomposition for the male and female median wages in Cape Town between 2016 and 2020.

Source: Author's own calculations from the CSP data

Table 7: Oaxaca-Blinder Decomposition for Female and Male Wage in eThekwini in 2016- 2020

Variables	**(1)** **2016**	**(2)** **2017**	**(3)** **2018**	**(4)** **2019**	**(5)** **2020**
Male	9.120*** (0.037)	9.208*** (0.026)	9.127*** (0.042)	9.120*** (0.041)	9.155*** (0.035)
Female	8.959*** (0.026)	9.021*** (0.022)	8.962*** (0.036)	8.953*** (0.029)	8.957*** (0.023)
difference	0.161*** (0.023)	0.187*** (0.017)	0.164*** (0.018)	0.168*** (0.021)	0.198*** (0.019)
explained	0.004 (0.017)	0.028* (0.015)	0.031* (0.018)	0.037* (0.020)	0.057*** (0.019)
unexplained	0.157*** (0.020)	0.159*** (0.011)	0.133*** (0.015)	0.131*** (0.014)	0.141*** (0.016)
Explained					
Export Propensity	0.001 (0.002)	0.001 (0.002)	0.001 (0.001)	0.004** (0.002)	0.001 (0.001)
Nightlights	0.002 (0.002)	0.001 (0.001)	0.001 (0.001)	0.000 (0.002)	0.000 (0.001)
Manufacturing	0.015 (0.011)	0.014 (0.011)	0.012 (0.008)	0.010 (0.007)	0.011 (0.008)
Tertiary	-0.002 (0.002)	-0.002 (0.002)	-0.002 (0.001)	-0.005** (0.002)	-0.002 (0.002)
Employees (15 – 25 years)	0.044** (0.021)	0.006 (0.010)	0.045* (0.023)	0.048 (0.031)	0.043* (0.022)
Employees (35+ years)	-0.047** (0.024)	0.013 (0.015)	-0.022 (0.027)	-0.019 (0.041)	0.005 (0.025)
Dist.: DBN Harbour	-0.005* (0.003)	-0.006** (0.003)	-0.003 (0.002)	-0.003 (0.002)	-0.002 (0.002)
Dist.: Dube Trade	-0.005* (0.003)	-0.001 (0.001)	-0.001 (0.001)	0.000 (0.001)	0.002 (0.002)

Unexplained					
Export Propensity	-0.021	-0.059**	-0.039	-0.069***	-0.023
	(0.034)	(0.027)	(0.033)	(0.027)	(0.020)
Nightlights	-0.183	-0.018	0.085	0.165	0.087
	(0.130)	(0.100)	(0.111)	(0.113)	(0.095)
Manufacturing	-0.009	0.002	-0.008	-0.003	-0.007
	(0.010)	(0.008)	(0.010)	(0.012)	(0.008)
Tertiary	-0.075	-0.007	-0.019	-0.065	-0.023
	(0.105)	(0.075)	(0.087)	(0.073)	(0.072)
Employees (15 – 25 years)	0.346	-0.087	-0.074	-0.098	0.164
	(0.377)	(0.265)	(0.245)	(0.165)	(0.221)
Employees (35+ years)	1.372	-0.174	-0.308	-0.499	0.592
	(0.868)	(0.783)	(0.647)	(0.465)	(0.452)
Dist.: DBN Harbour	-0.037	0.015	0.061	0.113***	0.020
	(0.053)	(0.042)	(0.042)	(0.042)	(0.034)
Dist.: Dube Trade	0.022	0.076	0.198***	0.149**	0.095
	(0.081)	(0.079)	(0.063)	(0.059)	(0.060)
Constant	-1.257	0.412	0.236	0.438	-0.764
	(1.258)	(0.994)	(0.915)	(0.653)	(0.723)
Observations	198	184	188	204	222

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

Note: Table 7 shows the Oaxaca-Blinder decomposition for the male and female median wages in eThekwini between 2016 and 2020.

Source: Author's own calculations from the CSP data

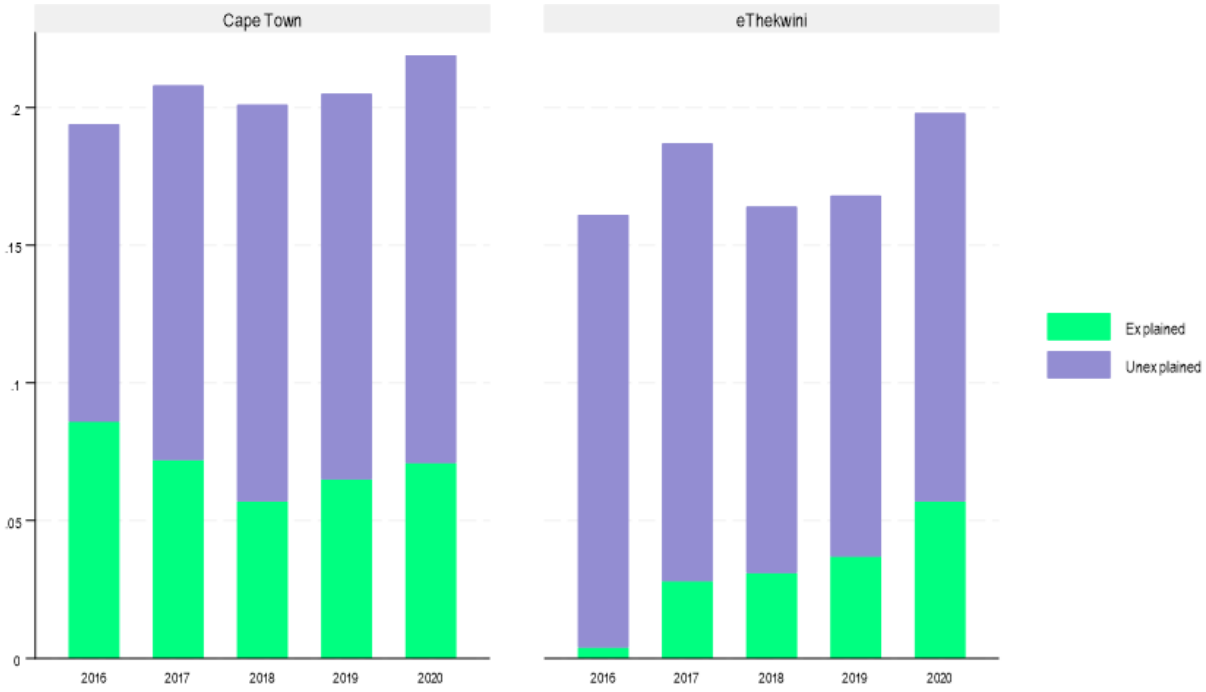

Figure 5: Decomposition of Log Median Wage by Gender in Cape Town and eThekwini

Note: Figure 5 shows the decomposition of the explained and unexplained components of the log median wage in Cape Town and eThekwini

Source: Author's own calculations from the CSP data

In Cape Town, the explained component of the gender wage gap has been falling over time, while the unexplained component has been rising over time, to produce a widening overall gender wage gap. In contrast, in eThekwini, the explained component rose over time, whereas the unexplained component fell over time. In both metros, the explained component is smaller than the unexplained component because it is only age that differs by gender.

Figure 6 decomposes the gender wage gap in Cape Town and eThekwini into explained and unexplained components.

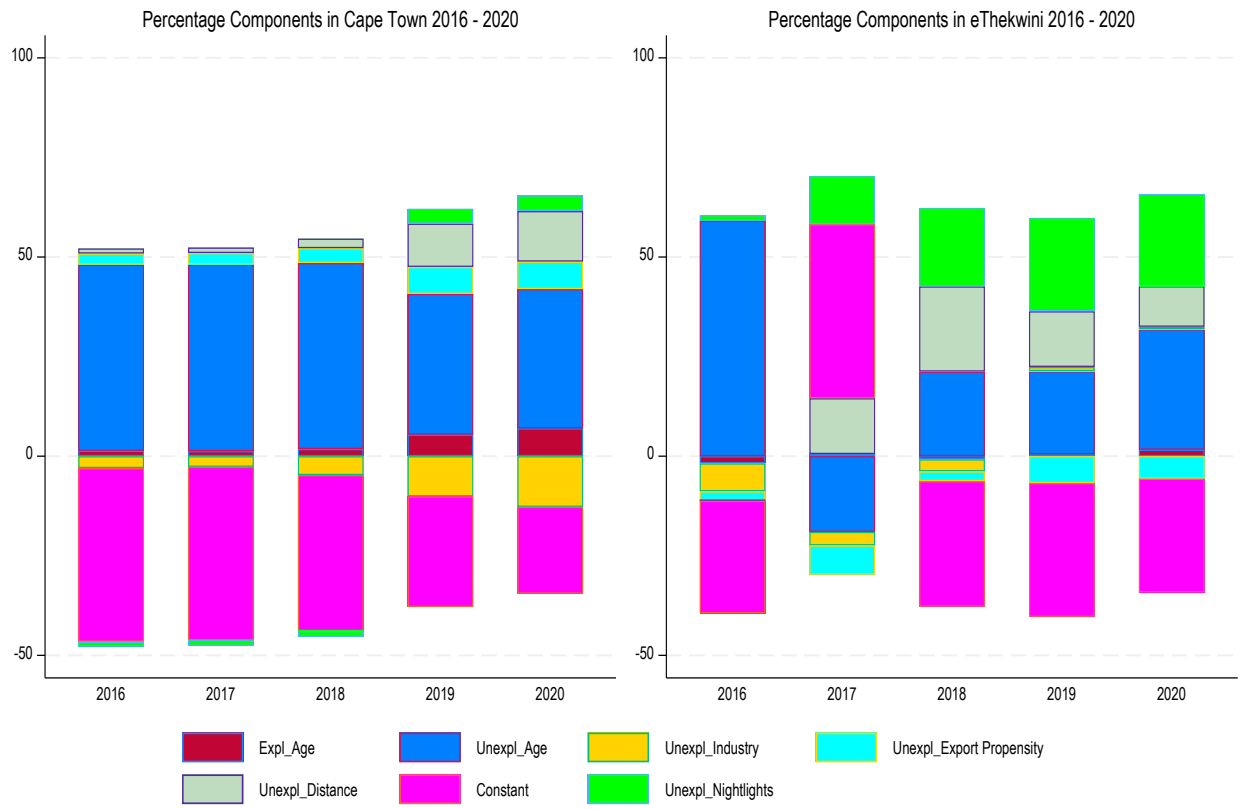

Figure 6: The Gender Wage Gap in Cape Town and eThekwini

Note: Figure 6 shows the decomposition of the gender wage gap in Cape Town and eThekwini by explained and unexplained components between 2016 and 2020.

Source: Author's own calculations from the CSP data

8.1 Discussions

Gender Wage Gap

Table 5 shows that in both metropoles, the gender wage gap was positive and highly significant across the years, suggesting that on average, the median woman in each hexagon earns less than the median man. On average, the gender wage gap in each hexagon was 20.5 percentage points in Cape Town and 17.5 percentage points in eThekwini.

Tables 6 and 7 show that in both metropoles, the gender wage gap was positive and highly significant throughout the period, suggesting that, on average, the median woman in each hexagon earns less than the median man. On average, between 2016 and 2020, the gender wage gap in each hexagon was 20.54 percentage points in Cape Town and 17.56 percentage points in eThekwini. In Cape Town, the explained component fell by 1.5 percentage points while the

unexplained component increased by 4 percentage points over time. This suggests that the unexplained, upper-bound component of the gender wage gap has been widening in Cape Town. The full details for Cape Town are available in Table 6. In contrast, in eThekwini, the explained component rose by 2.9 percentage points while the unexplained component fell by 1.6 percentage points over time. This suggests that the unexplained, upper-bound component of the gender wage gap has narrowed marginally in eThekwini. The full details for eThekwini are available in Table 7.

Export Propensity

Table 5 shows that the component of the export propensity variable was positive and highly statistically significant in Cape Town, whereas in eThekwini, it was negative and significant. This suggests that export propensity is associated with a wider gender earnings gap in Cape Town and a narrower one in eThekwini. On average, higher export propensity was associated with a gender wage gap that was 10 percentage points wider in Cape Town. In contrast, on average, the unexplained gap was 3.1 percentage points smaller for female employees in exporting firms than for comparable male employees in eThekwini.

Figure 6 shows that trade makes a different contribution to the gender wage gap in Cape Town and eThekwini. Tables 6 and 7 show that the unexplained component of the export propensity variable was positive and statistically significant for every year in Cape Town, whereas in eThekwini, it was negative throughout the study and significant in 2017 and 2019. This suggests that export propensity is associated with a wider gender earnings gap in Cape Town and a narrower one in eThekwini. On average, higher export propensity was associated with a gender wage gap that was 12.1 percentage points wider in Cape Town. In contrast, on average, the unexplained gap was 6.4 percentage points smaller for female employees in exporting firms than for comparable male employees in eThekwini.

Contradictory findings about the role of trade in Cape Town and eThekwini are consistent with Juhn *et al.* (2014)'s theoretical prediction that trade lowers the gender wage gap in the blue-collar sectors (which dominate in eThekwini) and may not lower it in white collar sectors (which dominate in Cape Town). This pattern is consistent with the theoretical prediction that trade-induced technology adoption is more prominent in blue-collar sectors, where it erodes the comparative advantage of men in physical skills and raises the wages of females relative to men. It is also consistent with the possibility that exports of goods intensive in bargaining

favour males in exporting firms in Cape Town and females in eThekwini, where bargaining is a comparative advantage. The paper's findings are consistent with Halvarsson *et al.* (2022) who found that dealing with foreign firms that are diverse in culture and societal norms requires negotiation skills, and men tend to have a comparative advantage in such skills. The paper's findings are also consistent with Kerr *et al.* (2020), who showed that, on average, male employees in the Western Cape province were 1.19 percentage points more unionized than female employees, whereas in KwaZulu-Natal, female employees were 1.99 percentage points more unionized than their male counterparts.

Distance

Tables 6 and 7 show that in both metropoles, the further away a location is from the centers of trade, the wider the gender earnings gap, suggesting that transaction costs to trade transmitted disproportionately to lower women's wages.

In Cape Town, the unexplained contribution of distance to the Harbour was positive and highly significant between 2016 and 2020, suggesting that the further away from the Harbour, the greater the earnings gap. This suggests that proximity to trade facilities is associated with a narrower gender wage gap. The median woman earned 9.82 percentage points lower median income than the median man. In eThekwini, the unexplained contribution of the distance to the Port of Durban was positive and significant only in 2019. The median woman earned 11.3 percentage points less income than the median man. The unexplained contribution of distance to Dube Trade Port was positive and significant in 2018 and 2019. The median woman earned 17.35 percentage points less income than the comparable man.

Sectoral Composition

The unexplained component of sectoral composition was more pronounced in Cape Town than in eThekwini. In Cape Town, the spatial concentration of manufacturing and tertiary firms was associated with a lower gender wage gap. The unexplained component of the proportion of the manufacturing sector to the gender wage gap in Cape Town was negative and significant in every year except 2018, with the median female earning 2.93 percentage points more income than the comparable male. The unexplained component of the proportion of tertiary firms was negative and significant in 2016 and 2017, with the median woman earning 37 percentage points more income than the comparable man.

This is consistent with a theory by Juhn *et al.* (2014), which suggests that in white-collar jobs, women get a higher wage relative to men due to their comparative advantage. Ngai and Petrongolo (2017) concur that female employees in the tertiary sector have a comparative advantage associated with interpersonal and communication skills. Female employees employed in interpersonal roles in the manufacturing sector also have a comparative advantage and hence higher wages.

Age

Tables 6 and 7 show that in Cape Town, the explained contribution of the local proportion of employees between 35 years old and above was positive and highly significant throughout the years. In eThekwini, it was positive for the proportion of employees between 15 and 25 years in 2016, 2018, and 2020, while for the proportion of employees 35 years old and above, it was positive and significant in 2016.

Cape Town and eThekwini's findings are consistent with the hypothesis that men tend to have more experience than women since women tend to take time off the labour market to rear children. The results are in harmony with studies that have found that the gender wage gap widens by age and upon entry to parenthood (Kleven *et al.,* 2019; Sin *et al.,* 2020). Joshi *et al.* (2020) found that the gender wage gap increased due to time taken off the labour market to rear families, which then resulted in less job experience for women than men in midlife. Rotman and Mandel (2022) concur after finding that, on average, female employees had less job experience than men due to socially constructed gender roles. The results are also consistent with the hypothesis that the contribution of the motherhood penalty to the gender wage gap in more personalized professions in the tertiary sector is high (Goldin & Katz, 2016).

Figure 6 shows that in Cape Town, age appears to widen the unexplained component of the gender earnings gap. In contrast, in eThekwini, age does not significantly account for the unexplained component of the gender earnings gap throughout the years. Table 6 shows that in Cape Town, the unexplained component of the local proportion aged between 15 and 25 years was positive and significant in 2016, 2017, and 2020, while for the proportion of employees 35 years and above, it was positive and significant every year except in 2019. The pattern appears to confirm the statistical discrimination theory, which contends that some firms pay less to females to counteract the loss in the likelihood of higher demand for job flexibility.

Figure 6 highlights that the effect of the constant is larger in Cape Town than in eThekwini, suggesting that the unexplained, upper-bound component of the gender wage gap attributable to discrimination is larger in Cape Town than in eThekwini.

9 Robustness Check

Ben Yahmed's (2017) taste-based discrimination theory, which predicts that trade widens the gender wage gap if exporting firms operate under imperfect competition, was tested in Cape Town and eThekwini by controlling for industry concentration using the Herfindahl-Hirschman Index (HHI), which is the squared sum of the industry share of the number of firms, and its spatial lag. The results of the decomposition for Cape Town and eThekwini are shown in Figure 7 for both metropoles and Table 8 (for Cape Town) and Table 9 (for eThekwini).

Table 8: Decomposition for Female and Male Wage in Cape Town in 2016- 2020 (controlling for HHI and HHI spatial lag)

Variables	**(1)** **2016**	**(2)** **2017**	**(3)** **2018**	**(4)** **2019**	**(5)** **2020**
Male	9.246*** (0.053)	9.282*** (0.054)	9.295*** (0.056)	9.304*** (0.056)	9.334*** (0.053)
Female	9.053*** (0.071)	9.074*** (0.071)	9.094*** (0.073)	9.099*** (0.068)	9.115*** (0.061)
difference	0.194*** (0.031)	0.208*** (0.028)	0.201*** (0.026)	0.205*** (0.022)	0.219*** (0.017)
explained	0.086*** (0.026)	0.071*** (0.026)	0.057** (0.026)	0.066** (0.026)	0.070*** (0.020)
unexplained	0.108*** (0.027)	0.137*** (0.028)	0.144*** (0.028)	0.139*** (0.027)	0.149*** (0.019)
Explained					
Export Propensity	0.000 (0.002)	-0.001 (0.001)	-0.002 (0.002)	-0.001 (0.001)	-0.001 (0.002)
Nightlights	-0.000 (0.001)	-0.001 (0.001)	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)
Manufacturing	0.001 (0.002)	0.000 (0.002)	0.000 (0.002)	0.000 (0.001)	0.001 (0.002)
Tertiary	-0.002 (0.003)	-0.002 (0.002)	-0.002 (0.002)	-0.001 (0.001)	-0.002 (0.002)
HHI	-0.002 (0.001)	-0.001 (0.001)	-0.002* (0.001)	-0.002 (0.001)	-0.002* (0.001)
HHI Spatial Lag	0.001 (0.001)	0.001 (0.001)	0.002 (0.002)	0.000 (0.001)	0.000 (0.001)
Employees 15 – 25 years	-0.001 (0.003)	-0.000 (0.001)	0.000 (0.006)	0.004 (0.007)	0.004 (0.005)

Employees 35+ years	0.090***	0.077***	0.067***	0.070***	0.075***
	(0.025)	(0.023)	(0.020)	(0.020)	(0.016)
Dist.: CPT Harbour	-0.000	-0.001	-0.004	-0.004	-0.005
	(0.004)	(0.004)	(0.005)	(0.005)	(0.004)
Dist.: Atlantis SEZ	-0.000	-0.000	-0.000	0.000	-0.000
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Dist.: CPT Airport	-0.001	-0.001	-0.001	-0.000	-0.001
	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)
Unexplained					
Export Propensity	0.154***	0.195***	0.141***	0.094***	0.071***
	(0.033)	(0.035)	(0.032)	(0.034)	(0.025)
Nightlights	-0.094	-0.125	-0.053	-0.030	0.032
	(0.124)	(0.083)	(0.092)	(0.092)	(0.069)
Manufacturing	-0.033**	-0.023*	-0.020*	-0.027**	-0.030**
	(0.015)	(0.013)	(0.012)	(0.013)	(0.012)
Tertiary	-0.416**	-0.297*	-0.128	-0.097	0.040
	(0.165)	(0.155)	(0.104)	(0.086)	(0.103)
HHI	0.022*	0.027***	0.016*	0.007	0.004
	(0.012)	(0.010)	(0.008)	(0.008)	(0.005)
HHI Spatial Lag	0.003	-0.002	-0.032	-0.000	-0.007
	(0.032)	(0.026)	(0.022)	(0.028)	(0.020)
Employees 15 – 25 years	1.207**	1.648***	1.056*	0.417	0.586**
	(0.512)	(0.526)	(0.545)	(0.380)	(0.285)
Employees 35+ years	3.189***	3.801***	2.302**	1.110	1.328**
	(0.936)	(0.969)	(1.036)	(0.769)	(0.644)
Dist.: CPT Harbour	0.139***	0.143***	0.085***	0.064***	0.057***
	(0.040)	(0.042)	(0.030)	(0.024)	(0.020)
Dist.: Atlantis SEZ	-0.116	-0.232*	-0.080	0.061	0.051
	(0.115)	(0.138)	(0.156)	(0.105)	(0.059)
Dist.: CPT Airport	-0.000	0.047	0.025	0.005	0.006
	(0.068)	(0.057)	(0.036)	(0.031)	(0.035)
Constant	-3.947***	-5.045***	-3.168**	-1.466	-1.990**
	(1.372)	(1.433)	(1.461)	(1.077)	(0.946)
Observations	288	280	278	288	298

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

Note: Table 8 shows the Oaxaca-Blinder decomposition for the male and female median wages in Cape Town between 2016 and 2020.

Source: Author's own calculations from the CSP data

Table 9: Oaxaca-Blinder Decomposition for Female and Male Wage in eThekwini in 2016 - 2020 (controlling for HHI and HHI Spatial Lag)

Variables	**(1)** **2016**	**(2)** **2017**	**(3)** **2018**	**(4)** **2019**	**(5)** **2020**

Male	9.120***	9.208***	9.127***	9.120***	9.155***
	(0.037)	(0.027)	(0.042)	(0.041)	(0.037)
Female	8.959***	9.021***	8.962***	8.953***	8.957***
	(0.026)	(0.023)	(0.036)	(0.030)	(0.025)
difference	0.161***	0.187***	0.164***	0.168***	0.198***
	(0.024)	(0.017)	(0.017)	(0.020)	(0.018)
explained	-0.004	0.024	0.025	0.030	0.053***
	(0.017)	(0.015)	(0.018)	(0.020)	(0.020)
unexplained	0.165***	0.163***	0.140***	0.137***	0.146***
	(0.020)	(0.011)	(0.014)	(0.013)	(0.015)
Explained					
Export Propensity	0.001	0.002	0.001	0.003*	0.001
	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)
Nightlights	0.002	0.001	0.001	0.000	0.000
	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)
Manufacturing	0.015	0.013	0.011	0.010	0.010
	(0.010)	(0.010)	(0.008)	(0.007)	(0.007)
Tertiary	-0.002	-0.001	-0.002	-0.005**	-0.003*
	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)
HHI	-0.002	-0.002	-0.003*	-0.004**	-0.003**
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
HHI Spatial Lag	-0.003	-0.003	-0.002	-0.001	-0.002
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Employees 15 – 25 years	0.037**	0.005	0.042*	0.046	0.042*
	(0.019)	(0.008)	(0.022)	(0.030)	(0.022)
Employees 35+ years	-0.044*	0.012	-0.021	-0.019	0.005
	(0.023)	(0.014)	(0.027)	(0.040)	(0.026)
Dist.: DBN Harbour	-0.003	-0.003	-0.001	-0.001	-0.000
	(0.003)	(0.003)	(0.002)	(0.002)	(0.001)
Dist.: Dube Trade	-0.005*	-0.000	-0.001	0.001	0.003
	(0.003)	(0.001)	(0.001)	(0.001)	(0.002)
Unexplained					
Export Propensity	-0.025	-0.054*	-0.031	-0.065**	-0.032
	(0.034)	(0.028)	(0.033)	(0.027)	(0.020)
Nightlights	-0.160	-0.000	0.090	0.175	0.114
	(0.127)	(0.099)	(0.104)	(0.108)	(0.094)
Manufacturing	-0.013	-0.000	-0.009	-0.003	-0.005
	(0.011)	(0.008)	(0.010)	(0.011)	(0.008)
Tertiary	-0.055	-0.032	-0.059	-0.088	-0.037
	(0.128)	(0.080)	(0.078)	(0.075)	(0.076)
HHI	-0.011	0.005	0.016	0.015	0.002
	(0.028)	(0.019)	(0.018)	(0.015)	(0.013)
HHI Spatial Lag	-0.023	0.004	-0.014	0.006	0.002
	(0.031)	(0.026)	(0.027)	(0.026)	(0.021)

Employees 15 – 25 years	0.118	-0.193	-0.182	-0.208	-0.160
	(0.360)	(0.242)	(0.257)	(0.176)	(0.244)
Employees 35+ years	0.998	-0.563	-0.563	-0.788*	-0.086
	(0.829)	(0.671)	(0.644)	(0.476)	(0.457)
Dist.: DBN Harbour	-0.011	0.010	0.050	0.101**	0.031
	(0.058)	(0.044)	(0.043)	(0.042)	(0.035)
Dist.: Dube Trade	0.012	0.086	0.179***	0.128**	0.044
	(0.086)	(0.070)	(0.063)	(0.060)	(0.064)
Constant	-0.664	0.900	0.662	0.863	0.273
	(1.167)	(0.856)	(0.905)	(0.678)	(0.756)
Observations	198	184	188	204	222

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

Note: Table 9 shows the Oaxaca-Blinder decomposition for the male and female median wages in eThekwini between 2016 and 2020.

Source: Author's own calculations from the CSP data

Figure 7: The Gender Wage Gap in Cape Town and eThekwini (controlling for HHI and HHI Spatial Lag)

Note: Figure 7 shows the Oaxaca-Blinder decomposition of the gender wage gap in Cape Town and eThekwini by explained and unexplained components when controlling for HHI and HHI spatial lag.

Source: Author's own calculations from the CSP data

The concentration of industry does not seem to have significantly contributed to the differences in the association between trade and the gender wage gap in Cape Town and eThekwini. This strengthens our claim that it is trade that is driving the results. The full details are available in Table 8 for Cape Town and Table 9 for eThekwini.

10 Conclusion and Policy Implications

Our analysis reveals a striking contrast in how trade exposure is associated with gender wage disparities across the two cities. In Cape Town, where the economy is primarily service-oriented, increased exposure to trade correlates with a widening gender wage gap. In contrast, in eThekwini, which is more manufacturing-intensive, trade appears to correlate with a narrowing of the gender wage gap. These divergent outcomes underscore the importance of local sectoral composition in shaping the distributional effects of trade. They also highlight that trade is neither gender-neutral, nor spatially uniform, even within a single national policy context.

Trade liberalization prompts firms, especially in blue-collar industries, to adopt modern technologies and production methods (Juhn *et al.,* 2014). This pattern is consistent with a process in manufacturing-dominated eThekwini whereby technology adoption erodes the traditional male comparative advantage in physically intensive tasks, boosting women's relative wages and narrowing the gender wage gap. Conversely, in white-collar-oriented Cape Town, trade appears to foster demand for negotiation and interpersonal skills, domains where men currently have a relative bargaining edge (Halvarsson *et al.,* 2022). This can amplify wage gaps if female workers lack equivalent access to bargaining forums or collective representation. Variations in collective bargaining powers can also mediate trade's gendered outcomes differently across metros. There are higher unionization rates for women in KwaZulu-Natal province (where eThekwini is) and for men in the Western Cape (where Cape Town is) (Kerr *et al.,* 2020).

In eThekwini, where the analysis indicates that trade is associated with a narrowing of the gender wage gap, particularly in areas with high concentrations of exporting manufacturing firms, location-specific interventions are necessary to sustain and deepen this trend. Targeted

technical training programmes for women in hexagons with strong manufacturing bases should focus on skills in digital fabrication, machinery operation, and industrial maintenance. These skills are crucial for increasing women's productivity in technologically modernizing firms and ensuring that they remain competitive and upwardly mobile in trade-exposed sectors.

By contrast, in Cape Town, where trade appears to have widened the gender wage gap, especially in locations dominated by service-sector exporters, there is a need for location-specific strategies that address gender disparities in bargaining and representation. In such locations, women-focused training in negotiation, contract management, and intercultural communication can help redress the gender imbalance in high-value roles that are increasingly rewarded in trade-intensive service industries.

Moreover, sector-specific gender equity clauses should be promoted within local Service Sector Bargaining Councils, particularly in those specific regions where the gender wage gaps are most pronounced. These clauses could require firms to conduct and disclose regular gender pay audits and to implement corrective measures as trade expands. Such policy levers are essential to prevent the concentration of trade-related wage gains among men and to integrate gender equity into the fabric of local industrial growth.

Treating trade as gender and location-neutral and spatially uniform reinforces inequalities.

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