THREE-FOURTHS A PENNY FOR YOUR THOUGHTS? GENDER PAY DIFFERENTIALS IN TRINIDAD AND TOBAGO: AN EMPIRICAL ANALYSIS

Karen Anne Roopnarine, BSc (Hons), MSc

Thesis submitted to the University of Nottingham for the degree of Doctor of Philosophy

March 2018

Abstract

The Caribbean is an understudied region in terms of gender wage gaps and this research adds new insights into the sparse economics literature on this topic for the region, and in particular, for the two-island state of Trinidad and Tobago. Economic inequality between men and women is a pertinent problem deserving of in-depth study because it has far-reaching inter-generational consequences. Furthermore, gender inequalities in the labour market are considered as indicators that considerably restrain economic growth. Trinidad and Tobago's economy has undergone tremendous strides in terms of economic growth over the past 20 years, and this study provides a deeper understanding of how the gender pay gap evolved over that time period. The present analysis of the gender wage gap has allowed us to ascertain if working women in Trinidad and Tobago were able to benefit from the country's improved economic prosperity.

The present study employs 2012 Continuous Sample Survey of the Population (CSSP) data for Trinidad and Tobago to investigate the causes of gender income differentials. The CSSP is used to generate labour force statistics for Trinidad and Tobago, and provides a wide range of information, including data on wages, gender, employment, unemployment, hours of work, industry, occupation, and level of education. The CSSP has two main advantages that make it a good source of data for analysing labour market issues in Trinidad and Tobago. Firstly, it is a nationally representative population survey, and secondly, it is the most detailed population survey for the country.

The Blinder-Oaxaca and Neumark methods of decomposition were used to portion the wage gap into "explained" and "unexplained"

components. The findings suggest that the differential is not well explained by differences in the levels of human capital ("explained" component) and indeed gender bias in favour of male workers seems to be prevalent ("unexplained" component). The raw wage gap in 2012 measured 11.4 per cent, and in the absence of gender discrimination women's wages could increase by as much as 26 per cent.

In addition to decomposing the gender wage gap at the mean level of wages, the research also investigated the causes of gender income differentials along the entire distribution of wages. Two recent quantile decomposition techniques – developed by the Machado and Mata (2005)/Melly (2006), and Firpo, Fortin and Lemieux (2009) were used to portion the gap into "explained" and "unexplained" components. Similar to the findings from the Blinder-Oaxaca methodology, the results for this portion of the research suggest that the differential in wages is not well explained by differences in the levels of human capital and substantial gender bias in favour of male workers.

Quantile decompositions allow us to ascertain if there is a "glass ceiling" or a "sticky floor" in the labour market. Glass ceilings are said to exist when there is a larger unexplained gender wage gap at the top of the wage distribution, whereas sticky floors exist when there is a larger unexplained wage gap at the lower end of the wage distribution. The results suggest that female workers in Trinidad and Tobago face sticky floors rather than a glass ceiling.

Lastly, the well-known Heckman two-step procedure (sometimes referred to as the limited information maximum likelihood (LIML) estimator) was employed to test for the presence of sample selection. The test for selectivity was carried out for both men and women separately. The results indicated no evidence of sample selection in any of the model specifications, including Mincerian-type wage regressions

with additional controls for occupation, industry, and sector of employment (public vs. private). However, the sample selection model did not consider any exclusion restrictions due to data limitations, and consequently the model proved to be weakly identified. The chapter concluded that the "uncorrected" OLS subsample is the more appropriate model to be used for analysis given that these estimates are more robust compared to a sample selection model without exclusion restrictions.

Acknowledgments

I would never have been able to finish my dissertation without the guidance of my supervisors, help from friends, and support from my family and husband. I would like to express my deepest gratitude to my supervisors, Dr. Simon Appleton and Dr. Sarah Bridges, for their exceptional guidance, caring, patience, and providing me with an excellent atmosphere for doing research.

I owe sincere and earnest thankfulness to the statistical agency in Trinidad and Tobago, the Central Statistical Office (CSO), and in particular Mr. Sterling Chadee for his tremendous assistance in providing me with essential data to facilitate my research.

I wish to express heartfelt thanks to Ms Sarah Nolan and the other members of staff at the School of Economics for their efficient administrative support, friendliness and willingness to help whenever required throughout the PhD programme. I also wish to express my gratitude to my office colleagues (from Room B56) at the School of Economics, University of Nottingham, who offered friendly advice and encouraging words of support from time to time and made going to the office a joy.

I would also like to thank my parents, Amoy and Peter, my sister, Wendy, and Aunt Chris. They were always supporting me and encouraging me with their best wishes. I wish to extend thanks to other family members and friends for their love, support, encouragement, and patience throughout my studies. It would be remiss of me to not mention the following persons, whose friendships ended up being the glue that held me together during my PhD journey: Grazziela, Eman, Camila, Ashira, Donneil, Allyson, Basile, Nadia, Antoinette, Marisa, Michelle, Nyron, Tanisha, Tawuya, and Dyneshia.

Finally, I would like to thank my husband, Antonio. He has been my rock, my strength, and my biggest cheerleader throughout my PhD journey (and life in general). Antonio has been a true and great supporter and has unconditionally loved me during my good and bad moments. He was instrumental in instilling confidence in me when I faltered, and provided me emotional support beyond measure. To him, I will forever be grateful and thank him for sticking by my side.

Table of Contents

List of Tables

List of Figures

Chapter 1 Introduction

1.1 Context and Motivation

> "*Throughout most regions and many occupations, women are paid less money than men for the same job. In a majority of countries, women's wages represent between 70 and 90 per cent of men's wages, with even lower ratios in some Asian and Latin American countries.*"
>
> (International Labour Organisation, 2009)

The same exists for Trinidad and Tobago. Based on 1993-data, the gender wage gap in Trinidad and Tobago measured 19.2 per cent (Olsen and Coppin, 2001). The principle of *equal pay for work of equal value* has gained global acceptance and is reflected in several International Labour Organization conventions, including the organisation's Gender Equality Action Plan 2010-2015. The importance of this issue is also reflected in the third goal of the United Nation's Millennium Development Goals – promote gender equality and empower women. Furthermore, as part of the United Nation's Post-2015 Development Agenda, the Sustainable Development Goals (SDGs) – the successor to the Millennium Development Goals – was signed in 2015, with the fifth goal stated as gender equality. It was highlighted that, even though goal five is a stand-alone goal, the SDGs would only be successful if women are completely integrated into all of the SDG goals.

Economic inequality between men and women is a pertinent problem deserving of in-depth study because it has far-reaching inter-generational consequences. Not only do current gender wage gaps affect women, they also affect their children and future generations as well. According to the World Bank (2011) there is evidence from several countries, both developed and developing, that when women have more control over household income (either their own income or cash transfers), children tend to benefit as a result of greater spending on food and education.

In poverty research, gender inequalities in the labour market are considered as indicators that considerably restrain economic growth (United Nations Development Programme 2008). The disparity in earnings among men and women has serious implications for Trinidad and Tobago given that 35 per cent of all households are headed by women (Household Budgetary Survey, 2008/2009). Data obtained from the Survey of Living Conditions (2005) has shown a decline in the national poverty Headcount Index from 18.4 per cent in 1998 (Household Budgetary Survey 1997/1998) to 11.0 per cent in 2005. Significantly, some 38 per cent of the poorest households in Trinidad and Tobago, in 2005, were headed by women.

Globally, there has been a substantial amount of research conducted concerning labour markets. Many of these studies have focussed on gender disparities in developed countries (*inter alia* Anderson *et al* 2001; Reiman 2001; Chichilnisky and Frederisksen 2008). However, there are fewer studies based on developing economies and even less on the Caribbean. Of the studies based on the Caribbean's labour markets, only a few have concentrated on the gender earnings gap. Reilly and Bellony (2009) and Bellony and Reilly (2009) looked at labour market earnings in two Eastern Caribbean islands – Dominica and St. Lucia, highlighting gender, ethnic, and inter-industry pay gaps. Sookram and Watson (2008) investigated wage discrimination between males and females in the informal sector of Trinidad and Tobago. Coppin (1998) explored women's earnings in Trinidad and Tobago based on household status (that is, headship versus non-headship) and ethnicity, while Coppin and Olsen (2007) investigated gender pay gaps in the public and private sectors in Trinidad and Tobago. More recently, Bellony *et al* (2010) investigated gender earnings gaps in two Caribbean countries – Barbados and Jamaica. This thesis contributes to the limited literature on gender wage gaps in the Caribbean region and in particular the two-island state of Trinidad and Tobago.

This particular type of study is also timely and relevant in the context of Trinidad and Tobago. The government of Trinidad and Tobago has stated that one of their strategic objectives includes the incorporation of "*a gender perspective in all development planning as the strategy for promoting gender equity and 'fairness' so*

that development planning itself becomes fundamentally gendered" (National Policy on Gender and Development, 2009). Furthermore, in the government's overall framework for sustainable development both female-headed households and single-parent households were identified as most vulnerable to poverty (Ministry of Planning and the Economy, *Medium-Term Policy Framework 2012-2014*). In Trinidad and Tobago, poverty is higher among female-headed households because women's wages tend to be lower and fewer women in this group are in paid employment (UN Women Caribbean, *Advocacy Brief: Strengthening Women's Economic Security and Rights*). The results and analysis in this thesis should prove useful to policymakers in devising a more directed approach to tackle the issue of gender inequality and discrimination in the Trinidad and Tobago labour market.

Trinidad and Tobago's economy has undergone tremendous strides in economic growth over the past 20 years, and this study provides a deeper understanding of how the gender pay gap evolved over that time period. During the years 1994 to 2008, Trinidad and Tobago experienced an economic boom; an analysis of the gender wage gap will allow us to ascertain if working women in Trinidad and Tobago benefited from the country's improved economic prosperity. During this time, new anti-discrimination legislation was passed – the Equal Opportunities Act of 2000. The current analysis is only for one year (2012), therefore, the significance of this new anti-discrimination legislation and its likely impact on the gender wage gap could not be adequately investigated. The analysis was however able to answer the question, which has been raised recently in both public and political fora: "*Do women in Trinidad and Tobago face a "glass ceiling"*[1]?" At the time of writing, there have been no other economic research papers analysing the "glass ceiling" effect for Trinidad and Tobago.

The main empirical objective of this research is to quantify the magnitude of the gender pay gap in Trinidad and Tobago. This analysis also provides a basis for gaining new insights into the nature and sources of gender wage inequality in Trinidad and Tobago. To achieve this objective, the gender wage gap was analysed

[1] The term "glass ceiling" refers to an informal barrier that limits the level to which a woman or another member of a demographic minority can advance within the hierarchy in an organisation. This barrier disregards factors that normally influence career development, such as education and earlier

using the well-known Blinder-Oaxaca and Neumark decomposition methodologies applied to nationally representative data for 2012. In addition, in order to analyse the wage gap throughout the entire wage distribution, the Machado and Mata (2005)/Melly (2006) and RIF-regressions (re-centred influence function) quantile decomposition techniques were employed.

Following many years of research analysing the magnitude (and source) of the mean gender wage gap (Blinder-Oaxaca decomposition), researchers have recently begun to consider the way in which relative wages differ for high- and low-wage workers (using quantile regressions). There are several reasons for this shift in analysis. Firstly, the magnitude of the gender wage gap is generally not constant across the entire wage distribution and the gap in mean wages obscures a great deal of the variation in the data. Secondly, a better understanding of the role of gender in the labour market emerges when there is an expanded focus on outcomes apart from simply the "average" man and woman, in particular, the presence of "glass ceilings" where the gender wage gap tends to be larger amongst workers earning relatively high wages, and the existence of "sticky floors" which occurs at the lower end of the wage distribution.

In the latter portion of the research, the issue of sample selection was tackled. This was done by estimating the wage equation jointly with selection into the labour market using Heckman's two-step method, which estimates selection first using a probit model for employment determination and then inserting the selection term (or the inverse Mills ratio) into the OLS estimation of the wage equation. For identification of the selection parameter in the earnings function, Heckman's two-step method requires variable(s) that influence the probability of employment but not the level of earnings (that is, *exclusion restrictions*). Due to data limitations, appropriate *exclusion restrictions* were void from the analysis, and consequently, the functional form of the selection equation was used for identification. Maddala (1985) has pointed out that even when no *exclusion restrictions* are used, an important feature of the selection model is its ability to investigate potential outcomes in addition to observed outcomes.

Finally, the results from the first-stage of the Heckman model (the probit model for employment determination) were used to explore the labour supply decision of women. These results highlight some of the factors that are most influential in determining the supply of labour and elucidate some of the reasons leading to the gender gap in wage employment in Trinidad and Tobago.

The data used in the analysis was derived from the 2012 (third quarter) Continuous Sample Survey of the Population (CSSP), which is conducted by the Central Statistical Office of Trinidad and Tobago (CSO). The CSSP is Trinidad and Tobago's labour force survey and is used to provide up-to-date data on labour force characteristics of the population on a continuing basis. The CSSP has two main advantages that make it a good source of data for analysing labour market issues in the country. Firstly, it is a nationally representative population survey, and secondly, it is the most detailed population survey for the labour market available for the country (Olsen and Coppin, 2001). Notwithstanding these advantages, the data set is limited[2] insofar that appropriate instrumental variables were not available to adequately address econometric issues such as the possible endogeneity of education, heterogeneity, and sample selection. Although, Card (1999) performed a survey of the literature on the causal relationship between education and earnings and concluded that the average (or average marginal) return to education for a given population is not much less than the estimate derived from a standard human capital earnings function fitted by OLS. Moreover, Card (1999) also concluded that IV estimates of the return to education based on family background are systematically higher than corresponding OLS estimates, implying that IV estimates have an even larger upward "ability" bias than OLS estimates.

[2] No major revisions have been made to the CSSP questionnaire since the late-1980s save for the inclusion of a few additional questions relating to ethnicity, location of employment, and having a second job. The other major nationally representative surveys conducted in Trinidad and Tobago include the Household Budget Survey (HBS) and the Survey of Living Conditions (SLC). Although both the HBS and SLC questionnaires include a question relating to gross monthly income, they do not enquire about the number of hours worked, making them not suitable for this analysis where hourly wages is used as the dependent variable. Additionally, the most recent HBS was conducted in 2008 while the most recent SLC was conducted in 2005. Consequently, as this research started in 2013, the (third quarter) 2012 CSSP was deemed as the most appropriate survey data to be used for our analysis.

1.2 Research Questions

The main research questions this thesis sought to answer include:

1. What is the overall size of the gender wage gap in Trinidad and Tobago?
2. Does the magnitude of the gender wage gap differ in the public sector versus the private sector?
3. Do women in Trinidad and Tobago face a "glass ceiling" or "sticky floor"?
4. What factors account for the gender gap in wage employment in Trinidad and Tobago?

1.3 Main Contributions

The main contributions of this thesis are two-fold. Firstly, it provided the first measure of the overall size of the gender wage gap in Trinidad and Tobago in twenty years. The detailed decompositions of the wage gap provide a greater understanding of some of the main sources of "discrimination" that working women in Trinidad and Tobago face, but not only for the overall working population, but within the public and private sectors as well. The thesis was able to reveal that the wage gap narrowed over the period 1993 to 2012.

Secondly, the thesis makes original contributions to the literature on gender wage gaps specifically for the economy of Trinidad and Tobago, by analysing the wage gap not only at the mean, but also at various points along the wage distribution. To date, there have been no other studies looking at gender pay differentials in Trinidad and Tobago between high-income and low-income earners. This portion of the research makes original contributions to the existing literature on discrimination in Trinidad and Tobago's labour market in the context of any existing "glass ceiling" and/or "sticky floor". Additionally, the research also adds to the literature insofar by analysing the gender pay gap via quantile decomposition for the public and private sectors.

The findings of this research prove that such analyses are important given that low-income earning women appear to face far more discrimination in the labour market

compared to their higher-income earning counterparts, and this result can prove useful for policy formulation and implementation.

1.4 Main Findings

The main findings showed that the gender wage gap narrowed over the past twenty years, moving from 19.2 per cent in 1993 (Olsen and Coppin, 2001) to 11.4 per cent in 2012. However, the size of the gap differs greatly in the public and the private sector; the male-female pay gap in the public sector is negligible (3.2 per cent), while the gap in the private sector is far greater (23 per cent). The decompositions compartmentalise the gap into two portions – first, a part due to differences in the productive characteristics between men and women and second, a part due to differences in returns for these characteristics. Given the fact that working women in Trinidad and Tobago have higher levels of educational attainment than men, the results of the Blinder-Oaxaca decompositions reveal that if women possessed the same mean characteristics as men, their wages would actually *decrease* by 11.6 per cent; however, if their productive characteristics were rewarded at the same rates as men, their wages could potentially increase by as much as 26 per cent.

The main result based on the quantile decompositions is that Trinidad and Tobago's labour market does not have a *glass ceiling*, but rather female workers face *sticky floors* – for the overall working population at the lower end of the wage distribution, the gender wage gap is much larger (25.1 per cent) compared to the higher end of wages where no gap exists.

The main focus of this thesis is measuring and decomposing the gender wage gap in Trinidad and Tobago. By the very design of wage equations, unemployed persons and those not in the labour market are omitted from the analysis. Given that the subsample used is restricted to only wage earners and not a random sample of the overall population, the coefficient estimates in the wage equations could be biased. In the OLS and quantile regressions used, the issue of sample selection was not taken into account.

The research concluded that the "uncorrected" OLS estimates used do not suffer from sample selection bias given that the Heckman two-step method was unable to reject the null hypothesis of no sample selection. However, this conclusion is a tentative one and some interpretational caution should perhaps be exercised given that the sample selection model was weakly identified, as it did not include any *exclusion restrictions* due to data limitations in the survey used. Nonetheless, some researchers (Stolzenberg and Relles, 1997) have noted that only if selection bias is very severe and the samples are large, does Heckman's two-step correction method improve estimates compared to the "uncorrected" OLS estimates.

Notwithstanding the issues surrounding self-selection in our sample, it should be noted however, that in the absence of selectivity correction, the coefficients should be interpreted as being *conditional* on the selected sample. In other words, inferences about *all* women of working age cannot be made. The coefficients in the "uncorrected" OLS and quantile regressions are biased estimates of the returns to covariates – and it is acknowledged that these 'returns to endowments' are of the given sample and cannot be applied to the working age population in general.

Finally, regarding employment in Trinidad and Tobago, in 2012, the percentage of men and women in wage employment was 66.3 per cent and 53.5 per cent, respectively. As expected, the predicted probability of women participating in the labour market increases with higher levels of education. Education has a larger (positive) impact on a woman's decision to engage in wage employment than it does for men. In keeping with societal norms, on average, having a partner (married/common law) decreases a woman's probability of participating in the labour market. One particularly interesting result with reference to ethnicity[3] is that ethnicity is not a significant determinant of wages for either men or women, but it does play a significant role in women's labour supply decision. Women of Indian descent are the least likely to participate in the labour market, and this may be due to historical and cultural norms within that sub-ethnic grouping.

[3] Trinidad and Tobago's ethnic composition in 2012 was: 38.6 per cent African, 41.6 per cent Indian, and 19.7 per cent Mixed/Other.

1.5 Organisation of Thesis

The remainder of this thesis is organised as follows: Chapter 2 discusses the issue of sample selection and explores the gender gap in employment. Chapter 3 gives an overview of the labour market in Trinidad and Tobago and decomposes the gender wage gap into "explained" and "unexplained" components using the Blinder-Oaxaca methodology based on OLS regressions. Chapter 4 explores the gender wage gap throughout the entire wage distribution using quantile regressions, paying particular attention to the "glass ceiling" and "sticky floor" phenomena. Chapter 5 concludes the thesis, highlights some of the limitations of the research, and gives some policy implications.

Chapter 2 Decomposing the Gender Wage Gap in Trinidad and Tobago with Sample Selection Adjustment

2.1 Introduction

The main focus of this thesis is measuring and decomposing the gender wage gap in Trinidad and Tobago. By the very design of wage equations, unemployed persons and those not in the labour force are omitted from the analysis. Several studies (Badel and Peña 2010, Beblo *et al* 2003) have shown that there is a positive correlation between wages and the propensity to participate in the labour market, and the estimated wage gap understates the true difference in earnings when self-selection is ignored. The wage equations used throughout the analysis were based on subsamples from a nationally representative labour force survey, the CSSP, based on specified criteria, such as, being of working age (15-65), employees only, and having a non-zero value for wages. The issue of self-selection is particularly relevant in the Trinidad and Tobago context given that in the period spanning 1990-2010, female labour force participation averaged less than 50 per cent. Consequently, without correcting for the likelihood of selectivity bias, the results from the OLS and quantile regression estimations may have indeed underestimated the size of the gender wage gap in Trinidad and Tobago.

Given that the subsample used is restricted to only wage earners and not a random sample of the overall population, the coefficient estimates in the wage equations could be biased. For instance, women with young children may not participate in the labour market since the wages they would earn would not offset the cost of childcare and the disutility from not being able to raise their children for themselves. Such women tend to have high reservation wages compared to women without young children. Hence, women with young children who decide to participate in the labour market, tend to do so because their offered wages are higher than their reservation wages. This is especially true for women who possess characteristics (such as high cognitive abilities, motivation, etc.), which are rewarded highly in the labour market.

Usually in applied econometric work, the researcher does not observe these characteristics and when estimating wages by OLS, the estimation *may* include a random sample of women without children alongside a non-random sample of women with children. If this is indeed the case, and we want the results of the estimation to apply to all women and not just those in the labour market, we need to take into account selection into the labour market. This can be done by estimating the wage equation jointly with selection into the labour market either simultaneously using Heckman's maximum likelihood estimator (efficient estimator) or Heckman's two-step method (consistent, but inefficient[4]), which estimates selection first using a probit model and then OLS estimation of the wage equation.

The survey used for this analysis, unfortunately, does not include any question(s) surrounding number of children and/or the ages of children in the household. Indeed, without such data we cannot test the hypothesis that the presence of (young) children in the household is a significant determining factor for female labour force participation in Trinidad and Tobago. Consequently, the functional form of the selection equation was used for identification rather than exclusion restrictions: broadly speaking, the same explanatory variables were used in both the wage equation and the selection equation.[5] This was due to the paucity of relevant data in the survey but one should also note that it is conceptually problematic to find suitable instrumental variables for the selection equation, as variables that determine labour market participation also determine wages (for example, level of education). Identification of the model by functional form was possible since the Inverse Mill's Ratio (IMR) is nonlinear (this is discussed in more detail in the Methodology section). Notably, as the IMR may be linear for some ranges,

[4] An efficient estimator is one that has small variances, that is, the estimator deviates as little as possible from the "true" value you are trying to estimate. An estimator is consistent if, as the sample size increases, the estimates produced by the estimator "converge" to the true value of the parameter being estimated. In other words, consistency means that, as the sample size increases, the sampling distribution of the estimator becomes increasingly concentrated at the true parameter value.

[5] The wage equation included the following variables: potential experience, potential experience squared, dummies for highest level of education attained, dummies for marital status, and dummies for ethnicity. The selection equation included the same variables with the exception of potential experience and its square; instead dummies for age categories ranging from 15 to 65 were used.

identification may be weak. Notwithstanding this, Maddala (1986) notes that even in the scenario where the data is censored and there are no available *exclusion restrictions*, we can define the selection equation over the whole population and analyse the model of interest from the censored sample.

Notwithstanding the issues surrounding self-selection bias, it should be noted however, that in the absence of selectivity correction the coefficients should be interpreted as being *conditional* on the selected sample. In other words, inferences about *all* women of working age cannot be made. The coefficients in the "uncorrected" regressions from the next two chapters are biased estimates of the returns to covariates – and it is acknowledged that these 'returns to endowments' are of the given sample and cannot be applied to the working age population in general (de la Rica *et al*, 2007).

Briefly, the research concludes that the "uncorrected" OLS estimates used do not suffer from sample selection bias given that the Heckman two-step method was unable to reject the null hypothesis of no sample selection. However, this conclusion is a tentative one given that the sample selection model was weakly identified as it did not include any *exclusion restrictions* due to data limitations in the survey used.

The rest of the chapter is outlined as follows: section 2.2 discusses the literature and theoretical background of the neoclassical theory of time allocation; section 2.3 presents the methodology used for analysis – Heckman correction procedure; section 2.4 outlines the data and econometric specification used while section 2.5 discusses the results. Section 2.6 concludes the chapter.

2.2 Literature Review

To estimate a wage equation for people of working age, the ideal would be to include all individuals whether or not they are working. However, earnings are only observed for those persons who are in the labour force, leading the researcher to use a selected sample. People self-select into employment, hence whether the wage is observed or not will depend on an individual's labour supply decision. Failing to account for this sample selection, may lead to biased estimates of the wage equation. Additionally, given that women are less likely to be employed than men in Trinidad and Tobago, the selectivity bias could affect the comparisons of returns to men's and women's covariates – for example, a small proportion of women in the labour force may be relatively more able or more ambitious and therefore their unobservable characteristics could be positively correlated with schooling and wages thus leading to biased estimates on the returns to their education. To deal with the issue of potential sample selection bias, this chapter employs Heckman's selection correction.

The neoclassical theory of time allocation is one of the eminent theories used to explain labour supply decisions of individuals – that is, the decision whether to participate or not in the work force. The main assumption of this theory is that individuals value their time according to his/her *preferences* that *maximise utility*, then decide whether to participate in the labour market. The decision is based on the value placed on market activities versus the value placed on non-market activities. If the value of time spent on market activities is higher than the value of non-market activities, then the individual decides to participate and vice versa.

The value of market activities depends on the prevailing wage rate in the market while the value of non-market activities depends on the individual's *tastes and preferences* as well as the demands placed on the individual's non-market time, such as, the number of children and dependents in the household and non-market income. Traditionally, women tend to have a high reservation wage (the

minimum wage rate at which a worker would be willing to accept employment) given that they tend to give a high value to non-market activities at home.

Several factors contribute to the difference in time spent on market and non-market activities between men and women. In some societies, women are considered better suited to work in household activities (such as child care) and women are viewed differently from men, particularly regarding different expectations of academic achievement. In such patriarchal societies, men tend to spend more time on market activities while women are more likely to spend time on home activities (Mollet, 2011). Given this, in such patriarchal societies, it is not unusual for women to have lower labour force participation rates compared to the participation rates of men. It can be argued that the relatively lower female labour force participation rate in Trinidad and Tobago may be because of the embedded patriarchy still present in the society. Indeed, some Caribbean feminists have asserted that gender roles during the time of colonialism have filtered down to subsequent generations (Bailey, 2003; Barriteau, 1995).

The neoclassical model of time allocation or the model of labour-leisure choice is traditionally used to analyse labour supply decisions of individuals, and is an extension of the utility maximisation problem of consumer theory. The model analyses how individuals make choices in deciding how they will spend a fixed amount of time. The model has two main assumptions:

1) There are only two possible uses of time – labour and leisure; and
2) Each individual selects the combination of hours of work and leisure that maximises his/her level of satisfaction (utility).

In the basic model, individuals maximise their utility or satisfaction (U) by consuming goods and services (C) and by consuming time in leisure activities (L). For working individuals, the opportunity cost of an additional hour of leisure time is his/her wage rate. Individuals choose not to work if the value of leisure time exceeds the market

wage. The amount consumed in goods and services and leisure depends on the individual's market wage (*W*), personal preferences, and non-labour income (*V*).

The individual's utility is therefore a function of the person's consumption of goods and services and leisure:

$$U = f(C, L) \qquad \text{Eq. (1)}$$

where *U* is an index that measures the individual's level of satisfaction or happiness, assuming that people are able to rank all possible combinations of *C* and *L* from least desirable to most desirable. Hence, a higher index *U* means greater amounts of *C* and/or *L* and greater satisfaction. *C* and *L* can be considered as economic "goods" – that is, the more of either is preferred to less.

A person's consumption of goods and leisure is constrained by his/her time and by his/her income. When an individual maximises his/her utility with respect to time during the period under analysis, (s)he must first allocate the day's discretionary time (*T*) towards either working for pay (*H*) or towards leisure (*L*). Income is derived from labour wages (*W * H*) and non-labour income (*V*). Non-labour income is independent of how many hours a person works and may include property income, dividends, and lottery prizes.[6]

These two constraints can be written as:

$$T = L + H \qquad \text{Eq. (2)}$$

$$C = (W * H) + V \qquad \text{Eq. (3)}$$

Equation 3 is the individual's budget constraint and shows that consumption expenditure cannot exceed the individual's total income.[7] The budget constraint can re-written as:

[6] For women, non-labour income may also include the husband's earnings.

[7] An additional assumption of the model is that the individual does not save or borrow. The specification of the budget constraint implies that the individual spends all if his/her income in the period under analysis.

$$C = W(T - L) + V \qquad \text{Eq. (4)}$$

Setting up the Lagrangian to derive the individual's utility maximisation problem gives:

$$\ell = U(C, L) + \lambda \{[W(T - L) + V] - C\}$$

The first order conditions are:

$$\frac{\delta \ell}{\delta C} = \frac{\delta U}{\delta C} - \lambda = 0 \ \therefore MU_C = \lambda \qquad \text{Eq. (5)}$$

$$\frac{\delta \ell}{\delta L} = \frac{\delta U}{\delta L} - \lambda W = 0 \ \therefore \frac{MU_L}{W} = \lambda \qquad \text{Eq. (6)}$$

Equating equations 5 and 6, we get:

$$\frac{MU_L}{MU_C} = W \qquad \text{Eq. (7)}$$

Equation 7 represents the utility-maximising labour supply decision principle – that is, for a given real wage, W, the individual chooses to work for the number of hours for which the marginal rate of substitution of leisure for the consumption of goods is equal to W. This type of solution is called an *interior solution* since the individual is not at either corner of the opportunity set, meaning (s)he is not working for all available hours, or working for no hours whatsoever.

In addition to the neoclassical theory of time allocation, other factors which determine women's labour supply decisions can be explained by patriarchal structures in the household and the wider society, characteristics of male and female labour supply, and incentives and disincentives created by national employment systems (Lisaniler and Bhatti, 2005). According to Walby (1994), a sociologist, patriarchy in the household, state and culture affect women's labour supply negatively.

In the Caribbean context, Seguino (2003) notes several reasons why Caribbean women face greater challenges than their male counterpart in terms of job search and employment; in turn, these obstacles may lead to lower labour force participation rates for women. Seguino (2003) states that since Caribbean women have primary responsibility for children, the elderly, and the ill, they tend to face more difficulty than men in searching for a job. Segunio (2003) also highlights that job searches incur costs, and caretakers would need to replace unpaid labour while seeking employment. This issue may also lead to women limiting their job search geographically to ensure their availability if they are needed at home on short notice to care for children and/or family members. These factors are likely to increase the probability of women being unemployed or opting to drop out of the labour market completely.

Although not formally tested in this current research, other sources of potential sample selectivity bias may arise in addition to the labour force participation process – namely, choice of sector of employment, for example, public versus private and/or formal versus informal employment. Optimising behaviour on the part of agents, may lead individuals to enter that sector which provides them with the greatest net advantage (Hoffnar and Greene, 1996). If the variables that affect sectoral choice of employment and earnings are correlated, then the earnings determination and sectoral choice processes will not be independent. This non-independence would result in biased estimates of male-female earnings differentials by sector of employment (Greene and Hoffnar, 1994; Belman and Heywood, 1989; Choudhury, 1994). To control for self-selection, the sorting of men and women into different employment statuses can be studied either using a probit model (if there are two work choices as *per* Heckman, 1979) or a multinomial logit model (if there are more than two work choices). The literature has proposed different methods (e.g. Lee, 1983 and Dubin and McFadden, 1984) for addressing the effect of selection into multinomial outcomes on wage estimations, which are similar to the Heckman two-stage procedure.

Additionally, the issue of sample selection is also relevant when using a quantile regression framework for analysing gender wage gaps. For instance, if the fraction of women participating in the labour market is higher at the top of the wage distribution, observed data will tend to under sample the low potential wage earners and oversample the high potential workers (Badel and Peña, 2010). At the time of writing, there is little agreement in the literature regarding the most appropriate treatment for selectivity bias in quantile regression models. However, one method that appears to be popular among economists (*inter alia* Chzhen and Mumford, 2011; Badel and Peña, 2010; and Nicodemo, 2009) involves an extension of the Machado and Mata (2005) methodology, which utilises the Buchinsky (1998) selection correction method for quantile regression. This method of decomposing gender wage gaps within a quantile regression framework and controlling for sample selection was first introduced by Albrecht, van Vuuren and Vroman (2009). Albrecht *et al* (2009) use a two-stage sample selection correction procedure that was introduced by Buchinsky (1998); the procedure combines a semi-parametric binary model for the participation equation with a linear quantile regression model for the wage equation. Similar to the Heckman two-step selection correction model, for identification to be possible, within the set of observables that influence the participation decision, at least one variable must be continuous and not included in the wage equation. For this reason, given the paucity of the data set used for the current analysis to sufficiently estimate the selection equation, selection correction was not attempted in the quantile regression decompositions.

2.3 Methodology

2.3.1 Heckman Selection Model

Heckman (1979) proposed two estimation techniques to overcome the self-selection problem. One method consists of using a maximum likelihood (ML) estimation of a selection model (referred to as the full-information maximum likelihood (FIML) estimator) assuming bivariate normality of the error terms in the wage and participation equations. The other method proceeds in two steps, ML probit estimation of the participation equation, and OLS estimation of the wage equation

using participants only and the normal hazard $\hat{\lambda}$ which is estimated from the first step as an additional regressor (the two-step method is referred to as the limited information maximum likelihood (LIML) method).

There are two reasons to prefer the LIML estimator to the direct FIML estimator. First, FIML relies on joint normality of the errors in the selection equation and equation of interest. The advantages and drawbacks are twofold – if neither equation is mis-specified, simultaneous estimation yields efficiency gains. On the other hand, misspecification of either (or both) the selection equation or the equation of interest, results in inconsistency. By contrast, the LIML estimator only relies on conditional moments, which, although derived under joint normality, may hold for a wider class of distributions. Second, using OLS in the second stage has the advantage that the average of the residual is zero, which does not hold for the FIML estimator. However, the LIML estimator is consistent, but inefficient, whereas, the FIML estimator is efficient. Summarily, consistency deals with the amount of bias in the estimate while efficiency concerns the size of the standard errors.

2.3.2 Heckman's Two-Step Selection Model

Heckman's (1976: 476, 1979: 154) two-step selection model is as follows. Using the case of only one independent variable, let equation 8 be the *regression equation* of substantive interest:

$$Y_1 = \beta_0 + \beta_1 X + \sigma\varepsilon \qquad \text{Eq. (8)}$$

X is the independent variable, Y_1 is the dependent variable, and $\sigma\varepsilon$ is the error term, where σ is a scalar and ε is normally distributed with a mean of 0 and a variance of 1 ($N_{(0,1)}$). β_0 and β_1 are the regression coefficients.

For the same data for which equation 8 is defined, we also define equation 9, called the *selection equation*:

$$Pr(Y_2 > T|Z) = Pr\big((\alpha Z + \delta) > T\big|Z\big) \quad \text{Eq. (9)}$$

In the selection equation, which is estimated with a probit, Y_2 is the dichotomous dependent variable, Z is the independent variable, α is the coefficient of Z, and δ is the normally distributed $N_{(0,1)}$ error term. Z may be identical to X; when this occurs estimation becomes problematic (discussed further in section 3.4). T is a scalar called the selection threshold. The value of $Y_1$is observed when $Y_2 > T$, and is censored (missing) for all other cases: $Y_2 \leq T$.

Heckman (1976) noted that there is a potential bias in using only selected cases to estimate equation 8. Heckman computed the conditional expectation of Y_1 *given that* Y_2 *is observed*, as:

$$E(Y_1|Y_2 > T) = \beta_0 + \beta_1 X + \sigma\rho_{\varepsilon\delta}\lambda(T - \alpha Z) \quad \text{Eq. (10)}$$

where $\rho_{\varepsilon\delta}$ is the correlation between ε and δ, and λ is the inverse Mills ratio (IMR), defined as:

$$\lambda(T - \alpha Z) = \frac{\phi(T-\alpha Z)}{1-\Phi(T-\alpha Z)} \quad \text{Eq. (11)}$$

where $\phi(T - \alpha Z)$ is the normal density function evaluated at $T - \alpha Z$, and $\Phi(T - \alpha Z)$ is the normal cumulative distribution function evaluated at $T - \alpha Z$.

In the presence of selection, estimation of the original regression equation (equation 8) will suffer from omitted variable problem as it omits the IMR. If the IMR [$\lambda(T - \alpha Z)$] is substantially correlated with X and Y_1, then instead of estimating equation 8, the appropriate estimation regression would be (*outcome equation*):

$$Y_1 = \beta_0 + \beta_1 X + \sigma\rho_{\varepsilon\delta}\lambda(T - \alpha Z) + \sigma'\varepsilon' \qquad \text{Eq. (12)}$$

$T - \alpha Z$ is estimated as the predicted values in a probit in which the independent variable is Z and the dependent variable is a dummy coded as 0 if Y_1 has a missing value and 1 if the value of Y_1 is not missing. Essentially, Heckman's two-step correction consists of estimating the value of $T - \alpha Z$ for each data case, calculating the inverse Mills ratio, $\lambda(T - \alpha Z)$, from those estimates, and then using the IMR as an additional regressor in equation 8. A test for selectivity bias can be performed by examining the coefficient on the IMR, with the null hypothesis being: $H_0: \rho_{\varepsilon\delta} = 0$ versus the alternative $H_1: \rho_{\varepsilon\delta} \neq 0$. Rejection of the null hypothesis can be interpreted as evidence in favour of the presence of selectivity bias. The regression line for Y_1 on X will be biased upward when ρ is positive and downward when ρ is negative, as the IMR is always positive. The size of the bias depends on the magnitude of the correlation, the relative variance of the disturbance, and the severity of the censoring.

The resultant estimates of β, ρ, and σ are consistent but not asymptotically efficient under the normality assumption. Heckman's two-step correction method has three (related) drawbacks:

1) The conventional standard error estimates are inconsistent because the outcome equation (eq. 12) is intrinsically heteroskedastic due to the selection. One possible solution to this problem is to compute robust standard error estimates.
2) The two-step method does not impose the constraint $|\rho| \leq 1$ that is implied by the underlying model. Often in practice, this constraint is violated.

3) The normality assumption is necessary for consistency.

2.3.3 Maximum Likelihood Estimator

Given these shortcomings of the two-step method, some researchers prefer using the full information maximum likelihood method instead. Asymptotically, the two methods are equivalent, but in small samples the results can differ. The FIML estimator is more efficient than the two-stage method but is also more sensitive to mis-specification due to non-normal disturbance terms. In applied work, the results of both estimators should be considered.

Similar to the LIML correction procedure, for the full information maximum likelihood method, there are two types of observations: 1) where $Y_1$is observed when $Y_2 > T$; and 2) where Y_1 is not observed when $Y_2 \leq T$. Recall that T is the selection threshold. Thus, if we set $T=0$, the likelihood function is the probability of the joint event Y_1 and $Y_2 > 0$:

$$\Pr(Y_1, Y_2 > 0|X, Z) = \frac{1}{\sigma}\phi\left(\frac{Y_1-\beta_0-\beta_1 X}{\sigma}\right) . \Phi\left(\frac{\alpha Z+\frac{\rho}{\sigma}(Y_1-\beta_0-\beta_1 X)}{\sqrt{1-\rho^2}}\right) \qquad \text{Eq. (13)}$$

Hence, the probability of an observation is seen in the data is the density function at the point Y_1 multiplied by the conditional probability distribution for Y_2 given the value of Y_1 that is observed.

For those observations where Y_1 is not observed, the likelihood function is simply the marginal probability that $Y_2 \leq 0$:

$$\Pr(Y_2 \leq 0) = \Phi(-\alpha Z) = 1 - \Phi(\alpha Z) \qquad \text{Eq. (14)}$$

The log likelihood for the entire sample of observations will be as follows:

$$\log L(\beta, \alpha, \rho, \sigma) = \Pi_0 log[1 - \Phi(\alpha Z)]$$

$$+ \Pi_1 \left[-log\ \sigma + log\ \phi \left(\frac{Y_1 - \beta_0 - \beta_1 X}{\sigma} \right) + log\ \Phi \left(\frac{\alpha Z + \frac{\rho}{\sigma}(Y_1 - \beta_0 - \beta_1 X)}{\sqrt{1-\rho^2}} \right) \right] \quad \text{Eq. (15)}$$

The parameter estimates for the sample selection model are obtained by maximizing this likelihood function with respect to its arguments and subject to $-1 \leq \rho \leq 1$. These estimates will be consistent and asymptotically efficient under the assumption of normality and homoscedasticity of the uncensored disturbances. If these assumptions fail, the FIML will no longer be consistent. A test for selectivity bias can be performed by testing the null hypothesis: $H_0: \rho = 0$ versus $H_1: \rho \neq 0$. Rejection of the null hypothesis would be evidence in favour of the existence of selectivity bias.

2.3.4 Two-Step Estimator versus Maximum Likelihood Estimator

Several Monte Carlo studies have been conducted to test the predictive power of the FIML, LIML, and the "uncorrected" subsample OLS sample selection models under various conditions, including with and without *exclusion restrictions*.[8] In many practical problems, the same set of variables in the outcome equation is usually present in the selection equation as well. In this scenario, the selection model is said to have no *exclusion restrictions* and is weakly identified. In these cases, the model is only identified through the nonlinearity of the inverse Mills ratio λ_i. However, collinearity problems are likely to arise, as the inverse Mills ratio is an approximately linear function over a wide range of its argument.

[8] See Puhani (2000, p.59-63) for a compilation of such studies spanning the period 1984 to 1996. Also, Chiburis and Lokshin (2007) perform Monte Carlo simulations to compare the performances of the FIML and LIML estimators of an ordered-probit selection model with and without *exclusion restrictions*.

Based on the results of the Monte Carlo studies highlighted in Puhani (2000), the correlation between the error terms, $\sigma\varepsilon_i$ and δ_i, corr($\sigma\varepsilon_i, \delta_i$), seems to affect the performance of the LIML estimator. Nelson (1984), Stolzenberg and Relles (1990), and Nawata (1993; 1994) provide evidence that the higher the correlation between $\sigma\varepsilon_i$ and δ_i, the greater the superiority of the FIML (and maybe OLS) estimator over the LIML in terms of efficiency (Puhani, 2000).

One criticism of the FIML estimator surrounds the sensitivity of the estimated coefficients of the outcome equation with respect to the distributional assumptions placed on the errors terms in the outcome (wage) equation and probit-type selection (propensity to work) equation (Little and Rubin, 1987). If the joint distribution of the error terms is mis-specified (either because the form of the distribution is incorrect or because of dependence on the conditional distribution of **Z**), the OLS parameter estimates $\hat{\beta}'s$ will be inconsistent.

Leung and Yu (1996) conclude that the degree of collinearity between the outcome equation's independent regressors and the inverse Mills ratio λ_i is the decisive criterion to determine the appropriateness of the FIML and LIML estimators in relation to the "uncorrected" subsample OLS. The degree of collinearity also limits the power of the t-test for sample selectivity on the coefficient of the inverse Mills ratio.

Little and Rubin (1987) noted that for the Heckman method to work in practice, *exclusion restrictions* are needed – that is, variables are needed in the outcome equation that are good predictors of the dependent variable (in our case, wages) and do not appear in the selection equation (that is, probability of being employed). In practice, it is often difficult to find such variables. For instance, in terms of modeling Mincerian-type wage equations, theory suggests that household variables such as the presence of children (especially when estimating female wages), the income of the spouse, household wealth, or non-labour household income are likely to influence reservation wage (and ultimately the decision to participate in wage

employment), but unlikely to influence the gross wage offered and hence should only be included in the selection equation (model of employment). However, in many instances these types of household data are not available; furthermore it is not always guaranteed that these variables are good predictors of the propensity to work (Puhani, 2000).

According to Puhani (2000), the most important difference for the performance of the alternative estimators (FIML, LIML, "uncorrected" subsample OLS) arise from the existence of *exclusion restrictions*. When there are no *exclusion restrictions*, collinearity problems are likely to arise; a high degree of censoring may also cause collinearity. Puhani (2000) suggests that if the econometrician cannot solve the collinearity problem, based on the evidence from Monte Carlo studies surveyed, the standard OLS should be used to estimate wage equations.

In practice, when deciding which estimator to use (FIML, LIML, or "uncorrected" subsample OLS), Leung and Yu (1996) suggest that a test for collinearity be performed by regressing the inverse Mills ratio on the regressors of the outcome equation and calculating the corresponding condition number. As a rule of thumb, if the condition number exceeds 10 (that is, collinearity is present),[9] the subsample OLS is the more robust estimator. If there are no collinearity problems, Heckman's LIML estimator should be used. However, if the FIML estimator can be computed, this estimator is recommended over the LIML estimator, as it is usually more efficient than the LIML estimator.

In practical cases, to solve collinearity problems, researchers try to find appropriate *exclusion restrictions.* As was previously mentioned, sourcing such appropriate instruments may be problematic. Selection models that do not have *exclusion restrictions* are said to be weakly identified, and in such cases, the t-tests for the presence of selectivity bias have incorrect size and often lead to the conclusion that

[9] This is an informal rule of thumb as researchers sometimes use a condition number threshold of 15 and as high as 30 to decide whether multicollinearity is of concern.

the null hypothesis of no sample selection is true. Additionally, the tests have low power, such that making a type II error (incorrectly failing to reject the null hypothesis) is likely, when in fact, sample selection is present. In this current study, the researcher was unable to source appropriate *exclusion restrictions* (see above for suggestions of such instruments) due to data limitations. Rendtel (1992) concludes that a sample selection model without *exclusion restrictions*, OLS is slightly preferable to the FIML estimator, and clearly preferable to LIML estimator. In short, as the Monte Carlo studies show, in those cases where Heckman's estimator(s) are particularly inefficient, the "uncorrected" subsample OLS may be more robust (Puhani, 2000).

2.3.5 Probit Model

Probit models are widely used for estimating the relationship between (binary) choices on the one hand and attributes of alternatives and individual decision-making on the other (Hausman and Wise, 1978). Labour force participation is defined as the ratio of the economically active population (persons aged 15-65, employed and unemployed) to the working age population:

$$Labour\ force\ participation = \frac{employed+unemployed}{working\ age\ population} \qquad \text{Eq. (16)}$$

The advantage of using a probit model is that the predicted values are bounded by 0 and 1. Since the parameters of the model are not marginal effects and are difficult to interpret, it is more useful to calculate these marginal effects of the regressors. Subsequently, the average marginal effect (AME) of each covariate on the probability of choosing to participate in the labour market can be estimated.

The coefficients obtained after running the probit regression (i.e. the selection equation - equation 9 above) do not have any direct interpretation. Instead, we are interested in the *ceteris paribus* effects of changes in the regressors affecting the

features of the outcome variable (labour force participation) – that is, the marginal effects.

Given that all the covariates in the analysis are discrete regressors, the average marginal effects (AMEs) can be calculated as:

$$mean\ \frac{\Delta \Pr(Y_{2i}>0|Z_i)}{\Delta_{Z_k}} = \frac{1}{N}\sum_{i=1}^{N} \frac{\Delta \Pr(Y_{2i}>0|Z=Z_i)}{\Delta_{Z_k}} \qquad \text{Eq. (17)}$$

The average marginal effects (AMEs) are obtained by calculating the marginal effects for each observation in the data, and then taking the average of these effects. Since all the covariates are discrete (or categorical) variables, the analysis will be the effect of changing the independent variable (in relation to the reference category) on the predicted probability of $\mathrm{Y}_{2i} > 0$, stated in percentage points. The marginal effect for categorical variables shows how the probability of $Y_{2i} > 0$ changes as the categorical independent variables change from 0 to 1, after holding all other variables in the model constant.

2.4 Data and Econometric Specification

2.4.1 Dependent Variable

Given that this portion of the research seeks to explore the issue of selectivity into employment, the dependent variable included only those persons in wage employment (see Table 2.1) rather than the strict definition of labour force participation, which includes both employed and unemployed persons. In recent years, Trinidad and Tobago has had low unemployment rates – the rate of unemployment steadily reduced from 20 per cent in the early 1990s to less than 5 per cent in 2008. Based on the current data set, the unemployment rates for men and women were 3.6 per cent and 6.6 per cent, respectively during the third quarter

of 2012. Labour force participation rates for the third quarter of 2012 were 72.5 per cent and 51.5 per cent for men and women, respectively. The corollary non-participation rates are 27.5 per cent for men and 48.5 per cent for women.

The Central Statistical Office of Trinidad and Tobago defines employed persons as persons fifteen (15) years old and above, who are engaged in the production of goods and services for pay, profit or family gain for at least one (1) hour during the survey week, including persons who had jobs but did not actually work due to reasons such as illness, vacation, study leave, suspension, maternity leave, etc. More specifically, employed persons are classified as:

a) All persons who worked for pay (in cash or kind) for any length of time during the survey week;
b) Persons who were temporarily absent from work because of vacation, illness, industrial dispute or similar cause, but who had jobs to which they would return at the end of that period of absence (seasonal workers out of work were not included); and
c) Persons who worked without pay on a family farm or business or as a learner.

A summary of individual characteristics for men and women who are in waged employment is presented in Table 2.1.[10] A greater proportion of men than women in Trinidad and Tobago are engaged in waged employment – 66.3 per cent of all men are employed versus 53.5 per cent of women. Not surprisingly, highly educated women (those with tertiary education) have the highest employment rate (81.1 per cent) compared to women with less education – 31.9 per cent and 46.8 per cent for women with primary and lower secondary school education, respectively. Married women are less likely to be employed (44.0 per cent) compared to married men (64.9 per cent). Among all women, women of Indian descent are the least likely to be employed, with only 40.3 per cent of Indian women being in the labour market compared with 65.6 per cent among African women and 58.4 per cent among women who are of mixed/other origin. The highest employment rates for both men

[10] The sample includes persons aged 15 to 65, but excludes full-time students and retired persons.

and women are for the age category 25-34 years at 71.9 per cent for men and 58.8 per cent for women.

Table 2.1: Individual Characteristics of Persons in Wage Employment (percent of total sample[1])

	Men	Women
Per cent in wage employment	66.3	53.5
Age Group		
15-24	71.9	58.8
25-34	74.4	64.8
35-44	66.1	58.1
45-54	59.1	46.4
55-65	54.0	33.2
Marital Status		
Single/ Separated	67.4	63.3
Married/ Common Law	64.9	44.0
Highest Level of Education		
Primary	53.1	31.9
Lower Secondary	67.0	46.8
Upper Secondary	75.8	67.9
Tertiary	78.4	81.1
Ethnicity		
African	68.9	65.6
Indian	63.5	40.3
Mixed/ Other	67.2	58.4

[1] Sample excludes students and retired persons.

2.4.2 Econometric Specification

To test and correct for the presence of selectivity bias, the wage equation remains the same as in the OLS and quantile regression estimations in the two subsequent chapters:

$$\log w_i = \alpha_i + \beta_1 \boldsymbol{X_i} + \beta_2 \boldsymbol{S_i} + \beta_3 x_i + \beta_4 x_i^2 + \mu_i \qquad \text{Eq. (18)}$$

where $\log w_i$, is the natural logarithm of hourly wages, $\boldsymbol{S_i}$ is a series of dummy variables for the highest level of education attained, x_i is potential experience, $\boldsymbol{X_i}$ is a vector of other variables assumed to affect wages (including marital status and ethnicity), α_i is a constant term, and μ_i is the error term.

The Heckman sample selection correction model assumes that there exists an underlying regression relationship, in our case, between participating in the labour

market and the Mincerian-type earnings equation above. Under some conditions we do not observe wages (equation 18); observation of wages is related to the selection equation (equation 19), which relates a latent variable s_i to observed characteristics $\boldsymbol{Z}_i$. Wages is observed only if:

$$s_i = \gamma_1 \boldsymbol{Z}_i + \varepsilon_i > 0 \qquad \text{Eq. (19)}$$

where s_i is the latent dependent variable that captures the propensity to participate in the labour market and takes the value of 1 if earnings are observed and is positive and 0 otherwise. $\boldsymbol{Z}_i$ includes all variables in equation 18 except for potential experience and potential experience squared; these are replaced with dummies for different age categories spanning the ages 15-65. Equation 19 is estimated using a probit model.

Generally, an *exclusion restriction*, that is, at least one variable that is included with a non-zero coefficient in the selection equation (equation 19) but does not appear in the equation of interest (equation 18) is required to generate credible estimates. Usually in applied work on the topic of gender wage gaps, the inclusion of variables affecting women's propensity to participate in the labour market, such as the number and/or ages of children present in the household or non-own labour household income (e.g. spouse's income or government assistance), are used as the *exclusion restriction(s)*. No such variables are available in the current data set being used for this analysis, and the author acknowledges that it may be difficult to adequately test and/or correct for the presence of sample selection bias.

The Heckman procedure assumes that μ_i (the error term from the wage equation) and ε_i (the error term from the selection equation) follow a bivariate normal distribution with correlation ρ. Selection bias occurs when the error terms of the selection and linear equations are correlated. Conditional on selection (i.e. s_i =1), the expected value of log *w* is:

$$E(\log w_i \mid s_i = 1) = \alpha_i + \beta_1 \boldsymbol{X_i} + \beta_2 \boldsymbol{S_i} + \beta_3 x_i + \beta_4 x_i^2 + \beta_\lambda \lambda_i \qquad \text{Eq. (20)}$$

where λ_i is the Inverse Mills Ratio (IMR), which depends on the $\gamma's$ from equation 19. A test for selectivity bias can be performed by examining the coefficient on the IMR, with the null hypothesis being: $H_0: \beta_\lambda = 0$ versus the alternative $H_1: \beta_\lambda \neq 0$. Rejection of the null hypothesis can be interpreted as evidence in favour of the presence of selectivity bias.

2.5 Results and Discussion

2.5.1 Heckman Model: Probit Results and Average Marginal Effects

Whether or not sample selection bias is present, the results of the probit model are informative in understanding the characteristics of individuals engaged in wage employment (Table 2.2). Also, the Heckman probit results show that individual characteristics affect men and women differently when deciding to engage in paid employment or not.

Based on the human capital model, not surprisingly given societal norms, a key variable in determining the probability of a woman being in wage employment is marital status. Being married or in a common-law relationship decreases the probability that a woman is employed by 11.6 percentage points while for men, marital status is not a significant factor in their decision to work or not.

Education, on the other hand, is a key variable in explaining the probability of both men and women being in wage employment, although higher education plays a more important role for women than it does for men. For men, upper secondary schooling and tertiary education increases the probability of being employed by a similar amount – 15.7 and 17.1 percentage points, respectively, compared to men with only primary school education. Meanwhile, for women, upper secondary education and tertiary education increase the probability of being employed by a

much larger amount – 24.8 and 38.4 percentage points, respectively. This may be indicative of the fact that more educated women are more likely to seek employment opportunities. Alternatively, it may also be indicative of employers' hiring practices or bias where employers seem to be keener on women's education than on men's when making hiring decisions (Khitarishvili, 2009).

Ethnicity plays a greater role in explaining the probability of being in wage employment for women than it does for men. Generally, ethnicity is not a highly significant factor in determining a man's decision to enter into employment. Meanwhile, Indian women and those of mixed/other heritage are less likely to be employed compared to African women *ceteris paribus*. The predicted probability of an Indian woman entering into formal employment falls by 14.7 percentage points (compared to African women) and for women of mixed/other origin, the predicted probability of being employed falls by 11.1 percentage points.

The fact that Indian women are less likely to participate in the labour market (compared with African women) may be due to cultural and historical norms, and the legacy of indentureship. A 1913 Commissioners report for Trinidad analysing women's labour during the indentureship period (which occurred during 1845-1917) stated that some men were withdrawing their wives from wage labour to '*devote themselves solely to domestic work including the care of children*'. Early in the 20th century, this practice became more frequent for a number of reasons. First, the colonial state was supporting Indian men in their attempts to reconstruct the patriarchal Indian family. Second, the redefinition of women as wives and mothers facilitated the local reproduction of the labour force, and most importantly, provided *free* labour for the peasant production of cane and food crops. Women were withdrawn into the domestic economy, but engaged in cane farming, rice production, and animal husbandry, but received no wages. These women were officially defined as non-earning "housewives" (Reddock, 1994). On the other hand, persons of mixed/other origins (Chinese, Caucasian, Syrian/Lebanese, etc.) were historically of a higher class than Africans and Indians in the Caribbean context (Coppin and Olsen, 1998). Belonging to a higher social class may explain the lower

probability of women of mixed/other origin being less likely to be in formal employment compared to African women as they may be from relatively more affluent households and the need to work is not as imperative. Indeed, poverty statistics for Trinidad and Tobago reveal that there was no significant difference in the level of poverty between the two major ethnic groups – Africans and Indians – in 1998, while poverty was almost non-existent in the residual "Other" category which included Whites, Chinese, Syrian-Lebanese, etc. (Kairi Consultants Ltd, 2004).

Compared to the default age category 15-24, women in their most probable child-bearing years are more likely to participate in the labour market: by 7.3 percentage points for those aged 25 to 34 and by 9.1 for those aged 35-44. In contrast, slightly older women (aged 45-54) are just as likely to be employed as young females aged 15-24. Not surprisingly, both male and female seniors (55-65 years old) are less likely to be in wage employment (14.1 and 9.8 percentage points, respectively) compared to men and women in the age group 15-24.

In the Trinidad and Tobago context, among women who choose to participate in the labour market, their labour market attachment is fairly strong. A 2008 International Labour Organisation (ILO) study on work and family life in Trinidad and Tobago revealed that many married women and women with children made *"a conscious decision to remain in the labour force"* (Center for Gender and Development Studies, 2004, p.54). Furthermore, the gradual increase in female labour force participation over the past few decades[11] has challenged the traditional roles that society has placed on women (International Labour Organisation, 2008). The ILO study noted that in many cases women have shown a capability of functioning equally well at family tasks *and* at productive employment.

[11] During the period 1985 to 2012, the female labour force participation rate increased from 41.8 per cent to 51.7 per cent.

Moreover, during an interview with a human resources business consultant operating in Trinidad and Tobago[12], she stated that women in Trinidad and Tobago are not in a position to (permanently) leave the workforce to raise a family especially with the high number of single mothers prevalent in the country. For blue-collar couples, the consultant stated that these women also do not leave the workforce because they tend to be the more responsible and stable parent.

Another factor impacting female labour market attachment in Trinidad and Tobago is the Maternity Protection Act No. 4, which was enacted in 1998. The Act is binding for both private sector employers and the State. Under the Act, female employees are entitled to 13 weeks' paid maternity leave and one month's pay during such leave. Also, an employee on maternity leave has the right to return to work.

[12] See Appendix III: Interview with Business Consultant Operating in Trinidad and Tobago for further details.

Table 2.2: Heckman (Two-Step) Selection Model – Probit Results

	Average Marginal Effect	
Dependent variable = wage employment	**Men**	**Women**
Age group (ref: 15-24)		
25-34	0.028	0.073*
	(0.035)	(0.037)
35-44	-0.062	0.091*
	(0.038)	(0.038)
45-54	-0.088*	0.000
	(0.041)	(0.039)
55-65	-0.141**	-0.098*
	(0.047)	(0.043)
Highest Level of Education Attained (ref: primary)		
Lower Secondary	0.088**	0.083**
	(0.029)	(0.028)
Upper Secondary	0.157***	0.248***
	(0.032)	(0.033)
Tertiary	0.171***	0.384***
	(0.044)	(0.036)
Marital Status (ref: unmarried)		
Married/Common Law	0.033	-0.116***
	(0.024)	(0.022)
Ethnicity (ref: African)		
Indian	-0.008	-0.147***
	(0.024)	(0.024)
Mixed/Other	-0.078*	-0.111***
	(0.032)	(0.030)
Number of observations	**2021**	**2011**

Standard errors in parentheses. * p<0.05, ** p<0.01, *** p<0.001.

Note: The probit results from the Heckman full model, which includes controls for occupation, industry and type of employee (public sector vs. private sector) in the wage equation, are qualitatively similar to those obtained from the human capital model.

2.5.2 Heckman Two-Step Model: Evidence of Sample Selection

Given the drawbacks of the FIML estimator (as discussed in section 2.3.4), in particular, its sensitivity to mis-specification of either (or both) the outcome equation or the selection equation (which leads to inconsistent estimates), the LIML estimator was used for analysis.[13] By contrast, the LIML estimator, although it also relies on joint normality of the disturbance terms, only relies on conditional moments and may hold for a wider class of distributions.

Following Leung and Yu's (1996) recommendation, a test for collinearity was performed. This test was done by regressing the inverse Mills ratio on the regressors of the wage equation, and then calculating the corresponding condition number. A complementary collinearity test was also performed using the *variance inflation factor* (VIF).[14] Table 2.3 shows the results of both collinearity tests. Across all model specifications (except for the public sector full model for men), collinearity was not found based on the condition numbers being below 10. On the other hand, based on the mean VIF, multicollinearity was found across all specifications of the human capital models for both men and women. The average mean VIF was "*substantially higher*" than 1, indicating there is multicollinearity across all the predictors (Montgomery, 2001). However, Montgomery (2001) has noted that the VIF score may be grossly inflated if you use categorical variables (as we have), interactions, or exponents.

Leung and Yu (1996) suggest that if there are no collinearity problems (based on a condition number of less than 10), the LIML estimator should be used. Table 2.4 presents the results for the tests for sample selection, which was performed by

[13] Asymptotically, the LIML and FIML are equivalent, but in small samples the results can differ. For completeness, the results from the FIML estimation are also presented later in the chapter. Summarily, selection was found to be present for women (full model), and private sector male employees (in both the human capital and full models).

[14] The Variance Inflation Factor (VIF) quantifies the severity of multicollinearity in an ordinary least squares regression analysis. The VIF is an index that measures how much variance of an estimated regression coefficient is increased because of multicollinearity. As a rule of thumb, if any of the VIF values exceeds 5 or 10, it implies that the associated regression coefficients are poorly estimated because of multicollinearity (Montgomery, 2001).

examining the coefficient on the IMR: $H_0: \beta_\lambda = 0$ versus the alternative $H_1: \beta_\lambda \neq 0$ (see equation 20).

Table 2.3: Collinearity Tests between IMRs and Regressors of Outcome Equation

Model	Men	
	Mean VIF	Condition Number
All Men/All Women		
Human Capital Model	5.30	8.73
Full Model	2.87	9.24
Public Sector		
Human Capital Model	6.07	9.34
Full Model	3.27	10.37
Private Sector		
Human Capital Model	5.08	8.54
Full Model	2.93	9.19
	Women	
	Mean VIF	Condition Number
All Men/All Women		
Human Capital Model	5.42	8.60
Full Model	2.91	9.00
Public Sector		
Human Capital Model	5.57	8.66
Full Model	3.28	9.96
Private Sector		
Human Capital Model	5.23	8.21
Full Model	2.88	8.72

Rejection of the null hypothesis is interpreted as evidence in favour of the presence of sample selection. None of the coefficients on the IMR are statistically significantly different from zero, leading us to conclude that selectivity is not present in any of our model specifications. A word of caution is needed since selection models that do not have *exclusion restrictions*, such as the one we are analysing, are usually weakly identified. Weakly identified selection models suffer from the t-tests for selection being incorrectly sized, often leading the researcher to make a type II error, that is, erroneously failing to reject the null hypothesis of no sample selection.

Table 2.4: Evidence of Sample Selection using the LIML estimator

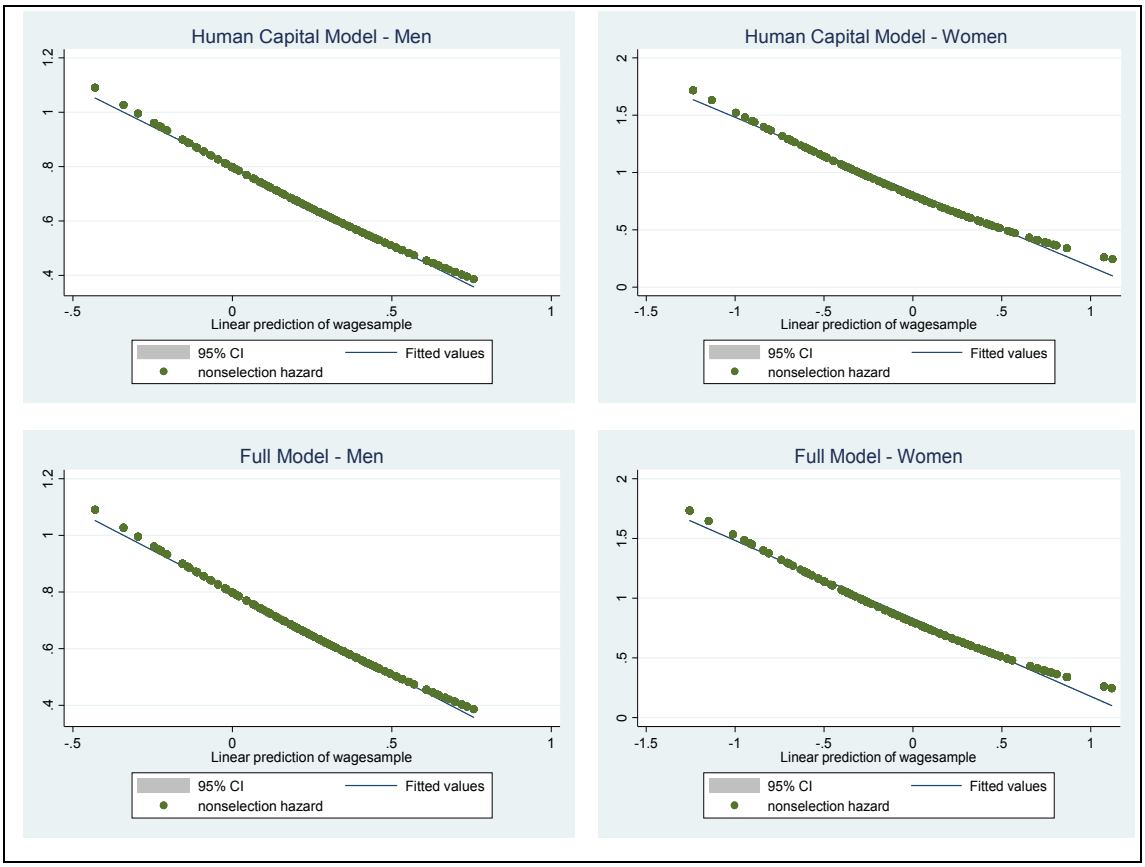
	Estimated coefficient of *lambda*	
	Men	**Women**
All Men/All Women		
Human Capital Model	-0.163	0.146
	(0.346)	(0.259)
Full Model	0.184	-0.174
	(0.317)	(0.222)
Public Sector		
Human Capital Model	-0.636	0.086
	(0.470)	(0.373)
Full Model	-0.158	-0.057
	(0.271)	(0.297)
Private Sector		
Human Capital Model	0.133	1.103
	(0.300)	(1.029)
Full Model	0.108	0.581
	(0.272)	(0.523)

Standard errors in parentheses. * p<0.05, ** p<0.01, *** p<0.001.

The identification of a selection model by functional form is only possible through the nonlinearity of the IMR. However, as the IMR may be linear for much of its argument, identification may be weak. This is indeed the case for our selection model, as plots of the IMRs for both the human capital and full models (Figure 2.5.1) reveal that a large portion of the IMR from these models is linear.

As much as we can tentatively conclude that selection does not appear to be an issue in our model(s), several Monte Carlo simulations show, including Rendtel (2000), the "uncorrected" OLS subsample estimates are more robust than the LIML estimator when the sample selection model does not have any *exclusion restrictions*. In short, we conclude that the estimates from the previous chapters using OLS and quantile regression *may* not suffer from selectivity bias and should be used for analysis instead of the sample selection model.

Figure 2.5.1: Plots of the Inverse Mills Ratio



2.5.3 Heckman FIML Model: Evidence of Sample Selection

This section discusses the results of the Heckman full information maximum likelihood (FIML) selection model. If we were to accept these results that selectivity is present, then the "uncorrected" OLS subsample estimation regression would have to be adjusted to include the presence of sample selection, which would have implications for the decomposition of the wage gap. The gender wage gap was decomposed following the adjustment to the OLS estimation and these results are also presented here.

Heckman FIML Model: Test for Sample Selection

Heckman's maximum likelihood estimator was also used to test for selectivity separately for men and for women. The test for selectivity is carried out by testing

the null hypothesis that $\rho=0$ versus the alternative that $\rho\neq0$ (see Equation 15). Rejection of the null hypothesis would be evidence in favour of the existence of sample selection. In terms of the full sample, the results do not reject the null of no selectivity for either men or women in the human capital model, but does reject the null for women only in the full model (Table 2.5). In the private sector, selectivity was found for men only in both the human capital and full models, while selectivity was not found in the public sector models.

Table 2.5: Evidence of Sample Selection using the FIML estimator

	Estimated coefficient of *rho*	
	Men	**Women**
All Men/All Women		
Human Capital Model	-0.219	0.170
Full Model	0.622	-0.861***
Public Sector		
Human Capital Model	-0.551	0.033
Full Model	-0.701	-0.033
Private Sector		
Human Capital Model	0.755**	0.251
Full Model	0.750**	0.173

* p<0.05, ** p<0.01, *** p<0.001

In the full model (using the full sample), the coefficient of *rho* in the selection equation for women was statistically significant; this implies that sample selection is present and that there is a need to 'correct' the female earnings function. The negative value of *rho* indicates that those unobserved characteristics that increase an individual's salary also lower the probability of this person being employed (Khitarishvili, 2009). A negative estimate of *rho* seems counterintuitive, and is not often discussed in the literature with many researchers either not addressing it or simply attributing it to model misspecification (Khitarishvili, 2009). The negative sign also has implications for the results of the Blinder-Oaxaca decomposition – a negative *rho* implies that mean wages of those in employment are lower than hypothetical mean wages for the full population (Khitarishvili, 2009). Accounting for selectivity would result in an increase in an unconditional estimate of women's

wages without a corresponding increase for men. Consequently, the gender wage gap with correction for sample selection bias should be lower than that without it.

Literature on sample selection bias usually involves discussion on the reservation wage hypothesis. This hypothesis postulates that if the wage offer is below the reservation wage, individuals will refuse the offer, and the offer will be unobserved. If the wage offer is above the reservation wage, persons will accept it and this wage offer will be observed. A negative correlation between the error terms of the wage equation and the selection equation, as in our (full) model for women, means that women are more likely to accept lower rather than higher wage offers (Khitarishvili, 2009). This result is counterintuitive; however, Ermisch and Wright (1994) have shown that negative *rho* can be consistent with the reservation wage hypothesis. The authors show that *rho* will be negative if the variance of wage offers is smaller than the covariance of the wage offers and reservation wages. For instance, if we assume that the means of wage offers and reservation wages are the same, then for individuals whose wage offer deviates positively from the mean, their reservation wage deviation from the mean would be even higher. Thus, individuals with higher wage offers will also be those persons more likely to be out of the sample with observed wages because they are the ones rejecting the offers.

Nicaise (2001) has an alternative explanation to account for a negative *rho*, which stems from the involuntary nature of unemployment, especially in the context of developing countries. In this argument, market wages are above individuals' reservation wages, but these individuals are not hired. Nicaise (2001) proposes that, holding all individual characteristics constant, employers offer jobs to individuals who are willing to work for less money, that is, offer jobs to those with lower reservation wages. In essence, individuals who are more likely to work are also those individuals who are paid less than would otherwise be observed for identical individuals in the population. Hence, individuals with higher reservation wages would be rejected by employers in favour of workers with lower reservation wages.

The fact that selection bias was found among women only in the full model and not in the human capital model (using the full sample) reveals that women self-select into particular occupations and industries. Women in employment appear to get lower wages controlling for job characteristics than would a random sample of women. However, it appears that this is offset by employed women tending to be in better paying industries/occupations than one would expect a random sample of women to be.

In the private sector however, sample selection bias was found for men only in both the human capital and full models. The coefficient on *rho* was statistically significant and positive. The positive coefficient of *rho* for men shows that men are less likely to accept jobs in the lower segment of the male wage offer distribution. This finding is consistent with the kernel density function of the log of hourly wages for men in the private sector (see Figure 4.2). In the private sector, the distribution of male wages is further right indicating that there are fewer men in the lower segment of the wage distribution (see also Table 4.2). The positive *rho* implies that the mean wages for men are overestimated, and would result in a decrease in men's wages without a corresponding increase in mean wages for women. Consequently, the gender wage gap with correction for sample selection bias should be lower than without it.

In many studies on gender wage gaps with sample selection adjustment, sample selection bias correction is usually performed only for women, implicitly assuming that sample selection bias is an issue only for the female population. The results of this current study show that the issue of sample selection bias is not one that affects only the female population, and more attention needs to be placed in analysing the causes of sample selection bias among women as well as men.

Heckman FIML Model: Wage Regression Results

In this section, comparisons will be made to the estimated coefficients of the "uncorrected" OLS earnings regressions from Chapter 3 with the Heckman "corrected" earnings regressions.

Just as in the "uncorrected" OLS results for the full model (full sample), the returns to education for both men and women are much lower compared to the estimated returns to education in the human capital model. However, for women in the Heckman full model, only tertiary education brings statistically significant (higher) returns to education – 32.8 per cent higher returns compared to women who only attained primary school level education (**Table 2.6**).

In terms of marital status, in the Heckman full model married men are estimated to receive a wage premium of 14.1 per cent over their unmarried counterparts. This wage premium for married men is estimated to be the same as in the human capital model (14.5 per cent). For married women however, in the Heckman full model, these women receive a wage premium of 10.2 per cent over unmarried women. This is in contrast with the human capital model, in which, the estimated return to being married was negative and statistically insignificant. Marital status for women was also statistically insignificant in the OLS earnings regressions.

Also in contrast to the human capital model for women, Indian women in the Heckman full model receive, on average, wages that are 7.7 per cent higher than the wages received by African women, *ceteris paribus*. In the OLS results, by comparison, ethnicity was statistically insignificant for both men and women.

For both sexes, all occupation and most industry dummy variables are characterised by positive wage premia relative to the reference occupational and industry

groupings (that is, elementary occupations and Social/Personal Services). These wage premia are similar in both the OLS and Heckman regressions.

Table 2.6: Heckman FIML Earnings Regression: All Men & All Women

	Human Capital Model		Full Model	
Dependent variable = log hourly wage	**Men**	**Women**	**Men**	**Women**
Potential Experience	0.0105*	0.0217***	0.004	0.0132**
	(0.004)	(0.005)	(0.004)	(0.004)
Potential Experience^2	0.00167	-0.0272**	0.001	-0.008
	(0.009)	(0.010)	(0.008)	(0.009)
Highest Level of Education Attained (ref: primary)				
Lower Secondary	0.201***	0.232***	0.136***	0.053
	(0.042)	(0.050)	(0.037)	(0.053)
Upper Secondary	0.499***	0.636***	0.356***	0.080
	(0.060)	(0.059)	(0.044)	(0.064)
Tertiary	1.159***	1.290***	0.756***	0.251**
	(0.073)	(0.062)	(0.075)	(0.077)
Marital Status (ref: unmarried)				
Married/Common Law	0.145***	-0.0184	0.139***	0.0988**
	(0.031)	(0.035)	(0.028)	(0.035)
Ethnicity (ref: African)				
Indian	-0.026	-0.033	-0.022	0.0931*
	(0.028)	(0.036)	(0.027)	(0.038)
Mixed/Other	-0.031	0.007	-0.056	0.081
	(0.046)	(0.047)	(0.038)	(0.046)
Occupation (ref: Elementary Worker)				
Machine Operator			0.249***	0.294
			(0.040)	(0.203)
Craft Worker			0.220***	0.480***
			(0.032)	(0.115)
Sales Worker			0.264***	0.134**
			(0.044)	(0.043)
Clerical			0.212***	0.286***
			(0.060)	(0.042)
Technician			0.397***	0.585***
			(0.044)	(0.051)
Professional			0.504***	0.837***
			(0.100)	(0.066)
Manager			0.619***	0.768***
			(0.081)	(0.089)
Industry (ref: Social/Personal Services)				
Agriculture/Fishing			-0.113	-0.051
			(0.094)	(0.147)
Mining/Quarrying			0.478***	0.225
			(0.063)	(0.123)
Manufacturing			0.191***	0.120
			(0.044)	(0.067)
Electricity/Gas/Water			0.278***	0.461**
			(0.071)	(0.161)
Wholesale/Retail			0.035	-0.032
			(0.043)	(0.042)
Transport/Communication			0.188***	0.190*
			(0.053)	(0.094)
Finance/Insurance			0.213***	0.208***
			(0.062)	(0.044)
Construction			0.106***	-0.207**
			(0.032)	(0.067)
Type of worker (ref: private sector employee)				
Public Sector			0.236***	0.299***
			(0.030)	(0.038)
Constant	2.725***	2.269***	2.341***	2.629***
	(0.146)	(0.087)	(0.068)	(0.088)
rho	-0.219	0.170	0.622	-0.861***
Number of observations	**2021**	**2011**	**2021**	**2007**

Robust standard errors in parentheses. * p<0.05, ** p<0.01, *** p<0.001.

In the private sector, the results of the Heckman full model reveal similar rates of return to education for men and women as was estimated in the OLS regressions (**Table 2.7**). The wage premia for occupations and industries for men and women in the Heckman full model were qualitatively similar to the OLS results with the exception of male professionals. Male professionals in the Heckman full model are estimated to earn a lower wage premium (relative to elementary workers, the reference occupational category) compared to the estimated wage premium found in the OLS earnings regression – that is, 39.0 per cent in the Heckman full model versus 54.9 per cent in the OLS regression.

Table 2.7: Heckman FIML Earnings Regressions – Private Sector

	Human Capital Model		Full Model	
Dependent variable= hourly log wage	**Men**	**Women**	**Men**	**Women**
Potential Experience	0.008	0.0164**	0.00463	0.0166***
	(0.005)	(0.006)	(0.005)	(0.005)
Potential Experience^2	0.00144	-0.0193	0.00277	-0.0229*
	(0.011)	(0.012)	(0.010)	(0.010)
Highest Level of Education Attained				
Lower Secondary	0.219***	0.167**	0.106*	0.0578
	(0.052)	(0.057)	(0.047)	(0.054)
Upper Secondary	0.455***	0.477***	0.257***	0.175**
	(0.059)	(0.065)	(0.054)	(0.062)
Tertiary	1.280***	1.171***	0.785***	0.560***
	(0.102)	(0.081)	(0.115)	(0.096)
Marital Status				
Married/Common Law	0.234***	0.0285	0.170***	-0.000981
	(0.039)	(0.043)	(0.034)	(0.036)
Ethnicity				
Indian	0.00819	0.0257	-0.0318	0.0121
	(0.039)	(0.042)	(0.034)	(0.039)
Mixed/Other	-0.0517	0.0639	-0.0448	0.0139
	(0.052)	(0.059)	(0.044)	(0.050)
Occupation				
Machine Operator			0.222***	0.051
			(0.048)	(0.191)
Craft Worker			0.179***	0.318**
			(0.038)	(0.113)
Sales Worker			0.117*	0.0213
			(0.057)	(0.054)
Clerical			0.201*	0.286***
			(0.101)	(0.057)
Technician			0.449***	0.475***
			(0.054)	(0.074)
Professional			0.390*	0.634***
			(0.156)	(0.114)
Manager			0.743***	0.704***
			(0.113)	(0.100)
Industry				
Agriculture/Fishing			-0.151	-0.269***
			(0.137)	(0.055)
Mining/Quarrying			0.633***	0.482***
			(0.076)	(0.113)
Manufacturing			0.257***	0.168*
			(0.052)	(0.068)
Electricity/Gas/Water			0.432*	-0.574**
			(0.174)	(0.206)
Wholesale/Retail			0.141**	0.0345
			(0.050)	(0.054)
Transport/Communication			0.177*	0.247
			(0.085)	(0.128)
Finance/Insurance			0.400***	0.359***
			(0.072)	(0.063)
Construction			0.279***	0.252**
			(0.042)	(0.097)
Constant	2.529***	2.290***	2.365***	2.254***
	(0.075)	(0.089)	(0.068)	(0.086)
rho	0.755**	0.251	0.750**	0.173
Number of observations	**927**	**811**	**927**	**807**

Robust standard errors in parentheses. * p<0.05, ** p<0.01, *** p<0.001.

Heckman FIML Model: Blinder-Oaxaca Decomposition Results with Sample Selection Correction

As it was previously discussed, in the presence of negative *rho*, the uncorrected wage distribution underestimates the true wage distribution, and vice versa for a positive *rho*. Given this, we expect that once we correct for sample selection bias, the mean wages for women in the full model (full sample) would increase, while the mean wages for men in the private sector will decrease (**Table 2.8**).

Using the full sample, the uncorrected results of the full model suggest that the wage gap was 13.3 per cent. Once the Heckman correction is implemented, women's mean wages increase from $22.26 to $33.88, closing the wage gap entirely. In fact, following the Heckman correction the mean wages for women is higher than the mean wages for men, which is estimated to be $25.23.

The uncorrected results for the sub-sample of the private sector mean wages for men and women are $23.57 and $19.25 (in the full model), respectively, resulting in a wage gap of 22.5 per cent. Correcting for the Heckman selection lowers the wage gap as men's mean wages decreases to $21.86 while women's mean wages remain unchanged. The resulting wage gap is now lower and is estimated at 13.6 per cent. In this scenario, the unexplained component of the wage gap (that portion attributable to differences in returns to characteristics) suggests that if women were to receive the same rates of return to their personal and job characteristics as men do, their wages are estimated to increase by 16.3 per cent. In the uncorrected results, the unexplained component suggests that women's wages would increase by 22.5 per cent if they were to receive similar rates of return to their characteristics as men receive.

In both cases when selection bias was found and corrected for, there was a sizeable decrease in the estimated gender wage gap. However opposing forces lead to this decrease – in the full sample, women's estimated wages increased while in the

private sector, men's estimated earnings decreased. These results for Trinidad and Tobago based on the full sample are contradictory to several studies where a positive correlation between wages and the propensity to participate in the labour market was found (Badel and Peña 2010, Beblo *et al* 2003). In these studies the estimated wage gap understates the true difference in earnings when self-selection is ignored.

Table 2.8: Decomposing the Gender Wage Gap correcting for Sample Selection (FIML)

	Human Capital Model	Full Model
Full Sample: All Men/All Women		
No selection		
(Geometric) Mean of male hourly wages	$25.23	$25.23
(Geometric) Mean of female hourly wages	$22.27	$22.26
Wage Gap:	1.133	1.133
Using a pooled waged structure, difference due to:		
Characteristics	0.859	0.861
Returns to characteristics	1.320	1.317
Selection applied to women		
(Geometric) Mean of male hourly wages		$25.23
(Geometric) Mean of female hourly wages		$33.88
Wage Gap:		0.745
Using a pooled waged structure, difference due to:		
Characteristics		0.864
Returns to characteristics		0.862
Public Sector:		
No selection		
(Geometric) Mean of male hourly wages	$32.71	$32.71
(Geometric) Mean of female hourly wages	$31.30	$31.30
Wage Gap:	1.045	1.045
Using a pooled waged structure, difference due to:		
Characteristics	0.835	0.898
Returns to characteristics	1.252	1.164
Private Sector:		
No selection		
(Geometric) Mean of male hourly wages	$23.57	$23.57
(Geometric) Mean of female hourly wages	$19.28	$19.25
Wage Gap:	1.223	1.225
Using a pooled waged structure, difference due to:		
Characteristics	0.914	0.975
Returns to characteristics	1.338	1.256
Selection applied to men		
(Geometric) Mean of male hourly wages	$21.62	$21.86
(Geometric) Mean of female hourly wages	$19.28	$19.25
Wage Gap:	1.122	1.136
Using a pooled waged structure, difference due to:		
Characteristics	0.914	0.977
Returns to characteristics	1.227	1.163

Heckman FIML Model: Summary

Positive sample selection bias was found to be present for women in the full model (using the full sample), which includes controls for occupations, industries, and type of worker (public sector vs. private sector) but not in the human capital model. This suggests that women in employment self-select into particular occupations and industries. Conditional on being in those occupations and industries, the sample of employed women appears to have favourable unobservables compared to the population of women as a whole. When the Heckman selection correction is implemented for women in the full model, the gender wage gap is eliminated as the mean wage for women is estimated to be higher than the mean wage for men. In other words, if all women engaged themselves in wage employment, the observed gender pay gap would disappear.

Sample selection bias was also found to be present for men in the private sector. Correcting for this bias among men, their mean wage is estimated to decrease, hence lowering the gender wage gap compared to the uncorrected wage gap. However, these Heckman selection results need to be interpreted with some care as appropriate *exclusion restriction(s)* were not available in the dataset used. Although the inclusion of *exclusion restrictions* is not necessary in parametric models, in practice, identification without the use of an instrument is weak. Nonetheless, it appears that the estimated gender wage gap for Trinidad and Tobago overstates the true differences in wages between the genders when self-selection is ignored.

2.6 Conclusions

This chapter, in part, explores the labour supply decision of women to highlight some of the factors that are most influential and may account for the gender gap in wage employment. In the sample used, the percentage of men and women in wage employment was 66.3 per cent and 53.5 per cent, respectively – Table 2.1. As

expected, the predicted probability of women participating in the labour market increases with higher levels of education. Education has a larger (positive) impact on a woman's decision to engage in wage employment than it does for men. In keeping with societal norms, on average, having a partner (married/common law) decreases a woman's probability of participating in the labour market by 11.6 percentage points. Meanwhile, women of Indian descent are less likely to participate in the labour market, and this may be due to historical and cultural norms within that sub-ethnic grouping.

However, demand factors can also account for this disparity in wage employment between men and women. According to Seguino (2003), in the Caribbean[15], employers appear to favour hiring male workers by giving them preferential access to jobs. "Unobserved" productivity differentials (such as commitment to work, potential for absenteeism, etc.) may account for this gender gap in employment and may lead to employers favouring one gender over the other. However, Seguino (2003) states that no research on the Caribbean (at least to her knowledge) have shown or even suggest that Caribbean women and men differ substantially in their attitudes towards work. Nonetheless, the absence of such differences in attitudes does not prevent employers from having prejudicial gender stereotypes that influence their hiring decisions (Seguino, 2003).

The main aim of this chapter was to analyse the gender wage gap in Trinidad and Tobago, taking into account the possible presence of sample selection bias. Heckman's two-step procedure tentatively concluded the absence of selection in our models. However, given the weak identification of the LIML estimator because of the lack of *exclusion restrictions* due to data limitations, and assuming that selection bias is only moderate, the "uncorrected" OLS estimates would be more robust and is considered to be the more appropriate model for analysis.

[15] This study included the three largest economies in the Caribbean region – Trinidad and Tobago, Jamaica, and Barbados.

Furthermore, Stolzenberg and Relles (1997) have noted that only if selection bias is very severe and the samples are large does the two-step correction improve estimates compared to the "uncorrected" OLS estimates. On the other hand, if selection bias is moderate, or if samples are relatively small with only a few hundred cases, it is highly likely that the two-step estimator will make estimates worse, even when sample selection is known to be present and the assumptions of the two-step correction method are satisfied.

2.7 References

Badel, A., and Peña, X. (2010). "Decomposing the Gender Wage Gap with Sample Selection Adjustment: Evidence from Colombia". Revista de Analisis Economico – *Economic Analysis Review*. Vol. 25 No.2 pp. 169-191.

Bailey, Barbara (2003). *A report of the ad hoc expert group meeting on gender socialization and domestic violence: Developing a research agenda*.

Barriteau, Eudine (1995). Postmodernist Feminist Theorizing and Development. Policy and Practice in the Anglophone Caribbean: The Barbados Case. In *Feminism/Postmodernism/Development*. Ed. Marianne Marchand and Jane Plupart. London: Routledge.

Beblo *et al* (2003). Measuring Selectivity-Corrected Gender Wage Gaps in the EU. Centre for European Economic Research: Discussion Paper No. 03-74.

Chiburis, Richard and Michael Lokshin (2007). Maximum likelihood and two-step estimation of an ordered-probit selection model. *The Stata Journal*. Vol. 7, No. 2, pp. 167-182.

Ermisch, J.F., and R.E. Wright (1994). Interpretation of Negative Sample Selection Effects in Wage Offer Equations. *Applied Economics Letters.* Vol. 94, No. 1, pp. 187–189.

French, Joan. (1994). "Hitting Where It Hurts Most: Jamaican Women's Livelihoods in Crisis." In Pamela Hausman, J. and David A. Wise. (1978). A Conditional Probit Model for Qualitative Choice: Discrete Decisions Recognizing Interdependence and Heterogeneous Preferences. *Econometrica.* Vol. 46, No. 2, pp. 403-426.

Hausman, J.A. and D.A. Wise (1978). A Conditional Probit Model for Qualitative Choice: Discrete Decisions Recognizing Interdependence and Heterogeneous Preferences. *Econometrica*. Vol. 46, No. 2, pp. 403-426.

Heckman, J. J. (1976). The Common Structure of Statistical Models of Truncation, Sample Selection and Limited Dependent Variables and a Simple Estimator for Such Models. *Annals of Economic Social Measurement*. Vol. 5, No. 4, pp. 475-492.

Heckman, J. J. (1979). Sample Selection Bias as a Specification Error. *Econometrica*, Vol. 47, No. 1, pp. 153-161.

International Labour Organisation (2008). Reconciling work and family: Issues and policies in Trinidad and Tobago. *Conditions of Work and Employment Series No. 18*.

Kairi Consultants Limited (2004). Trinidad and Tobago-Poverty Reduction and Social Development. Report submitted to the Inter-American Development Bank, January.

Khitarishvili, Tamar (2009). Explaining the Gender Wage Gap in Georgia. The Levy Economics Institute of Bard College: Working Paper No. 577.

Leung, S., F., Yu, S. (1996). On the Choice Between Sample Selection and Two-Part Models. *Journal of Econometrics*. Vol. 72, pp. 197-229.

Lisaniler, Fatma Güven and Feyza Bhatti (2005). Determinants of Female Labour Force Participation: A Study of North Cyprus. *Review of Social, Economic & Business Studies*. Vol. 5/6, pp. 209-226.

Little, R. J. A. and Rubin, D. B. (1987). "Statistical Analysis with Missing Data." New York: John Wiley & Sons.

Maddala, G.S. (1986). Chapter 28: Disequilibrium, Self-selection, and Switching Models in *Handbook of Econometrics.* Vol. 3, pp. 1633-1688.

Mollet, Julius Ary (2011). Female Labour Force Participation and Economic Development in West Papua. Cambridge Scholars Publishing, Newcastle.

Montgomery, D. C., E.A. Peck, and G.G. Vining (2001). Introduction to linear regression analysis, 3rd edition. New York: Wiley.

Morrissey, Marietta. (1998). "Explaining the Caribbean Family: Gender Ideologies and Gender Relations." In Christine Barrow (ed.), *Caribbean Portraits: Essays on Gender Ideologies and Identities*. Kingston: Ian Randle Publishers.

Nawata, K. (1993). A Note on the Estimation of Models with Sample Selection Biases. *Economics Letters*. Vol. 42, pp. l5-24.

Nawata, K. (1994). Estimation of Sample Selection Bias Models by the Maximum Likelihood Estimator and Heckman's Two-Step Estimator. *Economics Letters*. Vol. 45, pp. 33-40.

Nawata K. (2004). Estimation of the female labor supply models by Heckman's two-step estimator and the maximum likelihood estimator. *Mathematics and Computers in Simulation*, Volume 64, Issues 3–4, pp. 385–392.

Nelson, F. D. (1984). Efficiency of the Two-Step Estimator for Models with Endogenous Sample Selection. *Journal of Econometrics*. Vol. 24, pp. 181-196.

Nicaise, I. (2001). Human Capital, Reservation Wages, and Job Competition: Heckman's Lambda Reinterpreted. *Applied Economics*. Vol. 33, Issue 3, pp. 309–315.

Puhani, Patrick A. (2000). The Heckman Correction for Sample Selection and Its Critique. *Journal of Economic Surveys*. Vol.14, No.1, pp. 53-68.

Reddock, Rhoda (1994). *Women, Labour & Politics in Trinidad & Tobago: A History.* Kingston: Ian Randle Publishers.

Rendtel, U. (1992). On the Choice of a Selection-Model when Estimating Regression Models with Selectivity. DIW-Discussion Paper. No.53, Berlin.

Seguino, Stephanie (2003). Why Are Women In The Caribbean So Much More Likely Than Men To Be Unemployed? *Social and Economic Studies*. Vol. 52 (4), pp 83-120.

Senior, Olive. (1991). *Working miracles: Women of the English-Speaking Caribbean*. London: J. Currey.

Sparr (ed.), *Mortgaging Women's Lives*. London: Zed Books, pp. 165-82.

Stolzenberg, R. M. and Relles, D. A. (1990). Theory Testing in a World of Constrained Research Design: The Significance of Heckman's Censored Sampling Bias Correction for Non-experimental Research. *Sociological Methods and Research*. Vol. 18, No. 4, pp. 395-415.

Walby, S. (1994). Methodological and Theoretical Issues in the Comparative Analysis of Gender Relations in Western Europe. *Environment and Planning*. Vol. 26, pp. 1339-1354.

Chapter 3 Gender Wage Gap in Trinidad and Tobago

3.1 Introduction

This chapter provides new insight into the nature and sources of gender wage inequality in Trinidad and Tobago. To achieve this, the gender wage gap was analysed using the well-known Blinder-Oaxaca and Neumark decomposition methodologies applied to nationally representative data for 2012. This chapter also contributes to the literature on the Caribbean region, which is generally an understudied geographical region in terms of wage gaps.

Globally, there has been a substantial amount of research conducted concerning labour markets. Many of these studies have focussed on gender disparities in developed countries (see *inter alia* Anderson *et al* 2001; Reiman 2001; Chichilnisky and Frederisksen 2008). However, there are fewer studies based on developing economies and even less on the Caribbean. A World Bank report comprising case studies on women's employment and pay (edited by Psacharopoulos and Tzannatos, 1992) contains 21 case studies of 15 Latin American countries, but only 1 Caribbean nation (Jamaica) is featured in the report. A more recent co-publication by the World Bank and the Inter-American Development Bank, issued in 2012, again looking at the Latin American and Caribbean region, contained 2 case studies on the Caribbean – Jamaica and Barbados (edited by Ñopo, 2012).

Of the studies based on the Caribbean's labour markets, only a few have concentrated on the gender earnings gap. Reilly and Bellony (2009) and Bellony and Reilly (2009) looked at labour market earnings in two Eastern Caribbean islands – Dominica and St. Lucia, highlighting gender, ethnic, and inter-industry pay gaps. Sookram and Watson (2008) investigated wage discrimination between males and females in the informal sector of Trinidad and Tobago. In 1997, Coppin explored women's earnings in Trinidad and Tobago based on household status (that is, headship versus non-headship) and ethnicity. More recently, in 2010, Bellony *et al*

investigated gender earnings gaps in two Caribbean countries (Barbados and Jamaica).

This research is timely and relevant in the context of Trinidad and Tobago; the disparity in earnings among men and women has serious implications for Trinidad and Tobago, given that, 35 per cent of all households are headed by women (Household Budgetary Survey, 2008/2009). In poverty research, gender inequalities in the labour market are considered as indicators that considerably restrain economic growth (United Nations Development Programme 2008). Data obtained from the Survey of Living Conditions (2005) has shown a decline in the national poverty Headcount Index from 18.4 per cent in 1998 (Household Budgetary Survey 1997/1998) to 11.0 per cent in 2005. Significantly, some 38 per cent of the poorest households in 2005 were headed by women.

In 2003, an assessment of Trinidad and Tobago's progress towards achieving the United Nation's Millennium Development Goals (in particular Goal 3: promote gender equality and empower women) revealed the estimated income of women was far less than men in comparable positions despite their higher educational achievements at all levels (United Nations Development Programme, *Human Development Report*, 2003). In spite of being categorised by the World Bank as a high-income country, alongside fourteen years of consecutive positive economic growth (prior to the global recession), the national poverty rate still stands in double-digits. A better understanding of the gender wage gap and wage discrimination will assist in improving gender equity and social wellbeing in Trinidad and Tobago.

The Government of Trinidad and Tobago has already recognised the importance of gender equity as evidenced by the drafting of the National Policy on Gender and Development (later revised in 2009). In the draft Gender Policy document, one of the strategic objectives includes the incorporation of "*a gender perspective in all development planning as the strategy for promoting gender equity and 'fairness' so that development planning itself becomes fundamentally gendered"*. In the

Government's overall framework for sustainable development – the "Seven Interconnected Pillars for Sustainable Development", the second Pillar refers to Poverty Eradication and Social Justice. To address this Pillar, the government has identified both female-headed households and single-parent households as most vulnerable to poverty (Ministry of Planning and the Economy, *Medium-Term Policy Framework 2012-2014*). In Trinidad and Tobago, poverty is higher among female-headed households because women's wages tend to be lower and fewer women in this group are in paid employment (UN Women Caribbean, *Advocacy Brief: Strengthening Women's Economic Security and Rights*). The results and analysis in this thesis should prove useful to policymakers in devising a more directed approach to tackle the issue of gender inequality and discrimination in the Trinidad and Tobago labour market.

The main finding of this chapter is that the gender wage gap has narrowed over the past twenty years, moving from 19.2 per cent in 1993 (Olsen and Coppin, 2001) to 11.4 per cent in 2012. However, the size of the gap differs greatly in the public and the private sector; the male-female pay gap in the public sector is negligible (3.2 per cent), while the gap in the private sector is far greater (23 per cent). The decompositions seek to compartmentalise the gap into two portions – first, a part due to differences in the productive characteristics between men and women and second, a part due to differences in returns for these characteristics. The results of the decompositions (Neumark method) reveal that if women possessed the same mean characteristics as men their wages would actually decrease by 11.6 per cent, but if their productive characteristics were rewarded the same as men their wages could potentially increase by as much as 26 per cent.

The remainder of this chapter is organised as follows. The next section presents an overview of the Trinidad and Tobago labour market, while section 3.3 discusses the theoretical underpinnings seeking to explain the existence of the gender wage gap, outlines how the gap can be measured, and includes some discussion on the shortcomings of these techniques. Section 3.4 briefly looks at some previous studies on gender wage gaps in Trinidad and Tobago. Section 3.5 follows with the

description of the data and the model used to measure the gap, and section 3.6 entails the discussion of the results. Section 3.7 concludes the chapter.

3.2 Overview of the Trinidad and Tobago Labour Market

Trinidad and Tobago is a two-island republic (officially called the Republic of Trinidad and Tobago) situated between the Caribbean Sea and the North Atlantic Ocean, northeast of Venezuela. The republic has a land area of 5,128 square kilometres (1,980 square miles), with a population of approximately 1.3 million people according to the latest Population and Housing Census conducted in 2011.

Trinidad and Tobago is an energy-based economy (mostly crude oil and natural gas), with the energy sector accounting for on average 40 per cent of the country's Gross Domestic Product (GDP) over the five-year period 2009-2013[16], and an estimated per capita GDP of US$10,727 in 2013. The energy sector however, dominates output but not employment. Tourism and manufacturing are also important sources of national revenue. The World Bank ranks the country as a high-income non-OECD country, and it is the most industrialised country in the English-speaking Caribbean.

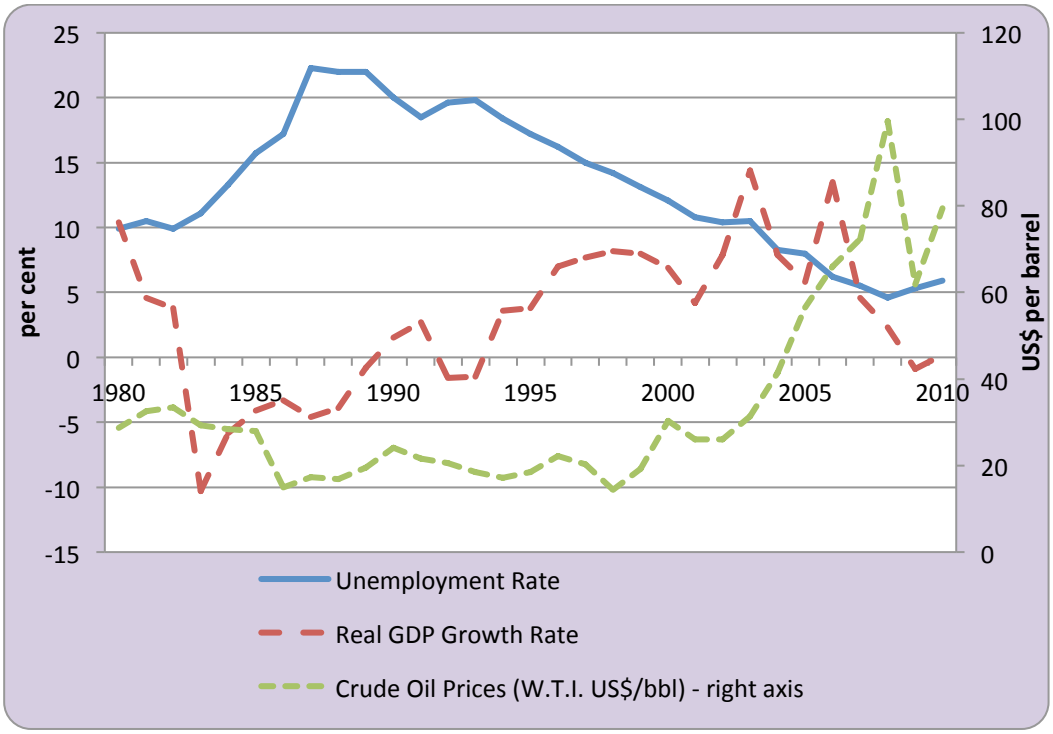
Oil was first discovered in Trinidad and Tobago in 1857 and soon grew to be a major contributor to the country's GDP. By 1970 the petroleum sector accounted for over 20 per cent of national output, and as oil prices increased so too did the importance of this sector grow in relation to economic growth. Given the country's dependence on the energy sector, Trinidad and Tobago's economic cycle has mirrored movements in the international price of oil. For instance, the country's boom period of 1974 to 1982 was accompanied by high and rising oil prices, and was followed by a bust period (1983-1989), when oil prices were low and falling.[17]

During the 1980s to the mid-1990s, Trinidad and Tobago's economy underwent several periods of bust and boom, before experiencing sustained economic growth

[16] Review of the Economy, 2013. Ministry of Finance and the Economy, Trinidad and Tobago.
[17] The average price of West Texas Intermediate (WTI) was US$17.26 per barrel in 1979, and jumped to US$28.67 per barrel in the following year and averaged US$31.55 over the three-year period 1980-1982. During the bust years of 1983-1989, WTI averaged US$22.08 per barrel.

for over a decade. The economy slowed in 1981 and 1982 (growing at 4.6 per cent per annum), then contracted over the years 1983-1989 with output declining by 4.8 per cent per annum. The economy recovered for a short period (1990-1991) before going into a slump again (1992-1993), and then had steady growth of 3.7 per cent per annum in 1994 and 1995 (Downes, 1998). Post-1995, the country experienced thirteen consecutive years of positive economic growth (growing at an annual average of 7.6 per cent) before the onset of the global financial crisis when the economy contracted by 0.9 per cent and 0.1 per cent in 2009 and 2010, respectively (Figure 3.2.1).

Figure 3.2.1: Unemployment Rate, Real GDP Growth Rate and Crude Oil Prices, 1980-2010



Source: Central Statistical Office of Trinidad and Tobago.

Given the country's recessionary period in the 1980s, the national unemployment rate more than doubled from 9.9 per cent in 1980 to 22.0 per cent in 1989. The economic recession also saw a decline in real wage rates, which fell by more than 9 per cent from 1983 to 1995 (Strobl and Walsh, 2003). By 2004, the national unemployment rate was in single digits and continued to progress downwards, measuring 5.9 per cent in 2010. With an unemployment rate at below 6.0 per cent, Trinidad and Tobago had the lowest unemployment rate among Caribbean

countries, with other countries experiencing double-digit unemployment rates (for example, in 2010 Jamaica's and Barbados' unemployment rates measured 12.4 per cent and 10.8 per cent, respectively). Real wages also improved, with the index of (real) average weekly earnings increasing by 36 per cent over the period 1995 to 2004.

As mentioned above, over the last five decades or so, Trinidad and Tobago's economy, including the labour market, has undergone significant changes. At the beginning of the twentieth century, like several other Caribbean countries, Trinidad and Tobago's economy depended heavily on the agriculture sector (mainly sugar and cocoa) to propel economic activity, and generate employment and foreign exchange. Following the discovery of oil, the importance of the agriculture sector, and in particular, employment in the sector, began to wane (Table 3.1).

Table 3.1: Distribution of Employment in Trinidad and Tobago by Sector, 1970-2011

/per cent/

Sector	1970	1975	1980	1985	1990*	1995*	2004-2011*
Agriculture and Forestry	23.0	14.0	10.0	11.0	12.1	10.7	2.6
Manufacturing, Mining, Quarrying	21.0	21.0	16.0	15.0	14.4	14.1	6.0
Construction, Electricity, Water, Gas	14.0	14.0	21.0	19.0	12.6	11.5	11.3
Distribution, Restaurants, Hotels	15.0	19.0	20.0	24.0	16.7	18.7	11.5
Transportation and Communication	6.0	8.0	8.0	7.0	7.3	7.1	4.5
Services	21.0	24.0	24.0	25.0	36.2	38.0	62.0

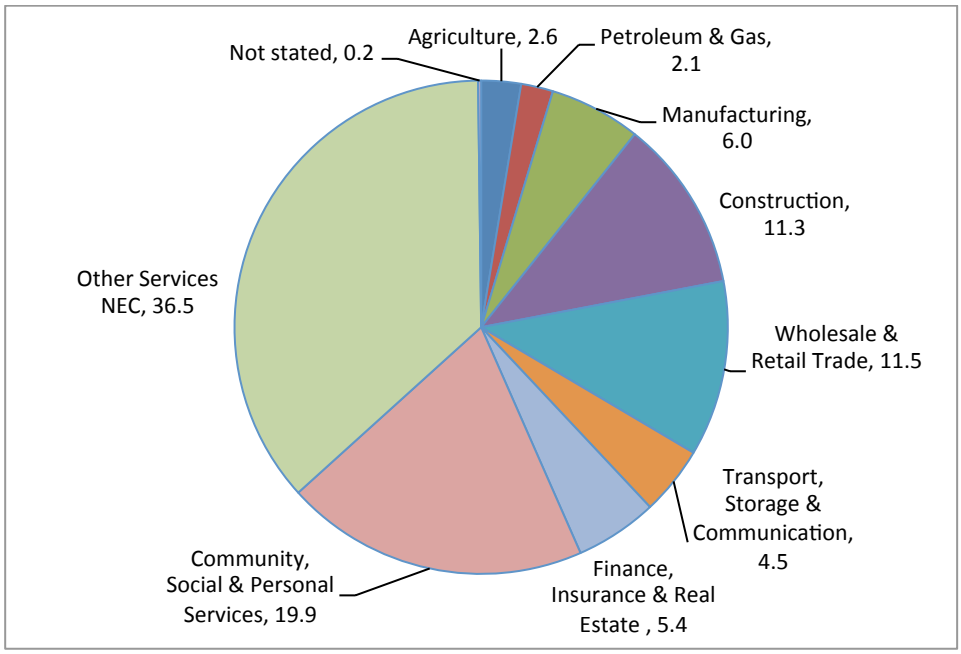
Source: Central Statistical Office of Trinidad and Tobago.

* The classification in 1990 onwards is more disaggregated than in previous years. In 1990 the petroleum industry accounted for 4.4 per cent of total employment, while in 1995 it accounted for 3.7 per cent, and averaged 2.1 per cent over the period 2004-2011.
Services category includes the following sub-categories: Finance, Insurance and Real Estate; Community, Social and Personal Services; and Other Services.

Employment in the agriculture sector moved from over 20 per cent of total employment in the 1970s to less than 5.0 per cent in the new millennium. The government and services sectors became the main employers in the economy

(Mahabir *et al*, 2013). During the period 2004 to 2011, the services sector accounted for, on average, 36.5 per cent of total employment; followed by community, social and personal services, which include the government (19.9 per cent); the construction sector (11.3 per cent); and wholesale and retail sectors (11.5 per cent) – Figure 3.2 Trinidad and Tobago, has often been argued, to suffer from Dutch Disease[18] following the oil boom of the 1970s – see *inter alia* Gelb (1988), Auguste *et al* (2011) and Hosein (2007). According to Hosein (2007), within the Caribbean region, the decline in the agriculture sector has been the most pronounced in Trinidad and Tobago; most notably, Trinidad and Tobago is the only country in the region that possesses significant oil and natural gas reserves.

Figure 3.2: Average Employment by Industrial Group, 2004-2011
/per cent/



Source: Central Statistical Office of Trinidad and Tobago.

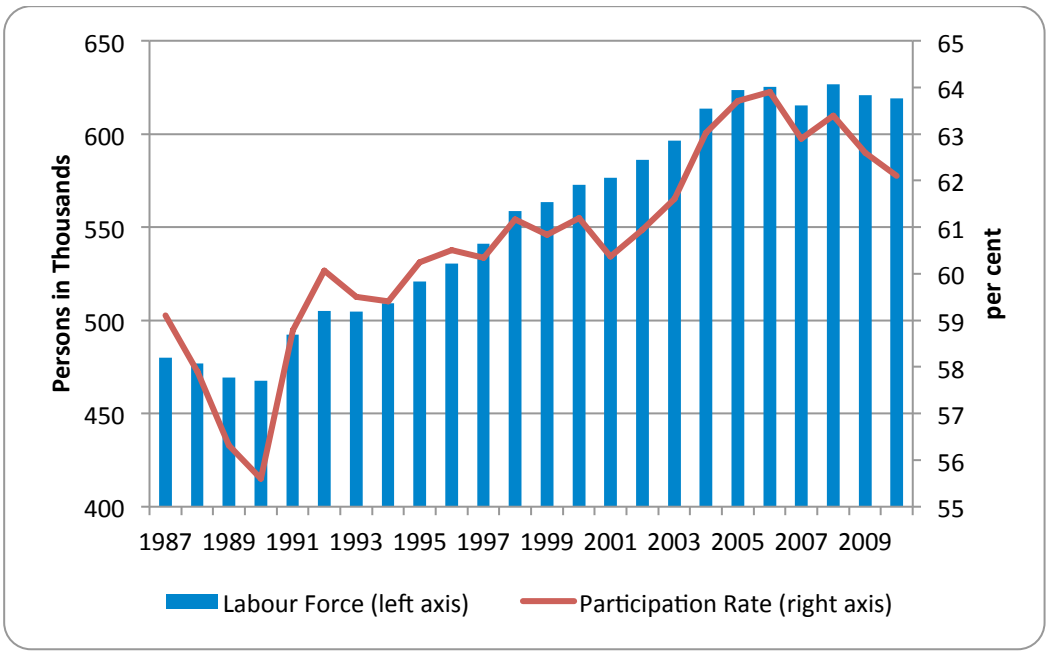
Following the recession of the 1980s, when the labour force participation rate (the labour force divided by the non-institutional population[19]) dipped to 55.6 per cent, the rate has hovered around 62 per cent over the last decade (Figure 3.22). The size

[18] Dutch disease refers to the relationship between the increase in economic growth propelled by the exploitation of natural resources and a decline in the manufacturing and/or agricultural sectors.

[19] The labour force consists of persons with a job, and those who are unemployed and seeking work. Persons who are not seeking work, for example a discouraged worker or a student, are not considered to be in the labour force. The non-institutional population consists of those persons who are 15 years old and over and who are not institutionalized.

of the labour force has increased over the years, moving from 480,000 persons in 1987 to 619,000 persons in 2010 – an annual average growth rate of 1.1 per cent (Figure 3.22). Even though males continue to be predominant, the share of females in the labour force has steadily increased moving from 31.8 per cent in 1980 to 41.4 per cent in 2010.

Figure 3.22: Trinidad and Tobago Labour Force and Participation Rates (Both Sexes), 1987-2010



Source: Central Statistical Office of Trinidad and Tobago.

As in most countries, female labour force participation rates[20] in Trinidad and Tobago are markedly lower than male participation rates. Despite this, the disparity between these rates has been decreasing – over the two decades spanning 1990 to 2010, male participation rates hovered around 75 per cent, while female participation increased from 38 per cent at the beginning of the period to just over 50 per cent in 2010.[21] Noteworthy however, in comparison to neighbouring Caribbean countries (namely, Jamaica and Barbados), Trinidad and Tobago has lower female participation rates. Between 2000 and 2009, Barbados and Jamaica's female

[20] The female labour force participation rate is the percentage of working age women who are either working or looking for work.

[21] Coppin (1997) attributes this increasing trend in female labour force participation (across the Caribbean) in large measure to higher levels of educational attainment and a changing social and economic structure, which affords women better labour market options.

labour force participation rates averaged 65.1 and 57.4 per cent, respectively[22] (Roopnarine and Ramrattan, 2012).

With respect to the institutional infrastructure, Rambarran (1998) has noted that Trinidad and Tobago's formal labour market institutions have "*traditionally been characterized by politically strong, oligopolistic firms producing for the domestic market and an equally powerful and aggressive trade union movement concentrated in the energy-related, capital-intensive manufacturing and public sectors."* In 2011, Trinidad and Tobago had 123 registered trade unions, representing 94,621 persons; this translates into a trade union intensity of 16.4 per cent (Mahabir *et al*, 2013). The presence of trade unions within specific industrial sectors can aid in the narrowing of the gender wage differential within that sector. Trinidad and Tobago's trade union intensity ratio of 16.4 per cent is considerably lower than the average trade union intensity of 26 per cent among industrialised countries.[23] Meanwhile, the country's trade union intensity ratio is on par with countries like Chile (14.3 per cent in 2009) and Mexico (14.4 per cent in 2010) (Mahabir *et al*, 2013).

The government of Trinidad and Tobago has ratified several International Labour Organisation (ILO) Conventions including the Tripartite Consultation (International Labour Standards) Convention, 1976 (No. 144). Some of the more important pieces of legislation passed in Trinidad and Tobago concerning the labour market include: the Industrial Relations Act (1972), the Retrenchment and Severance Payments Act (1985), the Minimum Wage Act (1976), and the Equal Opportunity Act (2000).

The Industrial Relations Act (IRA) was enacted to make better provision for the stabilisation, improvement and promotion of industrial relations in Trinidad and Tobago. The IRA made provisions for the establishment of an Industrial Court with jurisdiction *inter alia* to hear and determine trade disputes as well as to register collective agreements.

[22] Data were sourced from the International Labour Organisation (ILO).
[23] Data on industrialised countries refer to 2010, while Trinidad and Tobago's trade union intensity ratio refers to 2011 data.

The Retrenchment and Severance Payments Act prescribes the procedure to be followed in the event of redundancy and the provision for severance payments to retrenched workers. In the case of dismissal due to redundancy, the Act outlines the minimum severance payments to be a function of the length of uninterrupted service, generally 2–3 weeks for each year of service. Following the passing of the Retrenchment and Severance Payments Act, Rambarran (1998) highlighted that many employers consequently substituted full-time labour with part-time and temporary workers who are not covered by the legislation.

Even though the legislative framework allowing for the introduction of minimum wages was first passed in Trinidad and Tobago in 1976, a national minimum wage was only declared several years later in 1998. Since then, the national minimum wage has been revised twice and currently stands at TT$12.50[24] per hour (as of January 01, 2011) from TT$9.00 per hour (which was set in 2005), and up from the initial minimum wage of TT$7.00 per hour. The most recent amendment to the legislation raising the minimum wage to TT$12.50 per hour explicitly stated that this increase in the minimum wage was not intended to reduce the wages of employees who were already earning in excess of TT$12.50 an hour:

> *"This order shall not be construed as authorising –*
> *a) the reduction of wages paid to those employees who already receive wages in excess of the national minimum wage; and*
> *b) changes in the existing terms and conditions of any worker to effect a lowering of such terms and conditions."*
>
> (Minimum Wages Order 2010, Part II: 9)

In Trinidad and Tobago, the Equal Opportunity Act (EOA) was passed in 2000. The (EOA) prohibits an employer or prospective employer from discriminating against an employee or a prospective employee because of their status (race, disability, ethnicity, marital status, religion, sex, or geographical origin) and also from discrimination by victimisation whereby the person victimised is less favourably treated than other persons. The Act states that an employer shall not discriminate against an employee in the terms and conditions of employment as well as access to

[24] TT$ refers to Trinidad and Tobago dollars. TT$1.00 = US$0.16 (as at March 24, 2014).

opportunities for promotion, transfer, training, or any other benefit, facility or service related to the employment. The Act also allows for the establishment of an Equal Opportunity Commission and an Equal Opportunity Tribunal. Currently, Trinidad and Tobago does not have any legislation pertaining to *equal pay for work of equal value*.

3.3 Conceptual Framework

3.3.1 Theory of Discrimination

The gender wage gap is defined as the ratio of female to male earnings. Several theories have been put forward to explain the existence of the gender wage gap, where the gap is usually viewed as comprising of two parts: an "explained" portion and an "unexplained" portion. Some of these theories can be categorized as either neoclassical or institutional (sometimes referred to as labour market segmentation theories). However, no singular theory sufficiently explains the existence of the gender wage gap. Those theories used to account for the "explained" wage differential relate to human capital, social constructions of skill, "crowding" of jobs traditionally labelled as male and female jobs, labour market segmentation and other imperfections in the labour market. The "unexplained" component of the wage gap is usually considered to be due to discriminatory practices by employers.

Arrow (1971) describes labour market discrimination as follows,

> "*The fact that different groups of workers, be they skilled or unskilled, black and white, or male and female, receive different wages, invites the explanation that different groups must differ according to some characteristic valued on the market. In standard economic theory, we think first of all of differences in productivity. The notion of discrimination involves the additional concept that personal characteristics of the worker that are unrelated to productivity are also valued on the market. Such personal characteristics as race, ethnic background, and sex have been frequently adduced in this context.*"

Neoclassical theorists typically explain the male-female earnings gap within the tenets of human capital theory. Human capital theory relates the differences in pay for men and women to differences in the relative levels of human capital (experience and educational attainment), which is usually reflected in differences in productivity. Human capital is more profitable the longer the payoff period over which returns on investment can be realised (Altonji and Blank, 1999). The argument follows that most men expect to participate in the labour market throughout their lives, whereas some women expect to devote time to the household (either caring for their children or elderly parents), thereby shortening the payoff period and reducing the returns on the investment. In the latter case, it has been argued that for this reason women have acquired less human capital. Moreover, the human capital that a woman acquires will depreciate during her years out of the labour market (Altonji and Blank, 1999). In short, the value of the woman's human capital stock is reduced by her intermittent labour market attachment.

In the neoclassical literature, theoretical models have been used for both competitive and non-competitive market structures. The neoclassical models which assume competitive markets are based on Becker's concept of "*tastes for discrimination*", which assumes that employers or consumers have different "tastes" for the service of certain groups of workers (for example, women), or for the goods produced by these workers (Becker, 1971). These different tastes give rise to different wages, despite workers being equally skilled or productive. For instance, if employers *prefer* to hire males over females (prejudice in favour of male workers), a concept referred to in the literature as nepotism, employers will act as if hiring men is cheaper than it actually is (Becker, 1971). For instance, female workers may have to 'compensate' employers by being more productive at a given wage or, equivalently, by accepting a lower wage for identical productivity.

Neoclassical economists have also argued that discrimination may arise even in the absence of prejudice. The argument here stems from asymmetric information concerning the true productivity of potential male and female employees (Arrow, 1973). Given this uncertainty, employers use statistics about the average

performance of the group (here, male versus female) to predict the potential employee's productivity. This type of discrimination is termed *statistical discrimination*. Consequently, women may earn less than men simply because they have a higher probability of leaving the organisation (for instance, in order to rear children). By applying probabilities for the whole population to specific individuals, discrimination may arise.

In terms of institutional theories of labour market discrimination, the labelling of jobs as "male" and "female" can also influence gender pay differentials. When women are discouraged from applying to jobs seen as "men's jobs", (e.g. jobs in STEM industries – science, technology, mathematics and engineering), which are usually better paid jobs, women tend to "crowd" lower level occupations (e.g. teaching, nursing). This excess supply of female labour in these occupations tends to depress wages for such jobs. This phenomenon is known as *occupational crowding*.

The theory of segmented labour markets argues that the labour market consists of a primary market and a secondary market. The primary market offers workers higher wages and is usually characterized by higher levels of productivity, whereas, the secondary market is usually typified by low paying jobs, insecure employment and lower levels of productivity. Persons employed in the secondary market are usually limited in their ability to transfer to the primary market given their history of low productivity working in the secondary sector and by the labour market which favours those employees employed in the primary sector. Women may be concentrated in jobs within the secondary market for a number of reasons, as discussed above, including the effects of discrimination, and/or restrictions on their labour market options (Anderson *et al*, 2001).

In summary, wage differences among men and women can be partly explained in terms of their human capital endowments and access to the primary market for employment. In addition, there is overwhelming evidence to suggest that gender bias also plays an important role in determining the differences in wages for men

and women (Madheswaran and Khasnobis, 2007).[25] This discrimination of women's wages, sometimes measured by the "*discrimination coefficient*", is used to define employers "*taste for discrimination*" (Becker, 1971); this is discussed in more detail in the next section.

3.3.2 Decomposition Analysis

In the literature it is standard to investigate gender wage gaps using the Blinder (1973)-Oaxaca (1973) BO decomposition methodology. This decomposition approach is commonly used to measure labour market discrimination against women. The standard Oaxaca decomposition method enables the wage differential to be separated into differences that can be explained by differences in characteristics (sometimes referred to as the endowments component) and those that cannot be explained by differences in characteristics (usually referred to as the discrimination component). The Oaxaca methodology gives an estimate of the wage discrimination using *averages*, thus giving an indication of the overall extent of the gender wage gap.

In terms of the Oaxaca decomposition method, the gross wage differential can be defined as:

$$G = \frac{Y_m - Y_f}{Y_f} = \frac{Y_m}{Y_f} - 1 \qquad \text{Eq. (1)}$$

where Y_m and Y_f represent the wages of male and female individuals, respectively. In the absence of labour market discrimination, the male-female earnings differential would reflect pure productivity differences (Q):

$$Q = \frac{Y_m^0}{Y_f^0} - 1 \qquad \text{Eq. (2)}$$

where the superscript denotes the absence of market discrimination. The *market discrimination coefficient* (D) can then be defined as the proportionate difference between G +1 and Q +1:

[25] The authors reference previous studies such as the volume edited by G. Psacharopoulos and Z. Tzannatos (1992) which contains twenty-one studies of fifteen different Latin American countries, and Horton (1996) which analyses seven countries in East Asia. In the 1992 volume, on average, discrimination accounted for 88 per cent of the male pay advantage, while Horton (1996) concluded that differences in returns to male and female characteristics accounted for at least half of the gender pay gap (although this differential appears to be narrowing).

$$D = \frac{\left(Y_m/Y_f\right) - \left(Y_m^0/Y_f^0\right)}{\left(Y_m^0/Y_f^0\right)} \quad \text{Eq. (3)}$$

Equations (1) to (3) imply the following logarithmic decomposition of the gross earnings differential:

$$ln(G+1) = ln(D+1) + ln\,(Q+1) \quad \text{Eq. (4)}$$

This decomposition can be used to estimate male and female wage functions, using the semi-logarithmic earnings equations (Mincer, 1974) and ordinary least squares (OLS):

$$ln\,\bar{Y}_m = \hat{\alpha}_m + \sum \hat{\beta}_m \bar{X}_m \quad \text{(Male Earnings Function)} \quad \text{Eq. (5)}$$

$$ln\,\bar{Y}_f = \hat{\alpha}_f + \sum \hat{\beta}_f \bar{X}_f \quad \text{(Female Earnings Function)} \quad \text{Eq. (6)}$$

ln$\bar{Y}$ denotes the geometric mean of earnings, $\bar{X}$the vector of the mean values of the regressors, $\hat{\beta}$ the vector of coefficients, α the intercept term, and ε is the error term. The gross wage differential in logarithmic terms is given by:

$$ln(G+1) = ln\left(\bar{Y}_m/\bar{Y}_f\right) = \sum \hat{\beta}_m \bar{X}_m - \sum \hat{\beta}_f \bar{X}_f \quad \text{Eq. (7)}$$

The Oaxaca decomposition involves expanding equation (7). The difference of the coefficients of the two earnings functions is taken as *a priori* evidence of discrimination. In the absence of discrimination, for a given level of endowment, females would be paid according to the male wage structure. Hence, the hypothetical female earnings function without discrimination would be given as:

$$ln\bar{Y}_f = \hat{\alpha}_m + \sum \hat{\beta}_m \bar{X}_f \quad \text{Eq. (8)}$$

Subtracting equation (8) from equation (7), we get:

$$ln\,\bar{Y}_m - ln\,\bar{Y}_f = \left(\hat{\alpha}_m - \hat{\alpha}_f\right) + \sum \hat{\beta}_m \left(\bar{X}_m - \bar{X}_f\right) + \sum \bar{X}_f \left(\hat{\beta}_m - \hat{\beta}_f\right) \quad \text{Eq. (9)}$$

Alternatively, the decomposition can be represented as:

$$ln\,\bar{Y}_m - ln\,\bar{Y}_f = \left(\hat{\alpha}_m - \hat{\alpha}_f\right) + \sum \hat{\beta}_f \left(\bar{X}_m - \bar{X}_f\right) + \sum \bar{X}_m \left(\hat{\beta}_m - \hat{\beta}_f\right) \quad \text{Eq. (10)}$$

In equations (9) and (10), the first term on the right hand side gives the difference in the intercepts for the two groups, while the second term can be interpreted as differences in skills and characteristics, and the third term in both equations can be interpreted as the "*discrimination component*" or the difference in returns to characteristics.

By way of exposition based on equation (9), if $\bar{X}$ represented years of schooling, the coefficient on $\hat{\beta}_m$ gives an indication of how much a man's wage will increase if he gets one more year of schooling, while the coefficient on $\hat{\beta}_f$ gives the analogous statistic for women. Hence, if employers valued the characteristics (endowments) acquired by women as much as they value the endowments acquired by men, then $\hat{\beta}_m = \hat{\beta}_f$. Similarly, the intercepts give the earnings profile for each of the two groups. If employers valued the skills of men and women who have zero years of schooling equally, the two intercepts would be the same, that is, $\hat{\alpha}_m = \hat{\alpha}_f$. Therefore, the unexplained portion of the wage gap is captured by the difference in the intercepts and the third term. The wage gap that arises because of this differential treatment of men and women is typically defined as discrimination. The second term would be zero if men and women have the same average years of schooling ($\bar{X}_m = \bar{X}_f$); hence, part of the raw wage differential between men and women arises due to differences in skills between the two groups – the explained portion.

Either forms of the decomposition (equation 9 or 10) can be used based on the researcher's assumption of which wage structure (male or female) would exist in the absence of discrimination. However, decomposition can be sensitive to which wage structure is used, and in general, there is no *a priori* preference (Nordman and Rouband, 2005). In essence, the well-known "index number" problem arises. Researchers sometimes choose the wage structure for the more dominant group of workers; in this case, usually the male wage structure would be chosen as non-discriminatory.

Neumark (1988) has argued that the appropriate decomposition depends on the type of discrimination hypothesised – nepotism and/or discrimination. Under

nepotism, women are paid the competitive wage, but men are overpaid. Here, the coefficients from the women's earnings functions provide an estimate of the non-discriminatory wage structure. Under discrimination, employers pay men competitive wages but underpay women. In this case, the male coefficients should be taken as the non-discriminatory wage structure. In reality, employers may practice both nepotism and discrimination.

A possible solution to this dilemma is to assume that employer preferences are homogeneous of degree zero with each type of labour – that is, assume employers are only concerned about the proportion of each type of labour employed. With this restriction, Neumark proposed that the non-discriminatory wage structure can be estimated from an earnings function estimated over the pooled sample (that is, both men and women). This "pooled" wage structure is a weighted average of the male and female wage structures.

The Neumark (1988) general decomposition approach can be written as:

$$ln\,\bar{Y}_m - ln\,\bar{Y}_f = (\alpha_m - \alpha_f) + \sum \beta^* (\bar{X}_m - \bar{X}_f) + [\sum \bar{X}_m(\hat{\beta}_m - \beta^*) + \sum \bar{X}_f(\beta^* - \beta_f)]$$

Eq. (11)

where β^* is the vector of returns that would exist in the absence of gender discrimination. This decomposition form can be reduced to the Oaxaca's two cases above if the male wage structure is assumed to be non-discriminatory ($\beta^* = \beta_m$), or the female wage structure as non-discriminatory ($\beta^* = \beta_f$). β^* can be estimated using the weighted average of the wage structures of males and females via a pooled sample. The second term in equation (11) measures the amount of the total log earnings differential "explained" by gender differences in the measured characteristics. The first and the last two terms on the right hand side capture the "unexplained" portion of the log wage differential. Together, these three terms provide a possible measure of gender discrimination. The third and fourth terms of equation (11) capture the differences between the actual and pooled wages for men and women, respectively. More specifically, the third term reflects the overpayment of men (the advantaged group), while the fourth term gives the underpayment of women (the disadvantaged group).

Appleton *et al* (1999) has cautioned on the use of the Neumark decomposition technique since there is no evidence that the zero-homogeneity restriction on employer preferences is valid. In other words, it is not certain whether the pooled coefficients will be a good estimator of the non-discriminatory wage structure. Additionally, conventional wage structures may be mis-specified where key variables that may influence productivity (like motivation) are omitted (Appleton *et al*, 1999).

With reference to the data used to describe worker's characteristics most studies use micro-data from national surveys and include variables (subject to availability) such as hourly or gross wages; education; experience (or "potential experience", usually measured as age minus years of education minus age of school enrolment); age; ethnicity; marital status; on-the-job-training; tenure; occupation; industry; public versus private employment; union status; share of females in specific occupation; and location of job (that is, urban versus rural).

A meta-analysis of the international wage gap was conducted in 2005 by Weichselbaumer and Winter-Ebmer[26] in which the authors concluded that data restrictions had the biggest impact on the resulting gender wage gap. According to the authors, misspecification of the underlying wage equations due to data restrictions could result in serious bias in the calculation of the discrimination component. For instance, most researchers do not have access to variables like hourly wages or actual experience, and other human capital characteristics like on-the-job-training or job tenure. Also, Weichselbaumer and Winter-Ebmer (2005) found that using potential experience instead of actual experience overestimates the unexplained gender wage gap on average by 1.8 log points since this measure does not take into account women's more frequent labour market interruptions.

[26] This study included 263 research papers which covered 63 countries over the time period of the 1960s to 1990s.

3.3.3 Methodological Issues

In any analysis of the gender wage gap two major methodological issues arise (Beblo *et al*, 2003). Firstly, ensuring that the male and female earnings equations are estimated consistently, paying particular attention to the methodological problems of self-selection, heterogeneity, and endogeneity. Secondly, the choice of the decomposition technique of the wage gap is critical for meaningful interpretation of its components.

The Mincerian wage equations discussed above (equations 5 and 6) explain the male and female wage structures, respectively, following human capital theory where variables such as education and work experience are included in the $\boldsymbol{X}$ vector of explanatory variables. Most empirical studies also include job attributes (for example, public sector employment versus private sector), labour market features and demographic characteristics as well (Beblo *et al*, 2003). The endogenous variable is the logarithmic wage, $\ln Y$. These equations are usually estimated by ordinary least squares (OLS). Heckman *et al* (2003) have shown that the underlying assumptions of the Mincer wage equation may no longer hold and may in fact underestimate the returns to education.

Estimating these equations by OLS will provide consistent coefficient estimates[27] if the following orthogonality conditions are fulfilled:

$$E\left[\varepsilon_i \mid \bar{X}_i, I_i^* > 0\right] = 0 \qquad \text{Eq. (12)}$$

where I_i^* denotes a latent index variable which is positive if an individual i is employed and non-positive otherwise. For the orthogonality condition to be satisfied, the wage equation cannot be mis-specified (either through omitted variables, endogeneity or sample selection). Sample selection violates the orthogonality condition since by definition, the sample of working people excludes those who do not participate in the labour market and may not be a random selection of the overall population (Beblo *et al*, 2003). In addition, if the participation decision is correlated with the earnings function, the expected value of

[27] The property of consistency in an estimator ensures that the estimated coefficient will be close to the true parameter value with a high probability as the sample size "grows to infinity".

the error term in the earnings function may not be zero. To deal with this selectivity bias, a sample selection model of earnings can be applied which takes the participation decision into account (Beblo *et al*, 2003).

Earnings may also be influenced by a host of unobservable factors like intelligence and motivation; but these are difficult to measure. Heterogeneity arises if unobserved individual characteristics that affect wages are correlated with the explanatory variables. In effect, the presence of unobserved individual heterogeneity may yield biased coefficient estimates of the observed variables that are generated from OLS. This issue of heterogeneity may be circumvented by using panel data techniques or by using random parameter estimation (Beblo *et al*, 2003). The Trinidad and Tobago data set does not lend itself to panel data estimation.

The underlying wage equations can also be mis-specified due to the endogeneity of the explanatory variables. For example, education may be a function of previous earnings as well as present earnings; it is difficult to ascertain whether the higher earnings observed for better-educated workers are *caused* by their higher education, or whether individuals with greater earning capacity have chosen to acquire more schooling – this implies a simultaneity bias in the wage equation. To remove this bias, the endogenous variables should be instrumented (Beblo *et al*, 2003). The instrumented variable cannot be correlated with the error term, but should have a high correlation with the endogenous variable.

The second major methodological issue surrounding the analysis of gender wage gaps involves the choice of the decomposition technique used. For instance, as was previously mentioned the classic index number problem arises with the use of the BO decomposition methodology concerning the choice of the non-discriminatory wage structure used in the decomposition. With reference to the Neumark decomposition methodology, it was been found that this technique tends to overstate the effects of variables with large gender differences, and inaptly transfers some of the unexplained parts of the wage differential to the explained component (Fortin, 2006).

There is also a potential identification problem for dummy variable effects in BO decompositions, particularly for the unexplained component (Oaxaca and Ransom (1999); Fortin *et al.* (2010)) given that the sub-component estimates are sensitive to the choice of the reference category used in estimation. Oaxaca and Ransom (1999) showed that for the "unexplained" part of the gender wage differential, the subdivision into separate contributions is sensitive to locational transformations of the regressors. Thus, the results of the detailed "unexplained" component are arbitrary unless the regressors have natural zero points. Fortin *et al.* (2010) highlight that in BO decompositions, categorical variables generate two problems. First, categorical variables do not have a natural zero, therefore the reference point is usually chosen arbitrarily. Second, the conventional practice of omitting one category to identify the coefficients of the remaining categories makes the interpretation of the "unexplained" portion of the decomposition difficult – one cannot distinguish the portion attributable to group membership (that is, the true "unexplained" portion captured by the difference in intercepts) from the portion attributable to differences in the coefficient of the base (omitted) category. Jones (1983) initially highlighted these issues associated with the detailed decomposition of the "unexplained" component. Jones (1983) demonstrated that separating out the magnitude of the contribution of the constant term in the presence of a set of dummy variables depended on the omitted reference group. Fortunately, Oaxaca and Ransom (1999) also show that the estimated overall "unexplained" and the separately estimated endowment effects ("explained" component) are invariant with respect to the choice of left-out reference categories.

3.4 Previous Studies on Gender Wage Gaps in Trinidad and Tobago

There has been a wide range of empirical research on Trinidad and Tobago's labour market analysing disparities in wages not just based on gender, but ethnicity, marital status, employment in the public versus the private sector, and differences in wages in the formal and informal sectors of the economy. In this section, we attempt to summarise the results of these studies within the context of the gender wage gap for Trinidad and Tobago. We will focus the discussion on a few select issues known to

affect gender pay gaps, namely, returns to education, work experience, marital status, occupational segregation, ethnicity, and labour market participation.

Olsen and Coppin (2001) employed cross-sectional 1993 labour force (the Continuous Sample Survey of the Population, CSSP) data for Trinidad and Tobago to investigate the causes of gender income differentials. The authors found the unadjusted male-female income differential in 1993 to be 19 per cent, noting that this differential was relatively small when compared to the differentials observed in developed countries, which at the time ranged between 20 and 50 per cent (Blau *et al*, 1998). The male-female income differential in Trinidad and Tobago was also small when compared with other developing countries. For instance, the results of a World Bank study of 15 Latin American countries found that gender pay differentials averaged 30 per cent for the region (Psacharopoulos and Tzannatos, 1992). Comparisons to other Caribbean countries were relatively similar – based on 2004-data for Barbados and 2003-data for Jamaica, it was found that men earned between 14 and 27 per cent more than women in Barbados, and between 8 and 17 per cent more than women in Jamaica (Bellony, Hoyos, and Ñopo, 2010).

In 1993, working women in Trinidad and Tobago had higher levels of educational attainment than working men. This is also true for the overall Trinidad and Tobago population (that is, working and non-working persons). Olsen and Coppin (2001) noted that women enjoyed slightly higher returns to education than men and hypothesised that this may reflect women's poorer labour market options with low levels of education. Olsen and Coppin (2001) concluded that women in Trinidad and Tobago would have been worse off if they had men's level of education, as well as if they had received the male rate of return to education. These results suggest that women have a greater financial incentive than men to take advantage of higher levels of educational attainment (Olsen and Coppin, 2001).

With respect to the income-experience nexus, in Trinidad and Tobago, women were seen to have lower returns to experience than men and women's returns to

experience declined at a slightly faster rate than men's (Olsen and Coppin, 2001). For example, 20 years of experience was estimated to augment the average male's earnings by 62 per cent, but the same number of years of experience was estimated to increase the average female's wage by 42 per cent.

Being legally married had a statistically significant positive impact on both men's and women's wages (Coppin, 2000). However, the favourable, but smaller, marriage premium found for men in common law unions was not found for women in such unions (Coppin, 2000). For women, the premium for legal marriage is much smaller than that was observed for men. In 1993, men in common-law unions earned 72 per cent of what their legally married counterparts earned, while among women the corresponding ratio was 65 per cent (Coppin, 2000). Olsen and Coppin (2001) suggest that the observed difference in wage premia by type of marriage could be because, generally speaking, there may be a weaker marital bond in common law relationships where spouses in such unions are less likely to have the same level of career support as persons in legal marital unions.

Coppin (2000) estimated that just over half of the earnings differential between legally married men and those in common-law relationships was "explained" by differences in characteristics (age, education, work experience, etc.) that are valued by the labour market. On the other hand, the wage differential between married women and those in common-law unions was due to the endowments of characteristics they brought to their respective jobs.

Notwithstanding the above discussion, the effect of marriage yielding a wage premium, especially for men, might be a consequence of self-selection. Human capital theory postulates that the existence of marriage premiums arises because marriage itself increases the productivity of workers separate from the acquisition of additional human capital. Becker's (1981) theory of the family suggests that economies of scale within the family may allow both married partners to devote time and effort to labour market productivity. However, Ribar (2004) notes that

comparative advantage may lead to gender specialisation. The assumption is that married males will tend to specialise more in labour market activities, while married females will specialise in household production (Ribar, 2004). While labour market discrimination can account, in part, for the marriage wage premium that men enjoy, self-selection is also another underlying mechanism that should be considered: men who have characteristics that the labour market values may be in a better position to marry. In other words, marriage itself may not increase worker's productivity but, rather, more productive workers are more likely to get married (see *inter alia* Blackburn and Korenman, 1994; Hersch and Stratton, 2000; and Ribar, 2004).

Coppin (2000) estimated earnings functions correcting for self-selection and found that the marriage premium for men was reduced, but not eliminated. Even after controlling for self-selection a substantial marriage premium remained, implying that for married males working in Trinidad and Tobago, marriage does increase their productivity. The same was not true for those men in common-law unions where selectivity correction made the premium negative (Coppin, 2000). In contrast, correcting for selectivity in the female earnings functions substantially increased the marriage premium. This implies that the selectivity bias for women works in the opposite direction than for men. Unlike men, the less productive is a woman, the more likely she is to be married. This result is consistent with the marital choice literature which suggests that household gender specialisation results in men being valued more for their economic contributions and women being valued more for their household contributions (Becker, 1981; Manning and Smock, 1998; Sanchez *et al*, 1998).

Olsen and Coppin (2001) calculated the well-known Duncan Index of Dissimilarity[28] (Duncan and Duncan, 1955) values for gender segregation by occupation and for

[28] The Duncan Index of Dissimilarity (Duncan and Duncan, 1955) is a measure of occupational segregation and is often used to gauge whether there is a larger presence of one gender over another in a given occupation by identifying the percentage of employed women (or men) who would have to change occupations for the occupational distribution of men and women to be equal. A Duncan Index value of 0 implies the share of women in every occupation is the same as women's share of employment as a whole. In other words, 0 indicates *perfect* gender integration within the workforce, while a value of 1 indicates complete gender segregation within the workforce.

gender segregation by industry. In order to eliminate occupational segregation, 33.1 per cent of working women would have to change their occupations, while the concomitant value for industry was 35.8 per cent of women would have to change the industry in which they work in order for there to be a similar male-female distribution across industry categories. Moreover, Olsen and Coppin (2001) noted that women would have substantially higher incomes if their distribution of jobs by industry were the same as men's distribution of jobs, but by occupation, women would have significantly lower incomes with men's occupational distribution. This seemingly contrary outcome for industry and occupational distributions may be because of the structure of Trinidad and Tobago's labour market. It is not likely that most women in "female" occupations would be able to find similar jobs in "male" industries, where the rates of remuneration are higher (Olsen and Coppin, 2001). The authors do conclude however, that if all industry and occupational segregation were eliminated, overall, women would be better off in terms of receiving higher wages.

Sookram and Strobl (2009) utilized 1991-2004 waves of Trinidad and Tobago's labour force survey to analyse the role of educational choice in occupational gender segregation. In the context of gender wage gaps, it is widely recognised that occupational segregation can have substantial consequences in terms of gender discrimination as "female-type" jobs tend to be characterised by lower pay and worse working conditions. However, pre- and post-labour market entry decisions and opportunities regarding the level and type of education individuals pursue/receive can have an impact on future employment opportunities. These education choices can also be a consequence of discrimination with respect to family and societal gender preferences (Sookram and Strobl, 2009).

In terms of gender education policy in Trinidad and Tobago, the Education Act of 1966, the law that guides the course of education in the country, did not explicitly refer to gender-based discrimination in the education system. However, the

Education Policy Paper (1993-2003)[29] explicitly outlined guidelines to enhance gender equality in the education system. For example, one initiative emanating from this policy involved the development of a gender-neutral curriculum. Prior to this policy initiative, in co-educational schools there would be timetabled classes where the class would be divided between males and females, where the former would attend Industrial Arts classes (e.g. woodworking, metal work, technical drawing, etc.) while the latter would do Home Economics (cooking, sewing, home management, etc.). Under the new policy, the curriculum and timetable were reorganised in such a way that all students would partake in both Industrial Arts and Home Economics classes (Sookram and Strobl, 2009).

The investigation undertook by Sookram and Strobl (2009) covered the time period relevant to the implementation of the new educational policy that, in part, aimed at eliminating gender-based discrimination in education. In brief, the authors concluded that while educational segregation fell substantially over the period under review, this did not translate into less occupational segregation. At a more disaggregated level, there was considerable heterogeneity in terms of both education and occupation segregation. The authors discovered that at the disaggregated level, the link between educational choice and sorting by gender in employment is, on average, strongest and most consistent in lower level occupations. From a policy perspective, it seems that, at least in the case of Trinidad and Tobago, ensuring gender equality within the educational system was not sufficient to lead to less occupational segregation. Summarily, in Trinidad and Tobago, greater equality in human capital has not ensured greater equality in employment opportunities (Sookram and Strobl, 2009).

Olsen and Coppin (2001), again using 1993 labour force data for Trinidad and Tobago investigated the determinants of earnings by ethnicity and gender. The authors ran separate earnings functions for men and women across the major ethnicities prevalent in Trinidad and Tobago (African, Indian, Mixed/Other). They found the

[29] See National Report on the Development of Education in Trinidad and Tobago, 2004 for more details. Available at: http://www.ibe.unesco.org/National_Reports/ICE_2004/ttobago_scan.pdf.

largest male-female income differential (28 per cent) among Africans and the smallest differential (12 per cent) among the "Mixed/Other" ethnicity category. The researchers stated that one possible explanation for Africans having the largest male-female income differential might be due to this sub-ethnic grouping having the highest female labour force participation rate among the three ethnic groups.

Coppin and Olsen (2007) used 1993 data from the Trinidad and Tobago CSSP to investigate patterns of remuneration across the public and private sectors. The ratio of government to non-government wages in Trinidad and Tobago in 1993 was 1.63 for men and 2.14 for women. Government workers were found to have higher levels of education than their private sector counterparts, especially at the tertiary level. In terms of the gender pay gap, the authors found a much larger male-female income differential in the private sector compared to the pay gap found in public sector. In the public sector, men earned a wage premium of 6.3 per cent over women, while the male earnings premium in the private sector was estimated to be 31.6 per cent.

The authors suggest the smaller gender wage gap in public sector may be indicative of lower levels of gender discrimination within the public sector. Moreover, the researchers assert that the government may be using its market power to reduce gender discrimination. Notably, in 1993, the government's share of total employment was 33 per cent. This assertion was based on their findings where several personal characteristics (namely, education, experience, and marriage) received higher rates of return in the private sector compared to the public sector. However, in those cases where the rates of return to variables were higher in the government sector, the higher returns favoured women. In addition, in contrast to the general finding in empirical studies, women employed in the public sector enjoyed a larger marital premium compared to men. The authors postulate that this is evidence that the government in Trinidad and Tobago is attempting to use public policy to reduce levels of gender discrimination.

Sookram and Watson (2008) used the CSSP for 2006 to examine the relationship between the informal sector and gender. Caribbean economies have sizeable informal sectors – for Trinidad and Tobago, the size of the informal sector has been estimated to be between 14 per cent and 36 per cent during the period 1970-1999 (Llyod-Evans and Potter, 2002; Maurin *et al*, 2005; Sookram *et al*, 2006; Sookram and Watson, 2007). Men employed in the informal sector in Trinidad and Tobago tend to dominate in the "business" informal sector, whereas women tend to dominate in the "household" informal sector (Sookram *et al*, 2006; Sookram and Watson, 2007).

Based on the data from the 2006 CSSP, of the total number of individuals who work in the informal sector, 43.4 per cent of them were female. Sookram and Watson (2008) found that women were more likely than men to work only in one sector of the economy (informal versus formal), while men were more likely to work simultaneously in both sectors. There was evidence of a gender earnings gap in favour of men of 1.33 log points in the informal sector. Most of the observed income differential was attributed to wage discrimination rather than to differences in human capital between the two sexes. Moreover, the results show that experience is the main contributing factor in the male-female wage differential in the informal sector.

With respect to labour market participation, in Trinidad and Tobago, women are less likely to participate in the labour market. Based on 1993 labour force data, while women accounted for slightly more than half of the working and non-working sample, they comprised only one-third of the working sample (Coppin, 2000). Roopnarine and Ramrattan (2012) used 2008/2009 Household Budget Survey data for Trinidad and Tobago to investigate what are the main factors which influence the ability and/or desire of women to participate in the labour market. The results of the study were broadly in line with *a priori* expectations. Summarily, the level of schooling, household headship, and being unmarried/single all had positive influences on women's probability to participate in the labour market. On the other hand, the presence of children in the household, non-labour income (e.g. accessing social security programmes) and chronic illness had negative effects on female

participation. Country-specific variables like ethnicity and religion were also tested. Women of East Indian descent and Hindus were 10 per cent and 4 per cent, respectively, less likely to participate in the labour market. A feature of Trinidad and Tobago's labour market that may also account for the lower level of female participation is the low prevalence of part-time work among women. This feature of the Trinidad and Tobago labour market is in stark contrast to several developed countries' labour markets. In Trinidad and Tobago, among those women who work, they have similar lengths of the workweek, on average, 36.4 hours per week (Coppin, 1997).

3.5 Data and Econometric Specification

3.5.1 Data

Survey data was obtained from the Continuous Sample Survey of the Population (CSSP) for the third quarter of 2012. The CSSP is conducted by the national statistical office in Trinidad and Tobago (called the Central Statistical Office of Trinidad and Tobago) and is the country's official labour force survey.[30] The CSSP has two main advantages that make it a good source of data for analysing labour market issues in Trinidad and Tobago. Firstly, it is a nationally representative population survey, and secondly, it has the most detailed labour market characterisation of the population (Olsen and Coppin, 2001). The CSSP includes data on income, employment, sector, industry, education, and demographic characteristics. Consequently, using the CSSP should yield reliable results for the current type of labour market analysis being undertaken.

Notwithstanding these advantages, the data set is limited insofar that appropriate instrumental variables were not available to adequately address the econometric issues such as the possible endogeneity of education, heterogeneity, and sample

[30] The CSSP was designed as a multi-purpose household survey in 1963 with its primary objective being to provide up-to-date data on the labour force characteristics of the population of Trinidad and Tobago on a continuing basis. The survey used to be carried out on a semi-annual basis but was changed to a quarterly survey beginning from the first quarter of 1987. The duration of the quarterly survey is fixed to last exactly three months with each month consisting of two periods of a fortnight's duration.

selection. No major revisions have been made to the CSSP questionnaire since the late-1980s save for the inclusion of a few additional questions relating to ethnicity, location of employment, and having a second job. The other major nationally representative surveys conducted in Trinidad and Tobago include the Household Budget Survey (HBS) and the Survey of Living Conditions (SLC). Although both the HBS and SLC questionnaires include a question relating to gross monthly income, they do not enquire about the number of hours worked, making them not suitable for this analysis where hourly wages is used as the dependent variable. Additionally, at the time of conducting this research, both the HBS and the SLC were dated – the most recent HBS was conducted in 2008 while the most recent SLC was conducted in 2005. Consequently, as this research started in 2013, the (third quarter) 2012 CSSP was deemed as the most appropriate survey data to be used for our analysis.

During the third quarter of 2012, 8,070 persons were interviewed comprising of 4,002 men and 4,068 women. The sample that was drawn from these observations included only those persons aged 16-65 (that is, the working age population), employees (in the private and public sectors), those in full-time employment[31] and do not have a second job. All observations with a missing value for one of the variables were excluded. The number of observations in the sample was 2,022 with 1,168 males and 854 females. As the sample includes only wage earners (and only those observations of employed persons who reported non-zero wages), the results must be interpreted with some caution conditional on the selected sample.

The problems of sample selectivity, which tends to be more of an issue for women than for men due to their lower participation rates, and the potential problem of portion of the research given the lack of variables in the CSSP to form an appropriate selection equation (Heckman procedure) and/or instrumental variables. Labour force participation is often affected by family size, marital status, alternative sources of income besides wage-income, among other variables. The issue of selectivity and labour market participation is explored in more detail in Chapter 2.

[31] Full-time employment refers to persons who work at least 33 hours per week.

In terms of the returns to education obtained from OLS estimation, it is well established that if "ability" is positively correlated with both the level of education and earnings, the rate of return estimates based on OLS display an upward bias. Panel data techniques, such as instrumental variables, could be used to circumvent this issue of heterogeneity. However, even though there is consensus about the direction of the bias when heterogeneity is ignored, there is less agreement on its magnitude. Card (1999) has presented evidence to suggest that the extent of the bias may be modest. Card (1999) concluded, based on the results emanating from studies of identical twins, that there is a small upward bias (of about 10 per cent) in the return to education based on OLS estimation.

A summary of some descriptive statistics is presented in Table 3.3. The percentages of women and men employed in the public and private sectors appear to be similar with roughly 37 per cent of all women and all men being employed in the public sector and the remaining 63 per cent in the private sector.

Based on average gross monthly income, men out-earn women across all occupational groupings (Figure 3.5.1). However, on an hourly basis, (average) wages in the public sector for both men and women are fairly similar, while there is a much larger disparity between hourly wages for men and women in the private sector (Table 3.3). Average male (hourly) wages in the private sector is approximately 7 per cent higher than female private sector average wages. At the lower end of the pay scale men's average hourly wages are 4 times higher than women's average hourly wages. Meanwhile, at the middle of the wage distribution, hourly wages are similar for both genders, but at the higher end of the pay scale men's hourly wages are again higher than those of women – 1.8 times higher (Table 3.4). At first glance, Trinidad and Tobago's labour market shows signs of the "sticky floors" phenomena – that is, where the gender wage gap is wider at the bottom of the wage distribution.[32]

The average age of both working men and women is 37 years, but the average age of men employed in the public sector is slightly higher than women – 41 versus 38. The

[32] These striking differences in hourly wages for men and women at the lower and upper ends of the wage distribution will be explored in more detail using quantile regressions in the foregoing chapter.

reverse is true in the private sector, with the average age of women being slightly higher – 37 versus 35. The differences in ages between men and women working in the public and private sectors are significantly different from each other. Given that the CSSP does not capture actual experience, it is common in the literature to employ a measure of potential experience as a proxy. Potential experience is calculated as age minus years of education minus age at which formal schooling begins, which in Trinidad and Tobago is five years old. The largest disparity in the mean level of (potential) experience is in the public sector, with men having, on average, 26 years of experience compared with women having on average only 20 years of experience. Generally, a lower mean level of experience for working women is usually the mathematical consequence of their lower mean age and higher mean level of education than their male counterparts (Olsen and Coppin, 2001). In the public sector, women have, on average, 12.7 years of schooling compared to 10.3 years for men.

There is a higher percentage of female workers with tertiary (diplomas and university degrees) level education than there are male workers with post-secondary education (Table 3.3); this is contrary to human capital theory which postulates that, in general, given that women tend to have shorter payback periods to recoup their investment in human capital because they intermittently leave the labour market, women tend to accumulate lower levels of human capital compared to men (Altonji and Blank, 1999). This observation that working women have higher levels of educational attainment than men also applies to the overall Trinidad and Tobago population (that is, both working and non-working individuals). Indeed, a cursory look at the number of graduates from one of the country's leading tertiary learning institutions, the University of the West Indies, St. Augustine Campus, revealed that there was a higher number of female graduates[33] across all faculties except Engineering in the academic year 2010/2011. Furthermore, according to Reddock (2009), there is more incentive for young women in Trinidad and Tobago than there is for school-leaving males to stay in school longer, since there are fewer employment and financial opportunities (legal or otherwise) available to the former.

[33] Persons graduated from the following programmes: Advanced Diplomas, Certificates, Diplomas, Higher Degrees, and Undergraduate degrees.

In the overall working population, persons of African and Indian descent account for 84 per cent of the sample (with both ethnicities representing 42 per cent each), and all other ethnicities were grouped into a third category, referred to as "Mixed/Other"; this category includes minority ethnicities classified as White, Syrian/Lebanese, Chinese, Mixed and Other.

There is evidence of occupational segregation – for instance, a higher proportion of women are employed as clerical staff whereas there is a higher proportion of men working as machine operators (Table 3.3). On a more disaggregated level (not shown in Table 3.3), there is some level of occupational crowding for jobs traditionally labelled as "male" and "female". For example, in the occupational category "Professional", 74 per cent of the engineers were male, whereas, for the professions of nurses and primary school teachers 88 per cent were women in both professions.

The average (log) hourly earnings are higher in the public sector for both men and women than in the private sector. The sample used also shows that public sector employees are, on average, more educated than private sector employees. For instance, 13.7 per cent of the male employees in the public sector have achieved a university degree and 40 per cent of female public sector workers have a university degree. This compares to just 5.1 per cent and 11.3 per cent for male and female private sector employees with university degrees. Male public sector employees have more (potential) labour market experience (25.5 years) compared to female public sector employees (20.3 years) and both men and women (20.7 and 21.2 years) working in the private sector. This disparity in (potential) job experience may even be wider to the extent to which women are more likely to exit and re-enter the labour market to have a family, the potential experience calculation is likely to overestimate women's actual job experience. These differences in work experience and education may explain the higher average wage of public sector employees. Another probable cause for the disparity in average wages between public and private sector employees may be the greater concentration of professionals and

technicians in the public sector. Of all male public sector employees, 14.5 per cent are technicians while in the private sector only 9.2 per cent of all male employees are technicians. This disparity is even greater among women, with 27.7 per cent of all female public sector employees being technicians versus only 15.9 per cent of the female workforce being technicians in the private sector.

Table 3.2: Variable Definitions

Variable	Definition
Total Earnings	Gross Monthly Job Related Earnings – in Trinidad and Tobago dollars
Log Earnings	Natural Logarithm of Total Earnings
Education	Years of Education
Primary	1 if worker's highest level of education is primary schooling; 0 otherwise
Lower Secondary	1 if worker's highest level of education is CSEC (Caribbean Secondary Education Certificate)[1]; 0 otherwise
Upper Secondary	1 if worker's highest level of education is CAPE (Caribbean Advanced Proficiency Examinations)[2]; 0 otherwise
Tertiary	1 if worker's highest level of education is some university education; 0 otherwise
Public Sector	1 if the worker works for either a statutory board, government state enterprise, central government, or local government; 0 otherwise
Private Sector	1 if the worker works for a private enterprise; 0 otherwise
Potential Experience	Years of potential job experience = Age – (Years of) Education - 5
Potential Experience Squared	Years of potential job experience squared
Hours Worked	Number of hours worked in the previous week
Married	1 if the worker is married and currently living with spouse, or living with a common-law spouse; 0 otherwise
Unmarried	1 if the worker is not married/never had a partner, married but now living alone, or had a partner but now living alone; 0 otherwise
African	1 if the worker is of African descent; 0 otherwise
Indian	1 if the worker is of East Indian descent; 0 otherwise
Other	1 if the worker is of Mixed/Other ethnicity; 0 otherwise
Industry	Industries were classified based on the revised Standard Industrial Classification 2000 for Trinidad and Tobago (TTSIC)
Occupation	Occupations were classified based on the National Occupational Classification of Trinidad and Tobago (NOCTT)[3]

1 Caribbean Secondary Education Certificate (CSEC) examinations are usually taken by students after five years of secondary school, and are equivalent to the GCE Ordinary Level (O-Levels) examinations.

2 Caribbean Advanced Proficiency Examinations (CAPE) are equivalent to the British Advanced Levels (A-levels), and are voluntary qualifications that are intended for university entrance.

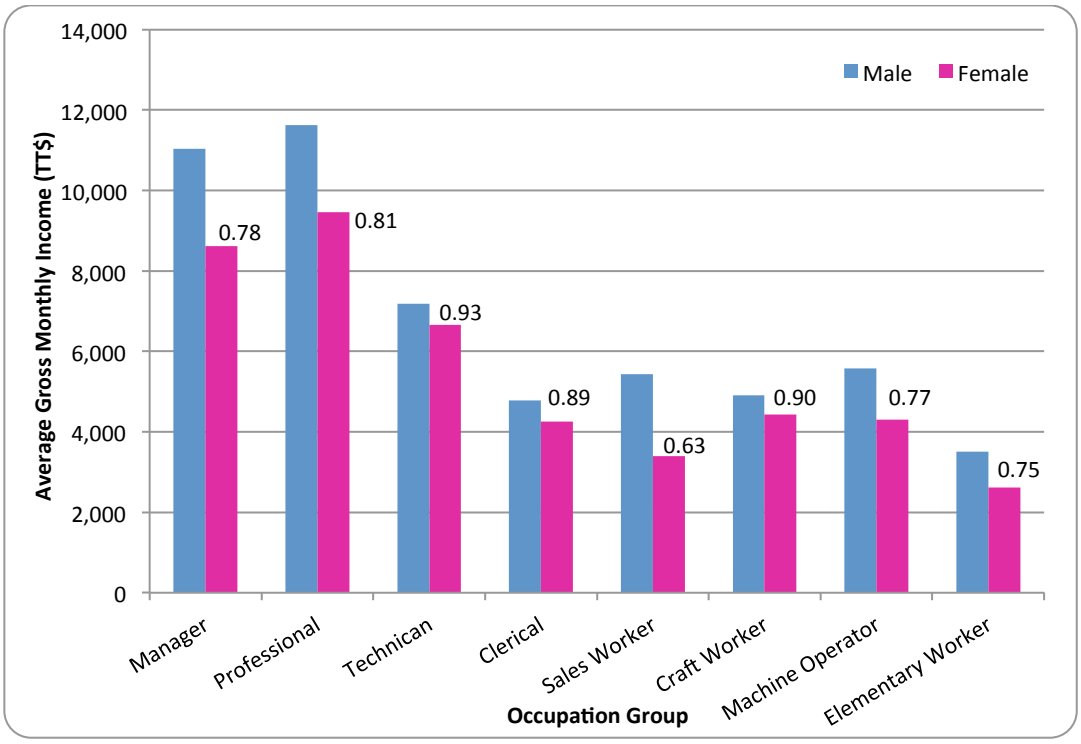
3 See Appendix I: National Occupational Classification of Trinidad and Tobago (2013) for further details.

Table 3.3: Sample Characteristics

	All		Public Sector		Private Sector	
	Men	**Women**	**Men**	**Women**	**Men**	**Women**
Sample size	1,168	854	392	350	776	504
Percentage of employed			33.4	41.0	66.6	59.0
Mean of log of hourly wages	3.28	3.17	3.50	3.46	3.17	2.96
Mean Age	37.2	37.2	40.8	37.9	35.4	36.8
Mean Potential Experience[1]	22.3	20.8	25.5	20.3	20.7	21.2
Mean Potential Experience Squared	662.4	586.4	807.0	564.0	589.4	602.0
Mean Years of Education	9.9	11.4	10.3	12.7	9.7	10.5
Education (%)						
Employees with at most:						
Primary schooling	24.3	15.6	21.7	11.1	25.6	18.7
Lower secondary schooling	39.6	31.3	28.8	18.6	45.0	40.1
Upper secondary schooling	28.1	30.1	35.7	30.3	24.2	30.0
Tertiary	8.1	23.0	13.7	40.0	5.1	11.3
Marital Status (%)						
Unmarried	54.9	56.6	48.7	56.0	58.1	57.1
Married	45.1	43.4	51.3	44.0	41.9	42.9
Ethnicity (%)						
African	38.4	45.7	48.1	52.0	33.5	41.4
Indian	47.0	36.1	39.4	30.6	50.8	40.0
Mixed/Other	14.6	18.2	12.5	17.4	15.7	18.7
Occupation (%)						
Elementary Worker	26.4	17.8	30.0	18.9	24.6	17.1
Machine Operator	13.5	1.5	10.2	0.3	15.2	2.4
Craft Worker	25.6	2.2	14.0	0.6	31.4	3.4
Sales Worker	12.5	23.7	14.8	9.1	11.4	33.7
Clerical	4.8	23.8	6.6	28.9	3.8	20.2
Technician	11.0	20.7	14.5	27.7	9.2	15.9
Professional	3.5	6.7	5.9	12.0	2.3	3.0
Manager	2.8	3.6	4.1	2.6	2.2	4.4
Industry (%)						
Construction	27.6	6.1	19.6	9.7	31.6	3.6
Agriculture/Fishing	2.4	1.2	3.6	2.6	1.8	0.2
Mining/Quarrying	4.8	0.9	2.8	0.9	5.9	1.0
Manufacturing	11.6	7.2	5.1	1.1	14.8	11.4
Electricity/Gas/Water	3.1	1.2	7.6	2.6	0.9	0.2
Wholesale/Retail	12.3	23.9	1.3	0.9	17.9	40.0
Transport/Communication	6.4	2.9	9.7	3.1	4.7	2.8
Finance/Insurance	6.8	12.1	2.0	3.4	9.2	18.1
Social/Personal Services/	25.0	44.5	48.3	75.7	13.3	22.7

1 Potential experience is defined as age minus years of education minus five.

Figure 3.5.1: Average Monthly Income by Gender



*Figures above the bars refer to the female-to-male earnings ratio.

Table 3.4: Hourly Wages

			Quantiles				
Hourly Wages*	**Mean**	**S.D.**	**Min.**	**0.25**	**Mdn.**	**0.75**	**Max.**
Male	30.88	20.31	5.00	18.75	25.00	37.50	225.00
Female	28.51	17.87	1.25	15.63	25.00	37.50	125.00

*Figures quoted in Trinidad and Tobago dollars.

3.5.2 Econometric Specification

Conventional Mincer-type wage equations were estimated for both men and women:

$$\log w_i = \alpha_i + \beta_1 \boldsymbol{X_i} + \beta_2 \boldsymbol{S_i} + \beta_3 x_i + \beta_4 x_i^2 + \mu_i \qquad \text{Eq. (13)}$$

where $\log w_i$, is an earnings measure (the natural logarithm of hourly wages. Hourly wages was obtained by dividing gross monthly wages by the number of worked hours. Working hours equal the number of hours worked on average during the week times four) for individual$i$, $\boldsymbol{S_i}$ represents a measure of schooling (more specifically, is a series of dummy variables for the highest level of education

attained), x_i is an experience measure (namely, potential experience), $\boldsymbol{X_i}$ is a vector of other variables assumed to affect wages (including marital status and ethnicity), α_i is a constant term, and μ_i is a disturbance term representing those factors that affect earnings but are not directly observed and is assumed to be independent of $\boldsymbol{X_i}$ and the other covariates. Given that this is a log-linear model, the coefficient β_k measures (approximately) the proportionate change in the expected value of log hourly wages given the covariates, $E(y|x)$ as x_k changes, as semi-elasticities.[34] Hence, α_i represents the logarithm of the wage due to zero schooling and experience; β_3 is the return to an additional level of schooling; and the coefficients β_3 and β_4 capture the positive but diminishing return to years of experience. The reference education category is primary school, unmarried for marital status, mixed/other for ethnicity, elementary for occupations, and social/personal services for industry. TablesTable 3.6 and Table 3.7 report the results for the human capital and expanded models, with separate log earnings functions for those employed in the public and private sectors.

Potential experience is used as a proxy for actual experience as this is not captured in the CSSP. Potential experience is included as a quadratic term, as is customary in this literature, to capture the concavity of the experience-earnings profile. The coefficients on potential experience and potential experience squared (β_3 and β_4) estimate the rate of growth in earnings resulting in an additional year of labour market experience; in lieu of actual data for on-the-job training, these coefficients can be interpreted as measuring the impact of on-the-job training on earnings. However, one must note that potential experience is usually a good measure of actual experience for men (since men tend to have continuous employment since leaving school), but less so for women (since women typically spend some time out of the labour force, for example, to care for young children, etc.). Consequently, the potential experience measure in reference to women tends to overestimate their actual years of experience and underestimate the impact of work experience on earnings (Tzannatos and Sapsford, 1993).

[34] The approximation is more accurate if β_k is small. The exact definition is that the proportional change in *y* is equal to $e^{\beta k} - 1$.

Schooling is a series of dummy variables for whether individuals' highest level of education is primary, lower secondary, upper secondary ('A' levels), or tertiary (diplomas and university degrees). The coefficients on the schooling dummies estimate the per cent increase in earnings (relative to the base dummy – primary school) resulting from obtaining an additional level of education.

Marital status is also a dummy variable for whether the employee is unmarried (single or separated) or married (including common-law). Dummies for ethnicity were also included (African, Indian, Mixed/Other). For the regression analysis, the "Mixed/Other" grouping was used as the base group since historically all the ethnic groups in this category have had higher social status in Trinidad and Tobago compared with Africans and Indians (Olsen and Coppin, 2001). Additionally, this avoids the issue of small sample size, which may yield unreliable estimates. In a second specification, additional controls for occupation and industry were included and the results of those estimates are presented in Table 3.7. The dependent variable was the log of hourly wages and was calculated as gross monthly-earned income divided by hours worked.

Pooled Regression with Gender Dummy

Some analyses of the gender wage gap begin with the estimation of the Mincer (1974) wage equation with the inclusion of a gender dummy to describe the relationship between wages and the relevant labour market characteristics:

$$\log w_i = \alpha_i + \beta_1 \boldsymbol{X_i} + \beta_2 \boldsymbol{S_i} + \beta_3 x_i + \beta_4 x_i^2 + \beta_5 F_i + \mu_i \qquad \text{Eq. (14)}$$

F_i is a gender dummy variable where 1 indicates a female individual and 0 a male individual. All other covariates are the same as in equation 13 above.

Pooled regression imposes the restriction that the returns to labour market characteristics are the same for men and women. Consequently, the coefficient on the gender dummy variable shows the extent to which the gender wage gap remains

unexplained after controlling for individuals' characteristics (see Appendix II: Measuring the Mean Gender Wage Gap using Pooled OLS Regressions Table AII.1 for the pooled regression results[35]). Given that a major limitation of using this pooled log wage equation is that the model assumes that the returns to labour market characteristics are the same across industries, occupations, sectors of employment, etc., Wald tests were conducted by interacting all the explanatory variables with the gender dummy variable to test whether or not the pooled estimation is appropriate. Previous studies have showed that men and women have different labour market characteristics and are rewarded differently for those characteristics. As such, this imposing restriction of the pooled earnings function may not be appropriate for the analysis at hand. Given the statistical significance of some of these tests[36] estimation of the separate earnings functions for men and women was deemed more appropriate.

3.6 Results

3.6.1 Wage Equations

In general, the results are consistent with the views of human capital and its influence on labour market income. For example, education and experience are statistically significant and both impact positively on income; experience, at least in the case of women, has a diminishing impact over time as is hypothesised by human capital theory. Similarly, demographic factors like marital status, in the case of men, influence earnings as expected; that is to say, those in marital unions tend to earn a premium over their unmarried counterparts.

The model based on human capital theory (Table 3.6), reveals that for both sexes, education is a highly significant determining factor, as expected, for wages. Given that schooling enters the regression as a series of dummies pertaining to the highest

[35] Summarily, the unexplained gender wage gap for the human capital model was 26.7 per cent and 23.2 per cent in the full model, which includes controls for sector of employment, occupation and industry.

[36] Wald tests on marital status, sector of employment, occupation, and industry were statistically significant at the 5 per cent level (see Appendix III Table AII.2).

level of education achieved (denoted below as P, LS, US, and, T for primary, lower secondary, upper secondary and tertiary), the private rate of return to different levels of schooling can be derived from the following formulae:

$$r_{LS} = (exp\ (\beta_{LS}) - 1)/(S_{LS} - S_P)$$

$$r_{US} = (exp\ (\beta_{US} - \beta_{LS}) - 1)/(S_{US} - S_{LS})$$

$$r_T = (exp\ (\beta_T - \beta_{US}) - 1)/(S_T - S_{US})$$

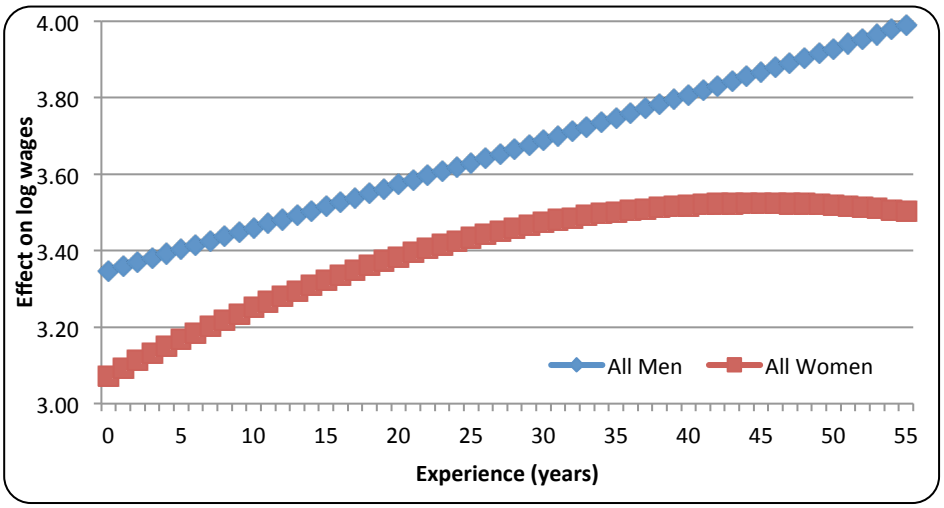
where S_P,S_{LS}, S_{US}, and S_T stand for the total number of years of schooling for each successive level. As expected, earnings increase with each incremental increase in educational attainment (Table 3.5).

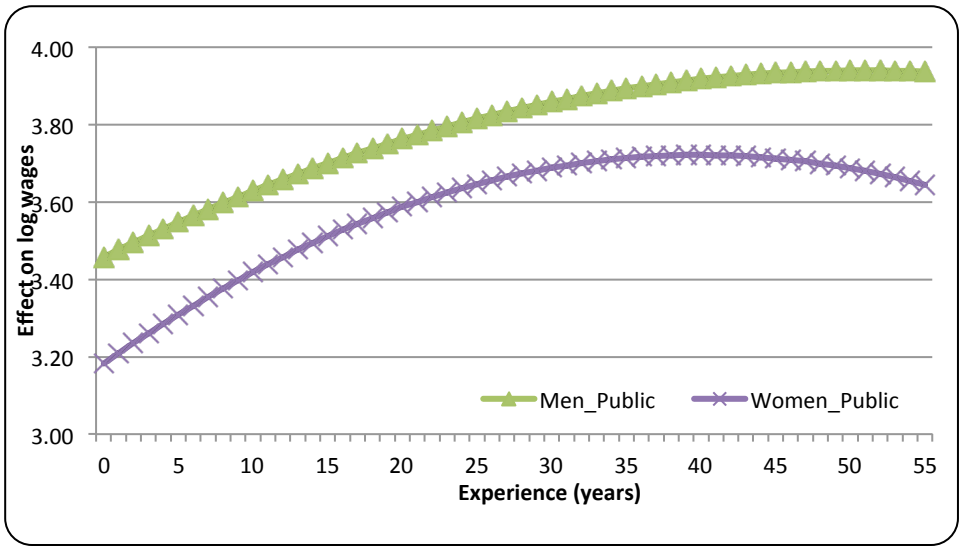
In the overall sample, the estimated differentials to schooling for women at all levels of education are not statistically different (at the 95% confidence interval) from those for men. In the public sector however women's private returns to lower secondary schooling is more than double the returns for men (9.2 per cent vs. 3.4 per cent), while the returns to upper secondary schooling is slightly higher for men than for women (12.6 per cent vs. 11.6 per cent); for tertiary education, male and female rates of return are 15.4 per cent and 15.0 per cent, respectively, but this difference is not statistically significant. In the private sector, there exists greater differences in the returns to schooling by gender, but none of these differences are statistically significant. Based on the results of this baseline model, workers in Trinidad and Tobago enjoy slightly higher returns to schooling at the tertiary level compared with the regional average (based on 2011 data) – on average, in Trinidad and Tobago men and women have returns to tertiary education upwards of 20 per cent compared to the regional (Latin America and the Caribbean) average of 17.6 per cent (Montenegro and Patrinos, 2013).

Table 3.5: Returns to Schooling by Educational Level and Gender – Human Capital Model

Highest level of Education	All Men	All Women	Public Sector		Private Sector	
			Men	Women	Men	Women
Lower Secondary	5.1%	4.6%	3.4%	9.2%	5.4%	2.8%
Upper Secondary	9.1%	11.9%	12.6%	11.6%	6.0%	9.4%
Tertiary	23.4%	21.8%	15.4%	15.0%	28.9%	24.2%

Figure 3.6.1: Wage-Experience Curves (Parsimonious Model)





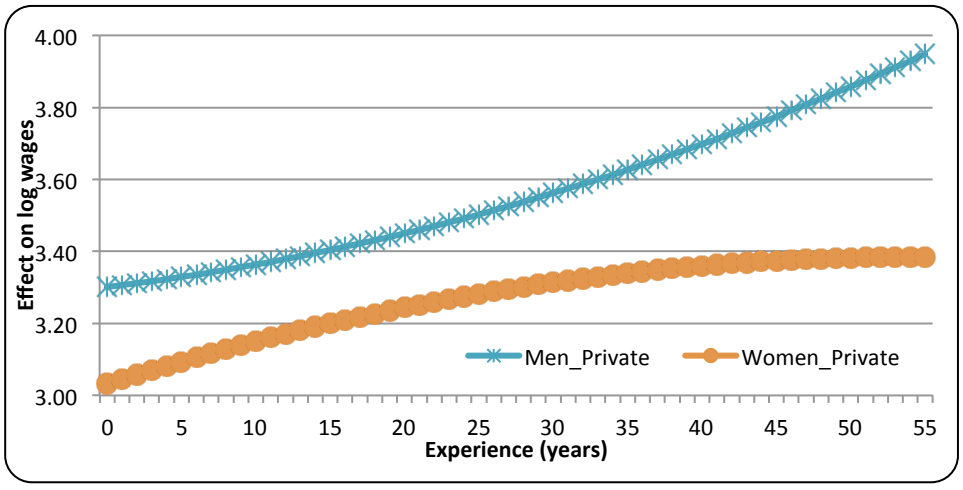


Table 3.6: Earnings Functions for Men and Women – Human Capital Theory

	All Men	All Women	Public Sector		Private Sector	
			Men	Women	Men	Women
Potential Experience	0.011***	0.020***	0.019***	0.027***	0.005	0.013**
	(0.004)	(0.005)	(0.007)	(0.008)	(0.005)	(0.006)
Potential Experience Squared	1.21E-05	-2.22E-04	-1.87E-04	-3.38E-04**	1.23E-04	-1.20E-04
	(8.40E-05)	(9.82E-05)	(1.37E-04)	(1.66E-04)	(1.07E-04)	(1.19E-04)
Education						
Lower Secondary	0.226***	0.205***	0.159***	0.378***	0.240***	0.133**
	(0.037)	(0.051)	(0.057)	(0.103)	(0.049)	(0.058)
Upper Secondary	0.536***	0.595***	0.567***	0.758***	0.455***	0.451***
	(0.041)	(0.054)	(0.055)	(0.09)	(0.057)	(0.065)
Tertiary	1.197***	1.221***	1.047***	1.229***	1.223***	1.128***
	(0.062)	(0.052)	(0.075)	(0.086)	(0.108)	(0.082)
Marital Status						
Married	0.146***	-0.004	0.080*	-0.085*	0.178***	0.045
	(0.029)	(0.033)	(0.043)	(0.047)	(0.036)	(0.042)
Ethnicity						
Indian	0.01	-0.037	-0.022	-0.050	0.027	-0.038
	(0.039)	(0.046)	(0.061)	(0.072)	(0.048)	(0.059)
African	0.034	-0.029	-0.041	-0.018	0.033	-0.079
	(0.039)	(0.045)	(0.06)	(0.068)	(0.049)	(0.06)
Constant	2.603***	2.394***	2.764***	2.384***	2.607***	2.477***
	(0.061)	(0.072)	(0.108)	(0.116)	(0.074)	(0.091)
No. of Observations	1,157	849	388	350	769	499
R-squared	0.365	0.443	0.446	0.444	0.286	0.342

Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1
Dependent variable is the log of hourly wages. Base dummy variables are: Education - primary school; Marital Status - unmarried; Ethnicity - mixed/other.

Table 3.7: Earnings Functions for Men and Women – Full Model

(Human Capital Theory & Controls for Industry and Occupation)

	All Men	All Women	Public Sector		Private Sector	
			Men	Women	Men	Women
Potential Experience	0.008**	0.019***	0.018***	0.021***	0.003	0.015***
	(0.004)	(0.004)	(0.007)	(0.006)	(0.005)	(0.005)
Potential Experience Squared	3.16E-05	-2-39E-04***	-2.14E-04*	-2.57E-04*	1.09E-04	-1.87E-04*
	(7.78E-05)	(8.51E-04)	(1.26E-04)	(1.42E-04)	(9.50E-05)	(9.99E-05)
Education						
Lower Secondary	0.156***	0.102**	0.025	0.170*	0.133***	0.034
	(0.036)	(0.049)	(0.049)	(0.093)	(0.045)	(0.056)
Upper Secondary	0.368***	0.284***	0.247***	0.265***	0.272***	0.163**
	(0.043)	(0.056)	(0.058)	(0.095)	(0.053)	(0.065)
Tertiary	0.794***	0.607***	0.561***	0.488***	0.649***	0.550***
	(0.075)	(0.066)	(0.088)	(0.099)	(0.13)	(0.102)
Occupation						
Machine Operator	0.211***	0.110	0.270***	1.040***	0.215***	0.072
	(0.043)	(0.213)	(0.064)	(0.129)	(0.051)	(0.194)
Craft Worker	0.153***	0.362***	0.212***	0.326	0.171***	0.328***
	(0.033)	(0.115)	(0.054)	(0.215)	(0.04)	(0.116)
Sales Worker	0.252***	0.120**	0.372***	0.375***	0.101*	0.037
	(0.046)	(0.05)	(0.063)	(0.102)	(0.059)	(0.054)
Clerical	0.195***	0.348***	0.155**	0.237***	0.202**	0.311***
	(0.059)	(0.045)	(0.072)	(0.074)	(0.095)	(0.057)
Technician	0.360***	0.594***	0.332***	0.606***	0.425***	0.487***
	(0.046)	(0.06)	(0.07)	(0.084)	(0.058)	(0.073)
Professional	0.516***	0.858***	0.478***	0.881***	0.549***	0.641***
	(0.102)	(0.07)	(0.108)	(0.095)	(0.167)	(0.116)
Manager	0.604***	0.746***	0.360***	0.679***	0.784***	0.714***
	(0.08)	(0.086)	(0.112)	(0.139)	(0.123)	(0.106)
Industry						
Agriculture/Fishing	-0.109	0.016	-0.018	-0.126	-0.112	-0.211***
	(0.1)	(0.163)	(0.104)	(0.18)	(0.153)	(0.058)
Mining/Quarrying	0.387***	0.040	0.192**	-0.187	0.627***	0.455***
	(0.063)	(0.113)	(0.09)	(0.212)	(0.081)	(0.122)
Manufacturing	0.093**	-0.018	0.355***	0.557***	0.257***	0.198***
	(0.044)	(0.065)	(0.085)	(0.164)	(0.055)	(0.071)
Electricity/Gas/Water	0.331***	0.475***	0.224***	0.438***	0.436**	-0.540**
	(0.074)	(0.181)	(0.075)	(0.104)	(0.19)	(0.211)
Wholesale/Retail	-0.096**	-0.176***	0.223	0.356***	0.136***	0.073
	(0.041)	(0.042)	(0.228)	(0.097)	(0.051)	(0.056)
Transport/Communication	0.161***	0.053	0.244***	0.150*	0.188**	0.189*
	(0.057)	(0.082)	(0.06)	(0.08)	(0.089)	(0.105)
Finance/Insurance	0.088	0.082**	-0.188	0.020	0.395***	0.385***
	(0.061)	(0.042)	(0.171)	(0.120)	(0.078)	(0.065)
Construction	0.046	-0.178***	-0.172***	-0.474***	0.276***	0.287***
	(0.033)	(0.068)	(0.048)	(0.1)	(0.045)	(0.099)
Constant	2.529***	2.370***	2.743***	2.478***	2.413***	2.289***
	(0.061)	(0.077)	(0.096)	(0.117)	(0.069)	(0.092)
No. of Observations	1,157	847	388	350	769	497
R-squared	0.463	0.572	0.608	0.677	0.439	0.520

Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1
Dependent variable is the log of hourly wages. Base dummy variables are: Education - primary school; Marital Status - unmarried (not reported); Ethnicity - mixed/other (not reported); Occupation - Elementary Occupations; Industry - Social/Personal Services.
Ethnicity and marital status are included in the regressions, but not shown.

In terms of potential experience, this variable is statistically significant for both men and women, with the exception of men working in the private sector. Figure 3.6.1

depicts the wage-experience nexus based on the "average" man and "average" women[37] and shows the effect of increasing potential experience on log wages (holding education, ethnicity, and marital status constant). Men appear to be rewarded much more than women for their work experience, and appear to have increasing returns over time. On the other hand, over time the rewards to women's work experience declined. For instance, after 40 years of experience, the log wages of women working in the private sector begin to wane, whilst the wages of their male counterpart remain on an upward trajectory.

Marital status is only significant for male employees in the private sector. Human capital theory postulates that being in a marital union tends to positively impact men's wages. In Trinidad and Tobago, married men working in the private sector enjoy wages that are on average 17.8 per cent higher than their unmarried colleagues. Ethnicity does not appear to be a significant determining factor for wages for both men and women. The statistically significant higher intercept terms for men employed in both the private and public sectors show that men enter the labour market at an advantage compared to women.

The models improve in explaining the variation in (log) wages when controls for occupation and industry are included given the higher R^2 value (Table 3.7). Most striking is the returns to schooling across all levels (lower secondary, upper secondary and tertiary) of academic achievement; these estimated returns are much lower in the full model than in the parsimonious one. For example, the returns to schooling in the private sector (for both men and women) more than halved compared to the estimated returns in the parsimonious model (Table 3.8). It appears, as one would expect, that higher levels of education help both men and women to get into higher paying occupations (and industries).

[37] Here the "average" man/woman was characterised using the coefficients on the independent variables based on the OLS estimates presented in Table 3.6 to determine the intercepts, that is, holding all other characteristics constant, the corresponding level of log wages with no experience.

After controlling for occupation and industry, the effect of potential experience on (log) wages for men and women show similar rates of diminishing returns although, in absolute terms men enjoy higher wage premiums for their work experience. In the private sector both men and women get higher wage premiums for their work experience compared to their respective counterparts working in the public sector. Similar to the parsimonious model, post-35 years of work experience, the wage premium private-sector female employees receive begin to diminish, whilst male employees continue to receive increasing returns for their work experience.

In general, tests for the equality of the coefficients on the categorical variables occupation and industry for men and women in the overall sample revealed that these respective coefficients are not significantly different from each other; the only male versus female coefficients that were significantly different from each other (at a 5% level) included Technicians and Professionals and those working in the Mining/Quarrying, and Construction industries. Notably, these occupations have a higher percentage of female workers (around 58 per cent of all employees for both occupational groups are female), whereas the two industries are predominately male (around 87 per cent). In the public sector the only coefficients that were statistically different between the genders were those for Machine Operators, Professionals, and Construction workers. In the private sector none of the occupation and industry coefficients were statistically different between male and female employees, except for the Electricity/Gas/Water industry.

The lack of significant differences in the coefficients for education, occupation and industry indicate that one should be careful not to read too much into the contribution of the coefficient differences in the decompositions.

Table 3.8: Returns to Schooling by Educational Level and Gender - Full Model

Highest level of Education	All Men	All Women	Public Sector		Private Sector	
			Men	Women	Men	Women
Lower Secondary	3.4%	2.1%	0.5%	3.7%	2.8%	0.7%
Upper Secondary	5.9%	5.0%	6.2%	2.5%	3.7%	3.4%
Tertiary	13.3%	9.5%	9.2%	6.2%	11.4%	11.8%

3.6.2 Decompositions of the Wage Equations

This section evaluates the gender differences in log wages via the standard decomposition methodologies discussed above, namely the Oaxaca and Neumark methods outlined in equations (9), (10) and (11). The gender wage gap decompositions based on these methods are shown in Table 3.9 using two different models, firstly using human capital characteristics only (parsimonious model) and secondly expanding the list of explanatory variables to include controls for occupation and industry (full model). For ease of interpretation, the decomposition results were retransformed from the logarithmic scale (recall that log of hourly wages was used as the dependent variable) to the original scale of hourly wages (in Trinidad and Tobago dollars, TT$).

In terms of the decompositions, using the Oaxaca methodology, the classic index number problem arises based on the chosen wage structure used as the "non-discriminatory" wage structure, or in other words, the wage structure used for the reference coefficients. There is no *a priori* preference for the use of either the male or female wage structure, even though some researchers tend to use the wage structure for the more dominant group as the reference wage structure. To circumvent the index number problem, the non-discriminatory wage structure was estimated over a pooled sample of both the male and female earnings functions – i.e. the Neumark method. The discussion of the results in the proceeding sections will be based on the Neumark method.

Considering the individual characteristics in the "explained" and "unexplained" components (Table 3.10 and Table 3.11), coefficients greater than unity indicate a widening of the gap, while coefficients less than unity, indicate a closing of the gap. Recall that the explained component is that portion of the wage differential that is explained by differences in characteristics between men and women, while the unexplained component corresponds to the differences in the coefficients as well as the difference between the constants. The unexplained component is usually attributed to discrimination in the labour market, but also captures all potential effects of differences in unobserved variables (e.g. ability and motivation).

In the parsimonious model, the (geometric) mean level of wages for men and women are TT$26.48 and TT$23.79, respectively; this translates into a gap of 11.3 per cent. Adjusting women's mean level of characteristics to the mean levels of men would *decrease* women's wages by 14.8 per cent, while equalising the differences in rates of return would *increase* women's wages by 30.6 per cent.

The major differences in mean characteristics between men and women ("explained" component) relate to potential experience and education. On average, men have more years of work experience than women – 22.3 years versus 20.8 years (this difference is statistically significant), while women have more years of schooling – 11.4 versus 9.9 (this difference is also statistically significant). If women's mean level of tertiary education was adjusted to the mean level of men's tertiary education, their wages would be 10.2 per cent lower, whereas, if they had the same years of experience as men, their wages would increase by 2.1 per cent.

The "unexplained" component of the gap appears to be driven in large part due to differences in the intercepts, and to a lesser extent, marital status. Married men receive higher wage premiums than do married women – if married women were rewarded at the equivalent rate as married men, their wages would increase by 3.4 per cent. The male advantage in the labour market is captured by the difference in

the constant terms – if employers valued female employees to the same extent that they valued male employees, female wages would increase by 35.7 per cent.

Table 3.9: Decomposing the Gender Wage Gap using the Oaxaca and Neumark Methods

	Parsimonious Model	Full Model
(Geometric) Mean of male hourly wages	$26.48	$26.48
(Geometric) Mean of female hourly wages	$23.79	$23.76
Wage Gap:	1.113	1.114
Using the male wage structure, difference due to:		
Characteristics	0.858	0.901
Returns to characteristics[1]	1.298	1.237
Using the female wage structure, difference due to:		
Characteristics	0.845	0.846
Returns to characteristics	1.317	1.317
Using a pooled wage structure, difference due to:		
Characteristics	0.852	0.884
Returns to characteristics	1.306	1.261

[1] The estimation of the pooled OLS wage regressions with a gender dummy yield similar results for the unexplained gender wage gap: 26.7 per cent for the human capital model and 23.2 per cent for the full model.

Based on the full model (which includes controls for occupation and industry), the gender wage gap in 2012 was 11.4 per cent. In a previous study based on 1993 data for Trinidad and Tobago (Olsen and Coppin, 2001), the male/female (log) income differential was 19.2 per cent. Thus, in the twenty years between the earlier study and this present analysis, the male/female income differential in Trinidad and Tobago has narrowed, possibly reflecting the positive impact of the passing of the Equal Opportunity Act (EOA) in 2000. In the current study, the mean level of women's wages is estimated to *decrease* by 11.6 per cent if they had the same (mean) characteristics as men given that a higher proportion of women have higher levels of education than men ("explained" component). However, women's mean level of wages would *increase* by 26.1 per cent if they received the same rates of return for relevant characteristics as men ("unexplained" component).

In terms of the "explained" component, most of the wage differential between men and women again relate to potential experience and education. Work experience leads to a widening of the gap; the potential experience and potential experience squared variables highlight that as work experience increases, the wage gap increases at a decreasing rate. With the inclusion of controls for occupation and industry, adjusting women's mean level of tertiary education to that of men's would decrease women's wages by 5.5 per cent. Other variables that account for a widening of the gap include the occupations of Sales and Clerical workers (which are female-dominated occupations – see Table 3.3), and a few industries, namely Social/Personal Services, Mining/Quarrying and Wholesale/Retail.

By far, the biggest contributor to the "unexplained" component of the male/female earnings gap is the difference in the constants. This suggests that male employees in Trinidad and Tobago enter the labour market at an advantage; regardless of their socioeconomic attributes (level of schooling, work experience, marital status, etc.) employers simply pay men more than they pay women. Other factors contributing to the widening of the unexplained part of the gap include education, marital status, and private sector employment. If women were rewarded to the same extent as men for their higher education degrees (that is, tertiary education), their wages would increase by 2.3 per cent. Similarly, if married women were rewarded at the same rate as married men their wages would increase by 2.6 per cent. Male employees in the private sector also appear to be more valued by employers; if female employees in the private sector received the same rate of return as their male counterparts, their wages would increase by 3.5 per cent. Differences in the coefficients for Sales and Elementary workers and those working in the Construction industry also account for a widening of the gap. Notwithstanding this, gender differences in coefficients for several other characteristics help to close the gap, as indicated by the value of the coefficients being less than unity.

Table 3.10: Decomposing the Gender Wage Gap – "Explained" Component (Differences due to Characteristics)

Differences due to Characteristics	Reference Wage Structure					
	Parsimonious Model			Full Model		
	Male	Female	Pooled	Male	Female	Pooled
Potential Experience	1.017	1.030*	1.021*	1.010	1.029*	1.016*
	(0.009)	(0.014)	(0.009)	(0.007)	(0.013)	(0.007)
Potential Experience Squared	1.001	0.983	0.995	1.002	0.981	0.996
	(0.006)	(0.010)	(0.005)	(0.006)	(0.010)	(0.005)
Education						
Primary	0.957***	0.956***	0.956***	0.975***	0.982***	0.977***
	(0.009)	(0.009)	(0.009)	(0.006)	(0.005)	(0.005)
Lower Secondary	0.978***	0.975***	0.977***	0.987***	0.990**	0.988***
	(0.006)	(0.007)	(0.006)	(0.004)	(0.003)	(0.003)
Upper Secondary	0.999	0.998	0.999	0.999	0.999	0.999
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Tertiary	0.900***	0.898***	0.898***	0.940***	0.957***	0.945***
	(0.012)	(0.011)	(0.011)	(0.009)	(0.007)	(0.007)
Marital Status						
Unmarried	1.001	1.000	1.001	1.001	1.000	1.001
	(0.002)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)
Married	1.001	1.000	1.001	1.001	1.000	1.001
	(0.002)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)
Ethnicity						
Mixed/Other	1.001	0.999	1.000	1.000	1.000	1.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Indian	0.999	0.998	0.999	1.000	1.000	0.999
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
African	0.999	1.000	1.000	0.999	1.000	0.999
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Sector Employed						
Public Sector				0.991**	0.987***	0.990***
				(0.003)	(0.004)	(0.003)
Private Sector				0.991**	0.987***	0.990***
				(0.003)	(0.004)	(0.003)

Exponentiated coefficients; standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

Table 3.10: Decomposing the Gender Wage Gap – "Explained" Component (Differences due to Characteristics) – cont'd

Differences due to Characteristics	Reference Wage Structure					
	Parsimonious Model			Full Model		
	Male	Female	Pooled	Male	Female	Pooled
Occupation						
Elementary Occupations				0.975***	0.967***	0.971***
				(0.006)	(0.008)	(0.006)
Machine Operators				0.993	0.970*	0.990*
				(0.004)	(0.012)	(0.004)
Craft Workers				0.978**	1.008	0.979**
				(0.007)	(0.020)	(0.007)
Sales Workers				1.005	1.031***	1.020***
				(0.004)	(0.006)	(0.004)
Clerical Workers				1.022*	1.018**	1.017***
				(0.010)	(0.007)	(0.005)
Technicians				0.992*	0.982***	0.987***
				(0.004)	(0.005)	(0.003)
Professionals				0.993*	0.986**	0.990**
				(0.003)	(0.005)	(0.004)
Managers				0.998	0.997	0.998
				(0.003)	(0.003)	(0.003)
Industry						
Social/Personal Services				1.032***	1.019**	1.026***
				(0.007)	(0.007)	(0.005)
Agriculture/Fishing				0.997	0.998	0.997
				(0.002)	(0.002)	(0.002)
Mining/Quarrying				1.013***	1.003	1.012***
				(0.003)	(0.005)	(0.003)
Manufacturing				1.001	1.003	1.001
				(0.002)	(0.003)	(0.001)
Electricity/Gas/Water				1.003	1.007*	1.003
				(0.001)	(0.003)	(0.002)
Wholesale/Retail				1.015**	1.010	1.015***
				(0.005)	(0.005)	(0.004)
Transport/Communication				1.001	1.002	1.001
				(0.002)	(0.003)	(0.001)
Finance/Insurance				0.997	0.991**	0.994*
				(0.003)	(0.003)	(0.002)
Construction				0.989	0.937***	0.981***
				(0.006)	(0.013)	(0.006)

Exponentiated coefficients; standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

Table 3.11: Decomposing the Gender Wage Gap – "Unexplained" Component (Differences due to Coefficients)

Differences due to Coefficients	Reference Wage Structure					
	Parsimonious Model			Full Model		
	Male	Female	Pooled	Male	Female	Pooled
Potential Experience	0.835	0.825	0.832	0.774*	0.759*	0.769*
	(0.111)	(0.118)	(0.112)	(0.091)	(0.096)	(0.091)
Potential Experience Squared	1.147	1.168	1.154	1.167*	1.192*	1.174*
	(0.088)	(0.102)	(0.092)	(0.079)	(0.092)	(0.081)
Education						
Primary	1.002	1.004	1.003	0.988	0.981	0.986
	(0.007)	(0.012)	(0.009)	(0.007)	(0.012)	(0.009)
Lower Secondary	1.011	1.014	1.013	0.987	0.984	0.986
	(0.011)	(0.014)	(0.012)	(0.010)	(0.013)	(0.012)
Upper Secondary	0.987	0.988	0.987	0.998	0.998	0.999
	(0.011)	(0.010)	(0.011)	(0.010)	(0.009)	(0.010)
Tertiary	0.998	0.999	1.000	1.029*	1.010*	1.023**
	(0.011)	(0.004)	(0.007)	(0.014)	(0.005)	(0.009)
Marital Status						
Unmarried	0.958***	0.960***	0.959***	0.968**	0.969**	0.968**
	-0.012	-0.0116	-0.0117	(0.011)	(0.010)	(0.010)
Married	1.033***	1.034***	1.034***	1.025**	1.027**	1.026**
	(0.010)	(0.010)	(0.010)	(0.009)	(0.009)	(0.009)
Ethnicity						
Mixed/Other	0.993	0.995	0.994	0.997	0.998	0.998
	(0.007)	(0.005)	(0.006)	(0.006)	(0.005)	(0.005)
Indian	1.004	1.005	1.004	1.000	1.001	1.001
	(0.011)	(0.014)	(0.012)	(0.009)	(0.012)	(0.010)
African	1.012	1.010	1.011	1.006	1.005	1.005
	(0.013)	(0.011)	(0.012)	(0.012)	(0.010)	(0.011)
Sector Employed						
Public Sector				0.977*	0.981*	0.979*
				(0.010)	(0.008)	(0.010)
Private Sector				1.034*	1.038*	1.035*
				(0.015)	(0.017)	(0.017)

Exponentiated coefficients; standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

Table 3.11: Decomposing the Gender Wage Gap – "Unexplained" Component (Differences due to Coefficients) – cont'd

Differences due to Coefficients	Reference Wage Structure					
	Parsimonious Model			Full Model		
	Male	Female	Pooled	Male	Female	Pooled
Occupation						
Elementary Occupations				1.019*	1.028*	1.023*
				(0.009)	(0.014)	(0.011)
Machine Operators				1.003	1.027	1.005
				(0.002)	(0.015)	(0.005)
Craft Workers				0.997	0.967	0.996
				(0.002)	(0.022)	(0.006)
Sales Workers				1.054***	1.028***	1.040***
				(0.013)	(0.007)	(0.012)
Clerical Workers				0.996	0.999	1.001
				(0.014)	(0.003)	(0.009)
Technicians				0.978*	0.988*	0.983
				(0.011)	(0.006)	(0.010)
Professionals				0.985*	0.992*	0.988*
				(0.006)	(0.003)	(0.005)
Managers				0.998	0.999	0.998
				(0.003)	(0.003)	(0.003)
Industry						
Social/Personal Services				0.972	0.984	0.978
				(0.019)	(0.011)	(0.017)
Agriculture/Fishing				0.999	0.999	1.000
				(0.002)	(0.003)	(0.002)
Mining/Quarrying				1.002	1.013	1.004
				(0.002)	(0.007)	(0.002)
Manufacturing				0.998	0.996	0.998
				(0.005)	(0.008)	(0.006)
Electricity/Gas/Water				0.998	0.994	0.998
				(0.002)	(0.004)	(0.003)
Wholesale/Retail				0.989	0.994	0.989
				(0.013)	(0.007)	(0.011)
Transport/Communication				1.000	0.999	1.000
				(0.003)	(0.006)	(0.003)
Finance/Insurance				0.986	0.992	0.989
				(0.008)	(0.004)	(0.007)
Construction				1.015***	1.071***	1.024**
				(0.005)	(0.019)	(0.008)
Constant Term	1.357***	1.357***	1.357***	1.375***	1.375***	1.375***
	(0.095)	(0.095)	(0.091)	(0.099)	(0.099)	(0.103)

Exponentiated coefficients; standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

3.6.3 Decompositions by Sector

Table 3.12 presents the wage decompositions separately for the public and private sectors based on the Neumark method. There is a much wider gap in the private sector than in the public sector. In fact, the gap in the public sector is negligible amounting to 3.2 per cent compared to a gap of almost 23 per cent in the private sector.

In the private sector, based on the full model, which includes controls for occupation and industry, the mean level of women's wages would *decrease* by 3.1 per cent if they had the same mean characteristics as men, but the mean level of their wages would *increase* by 26.8 per cent if they were paid the same rates of return to characteristics as men.

Table 3.12: Decomposing the Gender Wage Gap (Neumark Method) by Sector

	Parsimonious Model	Full Model
In the public sector:		
(Geometric) Mean of male hourly wages	$32.97	$32.97
(Geometric) Mean of female hourly wages	$31.94	$31.94
Wage Gap:	1.032	1.032
Using a pooled wage structure, difference due to:		
Characteristics	0.836	0.904
Returns to characteristics	1.235	1.144
In the private sector:		
(Geometric) Mean of male hourly wages	$23.71	$23.71
(Geometric) Mean of female hourly wages	$19.34	$19.30
Wage Gap:	1.226	1.229
Using a pooled wage structure, difference due to:		
Characteristics	0.911	0.969
Returns to characteristics	1.346	1.268

Looking at the "unexplained' component of the gender wage gap in the private sector in greater detail (Table 3.14), the gender differences in coefficients that widen the gap include marriage and being of African descent; however, the biggest single contributor to the unexplained component of the gap is the difference in the constant terms. Male private sector employees are rewarded twice as much as female private sector employees. Essentially upon entry into the labour market,

private sector employers favour men over women and pay the men much higher wages. Notably, in the private sector, both men and women receive similar rates of return for tertiary education.

One should note though that these results may reflect an overestimation of the "unexplained" component of the gender wage gap since the issues of heterogeneity, endogeneity, and selectivity have not been addressed. Additionally, as was noted previously, the Neumark method tends to overstate the effects of variables with large gender differences and transfers some of the "unexplained" portion to the "explained" component (Fortin, 20006).

Table 3.13: Decomposing the Gender Wage Gap (Neumark Method) by Sector – "Explained" Component

(Differences due to Characteristics)

Differences due to Characteristics	Parsimonious Model		Full Model	
	Public Sector	Private Sector	Public Sector	Private Sector
Potential Experience	1.121***	0.996	1.106***	0.997
	(0.037)	(0.006)	(0.032)	(0.005)
Potential Experience Squared	0.944*	1.000	0.946*	1.000
	(0.026)	(0.002)	(0.023)	(0.001)
Education				
Primary	0.948***	0.967**	0.977***	0.983**
	(0.013)	(0.011)	(0.007)	(0.006)
Lower Secondary	0.974**	0.988	0.986**	0.993
	(0.008)	(0.007)	(0.005)	(0.004)
Upper Secondary	1.007	1.000	1.002	1.000
	(0.005)	(0.002)	(0.002)	(0.001)
Tertiary	0.850***	0.957***	0.922***	0.977**
	(0.018)	(0.012)	(0.012)	(0.007)
Marital Status				
Unmarried	1.000	0.999	1.001	1.000
	(0.001)	(0.002)	(0.001)	(0.001)
Married	1.000	0.999	1.001	1.000
	(0.001)	(0.002)	(0.001)	(0.001)
Ethnicity				
Mixed/Other	0.999	1.000	1.001	1.000
	(0.002)	(0.001)	(0.001)	(0.001)
Indian	0.999	1.000	0.999	0.998
	(0.002)	(0.002)	(0.002)	(0.002)
African	1.000	1.001	0.999	0.999
	(0.001)	(0.001)	(0.001)	(0.001)

Exponentiated coefficients; standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

Table 3.13: Decomposing the Gender Wage Gap (Neumark Method) by Sector – "Explained" Component (Differences due to Characteristics) – cont'd

Differences due to Characteristics	Parsimonious Model		Full Model	
	Public Sector	Private Sector	Public Sector	Private Sector
Occupation				
Elementary Occupations			0.962***	0.978**
			(0.011)	(0.007)
Machine Operators			1.000	0.986*
			(0.005)	(0.006)
Craft Workers			0.990	0.963***
			(0.006)	(0.010)
Sales Workers			1.001	1.057***
			(0.002)	(0.010)
Clerical Workers			1.038***	1.004
			(0.009)	(0.006)
Technicians			0.984**	0.990**
			(0.005)	(0.004)
Professionals			0.979**	0.999
			(0.008)	(0.002)
Managers			1.002	0.991*
			(0.002)	(0.004)
Industry				
Social/Personal Services			1.022*	1.021***
			(0.009)	(0.006)
Agriculture/Fishing			0.999	0.994*
			(0.002)	(0.003)
Mining/Quarrying			1.000	1.020***
			(0.002)	(0.005)
Manufacturing			1.010*	1.001
			(0.004)	(0.001)
Electricity/Gas/Water			1.009*	1.001
			(0.004)	(0.001)
Wholesale/Retail			1.001	1.024**
			(0.002)	(0.009)
Transport/Communication			1.007*	0.999
			(0.004)	(0.001)
Finance/Insurance			1.002	0.985**
			(0.002)	(0.005)
Construction			0.965***	1.014
			(0.010)	(0.011)

Exponentiated coefficients; standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

Table 3.14: Decomposing the Gender Wage Gap (Neumark Method) by Sector – "Unexplained" Component

(Differences due to Coefficients)

Differences due to Coefficients	Parsimonious Model		Full Model	
	Public Sector	Private Sector	Public Sector	Private Sector
Potential Experience	0.838	0.850	0.920	0.777
	(0.197)	(0.139)	(0.187)	(0.110)
Potential Experience Squared	1.101	1.158	1.028	1.194*
	(0.159)	(0.110)	(0.127)	(0.097)
Education				
Primary	1.023*	0.989	1.003	0.985
	(0.012)	(0.013)	(0.012)	(0.014)
Lower Secondary	0.984	1.023	0.973*	1.010
	(0.014)	(0.019)	(0.011)	(0.020)
Upper Secondary	0.987	0.987	1.001	1.009
	(0.017)	(0.014)	(0.016)	(0.014)
Tertiary	0.991	1.004	1.027	1.003
	(0.014)	(0.007)	(0.017)	(0.008)
Marital Status				
Unmarried	0.958**	0.963*	0.986	0.967*
	(0.016)	(0.015)	(0.014)	(0.014)
Married	1.040**	1.029*	1.014	1.025*
	(0.016)	(0.012)	(0.013)	(0.011)
Ethnicity				
Mixed/Other	1.000	0.990	0.999	0.996
	(0.008)	(0.008)	(0.007)	(0.007)
Indian	1.009	1.002	0.998	0.992
	(0.016)	(0.016)	(0.012)	(0.014)
African	0.987	1.020	1.008	1.016
	(0.021)	(0.015)	(0.018)	(0.013)

Exponentiated coefficients; standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

Table 3.14: Decomposing the Gender Wage Gap (Neumark Method) by Sector – "Unexplained" Component (Differences due to Coefficients) – cont'd

Differences due to Coefficients	Parsimonious Model		Full Model	
	Public Sector	Private Sector	Public Sector	Private Sector
Occupation				
Elementary Occupations	1.371**	1.359***	1.057**	1.004
	(0.152)	(0.113)	(0.019)	(0.013)
Machine Operators			0.999	1.006
			(0.003)	(0.008)
Craft Workers			1.003	0.995
			(0.004)	(0.010)
Sales Workers			1.027**	1.019
			(0.010)	(0.016)
Clerical Workers			1.037**	0.995
			(0.013)	(0.009)
Technicians			1.000	0.995
			(0.015)	(0.010)
Professionals			0.990	0.998
			(0.009)	(0.004)
Managers			0.998	1.002
			(0.004)	(0.004)
Industry				
Social/Personal Services			0.993	0.969*
			(0.040)	(0.013)
Agriculture/Fishing			1.003	1.000
			(0.005)	(0.001)
Mining/Quarrying			1.005	0.999
			(0.003)	(0.002)
Manufacturing			0.998	0.989
			(0.004)	(0.009)
Electricity/Gas/Water			0.992	1.002
			(0.005)	(0.002)
Wholesale/Retail			0.998	0.966
			(0.002)	(0.019)
Transport/Communication			1.005	0.995
			(0.005)	(0.004)
Finance/Insurance			0.995	0.977*
			(0.005)	(0.011)
Construction			1.037**	0.989
			(0.015)	(0.008)
Constant term	1.371**	1.359***	1.047	1.512***
	(0.152)	(0.113)	(0.120)	(0.128)

Exponentiated coefficients; standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

3.7 Conclusions

Men in Trinidad and Tobago out earn women in all occupational groupings despite women generally being more educated. The largest disparity in the male-female earnings (average gross monthly income) is among sale workers; female sale workers earn on average 63 per cent of what their male counterpart earns. At the higher end of the pay scale, professional women only earn 81 per cent of men's income and female managers earn 78 per cent of what male managers earn. This is cursory evidence that the Trinidad and Tobago labour market has a "sticky floor" instead of a "glass ceiling" – that is, the wage gap is higher at the lower end of the wage distribution. Quantile regression analysis, which is not performed in this chapter, would confirm if Trinidad and Tobago's working women face "sticky floors" instead of a "glass ceiling".

The raw wage gap in 2012 was 11.4 per cent. The gender wage gap narrowed over the past twenty years given that the gap was estimated to be 19.2 per cent in 1993 (Olsen and Coppin, 2001). It is still unclear what were the main drivers contributing to the narrowing of the gap; one can speculate that the passing of the Equal Opportunity Act in 2000 may be one such factor, but the law in its current form does not address the issue of *equal pay for work of equal value*.

Based on the Neumark decomposition technique, women's earnings would actually *decrease* (by 11.6 per cent) if they possessed the same mean characteristics as men, but if they received the same rates of return as men for these characteristics their earnings are estimated to increase by 26.1 per cent.

A closer look at the pay gaps in the public and private sectors reveal that the pay gap in the public sector is relatively small, only 3.2 per cent compared to a pay gap of 23 per cent in the private sector. If the differences in the rates of return to characteristics were equalised, women's wages in the private sector are estimated to

increase by almost 27 per cent. The largest contributor to the "unexplained" (differences in coefficients) component of the gender pay gap is the difference in the intercepts – if female private sector employees were rewarded to the same extent as male private sector employees, women's wages would increase by over 50 per cent. This means that men employed in the private sector in Trinidad and Tobago appear to have a clear advantage over women when they enter the labour market regardless of their level of productivity. The wider pay differential in the private sector compared to that in the public sector might be due to lack of labour regulations and/or enforcement in the private sector compared to the public sector.

3.8 References

Altonji, Joseph and Rebecca Blank (1999). Race and Gender in the Labor Market in O. Ashenfelter and D. Card (ed.), 1999. "*Handbook of Labor Economics*", Edition 1, volume 3, number 3. Amsterdam: Elsevier.

Anderson, Tracy, J. Forth, H. Metcalf and S. Kirby (2001). The Gender Pay Gap. *Final Report to DfEE*, July.

Appleton, Simon, John Hoddinott and Pramila Krishnan (1999). The Gender Wage Gap in Three African Countries. *Economic Development and Cultural Change*, 47(2):289-312, (January).

Appleton, Simon, Lina Song and Qingjie Xia (2012). Understanding Urban Wage Inequality in China 1988-2008: Evidence from Quantile Analysis. *IZA Discussion Paper*, No. 7101, Institute for the Study of Labour Economics (IZA).

Arrow, Kenneth (1973). "The Theory of Discrimination." In Orley Ashenfelter and Albert Rees, eds., Discrimination in Labor Markets. Princeton: Princeton University Press

Auguste, Sebastián, Ramiro Moya and Sandra Sookram (2011). "Housing Finance Policy under Dutch Disease Pressure: The Mortgage Market in Trinidad and Tobago". Research Department Publications 4745, Inter-American Development Bank, Research Department.

Beblo, Miriam, D. Beninger, A. Heinze and F. Laisney (2003). Methodological Issues Related to the Analysis of Gender Gaps in Employment, Earnings and Career Progression. *Final Report for the European Commission Employment and Social Affairs DG*, October.

Becker, Gary S. (1971). *The Economics of Discrimination.* Chicago: University of Chicago Press,.

Bellony, Annelle, Hoyos, A. and Ñopo, H. (2010). *Gender Earnings Gaps in the Caribbean: Evidence from Barbados and Jamaica.* IDB Working Paper Series No.IDB-WP-210 (August).

Bellony, Annelle and Reilly, Barry (2009). An analysis of labour market earnings in St. Lucia. *Social and Economic Studies*, 58 (3 & 4). pp. 111-147.

Binder, Alan S. (1973). Wage Discrimination: Reduced Form and Structural Estimates. *Journal of Human Resources*, 8:436-455.

Borjas, George J. (2013). *Labor Economics* (Sixth Edition). New York: McGraw-Hill.

Card, David (1999). "The Causal Effect of Education on Earnings," in *Handbook of Labor Economics*, Volume 3A, ed, by Orley Ashenfelter and David Card. Amsterdam and New York: North Holland.

Chichilnisky, G. and E. H. Frederisksen (2008). An Equilibrium Analysis of the Gender Wage Gap. *International Labour Review*, Vol. 147, No. 2.

Coppin, Addington (1997). Women's Earnings in Trinidad and Tobago: An Analysis by Household Status and Ethnicity. *Social and Economic Studies,* Vol. 46:4, pp. 61-82.

Coppin, A. (2000). Does type of conjugal union matter in the labor market? Evidence from a Caribbean economy. *Review of Black Political Economy, 28*(2), 7-27.

Coppin, A. (2001, June). Would Cohabitors benefit more from the pay structures of their Single or Married counterparts? Evidence from Trinidad and Tobago. *Social and Economic Studies, 50*(2), 139-165.

Coppin, A., & Olsen, R. N. (1998). Earnings and ethnicity in Trinidad and Tobago. *The Journal of Development Studies, 34*(3), 116-134.

Coppin, A., & Olsen, R. N. (2007). Public vs. Private sector earnings differentials in the Caribbean region: Evidence from the economy of Trinidad and Tobago. *The Journal of Developing Areas, 40*(2), 51-54,58-61,64-65,69-74.

Costa, Joana and Elydia Silva (2008). The Burden of Gender Inequalities for Society in *Poverty in Focus*. International Poverty Centre, No. 13, January.

Dolton, Peter, Donal O'Neil and Olive Sweetman (1996). "Gender Differences in the Changing Labour Market." *The Journal of Human Resources*, Vol. 31(3), Summer.

Downes, Andrew S. (1998). An Economic Analysis of Unemployment in Trinidad and Tobago. *Working Paper No. 389,* Washington D.C.: Inter-American Development Bank.

Fontana, Marzia and Cristina Paciello (2007). *Labour regulations and anti-discrimination legislation: how do they influence gender equality in employment and pay?* Institute of Development Studies at Sussex, April.

Freeman, R.B. (1993). "Labour market institutions and policies: help or hindrance to economic development?" *Proceedings of the World Bank Annual Conference on Development Economics 1992,* Washington D.C.: The World Bank.

____ (1975). "Male-Female Wage Differentials and the Impact of Equal Pay Legislation". *The Review of Economics and Statistics*, Vol. 57 (4): 462-469.

Fortin, Nicole (2006). Greed, Altruism, and the Gender Wage Gap. Available at: http://www.econ.ubc.ca/nfortin/Fortinat8.pdf.

Gelb, A. and Associates (1988). Oil Windfalls: Blessing or Curse? World Bank: Oxford University Press.

Gunderson, Morley (1989). "Make-Female Wage Differentials and Policy Responses". *Journal of Economic Literature*, Vol. 27 (1): 46-72.

Heckman, J.J., Tobias, J.L., Vytlacil, E.J. (2003). "Simple estimators for treatment parameters in a latent variable framework". *Review of Economics and Statistics*, 85 (3), 748–754. August.

Horton, S. (1996). Women and Industrialization in Asia (edited). London and New York: Routledge.

Hosein, Roger (2007). "Booming Hydrocarbon Exports, De-agriculturalization and Food Security in Trinidad and Tobago." *Farm & Business: The Journal of the Caribbean Agro-Economic Society (CAES)*, Vol. 7 (1): 51-79.

Koenker, Roger and Gilbert Bassett Jr. (1978). "Qunatile Regressions." *Econometrica*, 46(1): 33-50.

Kunze, Astrid (2008). Gender Wage Gap Studies: Consistency and Decomposition. *Empirical Economics*, 35:63-76.

Machado, J.A.F. and J. Mata (2005). Counterfactual Decomposition of Changes in Wage Distributions Using Qunatile Regression. *Journal of Applied Econometrics*, 20(3): 445-465.

Madheswaran S. and Khasnobis, B.G. (2007). Decomposition of Gender Wage Gap in India: An Econometric Analysis. Presented at the 43rd Annual Conference of the Indian Econometric Society, Mumbai, January 5-7.

Mahabir, Reshma, Vishana Jagessar, Crystal Neptune and Delvin Cox (2013). Understanding Wages in a Small Open Economy: The Case of Trinidad and Tobago. *Central Bank of Trinidad and Tobago Working Papers, WP 11/2013, February*.

Manning, A. (2003). *Monopsony in motion: imperfect competition in labour markets.* Princeton: Princeton University Press.

Ministry of Community Development, Culture and Gender, Trinidad and Tobago (2009). *Draft National Policy on Gender and Development*, June.

Ministry of Planning and the Economy, Trinidad and Tobago (2011). *Medium-Term Policy Framework 2012-2014, Innovation for Lasting Prosperity*, October.

Ministry of Social Development, Poverty Reduction Programme, Trinidad and Tobago (2007). *Analysis of the Trinidad and Tobago Survey of Living Conditions - 2005.*

Montenegro, Claudio E. and Harry Patrinos (2013). *Returns to Schooling around the World.* Background Paper for the World Development Report 2013.

Neumark, D. (1988). Employers' Discrimatory Behaviour and the Estimation of Wage Discrimination. *Journal of Human Resources*, 23: 279-95.

Nordman C. and Rouband F. (2005). Reassessing the Gender Wage Gap: Does Labour Force attachment Really Matter? Evidence for Matched Labour force and Biographical Survey in Madagascar. ECINEQ Working Paper-16.

Oaxaca, R. (1973). Male-female Differentials in Urban Labour Markets. *International Economic Review*, 14 (3):693-709.

Olsen, R.N. and A. Coppin (2001). The Determinants of Gender Differentials in Income in Trinidad and Tobago. *Journal of Development Studies*, 37(5): 31- 56.

Olsen, R. N. (2010, March). The impact of more complex family structure upon marital earnings premiums. *International Review of Applied Economics, 24*, pp. 148-178.

Olsen, R. N., & Copin, A. (2010). Marital earnings premiums in Trinidad & Tobago: Ethnicity and Socioeconomic status. *The Journal of Developing Areas, 44*(1), pp. 201-227.

Psacharopoulas, G. and Z. Tzannatos (1992). Edited *Case Studies on Women's Employment and Pay in Latin America*, World Bank, Washington D.C.

Psacharopoulos, George and Harry Patrinos (2004). Returns to Investment in Education: A Further Update. *Education Economics*, Vol. 12, No. 2, pp. 111-134, August.

Rambarran, Aniston (1998). Labor Market Adjustment in an Oil-Based Economy: The Experience of Trinidad and Tobago in P. Dabir-Alai and M. Odekon (ed.) *Economic Liberalization and Labor Markets,* (Westport, Conn.: Greenwood), pp. 217–37.

Reddock, Rhoda and Yvonne Bobb-Smith (2008). "Reconciling work and family: Issues and policies in Trinidad and Tobago." ILO Conditions of Work and Employment Series No. 18.

Reilly, Barry and Bellony, Annelle (2009). The Determinants of Labor Market Earnings in a Small Caribbean Island: The Case of Dominica. *Journal of Developing Areas*, 43 (1). pp. 65-85.

Reiman, Cornelis (2001). The Gender Wage Gap in Australia. National Centre for Social and Economic Modelling, University of Canberra. Discussion Paper No. 54.

Rodgers, Y. and Berik, G. (2006). "Asia's race to capture post-MFA markets: a snapshot of labour standards compliance and impacts on competitiveness." *Asian Development Review*.

Roopnarine, Karen, and Dindial Ramrattan (2012). Female labour force participation: the case of Trinidad and Tobago. *World Journal of Entrepreneurship, Management and Sustainable Development* 8, no. 2/3:183-193.

Shapiro, D.M. and M. Stelcner (1987). The Persistence of the Male-Female Earnings Gap in Canada, 1970-1980: The Impact of Equal Pay Laws and Language Policies. *Canadian Public Policy/ Analyse de Politiques*, Vol. 13, No. 4, pp. 462-476, December.

Sookram, S. & Strobl, E. (2009). The role of educational choice in occupational gender segregation: Evidence from Trinidad and Tobago. *Economics of Education Review*, Vol. 28, pp. 1-10.

Sookram, Sandra and Watson, Patrick K. (2008). The Informal Sector and Gender in the Caribbean: The Case of Trinidad and Tobago. *Journal of Eastern Caribbean Studies*, 33(4): 42-66.

Strobl, Eric and Frank Walsh (2003). Minimum Wages and Compliance: The Case of Trinidad and Tobago. *Economic Development and Cultural Change*, 51(2):427-450.

Tzannatos, Z. (1999). "Women and labour market changes in the global economy: growth helps, inequalities hurt and public policy matters." *World Development*, 27 (3): 551-569.

Tzannatos, Z. and D. Sapsford (1993). *The Economics of the Labour Market.* London: Macmillan Press Limited.

United Nations Development Programme (2003).*Human Development Report.* New York: Oxford University Press.

United Nations Development Programme (2008). Annual Report.

Weichselbaumer, D. and Winter-Ebmer, R. (2005). A Meta-Analysis of the International Gender Wage Gap. *Journal of Economic Surveys*, 19(3): 479–511.

Appendix I: National Occupational Classification of Trinidad and Tobago (2013)

The Major Groups of occupations as described in the National Occupational Classification of Trinidad and Tobago (2013) produced by the Government of Trinidad and Tobago[38] are more fully described as follows:

Major Group 1: Managers

This Major Group includes occupations whose main tasks consist of planning, directing, coordinating and evaluating the overall activities of government, enterprises and other organizations, or of organizational units within them, and formulating and reviewing their policies, laws, rules and regulations. Formal preparation for these occupations may be supplemented or replaced partly or wholly by on-the-job training and/or experience.

Major Group 2: Professionals

This Major Group includes occupations whose main tasks require a high level of professional knowledge and experience. The main tasks consist of increasing the existing stock of knowledge, applying scientific and artistic concepts and theories, teaching about the foregoing in a systematic manner or engaging in any combination of these activities. Competent performance in most occupations in this Major Group requires skills at the fourth ISCO[39] skill level that have been acquired from tertiary-level education leading to a university or post-graduate university degree. On-the-job training and/or experience may supplement formal preparation or replace it partly or wholly.

[38] Document was prepared by the Occupational Research Unit - Curriculum Planning and Development Division, Ministry of Education Government of Trinidad and Tobago.

[39] ISCO refers to the International Labour Organisation's International Standard Classification of Occupations. ISCO serves as a model for the development or revision of corresponding national classifications and facilitates international communication on occupational information, in particular the production and presentation of reasonably comparable statistics for different countries.

Major Group 3: Technicians and Associate Professionals

This Major Group includes occupations involving the performance of mostly technical and related tasks connected with research and the application of scientific or artistic concepts, operational methods, and government or business regulations. Most occupations in this Major Group require skills at the third ISCO skill level that have been acquired from post-secondary education leading to an award not equivalent to a first university degree. On-the-job training and/or experience may supplement formal preparation or replace it partly or wholly.

Major Group 4: Clerical Support Workers

This Major Group includes occupations which involve the recording, organising, storing, computing and retrieving of information and performing a number of clerical duties in connection with money-handling operations, travel arrangements, requests for information and appointments. Most occupations in this Major Group require skills at the second ISCO skill level that have been acquired from secondary-level education lasting about five years. On-the-job training and/or experience may supplement formal preparation or replace it partly or wholly.

Major Group 5: Service and Sales Workers

This Major Group includes occupations involving personal and protective services related to travel, housekeeping, catering, personal care, or protection against fire and unlawful acts, or demonstrating and selling goods in wholesale or retail shops and similar establishments, as well as at stalls and in markets. Most occupations in this Major Group require skills at the second ISCO skill level that have been acquired from secondary-level education lasting about five years. On-the-job training and/or experience may supplement formal preparation or replace it partly or wholly.

Major Group 6: Skilled Agricultural, Forestry and Fishery Workers

Workers in this Major Group grow and harvest field or tree and shrub crops, gather wild fruits and plants, breed, tend or hunt animals, produce a variety of animal husbandry products, cultivate, conserve and exploit forests, breed or catch fish and cultivate or gather other forms of aquatic life in order to provide food, shelter and income for themselves and their households. Most occupations in this Major Group require skills at the second ISCO skill level that have been acquired from secondary-level education lasting about five years. On-the-job training and/or experience may supplement formal preparation or replace it partly or wholly.

Major Group 7: Craft and Related Trades Workers

Workers in this Major Group apply specific knowledge and skills to construct and maintain buildings, form metal, erect metal structures or set machine tools. They make, fit, maintain and repair machinery, equipment or tools, carry out printing work, and produce or process foodstuffs, textiles, or wooden, metal and other articles, including handicraft goods. The work is carried out by hand and by hand-powered and other tools that are used to reduce the amount of physical effort and time required for specific tasks, as well as to improve the quality of the products. The tasks call for an understanding of all stages of the production process, the materials and tools used and the nature and purpose of the final product. Most occupations in this Major Group require skills at the second ISCO skill level that have been acquired from secondary-level education lasting about five years. On-the-job training and/or experience may supplement formal preparation or replace it partly or wholly.

Major Group 8: Plant and Machine Operators and Assemblers

Workers in this Major Group operate and monitor industrial and agricultural machinery and equipment on the spot or by remote control, drive and operate trains, motor vehicles and mobile machinery and equipment, or assemble products from component parts according to strict specifications and procedures. The work mainly calls for experience with and an understanding of

industrial and agricultural machinery and equipment as well as an ability to cope with machine-paced operations and to adapt to technological innovations. Most occupations in this Major Group require skills at the second ISCO skill level that have been acquired from secondary-level education lasting about five years. On-the-job training and/or experience may supplement formal preparation or replace it partly or wholly.

Major Group 9: Elementary Occupations

This Major Group covers occupations that involve the performance of simple and routine tasks that may require the use of hand-held tools and considerable physical effort. Most occupations in this Major Group require skills at the first ISCO skill level that have been acquired from primary education. On-the-job training and/or experience may supplement formal preparation or replace it partly or wholly.

Appendix II: Measuring the Mean Gender Wage Gap using Pooled OLS Regressions

Table AII.1 Pooled OLS Earnings Functions

	Human Capital Model	Full Model
Potential Experience	0.0139***	0.0102***
	(0.003)	*(0.003)*
Potential Experience^2	0.000	0.000
	(0.000)	*(0.000)*
Education		
Lower Secondary	0.220***	0.117***
	(0.031)	*(0.029)*
Upper Secondary	0.564***	0.307***
	(0.033)	*(0.033)*
Tertiary	1.219***	0.644***
	(0.038)	*(0.046)*
Marital Status		
Married	0.0850***	0.0748***
	(0.022)	*(0.019)*
Ethnicity		
Indian	-0.011	-0.003
	(0.030)	*(0.027)*
African	0.003	0.010
	(0.030)	*(0.027)*
Female (1=female;0=male)	-0.267***	-0.232***
	(0.021)	*(0.023)*
Sector of Employment		
Public Sector		-0.266***
		(0.026)
Occupation		
Machine Operator		0.266***
		(0.041)
Craft Worker		0.255***
		(0.031)
Sales Worker		0.175***
		(0.031)
Clerical		0.259***
		(0.034)
Technician		0.479***
		(0.035)
Professional		0.672***
		(0.057)
Manager		0.668***
		(0.060)
Industry		
Agriculture/Fishing		-0.148*
		(0.086)
Mining/Quarrying		0.386***
		(0.062)
Manufacturing		0.112***
		(0.039)
Electricity/Gas/Water		0.226***
		(0.070)
Wholesale/Retail		-0.035
		(0.035)
Transport/Communication		0.111**
		(0.047)
Finance/Insurance		0.195***
		(0.044)
Construction		-0.040
		(0.031)
Constant	2.627***	2.767***
	(0.048)	*(0.054)*
Number of Observations	2006	2004
R-squared	0.401	0.533

Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.
Dependent variable is the log of hourly wages. Base dummy variables are: Education - primary school; Marital Status – unmarried; Ethnicity - mixed/other; Occupation - Elementary Occupations; Industry - Social/Personal Services.

Table AII.2: Wald Tests of Interaction Terms from Pooled OLS Regressions

Wald Test – Human Capital Model			
	df	**F**	**P>F**
female#education	3	1.48	0.2194
female#status	1	13.51	0.0002
female#ethnicity	2	0.60	0.5474
Overall	6	3.25	0.0035
Denominator	1990		
Wald Test - Full Model			
	df	**F**	**P>F**
female#education	3	1.72	0.1604
female#status	1	7.19	0.0074
female#ethnicity	2	0.12	0.8861
female#sector	1	4.49	0.0342
female#occupation	7	4.15	0.0002
female#industry	8	2.32	0.0176
Overall	22	3.23	0.0000
Denominator	1956		

Chapter 4 Glass Ceilings or Sticky Floors? Beyond the Mean Gender Wage Gap - Decomposition of Gender Wage Differentials in Trinidad and Tobago using Quantile Regressions

4.1 Introduction

Following many years of research analysing the magnitude (and source) of the mean gender wage gap (OLS analysis), researchers have recently begun to consider the way in which relative wages differ for high- and low-wage workers (using quantile regressions). There are several reasons for this shift in analysis. Firstly, the magnitude of the gender wage gap is generally not constant across the entire wage distribution and the gap in mean wages obscures a great deal of the variation in the data. Secondly, a better understanding of the role of gender in the labour market emerges when there is an expanded focus on outcomes apart from simply the "average" man and woman, in particular, the presence of "glass ceilings" where the gender wage gap tends to be larger amongst workers earning relatively high wages, and the existence of "sticky floors" which occurs at the lower end of the wage distribution (see Booth *et al*, 2003; Arulampalam *et al*, 2007; and Kee, 2006). Finally, the extent to which disparity in men's and women's productivity-related characteristics accounts for the gender wage gap also appears to differ between high-and low-wage workers. This implies that theoretical models of labour market discrimination—and the public policies adopted to deal with this phenomenon—need to be flexible enough to account for the full range of women's experiences both at the top and at the bottom of the wage distribution.

Additionally, there are several attractive features of quantile regression (QR). Firstly, unlike OLS regression that tends to be sensitive when outliers are present in the data and estimates may be inefficient when the dependent variable has a non-normal distribution, QR estimates are more robust. Second, QR allows for a fuller characterisation of the data, that is to say, QR facilitates the analysis of the impact of covariates on the full distribution or any particular percentile of the distribution, and not just the conditional mean (like in OLS regression). Third, unlike in OLS

regression, QR estimates do not require the existence of the conditional mean for consistency.

The main contribution of this chapter is to explore beyond the mean analysis of gender wage gaps in Trinidad and Tobago (which has been done by researchers in the past – Coppin (1997), Coppin and Olsen (1998), and Olsen and Coppin (2001)). This chapter makes original contributions to the existing literature on discrimination in Trinidad and Tobago's labour market in the context of any existing "glass ceiling" and/or "sticky floor" – there have been no papers employing quantile decomposition techniques using data based on Trinidad and Tobago. In using the conditional quantile decomposition technique developed by Melly (2006) this paper also seeks to answer the following counterfactual question: "How much would female workers in Trinidad and Tobago earn if they were paid based on the wage structure of male workers?"

This paper also adds to the existing literature by analysing the gender pay gap via quantile decomposition for the public and private sectors. The results of the previous chapter showed that the gender wage gap is much larger in the private sector than in the public sector, and this chapter also decomposes the wage gap via quantiles between the two sectors of employment.

Exploration into public sector pay is important since the size of the public sector wage bill has implications for both monetary and fiscal policy (Melly, 2005). In Trinidad and Tobago, wages and salaries averaged 14 per cent of total government expenditure during the fiscal years 2007 to 2012 (Review of the Economy, 2012). In terms of employment, the government of Trinidad and Tobago is the single largest employer in the country. In the sample used for this analysis, 36.7 per cent of all employees were employed in the public sector. In 1993 the government's share of total employment was about 33 per cent (Coppin and Olsen, 2007). Additionally, wage settlements in the public sector could have rippled effects on wage settlements in the private sector as well (Melly, 2005). Higher wage settlements in

the public sector could induce private sector employers to pay higher wages and this may have a negative effect on competitiveness in the international arena and fuel domestic inflation (Melly, 2005). In Trinidad and Tobago, following the hike in oil prices in the 1970s, the government was able to nationalise several industries (water, transportation, and telecommunications) and offered improved salary packages. High wages in the government sector in Trinidad and Tobago spilled over into other sectors as well (Hilaire, 1992), for instance, other sectors started to follow the government's initiative and included cost-of-living allowances (COLAs) to wages.

The data for Trinidad and Tobago show that wages in the public sector are higher than those in the private sector. Several reasons may account for this disparity in wages between the public and private sectors. The public sector operates under political constraints rather than profit constraints. Becker (1957) states that in a perfectly competitive market, employers who pursue goals other than competitiveness (for example, discriminating employers), will, in the long run, be driven out of the market. Governments, on the other hand, may be driven by political pressures to be exemplary employers and not pay very low wages to its less skilled workforce (Melly, 2005). One explanation put forward to explain the existence of the public sector wage premium in Trinidad and Tobago may be that the government uses public sector employment and wages to achieve particular policy goals, such as decreasing unemployment and decreasing gender and ethnic discrimination (Coppin and Olsen, 2007).

Generally, the presence of gender wage gaps and its heterogeneity over the wage distribution is, in part, a reflection of gender differences in work force attachment and as such, also reflects gender differences in the propensity to participate in the labour market (Picchio and Mussida, 2010). In many countries there exist sizeable gender wage gaps in employment rates, which make sample selection into the workforce an important issue when assessing gender wage gaps (Picchio and Mussida, 2010). Trinidad and Tobago is no different as female labour force participation rates are markedly lower than male participation rates. In the two decades spanning 1990 to 2010, male participation rates averaged around 75 per

cent, while female participation rates averaged 47 per cent. In light of this, the results of this research may have underestimated the true size of the gender wage gap.

Several reasons have been put forward to explain the existence of gender wage gaps and why they widen at the bottom and/or top of the wage distribution, even after controlling for observed characteristics across both genders. Booth and Francesconi (2003) have argued that women may be perceived as having a smaller work force attachment, especially at the bottom of the wage distribution, and this may affect how trade unions chose to represent them. Trade unions may be less likely to represent or may differentially represent the interests of female workers (Booth, 2009). Additionally, women at the bottom of the wage distribution are more likely to have less bargaining power or be more subject to firms' market power than comparable men; in this context, social norms and family commitments usually lead to men's careers taking precedence (Arulampalam *et al*, 2007). Empirically, the sticky floor phenomenon was found in Cyprus and Luxembourgh, and was attributed to the high segregation of women in low-paying industries and occupations (Christofides and Vrachims, 2010).

In terms of glass ceilings, Bjerk (2008) asserts that gender inequality in opportunity with respect to hiring and promotion to top paying jobs may be the reason behind the existence of glass ceilings. If women have a more intermittent career, they will have fewer opportunities to signal to employers their skills, and may need more time to accumulate these positive signals to be considered for promotions. Others support institutional arrangements as a probable reason for the existence of glass ceilings. Albrecht *et al* (2003), in the context of Sweden, states that the country's glass ceiling phenomenon is likely linked to parental leave and the day-care system which incentivise women to be in the workforce but may discourage strong career commitment. Sociological and psychological factors may also play a role in favouring men over women, particularly at the top of the wage distribution. Women may be less willing than men to negotiate over offered pay packages, and due to stereotypes, women may not be seen as potential leaders – and when they become

leaders, they might be evaluated less favourably. Also, women tend to be more risk averse and sometimes give priority to other perks of the job rather than wages (Picchio and Mussida, 2010 and Booth, 2009).

The main result of the paper concludes that Trinidad and Tobago's labour market does not have a *glass ceiling*, but rather female workers face *sticky floors*. However, it is likely that the glass ceiling is "hidden" given that at the higher end of the wage distribution, women have a greater number of years of education than men.

The rest of the chapter is as follows: section 4.2 outlines the conceptual framework and section 4.3 explains the methodology used for the regression and decomposition analyses; section 4.4 presents the data and econometric specification; section 4.5 discusses the estimation results; and section 4.6 concludes the chapter.

4.2 Estimation Approach – Quantile Regression

More recent publications have gone beyond the BO decomposition approach and applied quantile regression (QR) techniques as well (see for example, Arjulampalam *et al*, 2007, Albercht *et al*, 2001, and de la Rica and Dolado, 2008). QR techniques also decompose the difference between the male and female wage distributions into "explained" and "unexplained" components. However, instead of identifying differences at the mean, QR explains these differences quantile by quantile, that is, over the entire wage distribution. The conventional BO and Neumark decomposition techniques are based on mean regression analysis, but these approaches are limited since inequality depends on the entire distribution of wages, and not merely at the mean of the wage distribution; furthermore the parameters of the regression model may vary across the distribution (Appleton *et al*, 2014).

The aim of this part of the research is to analyse pay differentials across the entire distribution of wages. The quantile regression methodology (Koenker and Bassett,

1978) allows the characteristics of individuals to have different impacts at different points of the wage distribution, which consequently affects the implied decompositions at each point. This approach allows for the examination of the effects of either the "glass ceiling" or "sticky floor" phenomena. In the case of the former, a larger unexplained gender wage gap is observed at the top of the wage distribution, suggesting that, as women advance to top positions, their pay may not increase *pari pasu*. In the latter case, a larger unexplained earnings gap at the lower end of the wage distribution may suggest that females enter occupations and industries with low pay and few advancement opportunities (Christofides *et al*, 2010). At the time of writing, there is sparse research on either the "sticky floor" or the "glass ceiling" phenomena for Trinidad and Tobago.

The Oaxaca decomposition regressions are performed under the assumption that men and women have the same returns to characteristics. This assumption will be relaxed to run separate quantile regressions for men and women to see if the two groups have differing returns to the same labour market characteristics.

The QR method estimates the θ^{th} quantile variable, in this case logarithmic wage, conditional on a number of variables, under the assumption thatq_θ, the *conditional* quantile of Y, is linear in$\boldsymbol{X}$ (that is, $q_\theta = \boldsymbol{X}\beta(\theta)$. The model can be written as:

$$ln\ wage_i = \boldsymbol{X}_i\beta_\theta + \mu\,\theta_i\theta \in (0,1) \qquad \text{Eq. (1)}$$

and

$$Quant_\theta(ln\ wage_i|\boldsymbol{X}_i) = \boldsymbol{X}_i\beta_\theta \qquad \text{Eq. (2)}$$

$\boldsymbol{X}_i$ represents the vector of exogenous variables for each individual *i* and β_θ, represents the coefficient vector that needs to be estimated. $Quant_\theta\ (ln\ wage_i \mid \boldsymbol{X}_i\ )$ represents the conditional quantile of *ln wage* given $\boldsymbol{X}$.

The coefficient vector is found through the following equation:

$$min\ \beta(\theta)\{\sum_{i:y_i \geq x_i\beta(\theta)} \theta|y_i - x_i\beta(\theta)| + \sum_{i:y_i < x_i\beta(\theta)}(1-\theta)|y_i - x_i\beta(\theta)|\}$$

Eq. (3)

The coefficient vector, β_θ, can be interpreted as the estimated returns to individual characteristics at the θ^{th} quantile of the wage distribution. The advantage of this technique is that it allows for the possibility that characteristics have different returns at different parts along the wage distribution, which is not possible using the Ordinary Least Squares (OLS) analysis as employed by the Oaxaca decomposition methodology.

To make the results of the QR analysis comparable to the results of the BO and Neumark decompositions in the previous chapter, the same explanatory variables will be used – potential experience, potential experience squared, dummies for highest level of education achieved, marital status, ethnicity, and additional controls for occupation and industry. The focus of the quantile regression decompositions would be based on five quantiles -10% 25%, 50%, 75%, and 90%. Following other researchers (e.g. Christofides *et al*, 2012), we can define a *sticky floor* and a *glass ceiling* as existing if the 10th percentile and the 90th percentile respectively exceed other reference points of the wage distribution by at least two percentage points.

Appleton *et al* (2014) has noted however that some prudence needs to be taken when interpreting the results of quantile regressions since they pertain to *conditional* quantiles, not unconditional ones. According to Appleton *et al*, since unobserved determinants of wages are unobserved, it is not clear to the econometrician what these are. These unobserved determinants could possibly include measurement error or random factors like a worker's luck in landing a high paying job. Furthermore, the authors note that unobserved characteristics of a job may also be noteworthy – for example, the researcher may not observe firm size or

profitability, but rent-sharing theories (or gift exchange theory, Akerlof, 1982) imply these may have a significant effect on earnings.[40]

4.3 Decomposition Techniques

4.3.1 Conditional Quantile Decomposition

Machado and Mata (2005) and Melly (2006)

The simplest method to estimate the difference in wages between genders is to use a Mincer equation for wages with the inclusion of a gender dummy. However, this approach has several shortcomings, such as the presence of unobservable factors (variables) that may be correlated with the error term, sample selection bias, and the possibility that men and women may receive different rewards for the same characteristics (van der Velde et al, 2013). These shortcomings can be addressed by interacting the gender dummy with some of the other variables. In practice, this is equivalent to estimating two separate wage equations for men and women, and then decomposing the absolute differences in wages into a component attributable to differences in characteristics and a component that cannot be explained by differences in characteristics. The most widely used decomposition technique has been the Blinder-Oaxaca technique. The "unexplained" component is often seen as evidence of discrimination, but also captures the effects of unobserved characteristics (see section 3.3.2 for a more detailed discussion of this technique).

However, Kuhn (1987) was the first to put forward some of the limitations of this traditional approach of analysing gender wage gaps and discrimination. Conditional mean models do not allow for analyses based on non-central locations which can be useful for social research in studies like economic inequality and mobility. Secondly, conditional mean methods may fail to capture trends in the distribution and may be an inappropriate measure of central tendency in the presence of outliers. The quantile approach allows the researcher to test whether determinants of wages

[40] Rent-sharing theory suggests that higher wages may induce loyalty from workers who in turn increase their productivity. The extent to which this loyalty exists or even increases may be influenced by the extent to which the firm shares its profits with workers.

have different effects higher up the conditional wage distribution compared to workers at the lower end. Quantile regression analysis that was introduced by Koenker and Bassett (1978) can be more useful and informative even in the presence of highly skewed data, and has better properties in the presence of heteroscedasticity (Deaton, 1992).

As was previously mentioned, Appleton *et al* (2014) has cautioned that interpreting the results of quantile regressions should be done with some amount of care given that they relate to *conditional* quantiles. In other words, a worker at a high wage quantile is a worker with high wages given the values of observed determinants of wages, rather than simply a high wage worker *per se*. Additionally, workers at high wage quantiles tend to also have favourable unobserved determinants of wages. Given that unobserved determinants of wages are unobserved, it is not clear to the researcher what they are – these unobservables could include measurement error, random factors (for example, luck in landing a high paying job), and unobserved personal characteristics that affect earnings (in the theoretical literature this is usually labelled "ability" but may also include determination, ambition, and personal appearance). There may also be unobserved characteristics of the job as well – in the case that firm size and profitability are unobserved, rent sharing theories suggest that these may have a significant impact on earnings.

Machado and Mata (2004) proposed a quantile-based decomposition technique that combines quantile regression with bootstrapping.[41] First, in the quantile regression model the conditional quantiles of *ln wage* are given by equation (2) and these can be estimated by quantile regression. Second, underlying the MM technique is the probability integral transformation theorem from statistics: If U is uniformly distributed on [0,1], then $F^{-1}(U)$ has distribution F. Then, for a given X_i and a random $\vartheta \sim U[0,1]$, $X_i\beta_\vartheta$ has the same distribution as $ln\ wage_i|X_i$. In the MM technique,

[41] In statistics, bootstrapping falls into the broader class of resampling methods; bootstrapping refers to any test or metric that relies on random sampling with replacement. For instance, in the case where a set of observations are assumed to be from an independent and identically distributed population, the proprieties of an estimator (for example, its variance) can be estimated by constructing a number of resamples with replacement of the observed data set.

instead of keeping X_i fixed, a random X is drawn from the population, and $X\beta_\vartheta$ will have the same distribution as *ln wage* (the dependent variable).

Firstly, quantile regressions are used to estimate the effects of covariates on the location and shape of the conditional wage distribution. Quantile regressions (equation 2) are run separately for men and women to predict wages at various points of the wage distributions by gender. The MM methodology focuses on the impact of differences in the returns to characteristics on the gender wage gap. Hence, the authors estimate a counterfactual female wage distribution that women would have if their labour market characteristics were rewarded equivalently as men. Bootstrapping is used to estimate the counterfactual female wage distribution instead of using the average characteristics of the female sample.

Formally, the MM (2005) approach can be described as follows:

Step 1: generate a random sample, *u*, of size *n* from an uniform distribution *U*[0,1]: $\theta_1, \ldots, \theta_n$.

Step 2: for each θ of *u*, the QR coefficients $\beta_{F(\theta)}$ and $\beta_{M(\theta)}$ in equation (2) are estimated using the female and male data set, respectively.

Step 3: draw a random female sample with replacement and use their characteristics to predict wages using the estimated coefficients obtained in step 2. This prediction enables the calculation of the marginal distribution of female wages and the marginal distribution of male wages that would prevail if men's characteristics were distributed the same as women's.

Step 4: calculate the gender wage gap at each quantile using the new estimated female wage distribution and the estimated counterfactual male wage distribution.

One major disadvantage of the MM decomposition approach is that the individual contribution of each covariate (individual and firm-level characteristics) on the

gender wage gap cannot be disaggregated, which makes it less useful for policy recommendations.

In this chapter, the method proposed by Melly (2006) was used to estimate the parameters of the Machado and Mata (MM) decomposition.[42] The Melly (2006) estimator based on the conditional quantile regression methodology is very similar to the MM decomposition technique. The MM technique is based on simulation methods and can be very computationally tedious; however, Melly (2006) shows that if the number of simulations used in the MM procedure goes to infinity, the Melly (2006) decomposition technique is numerically similar to the MM procedure. One should note that the Melly (2006) decomposition method assumes exogeneity for all covariates – as such, the use of instrumental variables or sample selection procedures could be used to address this issue. Similar to the MM technique, the Melly (2006) decomposition technique does not allow for computing detailed decompositions.

In brief, in step 1, instead of drawing a random sample from a uniform distribution, Melly estimates conditional (linear) regressions for a large number of quantiles and then integrates the conditional wage distribution over the covariates to estimate the unconditional distribution. This allows for a more precise estimation of the unconditional distribution of wages using the information contained in the covariates. Also, the procedure allows for the estimation of counterfactual unconditional distributions – that is, by using the characteristics distribution of female workers and the coefficients estimated using the data for male workers, the counterfactual distribution of wages can be estimated, which is the distribution of wages female workers would receive if they had the same output function as male workers. This counterfactual distribution is then used to decompose the differences in distribution. For each quantile considered, the wage gap can be decomposed into a part explained by differences in characteristics and a part explained by differences

[42] The estimates were computed with Melly's (2006) implementation of the "rqdeco" command in Stata.

in coefficients. This essentially is a generalisation of the Oaxaca-Blinder decomposition for the mean.

For the Melly (2006) estimator, as was stated in equation (2), the conditional quantile function for men would be:

$$Q_{M,\theta}(ln\ wage_M|\boldsymbol{X}_M) = \boldsymbol{X}_{M,i}\beta_{M,\theta} \quad \text{Eq. (4)}$$

and for women:

$$Q_{F,\theta}(ln\ wage_F|\boldsymbol{X}_F) = \boldsymbol{X}_{F,i}\beta_{F,\theta} \quad \text{Eq. (5)}$$

The Melly (2006) approach can be described in the following steps:

Step 1: estimate the entire conditional distribution by quantile regression.

Step 2: obtain the unconditional distribution function by integrating the conditional distribution function over a range of covariates.

Step 3: invert the unconditional distribution function (counterfactual distribution) to obtain the unconditional quantiles of interest.

Since the conditional quantile function may not necessarily be monotonic and impossible to invert, Melly (2006) proposed integrating the entire conditional distribution function by integrating over the full set of covariates. Note that the conditional cumulative distribution of wages is $F_W(Q_\theta)$ in equation (6), and the inverse of the distribution function, $F_W^{-1}(\theta)$, is in fact, the quantile function:

$$\theta = F_W(Q_\theta) = E[F_{W|X}\big(Q_\theta(W|X)\big) = \int F_{W|X}\big(Q_\theta(W|X)\big)dF_X(X) \quad \text{Eq. (6)}$$

Hence, in order to obtain our counterfactual quantile of interest, we need to invert the counterfactual distribution of interest, $Q_{M,\theta}^C = F_{W_M^C}^{-1}(\theta)$. The counterfactual distribution uses the distribution of the characteristics of female workers with the wage structure of male workers as follows:

$$F_{W^C_{M,\theta}}(W) = \int F_{M,\theta|X_M}(W|X)dF_{X_F}(X) \quad \text{Eq. (7)}$$

The standard errors can be obtained by bootstrapping the results, but this technique is computationally demanding and time consuming. To deal with this, Melly (2005) constructed an analytical estimator of the asymptotic variance using the asymptotic results for the parametric estimator.

Once the key counterfactual, $Q^C_\theta = X_{F,i}\beta_{M,\theta}$ is estimated, the wage gap of the unconditional quantile function can be decomposed between the two genders:

$$\Delta_\theta = \left[Q_{M,\theta} - Q^C_{M,\theta}\right] + \left[Q^C_{M,\theta} - Q_{F,\theta}\right] \quad \text{Eq. (8)}$$

The first term on the right-hand side represents the effect of characteristics (or the quantile endowment effects) and the second term represents the effect of coefficients.

4.3.2 Unconditional Quantile Decomposition (using RIF-regressions)

Firpo, Lemieux and Fortin (2009)

A major drawback of the Machado and Mata (2005) and Melly (2006) decomposition techniques is that they both fail to provide detailed decompositions such that the effect of individual covariates on the unconditional quantile wage distribution cannot be estimated. Firpo, Lemieux and Fortin (2009) provide an alternative decomposition technique that allows for the computation of detailed decompositions.

In the case of quantiles, RIF-regressions (re-centred influence function) can be viewed as *un*conditional quantile regressions – it estimates the changes in the distribution of covariates on the quantiles of the unconditional distribution of an outcome variable. The influence function is a widely used tool in robust estimation; it is re-centred so the mean of the re-centred influence function corresponds to the statistic of interest. RIF-regressions are similar to standard regressions except that

the dependant variable is replaced by the corresponding RIF of the statistic of interest – in our case, the log of hourly wages.

According to Firpo *et al* (2010), RIF-regression methods enable detailed decompositions to be performed for any distributional statistic for which an influence function can be computed. In this study, we focus on the difference between quantiles, Q_θ, of the marginal unconditional distribution F_W. RIF-regression methods are especially useful to analyse *glass ceilings* in the context of gender wage gaps as these methods can be used to perform Oaxaca-Blinder-type detailed decompositions.

Given that this research seeks to explore the phenomena of glass ceilings and sticky floors, we are interested in quantiles. In this case, the influence function $IF\ (W, Q_\theta)$, is defined as follows (Firpo *et al*, 2009):

$$IF(W, Q_\theta) = (\theta - \mathbb{I}\{W \leq Q_\theta\})/f_W(Q_\theta) \qquad \text{Eq. (9)}$$

where $\mathbb{I}\{\cdot\}$ is an indicator function, and $f_W(\cdot)$ is the density function of the marginal distribution of W evaluated at Q_θ. The RIF function is equal to $Q_\theta + IF(W, Q_\theta)$, and can be written as:

$$RIF(W; Q_\theta) = Q_\theta + \frac{\theta - \mathbb{I}\{W \leq Q_\theta\}}{f_W(Q_\theta)} \qquad \text{Eq. (10)}$$

The RIF for a quantile is simply an indicator (dummy) variable $\mathbb{I}\{W \leq Q_\theta\}$ for whether the dependent variable (in our case, the log of hourly wages, W) is less than or equal to the quantile Q_θ of interest. Firpo, Fortin and Lemieux (2009) explain how to compute the RIF, and then run regressions of the RIF on the vector of covariates. For quantiles, the RIF is first estimated by computing the sample $\hat{Q}_\theta$, and estimating the density at that point, usually using a kernel density. Then, an estimate of the RIF for each observation, $\widehat{RIF}(W_i; Q_\theta)$, is generated by plugging in the estimates of the sample quantile $\hat{Q}_\theta$ and the density function evaluated at Q_θ, that is, $\hat{f}(\hat{Q}_\theta)$ into

equation (10). The expected values of the RIF-regression when used for quantiles can be thought of as *unconditional* quantile regression.

The coefficients of the unconditional quantile regression are estimated for each group (in our case, for men and women), and can then be used to perform the equivalent of the Oaxaca-Blinder decomposition for each quantile as follows:

$$\hat{\Delta}_{\theta} = (\bar{X}_M - \bar{X}_F)\hat{\gamma}_{F,\theta} + \bar{X}_M\left(\hat{\gamma}_{M,\theta} - \hat{\gamma}_{F,\theta}\right) \quad \text{Eq. (11)}$$

The first term on the right hand side represents the differences in characteristics (endowments) and the second term represents the differences in returns to characteristics, that is, the wage structure effect. As was previously stated, this methodology allows for detailed decompositions so that the contribution of each covariate to both the endowments and returns effects can be estimated. This is done using linear approximation. The first and second terms in equation (11) can be rewritten as the sum of the contribution of each covariate as follows:

$$(\bar{X}_M - \bar{X}_F)\hat{\gamma}_{F,\theta} = \sum_{k=1}^{K}(\bar{X}_{Mk} - \bar{X}_{Fk})\hat{\gamma}_{Fk,\theta} \quad \text{Eq. (12)}$$

$$\bar{X}_M\left(\hat{\gamma}_{M,\theta} - \hat{\gamma}_{F,\theta}\right) = \sum_{k=2}^{K}\bar{X}_{Mk}\left(\hat{\gamma}_{Mk,\theta} - \hat{\gamma}_{Fk,\theta}\right) \quad \text{Eq. (13)}$$

Firpo *et al* (2010) show that the aggregate decomposition results obtained from the RIF regressions should not be statistically significantly different from the decomposition results obtained from the Machado and Mata (2005) methodology.

Firpo *et al* (2010) highlighted that the RIF-regression technique is advantageous given its use of linearization. Linearization makes it easy to invert the proportion of interest by dividing by the density. Further, since we perform the inversion locally, another advantage of using this technique is that there is no need to evaluate the global impact at all points of the distribution, and hence circumvent having to address the problem of monotonicity. Lastly, the use of linearization generates a

simple regression, which is easy to interpret, and the resultant decomposition is path independent.[43]

Despite these advantages, the RIF-regression technique does have a few limitations as well. RIF-regression assumes the invariance of the conditional distribution, that is, it assumes there are no general equilibrium effects (Fortin *et al,* 2010). Also, in practical terms, there is a question of how good is this linear approximation. The RIF-technique transforms a non-linear distributional function into a linear approximation, which can potentially lead to approximation errors and consequently, the estimation of inconsistent results. Firpo *et al* (2010) highlighted that for relatively smooth dependent variables, the RIF technique should yield reliable results. However, if there is considerable heaping in the distribution of the dependent variable (as is usually the case for wage distributions), Firpo *et al* (2010) advises to over-smooth the density estimates and compare these values around the quantile of interest.

4.4 Data and Econometric Specification of Wage Function

The same data set (Continuous Sample Survey of the Population, CSSP) used in the previous chapter was also used in this analysis, as well as the same covariates – potential experience, potential experience squared, dummies for highest level of education obtained, marital status and ethnicity. In an expanded version of the model controls for public versus private sector employment, occupation[44], and industry were included. The reference categories include: primary school (education), unmarried (marital status), mixed/other (ethnicity), private sector employee (type of worker), elementary occupations, and social/personal services (industry). Like in the previous chapter, the problem of sample selectivity is not addressed due to the paucity of appropriate variables in the CSSP.

[43] The independence of path refers to a property of a function for which the line integral has the same value along the curve between two specified points.
[44] See Appendix I: National Occupational Classification of Trinidad and Tobago (2013) for more details on the classification of occupations.

Table 4.1 presents the sample characteristics of the dependent variable (log of hourly wages) and some of the covariates over both high and low quantiles. At the lower end of the wage distribution there is a greater disparity between male and female wages compared to the median and higher end of the distribution where both genders have similar (log) hourly wages. At the 10th percentile men's (log) hourly wages are 2.36 versus women's wages of 2.29. However at the 90th percentile, both genders earn equivalent wages. This is cursory evidence that women in Trinidad and Tobago's labour market may face "sticky floors" instead of a "glass ceiling". Even though men and women earn the same hourly wage at the top of the wage distribution and there appears to be no *glass ceiling*, this may be hidden given that at the higher end of the wage distribution women have a greater number of years of education than men. At the 90th percentile women have three more years of education than men.

Table 4.1: Sample Characteristics

	Mean		**p10**		**p50**		**p90**	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
Log of hourly wages	3.28	3.17	2.36	2.29	3.19	3.20	3.90	3.90
Age	37	37	32	37	37	37	40	38
Potential Experience	22	21	18	22	22	22	24	18
Years of Education	10	11	9	10	9	10	11	14
Number of observations	**1,167**	**844**	**59**	**80**	**160**	**83**	**35**	**32**

Graph 1 displays the unadjusted raw gender wage gap by quantile (that is, the gender differences in log hourly wages by quantile). Sticky floor and glass ceiling effects can be defined to exist if the 10th percentile and the 90th percentile of the total wage gap, respectively, exceed other reference points of the wage distribution by at least two percentage points. At the 10th percentile the unadjusted total gender wage gap is 0.26 log points and -0.06 log points at the 90th percentile. Using the 50th percentile (median) as the reference point, at the 10th percentile the total wage gap is almost 30 percentage points higher, while at the 90th percentile, the total wage

gap is 6 percentage points lower than the median. This shows evidence of a sticky floor in the labour market in Trinidad and Tobago and is the impetus for the use of quantile decompositions in our econometric analysis.

Graph 1: Unadjusted (Raw) Gender Wage Gap

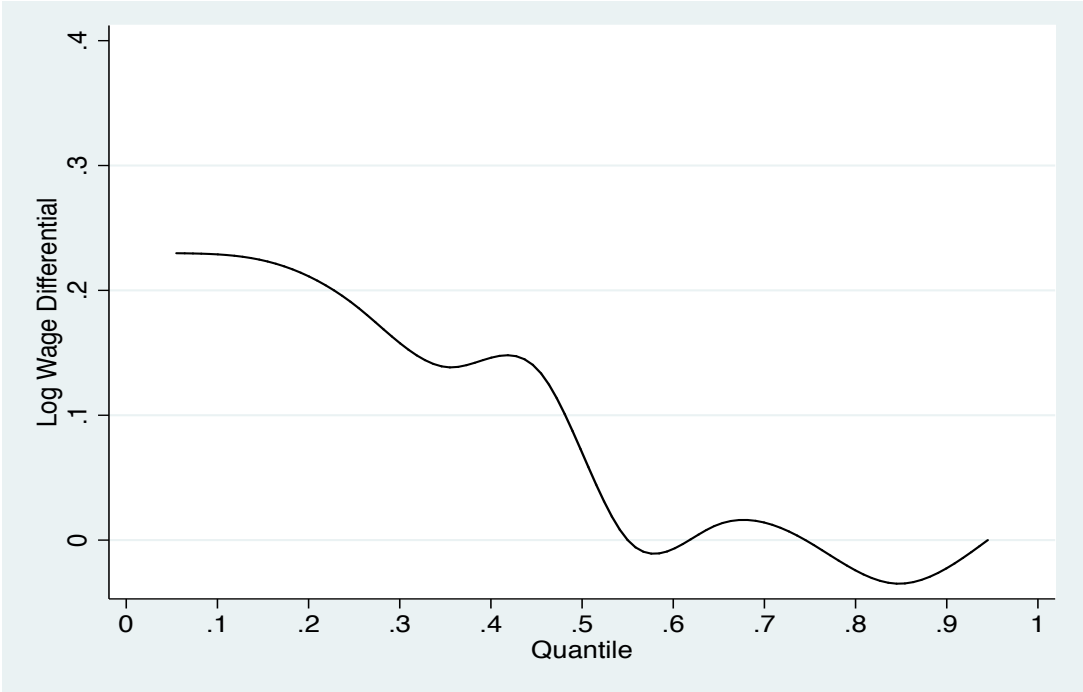


Figure 4.1 shows the percentages of workers (densities) at every point of the income distribution for the log of hourly wages. At lower levels of wages, there is a higher concentration of women than men. The male curve is taller and thinner, which indicates that the male wage distribution is more condensed than the corresponding function for females. Further, the distribution of male wages is farther to the right, which is consistent with men receiving higher average wages than women. The Kolmogorov-Smirnov test for equality of distribution functions indicate that (log) hourly wages for the both genders do not have the same distribution function.

Figure 4.1: Kernel Density Estimate of the Wage Distribution

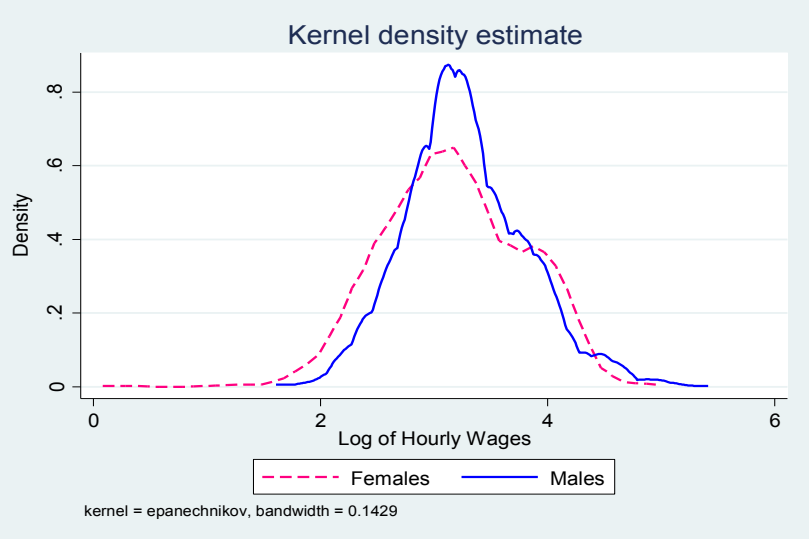
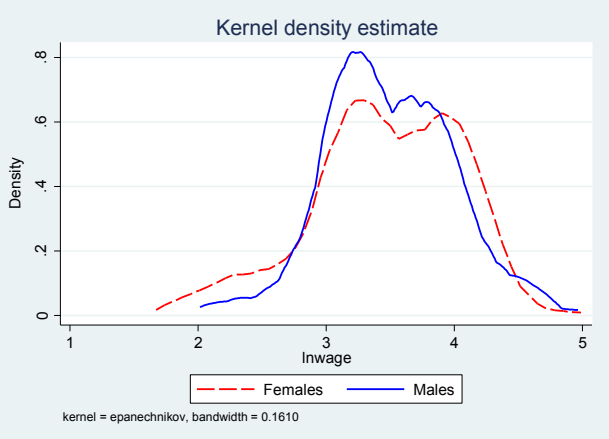
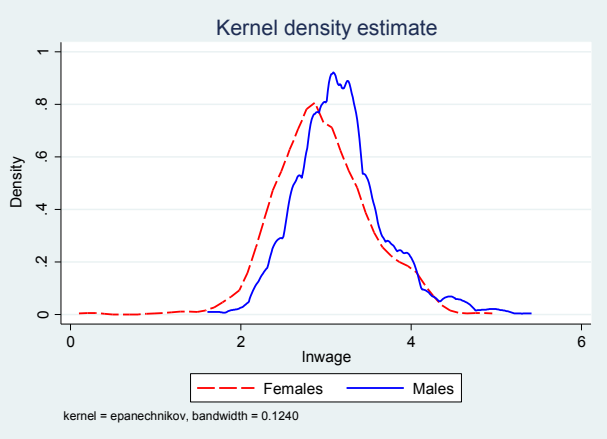


Figure 4.2: Kernel Density Estimate of the Wage Distribution by Sector of Employment



Public Sector



Private Sector

The mean of log hourly wages in the public sector is higher for both men and women compared to the mean of log hourly wages in the private sector (see Table 3.3).

Figure 4.2 depicts the kernel density functions of log hourly wages in the public and private sectors. In the private sector, the distribution of male wages is farther right indicating that they receive higher wages than women. The distribution of wages for both men and women in the private sector is more compressed than in the public sector. This finding is contrary to other countries, such as Germany where wages in

the public sector are more compressed (Melly, 2005). For both genders, the private sector earnings distribution is characterised by a higher density function around the mode.

Figure 4.3: Deviation of Monthly Earnings from National Average by Occupation

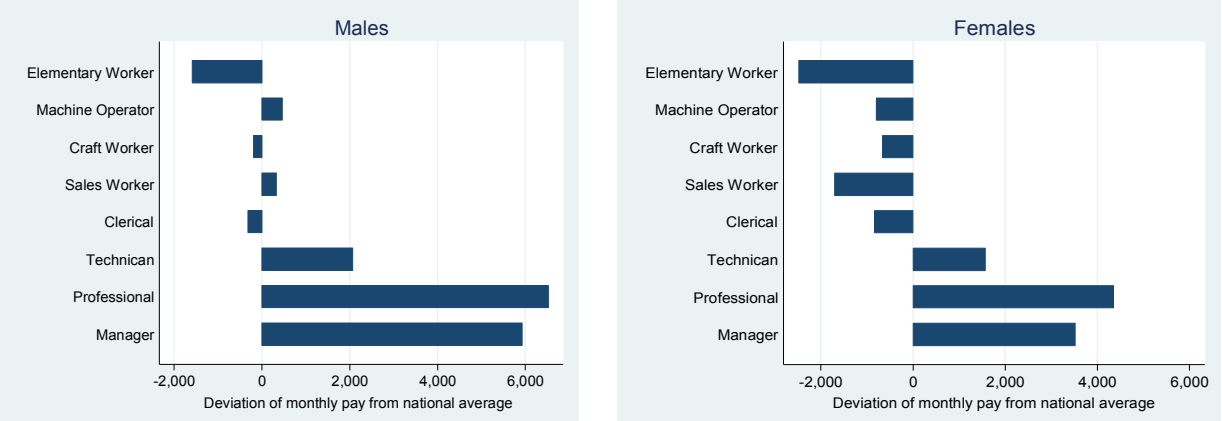


Figure 4.3 and Figure 4.4 depict the deviation of (gross) monthly wages from the national average for men and women by occupational classifications and industry of employment. For lower level occupations[45], such as, elementary workers, sales workers, and clerical staff, for women, their wages are much lower than the national average and considerably lower than their male counterparts. For higher-end occupations, such as professionals and managers, the (positive) deviation from the monthly national average of wages is less for women compared to men's wages in such occupations.

The proportion of men working in those industries classified in Figure 4.4 is larger than the proportion of women except for the Social and Personal Services, Wholesale and Retail, and Finance and Insurance industries.[46] In all of the male-dominated industries that have a positive deviation from the monthly national average of wages, this positive deviation is greater for men compared to women.

[45] See Appendix I: National Occupational Classification of Trinidad and Tobago (2013) for details of the skill level required for each occupational classification.

[46] The proportion of men dominates the following industries: Agriculture/Fishing (73.7 per cent); Mining/Quarrying (87.7 per cent); Manufacturing (69.2 per cent); Electricity/Gas/Water (78.7 per cent); Transport (75.0 per cent); and Construction (86.2 per cent). Meanwhile, women dominate in the following industries: Social/Personal Services (56.0 per cent); Wholesale/Retail (58.5 per cent); and Finance/Insurance (56.6 per cent).

Among those industries that have a negative deviation from the monthly national average of wages (namely, Agriculture and Fishing, Wholesale and Retail and Construction), women's wages are much lower than the national average and considerably lower than their male counterparts.

Figure 4.4: Deviation of Monthly Earnings from National Average by Industry

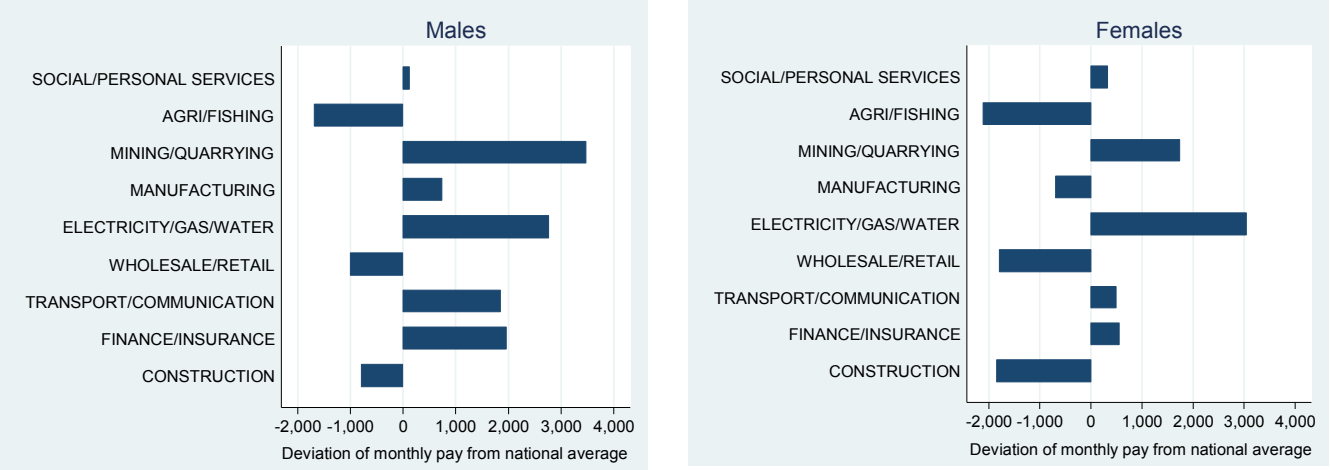


Table 3.3 (Sample Characteristics) in the previous chapter revealed that average (log) hourly earnings are higher in the public sector for both men and women than in the private sector. The sample used also shows that public sector employees are, on average, more educated than private sector employees. For instance, 13.7 per cent of the male employees in the public sector have achieved a university degree and 40 per cent of female public sector workers have a university degree. This compares to just 5.1 per cent and 11.3 per cent for male and female private sector employees with university degrees. Male public sector employees have more (potential) labour market experience (25.5 years) compared to female public sector employees (20.3 years) and both men and women (20.7 and 21.2 years) working in the private sector. These differences in work experience and education may explain the higher average wage of public sector employees. Another probable cause for the disparity in average wages between public and private sector employees may be the greater concentration of professionals and technicians in the public sector. Of all male public sector employees, 14.5 per cent are technicians while in the private sector only 9.2 per cent of all male employees are technicians. This disparity is even greater among women, with 27.7 per cent of all female public sector employees

being technicians versus only 15.9 per cent of the female workforce being technicians in the private sector.

Table 4.2: Sample Characteristics by Sector of Employment

Public Sector						
	p10		**p50**		**p90**	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**
Log of hourly wages	2.33	2.26	3.19	3.20	3.90	3.90
Age	37	39	41	36	40	38
Potential Experience	23	25	27	20	24	19
Years of Education	9	9	9	11	11	14
No. of observations	**13**	**32**	**79**	**45**	**83**	**80**
Private Sector						
	p10		**p50**		**p90**	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**
Log of hourly wages	2.37	2.30	3.20	3.21	3.91	3.91
Age	31	36	35	38	40	37
Potential Experience	18	22	20	23	24	19
Years of Education	9	10	9	10	11	14
No. of observations	**89**	**123**	**134**	**57**	**58**	**31**

4.5 Results

4.5.1 Earnings Functions

Table 4.3 and Table 4.4 present the estimates from the quantile regressions at the 25th, 50th and 75th percentiles run on separate wage functions for men and women. Table 4.3 presents the results from the human capital theory (Mincer-type wage equations), while the estimates in Table 4.4 include controls for sector of employment, occupation and industry. Figure 4.5.1 and Figure 4.5.2 provide a visualisation of the results from the human capital wage specification. In the graphs the black broken horizontal line represents the OLS estimates and the dotted lines

on either side of this line represent the corresponding 95% confidence interval. The curves in the graphs and the shaded area are the quantile regression estimates and their corresponding 95% confidence intervals. In the log wage quantile regressions, the coefficient estimates, $\hat{\beta}(\theta)$ are interpreted as the estimated returns to individual characteristics at the ϑ^{th} quantile of the log wage distribution.

In the human capital theory specification, a Wald test shows that the constant/intercept terms for both genders are significantly different from each other across the quantiles. The male intercept term is higher than that for females throughout the wage distribution, indicating that regardless of their productivity levels, men enter the labour market at an advantage over women. This may be due, in part, to discriminatory practices by employers but may also be the consequence of men being more successful at negotiating higher pay packages than women. Discussion with the Chief Executive Officer at a leading business performance improvement consultancy firm based in Trinidad indicated that, in her opinion, one of the main reasons for the existence of the gender wage gap in Trinidad and Tobago is that women were not as confident as men when negotiating their pay packages and they tend to undersell themselves in the workforce. In the psychology literature, there is evidence that men systematically overestimate their own abilities when predicting their future performances, while females tend to underestimate their future performance (see Maccoby and Jacklin, (1974), Frieze *et al, (*1978), and Kahneman *et al* (1982) for discussion of this evidence).

As expected, the differential rate to schooling increases with the attainment of higher qualifications for both men and women. Degree holders have the greatest advantage, as the coefficient on tertiary education is positively significant and greater than other qualification dummies. However, Wald tests show that for every level of education obtained, the differential rate to education[47] do not differ significantly from each other *across the quantiles* in the case of both men and women. Women experience higher differentials than men, with rates ranging

[47] The differential rates to education were calculated at the exponential of the corresponding coefficient minus one.

between 239.4 per cent and 270.2 per cent, whilst the differential rate to education for men ranges between 229.0 per cent and 253.6 per cent.

The return to (potential) experience is statistically significant for both men and women across the entire distribution of wages, except for men at the lower end of the distribution. The return to experience remains stable as you move up the wage distribution, for instance, the return to experience for women is 1.5 per cent at both the 25th and 75th percentiles, and for men the return to experience is 1.3 per cent at the median and 1.5 per cent at the 75th percentile.

Married men appear to earn a wage premium compared to their unmarried counterparts – this is usual in the literature for both developed (Schoeni, 1995) and developing countries (Coppin and Olsen, 1998; Olsen and Coppin, 2001; Olsen, 2005). However, this premium decreases as you go up the wage distribution. At the 25th percentile, married men receive a wage premium of 17.6 per cent, but this decreases to 9.4 per cent at the 75th percentile. Marital status is not a statistically significant determinant of wages for women. Anecdotal evidence in Trinidad and Tobago (based on discussion with the CEO of a consultancy firm operating in Trinidad – referenced above) shows that employers do consider marital status in their hiring decisions, especially in this new age of uncertainty; but it does depend on the role– some roles require travel so family life (including marital status) is always a consideration when hiring for particular roles/positions. Some employers prefer a young single educated female instead of a young and newly married educated female employee. In addition, the CEO noted that married men tend to negotiate for a higher salary often times citing he has a family as his reason for demanding a higher salary. There is also greater pressure on a married man with respect to his relationship at home to earn more and provide for his family; the man's ego also plays a role in ensuring his earning status.

Meanwhile, ethnicity is not statistically significant for men throughout the entire wage distribution, but is statistically significant for women of East Indian descent at

the 75th percentile – these women earn 11 per cent less than women of mixed or other ethnicities. Recall that the "mixed/other" category includes minority ethnicities such as White, Syrian/Lebanese and Chinese, all ethnic groups which have historically had a higher social status in Trinidad and Tobago compared to the two major ethnic groups – Indian and African (Olsen and Coppin, 2001).

In the full model, the differentials to education for both men and women and across all the quantiles estimated more than halved compared to the human capital theory specification. In other words, based on the full model, about half of the differentials to schooling are accounted for by the choice of sector of employment – private or public, occupation, and industry. Again, the differentials to (all levels of) education for men and women are not statistically different from each other across the various quantiles estimated with the exception of tertiary education at the 75th percentile. Noteworthy is that compared to the human capital model where women enjoyed higher differentials to education, in the full model this is reversed. In the full model men benefit more from tertiary education across the entire distribution of wages – their wages increase between 82.9 per cent and 95.2 per cent, whereas women benefit from tertiary education range between 49.5 per cent and 65.5 per cent in higher wages.

Throughout the wage distribution both men and women working in the public sector enjoy wage premiums over their counterparts employed in the private sector. Women, however, receive a higher wage premium for working in the public sector compared to their male counterpart. Notably, at the 75th percentile women receive significantly higher wage premiums compared to men – 30.1 per cent versus 18.6 per cent. This substantiates the results from the previous chapter where it was found that there is a significantly higher (pure) wage gap in the private sector (23.0 per cent) compared to the public sector (3.2 per cent).[48] Given that female public sector workers throughout the wage distribution receive at least a 30.0 per cent premium over female private sector employees may be evidence that the

[48] The (pure) wage gaps in both the public and private sectors in 2012 are lower than in 1993 when they measured 6.3 per cent and 32 per cent, respectively (Coppin and Olson, 2007).

government of Trinidad and Tobago is attempting to counteract discriminatory practices with respect to employment and pay in the private sector.

In terms of occupations, being employed as a Clerk, Technician, Professional or Manager are the only occupations (compared to Elementary occupations) that are statistically significant in determining wages for both genders across the entire wage distribution. At the 25th percentile, female and male Technicians and Managers receive statistically similar wage premiums whilst Professional women receive (log) hourly wages almost twice as much as Professional men (91.5 per cent versus 45.7 per cent). At the 75th percentile, female Technicians receive higher wage premiums compared to men (63.0 per cent versus 41.8 per cent), while male and female Professionals and Managers receive similar wage premiums.

Pooled Quantile and RIF-OLS Regressions with Gender Dummy

As a prelude to the more extensive quantile decompositions based on the Machado and Mata and Firpo *et al* RIF procedures, pooled quantile and RIF-OLS regressions that included a gender dummy were estimated. The results of these estimations showed a larger unexplained gender wage gap at the lower end of the wage distribution (see Appendix IV: Measuring the Gender Wage Gap using Pooled Quantile and Pooled RIF Regressions).

Based on the pooled quantile regressions, for the human capital model, at the 10th percentile, women earned 30.9 per cent less than men and 22.5 per cent less at the 90th percentile (Appendix Table IV.1). Inter-quantile tests were undertaken based on the 90th – 10th differences to assess whether differences between these quantiles are statistically significant. Results of the inter-quantile tests showed that the coefficients on the gender dummy at the 10th and 90th percentile are statistically different from each other at the 10 per cent level (Appendix Table IV.3).

The results from pooled RIF-OLS for the human capital model were qualitatively similar, with women earning 32.2 per cent less than men at the 10th percentile and 16.8 per cent less at the 90th percentile (Appendix Table IV.4). The disparity in the size of the gender wage gap across the wage distribution is more evident when controls for sector of employment, occupation and industry are included. The pooled RIF-OLS (full model) estimated the gender wage gap at 35.0 per cent at the 10th percentile compared with 9.2 per cent at the 90th percentile (Appendix Table IV.5). A Wald test of the equality of the gender coefficients between the 90th and 10th quantiles show that they are statistically different from each other at the 1 per cent level (Appendix Table IV.6). All these results point to a *sticky floor* for Trinidad and Tobago.

Consequently, it was deemed that the more extensive quantile decompositions would be fruitful in examining the gender wage gap across the distribution of wages and would provide a deeper understanding of the sticky floor/glass ceiling phenomena for the Trinidad and Tobago labour market.

Table 4.3: Earnings Functions for Men and Women – Quantile Regressions (Human Capital Theory)

VARIABLES	QR_m25	QR_f25	QR_m50	QR_f50	QR_m75	QR_f75
Potential Experience	0.007	0.015**	0.013***	0.019***	0.015**	0.015***
	(0.006)	*(0.007)*	*(0.005)*	*(0.005)*	*(0.006)*	*(0.005)*
Potential Experience^2	8.50E-05	-1.23E-04	-5.52E-05	-1.72E-04	-5.66E-05	-1.14E-04
	(1.18E-04)	*(1.33E-04)*	*(9.39E-05)*	*(1.20E-04)*	*(1.26E-04)*	*(1.28E-04)*
Education						
Lower Secondary	0.281***	0.220***	0.216***	0.213***	0.216***	0.288***
	(0.050)	*(0.058)*	*(0.046)*	*(0.070)*	*(0.036)*	*(0.058)*
Upper Secondary	0.540***	0.618***	0.522***	0.615***	0.590***	0.654***
	(0.048)	*(0.055)*	*(0.057)*	*(0.073)*	*(0.041)*	*(0.065)*
Tertiary	1.233***	1.303***	1.191***	1.309***	1.263***	1.222***
	(0.075)	*(0.075)*	*(0.077)*	*(0.071)*	*(0.108)*	*(0.061)*
Marital Status						
Married	0.176***	0.033	0.154***	-0.022	0.094***	0.030
	(0.041)	*(0.049)*	*(0.033)*	*(0.036)*	*(0.034)*	*(0.042)*
Ethnicity						
Indian	-4.24E-04	-0.052	-1.44E-16	-0.052	0.011	-0.110*
	(0.060)	*(0.063)*	*(0.041)*	*(0.051)*	*(0.038)*	*(0.061)*
African	0.043	-0.056	0.038	-0.042	0.021	-0.032
	(0.064)	*(0.064)*	*(0.048)*	*(0.048)*	*(0.042)*	*(0.060)*
Constant	2.326***	2.120***	2.595***	2.378***	2.839***	2.706***
	(0.092)	*(0.093)*	*(0.071)*	*(0.096)*	*(0.078)*	*(0.093)*
Observations	1,157	849	1,157	849	1,157	849

Note: Bootstrapped standard errors using 200 replications in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Dependent variable is the log of hourly wages. Base dummy variables are: Education - primary school; Marital Status - unmarried; Ethnicity - mixed/other.

Table 4.4: Earnings Functions for Men and Women – Quantile Regressions

(Full Model)

VARIABLES	QR_m25	QR_f25	QR_m50	QR_f50	QR_m75	QR_f75
Potential Experience	0.007	0.019***	0.007	0.016***	0.005	0.014***
	(0.005)	*(0.005)*	*(0.004)*	*(0.004)*	*(0.005)*	*(0.005)*
Potential Experience^2	-1.54E-05	-2.22E-04*	-7.29E-07	-1.66E-04*	4.17E-05	-1.88E-04**
	(9.85E-05)	*(1.16E-04)*	*(8.52E-05)*	*(9.48E-05)*	*(1.04E-04)*	*(9.44E-05)*
Education						
Lower Secondary	0.118**	0.109	0.137***	0.115**	0.110**	0.088
	(0.048)	*(0.069)*	*(0.037)*	*(0.053)*	*(0.044)*	*(0.065)*
Upper Secondary	0.281***	0.236***	0.312***	0.266***	0.305***	0.246***
	(0.051)	*(0.076)*	*(0.045)*	*(0.055)*	*(0.058)*	*(0.072)*
Tertiary	0.650***	0.504***	0.669***	0.497***	0.604***	0.402***
	(0.109)	*(0.105)*	*(0.069)*	*(0.081)*	*(0.121)*	*(0.085)*
Sector of Employment						
Public Sector	0.283***	0.323***	0.273***	0.346***	0.186***	0.301***
	(0.046)	*(0.080)*	*(0.033)*	*(0.043)*	*(0.036)*	*(0.057)*
Occupation						
Machine Operator	0.264***	0.241	0.248***	0.221	0.359***	0.126
	(0.049)	*(0.422)*	*(0.054)*	*(0.183)*	*(0.053)*	*(0.359)*
Craft Worker	0.187***	0.306	0.203***	0.380***	0.239***	0.406**
	(0.043)	*(0.211)*	*(0.038)*	*(0.120)*	*(0.045)*	*(0.203)*
Sales Worker	0.249***	0.108	0.263***	0.158***	0.384***	0.135**
	(0.071)	*(0.075)*	*(0.059)*	*(0.059)*	*(0.060)*	*(0.062)*
Clerical	0.216***	0.361***	0.169*	0.333***	0.225***	0.241***
	(0.071)	*(0.083)*	*(0.089)*	*(0.047)*	*(0.070)*	*(0.058)*
Technician	0.443***	0.561***	0.398***	0.679***	0.418***	0.630***
	(0.064)	*(0.091)*	*(0.049)*	*(0.067)*	*(0.070)*	*(0.069)*
Professional	0.457***	0.915***	0.609***	0.906***	0.745***	0.825***
	(0.151)	*(0.103)*	*(0.093)*	*(0.080)*	*(0.167)*	*(0.086)*
Manager	0.550***	0.680***	0.645***	0.760***	0.713***	0.837***
	(0.137)	*(0.159)*	*(0.112)*	*(0.122)*	*(0.130)*	*(0.147)*
Industry						
Agriculture/Fishing	-0.151	-0.273	-0.087	-0.063	0.076	0.092
	(0.158)	*(0.313)*	*(0.134)*	*(0.187)*	*(0.153)*	*(0.203)*
Mining/Quarrying	0.471***	0.351	0.404***	0.189	0.475***	0.086
	(0.081)	*(0.286)*	*(0.071)*	*(0.154)*	*(0.107)*	*(0.136)*
Manufacturing	0.186***	0.144	0.149***	0.161**	0.240***	0.152
	(0.062)	*(0.106)*	*(0.051)*	*(0.072)*	*(0.068)*	*(0.108)*
Electricity/Gas/Water	0.251*	0.332	0.276***	0.470**	0.379***	0.480***
	(0.152)	*(0.277)*	*(0.080)*	*(0.218)*	*(0.096)*	*(0.108)*
Wholesale/Retail	0.062	0.029	0.034	0.037	0.005	-0.044
	(0.059)	*(0.083)*	*(0.051)*	*(0.047)*	*(0.052)*	*(0.063)*
Transport/Communication	0.167***	0.034	0.158**	0.12	0.262***	0.134
	(0.060)	*(0.111)*	*(0.076)*	*(0.110)*	*(0.075)*	*(0.094)*
Finance/Insurance	0.257**	0.323***	0.139**	0.275***	0.217**	0.227***
	(0.107)	*(0.076)*	*(0.066)*	*(0.049)*	*(0.108)*	*(0.062)*
Construction	0.171***	-0.354**	0.063*	-0.152	0.103**	-0.041
	(0.044)	*(0.140)*	*(0.034)*	*(0.100)*	*(0.044)*	*(0.090)*
Constant	2.207***	2.003***	2.491***	2.202***	2.707***	2.565***
	(0.082)	*(0.113)*	*(0.078)*	*(0.094)*	*(0.081)*	*(0.111)*

Note: Bootstrapped standard errors using 200 replications in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Dependent variable is the log of hourly wages. Base dummy variables are: Education - primary school; Marital Status - unmarried; Type of Worker – private sector; Occupation – Elementary Occupations; and Industry – Social/Personal Services.

Marital status and ethnicity are included, but not reported; estimated coefficients, size and sign are qualitatively similar to those obtained in the human capital specification.

Figure 4.5.1: Quantile Regression of Log Wages for Women – HC Model

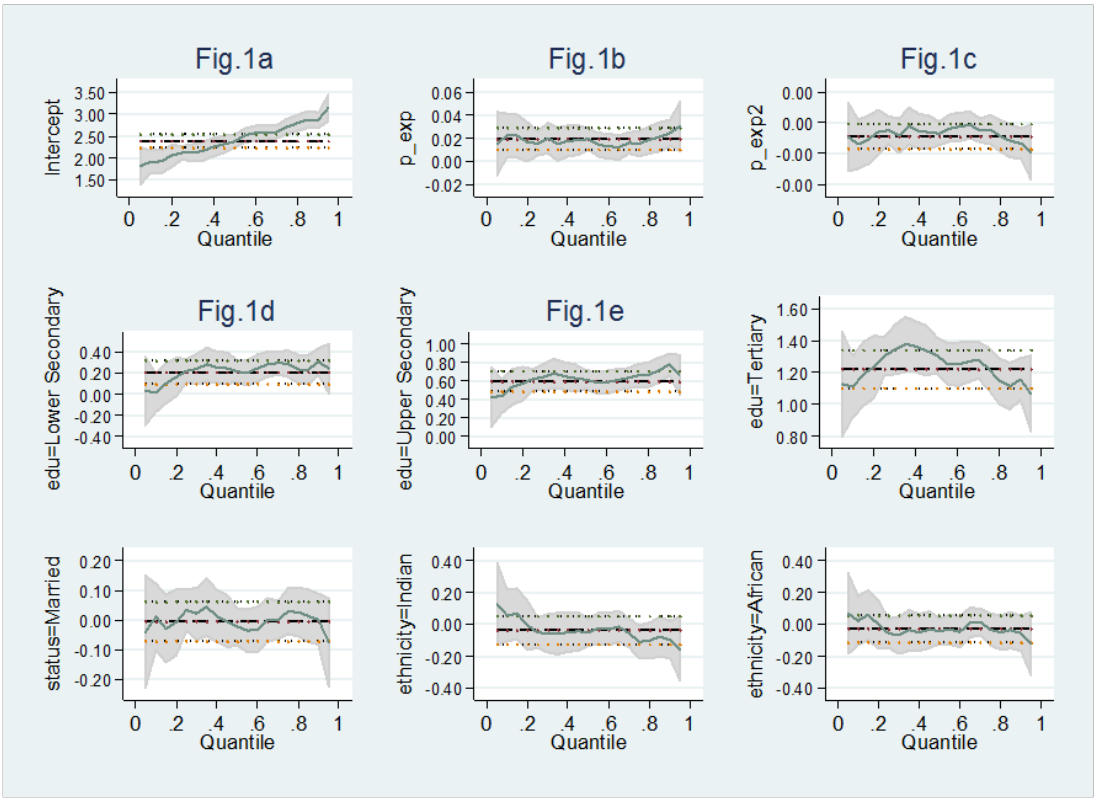
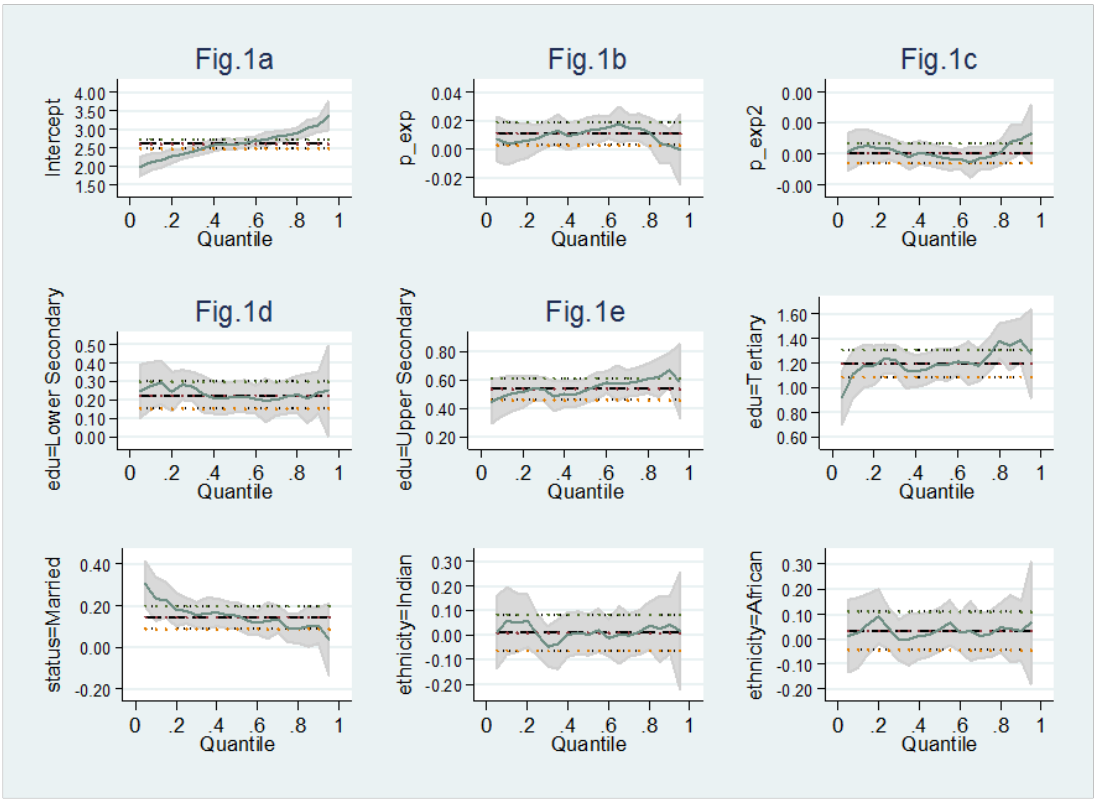


Figure 4.5.2: Quantile Regression of Log Wages for Men – HC Model



4.5.2 Decompositions of Log Wage Equations

In order to decompose the differences in the wage distribution into differences in the coefficients and differences in the workers' attributes (characteristics), we apply the Oaxaca-Blinder decomposition and the Machado and Mata (2005)/Melly (2006) procedure described in Section 4.3.1 with the number of bootstrap replications set to 200. As was previously stated, the Machado and Mata (2005) and Melly (2006) decomposition techniques do not allow for detailed decompositions so that the effect of individual covariates on the wage gap cannot be estimated. Nonetheless, Table 4.5 contains a summary of the decomposition of the wage gap delineating a portion attributable to differences in characteristics ("explained" component) and a portion attributable to differences in coefficients ("unexplained" component). The counterfactual-based estimates of the wage differential are for five selected quantiles ranging between the 10^{th} and 90^{th} percentiles including the 25^{th}, 50^{th}, and 75^{th}. The figures are presented in exponential form for ease of interpretation (recall that the dependent variable is the log of hourly wages); figures greater than unity indicate a widening of the gap whereas figures less than unity indicate a closing of the gap.

Based on the mean regression (OLS) decomposition used in the Oaxaca-Blinder methodology, the raw gender wage gap is 11.4 per cent in the full model. The results of the MM (2005)/Melly (2006) decomposition technique, based on quantile regressions, show that by focussing only on the mean gender wage gap (OLS), substantial variations in the gap will be hidden. For instance, the extent of the wage gap at the lower end of the wage distribution (25.1 per cent) is much larger while there is little to no wage gap at the higher end of the distribution. Given that the differential is greatest at the lower end of the wage distribution, this is an indication that women in Trinidad and Tobago face a "*sticky floor*" rather than a *glass ceiling*. This result is similar to only a few countries in the world whose labour markets have sticky floors instead of glass ceilings; some of these countries include Australia (Johnston and Less, 2012), Pakistan (Ahmed and Hyder, 2008), Cyprus, Luxembourg, Slovenia, Spain (Christofides *et al*, 2010), and Thailand (Fang and Sakellariou, 2011).

According to Christofides *et al* (2010), the phenomenon of sticky floors in Cyprus and Luxembourg is, in part, due to the high segregation of women in low-paying industries and occupations. In Pakistan, the authors attribute the country's sticky floor to low female labour force participation and the concentration of females in a few particular occupations (gender occupational segregation) – Ahmed and Hyder, 2008. Notably, in Pakistan, education is the main variable contributing to gender occupational segregation.

In terms of the "explained" component, if women had the same characteristics as men, their wages are estimated to *decrease* along the entire wage distribution. Recall that throughout the wage distribution, women have at least one more year of education than men (Table 4.1). At the 10^{th} percentile, women's wages are estimated to decrease by 6.0 per cent if they had equivalent characteristics as men and by 12.7 per cent at the 90^{th} percentile; the corresponding estimated decrease in female wages at the 25^{th}, 50^{th}, and 75^{th} percentiles are 7.7 per cent, 10.9 per cent, and 11.8 per cent, respectively. This result is not surprising given that at the 90^{th} percentile women have three more years of education than men (Table 4.1). Given these results, the OLS estimation by its nature being a mean regression analysis, was unable to capture this disparity in the explained component across the wage distribution. Based on the OLS estimate, if women had the same characteristics as men, their wages would decrease, on average, by 11.6 per cent. Looking at the human capital model versus the full model, at the 90^{th} percentile, women's wages are estimated to decrease by 22.6 per cent in the human capital model (0.774 in Table 4.5), but the estimated decrease in wages is much smaller in the full model at 12.7 per cent (0.873 in Table 4.5). This result signals than women may have better human capital/productive characteristics, but men appear to have more favourable job characteristics (occupations and industries).

The estimated impact of the "unexplained" component on wages decreases as you move higher up along the wage distribution. This may be an indication that women

face greater discrimination at the lower end of the wage spectrum compared to higher paid women. For instance, at the 10th percentile (low-paid women), for their given characteristics, if women were to be paid based on the male wage structure, their wages would *increase* by 33.0 per cent whereas their wages would *increase* by much less (11.8 per cent) at the 90th percentile (high-paid women). The Oaxaca decomposition is unable to highlight these differences in the returns to characteristics across the distribution of wages. At the higher end of the distribution of wages (75th and 90th percentiles), women appear to benefit less from working in particular occupations and industries as their wages are estimated to increase by 26.2 per cent in the human capital model, but only by 11.8 per cent in the full model, which includes controls for occupation and industry. Women receive lower returns to their productive characteristics, but this is partly due to them securing less favourable job characteristics.

Table 4.5: Wage Decompositions

Oaxaca Decomposition				
	HC Model	**Std. Err.**	**Full Model**	**Std. Err.**
Raw Difference	1.113***	0.029	1.114***	0.029
Explained (characteristics)	0.852***	0.015	0.884***	0.020
Unexplained (coefficients)	1.307***	0.026	1.261***	0.028
Machado and Mata (2005) / Melly (2006) Decomposition				
	HC Model	**Std. Err.**	**Full Model**	**Std. Err.**
Quantile .10				
Raw Difference	1.277***	0.030	1.251***	0.028
Explained (characteristics)	0.923***	0.021	0.940**	0.033
Unexplained (coefficients)	1.385***	0.020	1.330***	0.022
Quantile .25				
Raw Difference	1.202***	0.026	1.189***	0.024
Explained (characteristics)	0.911***	0.018	0.923***	0.028
Unexplained (coefficients)	1.319***	0.016	1.288***	0.016
Quantile .50				
Raw Difference	1.080**	0.024	1.095**	0.026
Explained (characteristics)	0.870***	0.022	0.891***	0.027
Unexplained (coefficients)	1.242***	0.015	1.229***	0.016
Quantile .75				
Raw Difference	0.976	0.038	0.998	0.033
Explained (characteristics)	0.803***	0.030	0.882***	0.032
Unexplained (coefficients)	1.216***	0.022	1.131***	0.021
Quantile .90				
Raw Difference	0.976	0.024	0.976	0.030
Explained (characteristics)	0.774***	0.049	0.873***	0.042
Unexplained (coefficients)	1.262***	0.028	1.118***	0.029

Exponentiated coefficients; bootstrapped standard errors using 200 replications for quantile decompositions.
* p<0.05, ** p<0.01, *** p<0.001.

4.5.3 Decompositions of Log Wage Equations by Public-Private Sector of Employment

In the previous chapter based on the Oaxaca decomposition methodology we saw that there was a much larger gender wage gap in the private sector (22.9 per cent) compared to the public sector (3.2 per cent). Given this finding, we also performed quantile decompositions based on sector of employment to analyse the differences in the returns to coefficients and differences in the returns to workers' attributes along the wage spectrum. The same covariates from the earlier human capital model and full model were used. These results are summarised in Table 4.6.

The Oaxaca decomposition methodology masks the great variability in the size of the gender wage gap along the wage distribution in both the public and private sectors. At the mean (Oaxaca methodology), the gender wage gap in the public sector was 3.2 per cent in both the human capital and full models, but based on the MM (2005)/Melly (2006) quantile decomposition methodology, the wage gap is much larger at the lower end of the wage distribution. At the 10^{th} percentile, the gender wage gap is estimated to be 30.1 per cent and 22.8 per cent in the human capital and full models, respectively. At higher wages (90^{th} percentile), women earn slightly higher wages (2.9 per cent premium in the full model) compared to male public servants. At the median, there is no wage gap with men and women earning equivalent wages.

The estimated unexplained public sector wage gap varies strongly with θ (quantile under consideration). For women, their wages are expected to increase by as much as 32.3 per cent at θ = 0.10 if they were to be paid at the same rate as men for their given characteristics, while their wages are estimated to decrease marginally by 1.4 per cent at θ = 0.90. The public sector has a relatively wide pay dispersion (see Figure 4.2) and therefore, has a wide pay inequality that was previously hidden when the Oaxaca decomposition method was used. The explained component of the public sector pay gap is more stable over the wage distribution and does not vary very much with θ (in the full model). However, at the higher end of the wage distribution, based on the human capital model, female wages are estimated to decrease by 20.7 per cent if they had the same characteristics as men, and their wages are estimated to decrease by just 1.6 per cent in the full model. Also at the higher end of the wage distribution, based on the human capital model, if women were to receive the same rate of return to characteristics as men do (unexplained component), their wages are expected to increase by 24.6 per cent, but this disappears in the full model (which includes controls for occupation and industry).

In the private sector, the gender wage gap is just over 25.0 per cent at the lower end of the wage distribution at the 10^{th} and 25^{th} percentiles. In the full model, at the 75^{th} and 90^{th} percentiles the wage gap falls to 16.0 per cent and 12.0 per cent, respectively. Given that the wage gap is largest at the lower end of the wage distribution in both the public and private sectors, we conclude that women in Trinidad and Tobago face *sticky floors* irrespective of their sector of employment. Notwithstanding this, there still appears to have sizeable amounts of discrimination (unexplained component) in the private sector along the entire spectrum of wages. Throughout the wage distribution in the private sector, if women were to be paid at the same rate as men for their given characteristics, their wages would increase by approximately 22 per cent.

These results show that the public sector pay gap is mostly prevalent at the lower end of the wage distribution whereas there is a higher private sector gap throughout the entire wage distribution. Interestingly, this contradicts with standard economic theory. Becker (1957) has suggested that profit-maximising behaviour, which is the norm in the private sector, conflicts with the practice of discrimination on the part of profit-maximising firms ("taste-based discrimination"). Nonetheless, one main reason why the male-female wage differential in the public sector may be smaller than in the private sector is the fact that the pay system in the public sector is centralised. The Personnel Department of the Government of Trinidad and Tobago, established by the Civil Service Act 1965 (Chapter 23:01), is responsible for determining and advising on the pay and other terms and conditions of service for employees within the public sector (public service and statutory bodies). Also, Trinidad and Tobago enacted the Equal Opportunity Act in 2000, which promotes equality in opportunity between persons of different status, including sex. It is likely that enforcement of this Act and other labour regulations is more prevalent in the public sector than it is in the private sector. Furthermore, most of the private sector in Trinidad and Tobago is not unionised – Mahabir *et al* (2013) noted that in 2011, the trade union intensity ratio for Trinidad and Tobago was 16.4 per cent.

Table 4.6: Wage Decompositions by Sector of Employment

	Public Sector				Private Sector			
	Oaxaca Decomposition							
Mean Analysis	**HC Model**	**Std. Err.**	**Full Model**	**Std. Err.**	**HC Model**	**Std. Err.**	**Full Model**	**Std. Err.**
Raw Difference	1.032	0.041	1.032	0.041	1.226***	0.038	1.229***	0.038
Explained (characteristics)	0.836***	0.024	0.904**	0.031	0.911***	0.017	0.969	0.027
Unexplained (coefficients)	1.235***	0.041	1.144***	0.035	1.346***	0.035	1.268***	0.036
	Machado and Mata (2005) / Melly (2006) Decomposition							
	HC Model	**Std. Err.**	**Full Model**	**Std. Err.**	**HC Model**	**Std. Err.**	**Full Model**	**Std. Err.**
Quantile .10								
Raw Difference	1.301**	0.086	1.228**	0.075	1.251***	0.029	1.259***	0.026
Explained (characteristics)	0.907**	0.034	0.929*	0.052	0.946**	0.028	1.020	0.041
Unexplained (coefficients)	1.434***	0.032	1.323***	0.040	1.322***	0.024	1.235***	0.025
Quantile .25								
Raw Difference	1.035	0.036	1.062	0.038	1.253***	0.029	1.253***	0.026
Explained (characteristics)	0.886***	0.036	0.917***	0.040	0.931**	0.022	1.014	0.038
Unexplained (coefficients)	1.169***	0.022	1.158***	0.024	1.345***	0.024	1.235***	0.022
Quantile .50								
Raw Difference	0.970	0.038	1.000	0.043	1.217***	0.024	1.214***	0.021
Explained (characteristics)	0.811***	0.041	0.896***	0.040	0.932**	0.019	0.985	0.036
Unexplained (coefficients)	1.197***	0.033	1.117***	0.032	1.306***	0.020	1.233***	0.021
Quantile .75								
Raw Difference	0.921**	0.032	0.913**	0.033	1.152***	0.033	1.160***	0.034
Explained (characteristics)	0.832***	0.048	0.929**	0.045	0.896***	0.036	0.948*	0.044
Unexplained (coefficients)	1.106**	0.030	0.983	0.028	1.285***	0.024	1.224***	0.025
Quantile .90								
Raw Difference	0.988	0.027	0.971	0.025	1.109*	0.052	1.120*	0.048
Explained (characteristics)	0.793***	0.071	0.984	0.052	0.840***	0.059	0.906*	0.059
Unexplained (coefficients)	1.246***	0.037	0.986	0.033	1.320***	0.042	1.236***	0.042

Exponentiated coefficients; bootstrapped standard errors using 200 replications for quantile decompositions.
* p<0.05, ** p<0.01, *** p<0.001.

4.5.4 Decomposition of Log Wage Equations using RIF-OLS regressions

As discussed earlier, the main advantage of the RIF-OLS decomposition technique developed by Firpo, Fortin and Lemieux (2009) is that it allows for the computation of detailed decompositions across quantiles. More specifically, the technique facilitates the estimation of the contribution of each covariate in determining gender wage differentials at different quantiles, either as part of the composition effect (that is, the effect of the characteristics) or the wage structure effect (the effect of coefficients).

In order to compare the results of the RIF decompositions with the MM (2005)/Melly (2006) decompositions, the same models and covariates were used – that is, a human capital model; an extended model (full model) which includes controls for sector of employment, occupation and industry; and separate decompositions for the public and private sectors. The decompositions were also based on the same five quantiles – 10%, 25%, 50%, 75% and 90%.

The results from both quantile decomposition techniques are broadly similar to each other, with some noticeable differences at the extremes of the wage distribution – at the 10th and 90th quantiles (Figure 4.7). Both decompositions point to a higher wage gap at the lower end of the wage distribution indicating that women in Trinidad and Tobago face sticky floors rather than a glass ceiling. The median decompositions for both techniques are consistent with the mean regression analysis.

Figure 4.7: Raw Gender Wage Gap

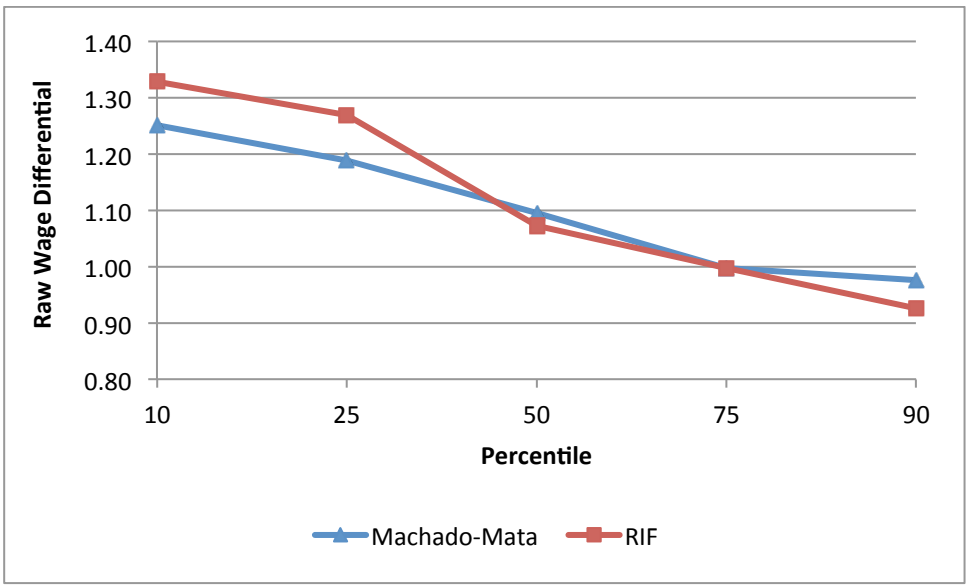


Table 4.7 to Table 4.9 present the detailed decompositions for the human capital and full models, respectively. In terms of the explained component, upper secondary and tertiary education in both models help to reduce gender wage differentials across the entire wage distribution. Given that these coefficients are all

less than one within the explained component highlights the prominence of education being a source of better female endowments. At the higher end of the wage distribution in both models, where women have more years of tertiary education than men, the effect of reducing gender wage differentials is seen the most.

In the full model (Table 4.8 and Table 4.9), in addition to education, working in the public sector decreases the explained component of the wage gap across all quantiles. Notably, only Machine Operators and Craft Workers widen the explained component of the wage gap throughout the wage distribution. These two occupations are male-dominated employing 13.5 per cent and 25.6 per cent, respectively of all men in the sample compared with only 1.5 per cent and 2.2 per cent of all female workers. The wage gaps within these two professions are wider at the lower end of the pay scale.

The total unexplained component (returns to characteristics) in both the human capital and the full model is sizeable at the lower end of the pay scale. For instance, if female workers received similar rates of return for their endowments, at the 10^{th} percentile their wages are likely to increase by 36.9 per cent in the human capital model, and 29.0 per cent after controlling for job characteristics (full model). There appears to be less *discrimination* taking place among higher paying jobs, as women's wages are estimated to increase by either 12.4 per cent (human capital model) or 4.3 per cent (full model) at the 90^{th} percentile if they were rewarded equivalently as men.

With respect to the individual contributors to the coefficient component, the potential experience variable exerts a sizeable impact on gender wage differentials throughout the wage distribution (see Figure). Its effect widens the pay gap, and is most prominent at the lower end of the wage distribution (see Figure 8). This shows that men's (potential) work experience is rewarded more than that of women, and even more so among lower paying jobs. The returns to education in both models, in

particular upper secondary and tertiary education, are also positive (i.e., coefficients are greater than unity) at the higher end of the wage distribution. This means that even though women are better educated, men receive greater rewards to education at higher quantiles.

Married men are consistently rewarded a premium for their marital status across all quantiles except at the 90th percentile in the full model. Lower paid married men earn the greatest premium, receiving about 10.7 per cent (human capital model) and 6.6 per cent (full model) higher wages at the 10th percentile compared to their married female counterpart. As was previously discussed, this may be due in part to men being more successful at negotiating their salary packages and using their marital status as a reason for requesting higher wages. Further, women at the bottom of the wage distribution are more likely to have less bargaining power and social norms and family commitments may lead to men's careers taking precedence (Arulampalam *et al*, 2007).

Apart from these individual covariates contributing to the widening of the wage differential across the quantiles, the constant term exerts the biggest individual impact. This may be indicative of discriminatory practices on the part of employers as men simply enter the labour market at an advantage over women. The extent of *discrimination* is highest between the 25th and 75th quantiles, but its impact on the wage differential at the higher end of wages is almost mute. Despite the full model including additional controls for sector of employment, occupation and industry, the constant term still remains large (greater than unity), reflecting the sizeable male-advantage in the labour market.

Table 4.7: Wage Decompositions based on RIF-Regressions (Human Capital Model)

	Q10	Q25	Q50	Q75	Q90
Raw Difference	**1.302*** **	**1.268*** **	**1.073** **	**0.996**	**0.924** **
	(0.052)	*(0.043)*	*(0.034)*	*(0.048)*	*(0.038)*
Explained Component					
Potential Experience	1.007	1.004	1.011*	1.027**	1.036**
	(0.011)	*(0.008)*	*(0.008)*	*(0.015)*	*(0.019)*
Potential Experience^2	1.006	1.009	1.005	0.995	0.979*
	(0.011)	*(0.009)*	*(0.006)*	*(0.010)*	*(0.013)*
Education					
Lower Secondary	1.015**	1.016***	1.022***	1.022***	1.009**
	(0.007)	*(0.006)*	*(0.007)*	*(0.007)*	*(0.004)*
Upper Secondary	0.991	0.989	0.987	0.983	0.992
	(0.009)	*(0.010)*	*(0.012)*	*(0.016)*	*(0.008)*
Tertiary	0.927***	0.901***	0.852***	0.752***	0.811***
	(0.012)	*(0.013)*	*(0.016)*	*(0.025)*	*(0.022)*
Marital Status					
Married	1.002	1.002	1.002	1.000	1.000
	(0.003)	*(0.003)*	*(0.002)*	*(0.001)*	*(0.001)*
Ethnicity					
Indian	1.011**	1.005	1.003	0.992	0.991
	(0.007)	*(0.005)*	*(0.004)*	*(0.006)*	*(0.006)*
African	0.994	0.995	0.999	1.003	1.008
	(0.005)	*(0.004)*	*(0.003)*	*(0.004)*	*(0.005)*
Total	**0.952*** **	**0.919*** **	**0.876*** **	**0.769*** **	**0.822*** **
	(0.011)	*(0.011)*	*(0.014)*	*(0.022)*	*(0.020)*
Unexplained Component					
Potential Experience	0.848	1.022	0.881	0.745	0.513**
	(0.231)	*0.207*	*(0.131)*	*(0.169)*	*(0.129)*
Potential Experience^2	1.158	0.998	1.056	1.224	1.508***
	(0.194)	*(0.125)*	*(0.105)*	*(0.168)*	*(0.192)*
Education					
Lower Secondary	1.111*	0.953	0.973	0.993	1.000
	(0.058)	*(0.039)*	*(0.028)*	*(0.032)*	*(0.025)*
Upper Secondary	1.008	0.898***	0.927***	1.006	1.052*
	(0.041)	*(0.030)*	*(0.023)*	*(0.035)*	*(0.031)*
Tertiary	1.001	0.942***	0.928***	0.967*	1.074***
	(0.018)	*(0.014)*	*(0.010)*	*(0.017)*	*(0.027)*
Marital Status					
Married	1.107***	1.073***	1.084	1.089	1.006
	(0.036)	*(0.029)*	*(0.026)*	*(0.039)*	*(0.033)*
Ethnicity					
Indian	0.999	1.018	1.007	1.009	1.092**
	(0.044)	*(0.035)*	*(0.029)*	*(0.045)*	*(0.045)*
African	1.016	0.992	1.009	1.017	1.116**
	(0.045)	*(0.034)*	*(0.030)*	*(0.048)*	*(0.049)*
Constant term	1.106	1.546***	1.428***	1.317*	1.050
	(0.233)	*(0.228)*	*(0.166)*	*(0.215)*	*(0.157)*
Total	**1.369*** **	**1.379*** **	**1.225*** **	**1.296*** **	**1.124*** **
	(0.053)	*(0.044)*	*(0.032)*	*(0.047)*	*(0.038)*

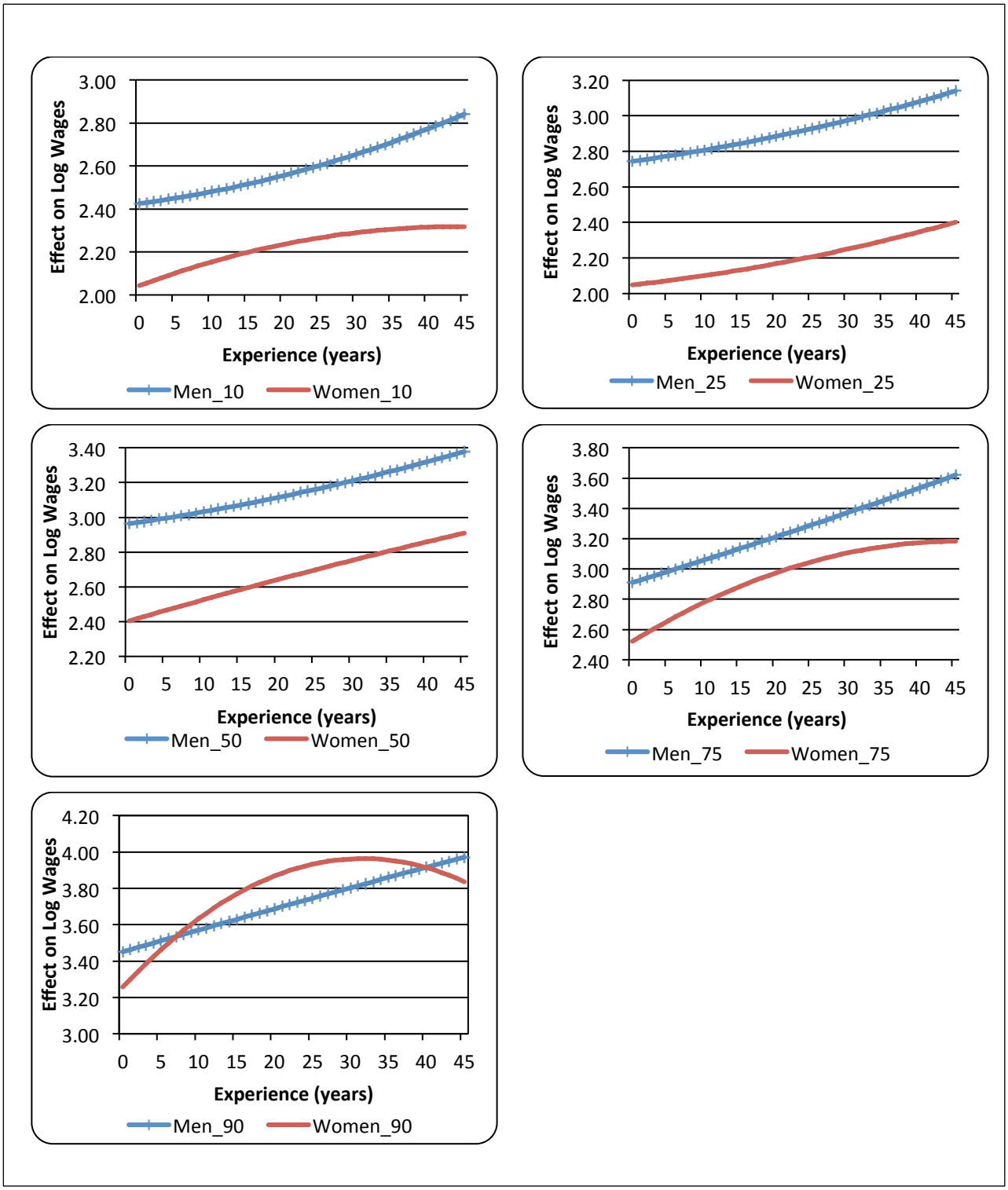
Table 4.8: Wage Decompositions based on RIF-Regressions – Explained Component (Full Model)

	Q10	Q25	Q50	Q75	Q90
Raw Difference	**1.328*** **	**1.269*** **	**1.073** **	**0.998**	**0.926***
	(0.052)	*(0.043)*	*(0.034)*	*(0.049)*	*(0.038)*
Potential Experience	1.004	1.000	1.006	1.013	1.030
	(0.010)	*(0.007)*	*(0.007)*	*(0.010)*	*(0.016)*
Potential Experience^2	1.005	1.008	1.005	1.001	0.981
	(0.011)	*(0.008)*	*(0.006)*	*(0.009)*	*(0.012)*
Education					
Lower Secondary	1.008	1.011	1.015	1.013	1.005
	(0.006)	*(0.005)*	*(0.005)*	*(0.005)*	*(0.004)*
Upper Secondary	0.995	0.993	0.993	0.990	0.995
	(0.005)	*(0.007)*	*(0.007)*	*(0.010)*	*(0.005)*
Tertiary	0.968	0.953	0.919	0.858	0.879
	(0.012)	*(0.011)*	*(0.012)*	*(0.020)*	*(0.019)*
Marital Status					
Married	1.002	1.002	1.001	1.000	1.000
	(0.003)	*(0.003)*	*(0.002)*	*(0.001)*	*(0.001)*
Ethnicity					
Indian	1.011	1.004	1.002	0.993	0.993
	(0.007)	*(0.005)*	*(0.004)*	*(0.006)*	*(0.006)*
African	0.994	0.995	0.999	1.003	1.007
	(0.005)	*(0.003)*	*(0.002)*	*(0.004)*	*(0.004)*
Sector of Employment					
Public Sector	0.981	0.978	0.981	0.969	0.984
	(0.007)	*(0.007)*	*(0.006)*	*(0.010)*	*(0.006)*
Occupation					
Machine Operator	1.048	1.050	1.052	1.047	1.007
	(0.011)	*(0.009)*	*(0.008)*	*(0.011)*	*(0.008)*
Craft Worker	1.109	1.088	1.099	1.083	1.031
	(0.019)	*(0.014)*	*(0.012)*	*(0.014)*	*(0.011)*
Sales Worker	0.968	0.994	0.980	0.968	0.996
	(0.010)	*(0.007)*	*(0.005)*	*(0.007)*	*(0.005)*
Clerical	0.944	0.948	0.931	1.010	1.023
	(0.014)	*(0.012)*	*(0.011)*	*(0.011)*	*(0.008)*
Technician	0.962	0.963	0.945	0.927	0.978
	(0.009)	*(0.008)*	*(0.010)*	*(0.014)*	*(0.008)*
Professional	0.989	0.989	0.984	0.966	0.975
	(0.005)	*(0.004)*	*(0.006)*	*(0.012)*	*(0.010)*
Manager	0.996	0.996	0.995	0.993	0.995
	(0.004)	*(0.004)*	*(0.005)*	*(0.007)*	*(0.006)*
Industry					
Agriculture/Fishing	0.998	1.000	1.001	0.998	0.999
	(0.003)	*(0.002)*	*(0.001)*	*(0.001)*	*(0.001)*
Mining/Quarrying	1.016	1.014	1.015	1.026	1.020
	(0.004)	*(0.003)*	*(0.004)*	*(0.007)*	*(0.008)*
Manufacturing	1.010	1.006	1.003	1.011	1.007
	(0.004)	*(0.003)*	*(0.002)*	*(0.005)*	*(0.004)*
Electricity/Gas/Water	1.003	1.002	1.004	1.014	1.013
	(0.002)	*(0.001)*	*(0.002)*	*(0.005)*	*(0.006)*
Wholesale/Retail	0.994	1.006	1.013	1.000	0.986
	(0.009)	*(0.007)*	*(0.005)*	*(0.006)*	*(0.006)*
Transport/Communication	1.006	1.005	1.004	1.009	1.009
	(0.003)	*(0.002)*	*(0.002)*	*(0.004)*	*(0.005)*
Finance/Insurance	0.984	0.984	0.993	0.990	0.986
	(0.005)	*(0.005)*	*(0.003)*	*(0.005)*	*(0.005)*
Construction	1.045	1.030	1.010	1.009	0.995
	(0.016)	*(0.012)*	*(0.008)*	*(0.011)*	*(0.008)*
Total (explained component)	**1.030**	**1.010**	**0.935** **	**0.879*** **	**0.888*** **
	(0.022)	*(0.021)*	*(0.021)*	*(0.033)*	*(0.027)*

Table 4.9: Wage Decompositions based on RIF-Regressions – Unexplained Component (Full Model)

Unexplained Component	**Q10**	**Q25**	**Q50**	**Q75**	**Q90**
Potential Experience	0.756	0.897*	0.837*	0.810	0.625**
	(0.151)	*(0.129)*	*(0.090)*	*(0.132)*	*(0.113)*
Potential Experience^2	1.185	1.056	1.069	1.109	1.331***
	(0.142)	*(0.093)*	*(0.073)*	*(0.105)*	*(0.124)*
Education					
Lower Secondary	1.109***	0.983	0.991	0.974	0.99
	(0.039)	*(0.029)*	*(0.019)*	*(0.022)*	*(0.018)*
Upper Secondary	1.057*	0.972	0.99	1.005	1.036
	(0.032)	*(0.027)*	*(0.019)*	*(0.025)*	*(0.023)*
Tertiary	1.038**	0.990**	0.973**	0.993	1.084***
	(0.019)	*(0.016)*	*(0.013)*	*(0.022)*	*(0.029)*
Marital Status					
Married	1.066***	1.050***	1.050***	1.041*	0.995
	(0.025)	*(0.020)*	*(0.017)*	*(0.025)*	*(0.023)*
Ethnicity					
Indian	0.981	1.004	0.995	0.997	1.055*
	(0.030)	*(0.023)*	*(0.019)*	*(0.030)*	*(0.030)*
African	0.987	0.982	0.998	1.001	1.072**
	(0.033)	*(0.025)*	*(0.021)*	*(0.034)*	*(0.034)*
Sector of Employment					
Public Sector	0.991	0.978**	0.957**	0.97	0.973
	(0.028)	*(0.022)*	*(0.018)*	*(0.028)*	*(0.025)*
Occupation					
Machine Operator	1.005	0.997	1.005	1.002	0.997
	(0.009)	*(0.006)*	*(0.005)*	*(0.007)*	*(0.004)*
Craft Worker	0.984**	0.985**	0.987**	1.006	1.006
	(0.007)	*(0.007)*	*(0.007)*	*(0.008)*	*(0.003)*
Sales Worker	0.977	1.018	1.013	1.054***	0.995
	(0.025)	*(0.021)*	*(0.014)*	*(0.019)*	*(0.016)*
Clerical	0.968**	0.979	0.99	1.005	1.000
	(0.014)	*(0.011)*	*(0.008)*	*(0.011)*	*(0.009)*
Technician	0.965*	0.968**	0.968**	0.952**	0.985
	(0.020)	*(0.016)*	*(0.013)*	*(0.020)*	*(0.018)*
Professional	0.977***	0.982***	0.985***	0.976**	0.972*
	(0.009)	*(0.006)*	*(0.005)*	*(0.010)*	*(0.015)*
Manager	0.991**	0.993	0.994	0.993	0.989
	(0.004)	*(0.004)*	*(0.004)*	*(0.008)*	*(0.009)*
Industry					
Agriculture/Fishing	1.007	1.000	0.999	1.001	1.001
	(0.008)	*(0.005)*	*(0.004)*	*(0.002)*	*(0.001)*
Mining/Quarrying	1.002	1.003	1.001	1.004	1.007
	(0.001)	*(0.003)*	*(0.002)*	*(0.004)*	*(0.005)*
Manufacturing	0.996	1.003	0.997	1.001	1.010
	(0.011)	*(0.009)*	*(0.008)*	*(0.011)*	*(0.009)*
Electricity/Gas/Water	1.003	1.002	0.999	0.991**	0.998
	(0.003)	*(0.002)*	*(0.002)*	*(0.005)*	*(0.006)*
Wholesale/Retail	0.994	1.015	1.01	0.989	1.012
	(0.022)	*(0.017)*	*(0.012)*	*(0.016)*	*(0.013)*
Transport/Communication	0.995	0.996	0.996	1.012*	1.015**
	(0.004)	*(0.004)*	*(0.004)*	*(0.007)*	*(0.006)*
Finance/Insurance	0.993	0.995*	0.985*	0.985	1.023
	(0.011)	*(0.009)*	*(0.008)*	*(0.012)*	*(0.014)*
Construction	1.052***	1.033***	1.021***	0.998	1.016***
	(0.017)	*(0.011)*	*(0.008)*	*(0.010)*	*(0.006)*
Constant term	1.269	1.433***	1.417***	1.330**	1.006
	(0.226)	*(0.179)*	*(0.130)*	*(0.170)*	*(0.114)*
Total	**1.290*** **	**1.257*** **	**1.148*** **	**1.135*** **	**1.043**
	(0.044)	*(0.032)*	*(0.023)*	*(0.034)*	*(0.031)*

Figure 4.8: Wage-Experience Curves – Human Capital Model



4.5.5 Decomposition of Log Wage Equations by Public-Private Sector of Employment (using RIF-OLS regressions)

In Chapter 3 where we used the Blinder-Oaxaca methodology as the baseline analysis for this present research, there was a much larger pay gap in the private sector (22.9 per cent) than in the public sector (3.2 per cent). Here, we use the RIF-OLS regressions to decompose wage differentials in both sectors of employment over varying quantiles to see if the wage gap differs along the distribution of wages.

Public Sector

The overall pay gap in the public sector is largest at the 10th percentile, amounting to 25.4 per cent in the full model (Table 4.11). This is mostly driven by differences in the returns to characteristics (unexplained component). At the higher end of the wage distribution, women are rewarded more than men for their (potential) work experience, but this trend reverses at the lower end of the wage distribution with men being rewarded at much higher rates for their experience (Figure 4.9). Marital status of men working in the public sector does not appear to impact the unexplained gender wage differential throughout the entire distribution of wages as these coefficients are close to unity (Table 4.12).

In the occupational groupings for Clerical workers, Technicians, and Professionals, women are rewarded slightly more than men (these coefficients are just under unity). Notably, these three categories are female-dominated – for clerical workers, 28.9 per cent of all female public servants are clerks compared to only 6.6 per cent of all male public servants; 27.7 per cent of female public sector employees are technicians compared to 14.5 per cent of all men; and 12.0 per cent of all female public sector workers are professional staff compared with 5.9 per cent of all male public sector workers (see Table 3.3: Sample Characteristics). Even though there exists some level of occupational segregation, women in these professions are not unduly paid as sometimes suggested in the economics literature.

In terms of industries, men appear to be rewarded much more among low paid jobs in the Construction industry (27.3 per cent higher at the 10^{th} percentile) – Table 4.12. Men also appear to simply enter the job market at the lower end of the pay spectrum at a great advantage over women given that the constant term is large and greater than unity. This male advantage dissipates at the higher end of the wage distribution.

In the full model for the public sector, just as in the sample for the entire working population, the fact that women are better educated than men is reflected in the negative impact (coefficients of less than unity) of tertiary education on the explained differential of the gap throughout the entire distribution of wages (Table 4.11).

Table 4.10: Wage Decompositions in the Public Sector (using RIF-regressions) Human Capital Model

	Q10	Q25	Q50	Q75	Q90
Raw Difference	**1.254****	**1.060**	**0.971**	**0.879****	**0.932**
	(0.108)	*(0.049)*	*(0.056)*	*(0.046)*	*(0.055)*
Explained Component					
Potential Experience	0.959	1.038	1.119***	1.190***	1.154***
	(0.068)	*(0.040)*	*(0.049)*	*(0.059)*	*(0.062)*
Potential Experience^2	1.083	0.998	0.956	0.898***	0.921*
	(0.079)	*(0.034)*	*(0.034)*	*(0.035)*	*(0.041)*
Education					
Lower Secondary	1.039*	1.025**	1.044***	1.012*	1.013*
	(0.023)	*(0.012)*	*(0.016)*	*(0.007)*	*(0.008)*
Upper Secondary	1.038	1.029	1.044	1.023	1.014
	(0.031)	*(0.022)*	*(0.034)*	*(0.018)*	*(0.012)*
Tertiary	0.777***	0.811***	0.696***	0.748***	0.779***
	(0.041)	*(0.026)*	*(0.033)*	*(0.030)*	*(0.031)*
Marital Status					
Married	1.005	1.003	1.001	0.997	1.001
	(0.007)	*(0.004)*	*(0.004)*	*(0.004)*	*(0.005)*
Ethnicity					
Indian	1.002	1.003	1.000	1.004	0.986
	(0.011)	*(0.006)*	*(0.007)*	*(0.006)*	*(0.009)*
African	1.000	0.999	0.999	1.001	1.005
	(0.006)	*(0.003)*	*(0.003)*	*(0.003)*	*(0.006)*
Total	**0.876*****	**0.890*****	**0.811*****	**0.829*****	**0.843*****
	(0.029)	*(0.021)*	*(0.029)*	*(0.027)*	*(0.027)*
Unexplained Component					
Potential Experience	1.267	0.779	0.617*	0.592	0.786
	(0.720)	*(0.198)*	*(0.182)*	*(0.179)*	*(0.295)*
Potential Experience^2	0.772	1.176	1.321	1.392*	1.233
	(0.315)	*(0.220)*	*(0.233)*	*(0.223)*	*(0.240)*
Education					
Lower Secondary	0.803*	0.947	0.942*	1.000	1.007
	(0.090)	*(0.041)*	*(0.033)*	*(0.022)*	*(0.024)*
Upper Secondary	0.623***	0.911*	1.003	1.05	1.057
	(0.095)	*(0.050)*	*(0.045)*	*(0.041)*	*(0.046)*
Tertiary	0.707***	0.903***	0.933***	1.038	1.165***
	(0.068)	*(0.031)*	*(0.025)*	*(0.031)*	*(0.058)*
Marital Status					
Married	1.081	1.068	1.073*	1.045	0.985
	(0.074)	*(0.038)*	*(0.044)*	*(0.043)*	*(0.049)*
Ethnicity					
Indian	0.995	0.976	1.047	1.047	1.063
	(0.072)	*(0.036)*	*(0.048)*	*(0.043)*	*(0.056)*
African	0.951	0.952	0.972	1.062	1.117
	(0.093)	*(0.050)*	*(0.060)*	*(0.062)*	*(0.083)*
Constant term	4.047***	1.684***	1.524**	1.014	0.785
	(1.692)	*(0.329)*	*(0.310)*	*(0.181)*	*(0.184)*
Total	**1.432*****	**1.192*****	**1.197*****	**1.06**	**1.105***
	(0.131)	*(0.049)*	*(0.053)*	*(0.042)*	*(0.059)*

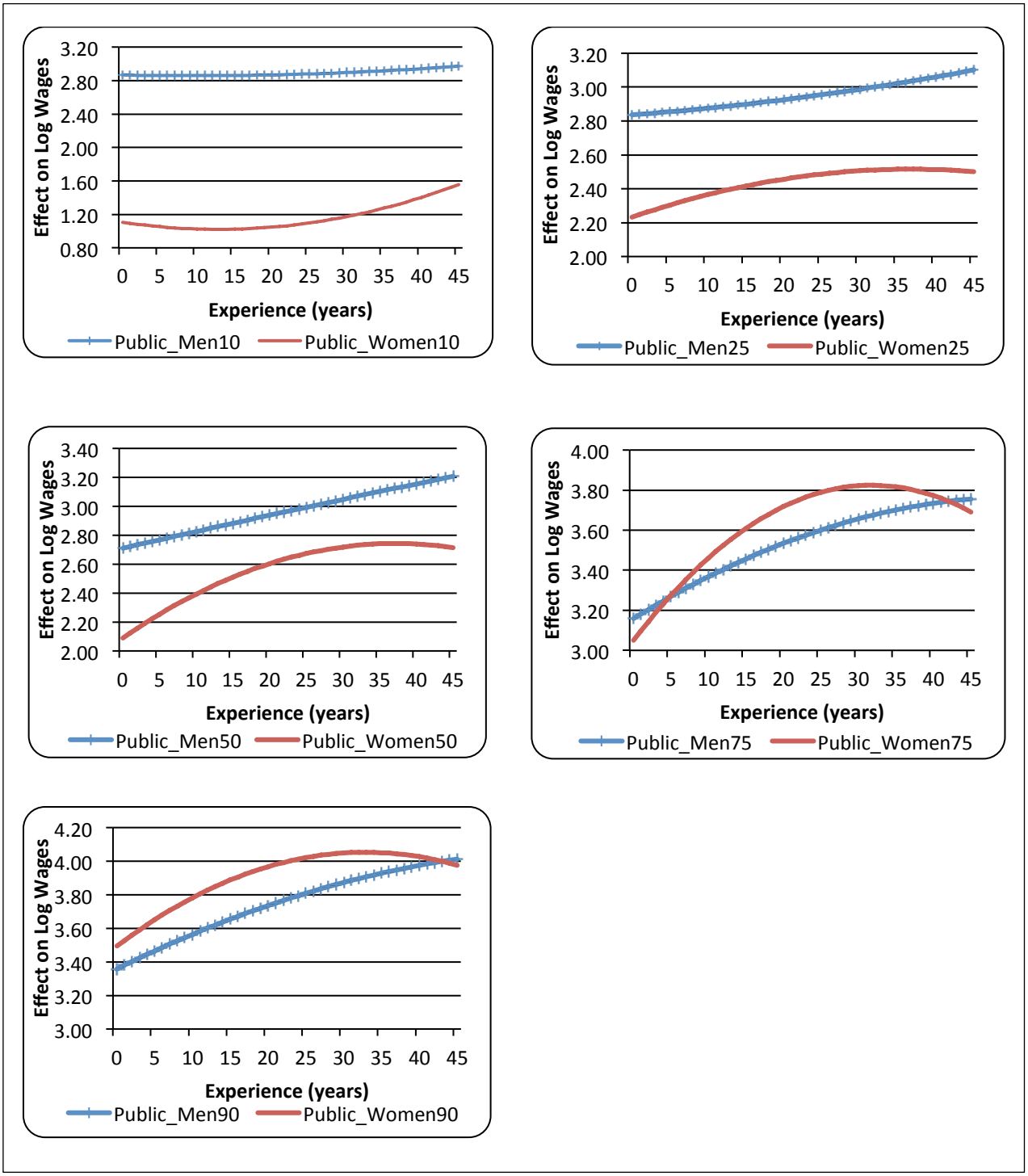
Table 4.11: Wage Decompositions in the Public Sector (using RIF-regressions) - (Explained Component)
Full Model

	Q10	Q25	Q50	Q75	Q90
Raw Difference	**1.254**	**1.060**	**0.971**	**0.879****	**0.932**
	(0.014)	*(0.050)*	*(0.057)*	*(0.047)*	*(0.056)*
Explained Component					
Potential Experience	0.982	1.053*	1.080**	1.157***	1.144***
	(0.062)	*(0.039)*	*(0.040)*	*(0.050)*	*(0.058)*
Potential Experience^2	1.049	0.974	0.967	0.913**	0.926*
	(0.070)	*(0.032)*	*(0.032)*	*(0.033)*	*(0.041)*
Education					
Lower Secondary	1.010	1.006	1.024**	1.004	1.007
	(0.019)	*(0.009)*	*(0.011)*	*(0.006)*	*(0.007)*
Upper Secondary	1.012	1.009	1.019	1.014	1.010
	(0.015)	*(0.008)*	*(0.016)*	*(0.011)*	*(0.010)*
Tertiary	0.924	0.922***	0.834***	0.849***	0.852***
	(0.050)	*(0.024)*	*(0.028)*	*(0.026)*	*(0.030)*
Marital Status					
Married	1.007	1.003	1.005	1.000	1.004
	(0.007)	*(0.004)*	*(0.004)*	*(0.004)*	*(0.005)*
Ethnicity					
Indian	1.000	1.003	1.004	1.008	0.989
	(0.010)	*(0.005)*	*(0.006)*	*(0.007)*	*(0.009)*
African	0.999	0.998	0.996	0.998	1.001
	(0.006)	*(0.003)*	*(0.005)*	*(0.004)*	*(0.004)*
Occupation					
Machine Operator	1.055***	1.060***	1.054***	1.022**	1.015
	(0.016)	*(0.013)*	*(0.016)*	*(0.011)*	*(0.014)*
Craft Worker	1.073***	1.073***	1.042***	1.026**	0.998
	(0.024)	*(0.016)*	*(0.013)*	*(0.011)*	*(0.013)*
Sales Worker	1.011	1.024**	1.037**	1.010	1.000
	(0.013)	*(0.012)*	*(0.018)*	*(0.007)*	*(0.005)*
Clerical	0.935*	0.912***	0.970	1.013	1.003
	(0.037)	*(0.020)*	*(0.019)*	*(0.011)*	*(0.014)*
Technician	0.943**	0.934***	0.910***	0.945***	0.985
	(0.024)	*(0.018)*	*(0.022)*	*(0.015)*	*(0.012)*
Professional	0.975*	0.968***	0.952***	0.952***	0.955**
	(0.014)	*(0.013)*	*(0.018)*	*(0.018)*	*(0.019)*
Manager	1.006	1.006	1.008	1.006	1.008
	(0.006)	*(0.006)*	*(0.008)*	*(0.006)*	*(0.008)*
Industry					
Agriculture/Fishing	0.997	0.999	1.000	1.000	1.000
	(0.007)	*(0.003)*	*(0.002)*	*(0.001)*	*(0.001)*
Mining/Quarrying	0.993	0.999	1.006	1.003	1.003
	(0.008)	*(0.003)*	*(0.004)*	*(0.005)*	*(0.006)*
Manufacturing	1.001	1.003	1.020***	1.014**	1.026**
	(0.003)	*(0.003)*	*(0.008)*	*(0.007)*	*(0.014)*
Electricity/Gas/Water	1.003	1.006*	1.020***	1.013	1.012
	(0.003)	*(0.003)*	*(0.008)*	*(0.008)*	*(0.010)*
Wholesale/Retail	1.001	1.000	1.001	1.002	1.002
	(0.002)	*(0.001)*	*(0.003)*	*(0.004)*	*(0.006)*
Transport/Communication	1.000	1.006*	1.025***	1.016**	1.012
	(0.005)	*(0.004)*	*(0.008)*	*(0.008)*	*(0.010)*
Finance/Insurance	1.007	1.005	0.999	0.998	0.994
	(0.008)	*(0.005)*	*(0.003)*	*(0.003)*	*(0.005)*
Construction	0.917***	0.971***	0.975**	0.991**	0.997
	(0.027)	*(0.011)*	*(0.009)*	*(0.004)*	*(0.004)*
Total (explained component)	**0.889*****	**0.920****	**0.923*****	**0.925***	**0.922***
	(0.041)	*(0.029)*	*(0.043)*	*(0.039)*	*(0.041)*

Table 4.12: Wage Decompositions in the Public Sector (using RIF-regressions) - (Unexplained Component)
Full Model

Unexplained Component	**Q10**	**Q25**	**Q50**	**Q75**	**Q90**
Potential Experience	0.842	0.696*	0.765	0.803	1.011
	(0.370)	*(0.143)*	*(0.177)*	*(0.198)*	*(0.305)*
Potential Experience^2	1.039	1.219*	1.118	1.149	1.063
	(0.301)	*(0.167)*	*(0.141)*	*(0.136)*	*(0.158)*
Education					
Lower Secondary	0.933	0.993	0.943**	0.991	1.006
	(0.078)	*(0.033)*	*(0.025)*	*(0.016)*	*(0.019)*
Upper Secondary	0.938	1.000	0.986	1.053	1.062
	(0.111)	*(0.048)*	*(0.040)*	*(0.033)*	*(0.039)*
Tertiary	0.949	0.969	0.955	1.073*	1.153***
	(0.082)	*(0.035)*	*(0.033)*	*(0.037)*	*(0.059)*
Marital Status					
Married	1.015	1.025	1.006	0.993	0.965
	(0.055)	*(0.027)*	*(0.027)*	*(0.029)*	*(0.034)*
Ethnicity					
Indian	1.002	0.992	1.029	1.019	1.010
	(0.051)	*(0.027)*	*(0.032)*	*(0.032)*	*(0.041)*
African	1.015	0.991	1.012	1.033	1.062
	(0.074)	*(0.038)*	*(0.043)*	*(0.046)*	*(0.059)*
Occupation					
Machine Operator	0.997	1.000	1.000	0.995*	0.991*
	(0.003)	*(0.001)*	*(0.002)*	*(0.003)*	*(0.005)*
Craft Worker	0.984	1.002	0.998	1.003	1.001
	(0.012)	*(0.002)*	*(0.003)*	*(0.002)*	*(0.002)*
Sales Worker	0.988	1.007	1.008	0.986	0.983
	(0.053)	*(0.022)*	*(0.021)*	*(0.016)*	*(0.016)*
Clerical	0.931	0.984	1.005	0.997	1.006
	(0.041)	*(0.019)*	*(0.018)*	*(0.011)*	*(0.015)*
Technician	0.876	0.987	0.932**	0.925***	0.952*
	(0.065)	*(0.031)*	*(0.030)*	*(0.025)*	*(0.026)*
Professional	0.953	0.988	0.965**	0.951***	0.982
	(0.030)	*(0.013)*	*(0.014)*	*(0.016)*	*(0.027)*
Manager	0.987	1.007	0.997	0.977**	0.970**
	(0.012)	*(0.007)*	*(0.007)*	*(0.009)*	*(0.012)*
Industry					
Agriculture/Fishing	1.017	1.005	0.994	0.994**	0.997
	(0.025)	*(0.010)*	*(0.007)*	*(0.003)*	*(0.003)*
Mining/Quarrying	1.013	1.003	1.002	1.001	1.003
	(0.014)	*(0.004)*	*(0.002)*	*(0.004)*	*(0.003)*
Manufacturing	0.999	0.996	0.995	0.998	1.002
	(0.003)	*(0.003)*	*(0.004)*	*(0.005)*	*(0.006)*
Electricity/Gas/Water	0.999	0.996	0.989*	0.993	1.000
	(0.004)	*(0.003)*	*(0.006)*	*(0.008)*	*(0.008)*
Wholesale/Retail	1.001	0.998	0.998	1.001	1.000
	(0.001)	*(0.002)*	*(0.004)*	*(0.003)*	*(0.005)*
Transport/Communication	0.993	0.988**	1.001	1.01	1.011
	(0.006)	*(0.005)*	*(0.007)*	*(0.007)*	*(0.008)*
Finance/Insurance	1.007	0.996	0.990	0.999	1.009
	(0.010)	*(0.005)*	*(0.006)*	*(0.004)*	*(0.008)*
Construction	1.273***	1.058**	0.984	0.978**	0.997
	(0.082)	*(0.023)*	*(0.014)*	*(0.009)*	*(0.008)*
Constant term	1.929*	1.384*	1.530**	1.069	0.815
	(0.669)	*(0.242)*	*(0.229)*	*(0.146)*	*(0.138)*
Total	**1.411*** **	**1.153*** **	**1.052**	**0.950**	**1.010**
	(0.112)	*(0.038)*	*(0.037)*	*(0.031)*	*(0.045)*

Figure 4.9: Wage-Experience Curves – Public Sector (HC Model)

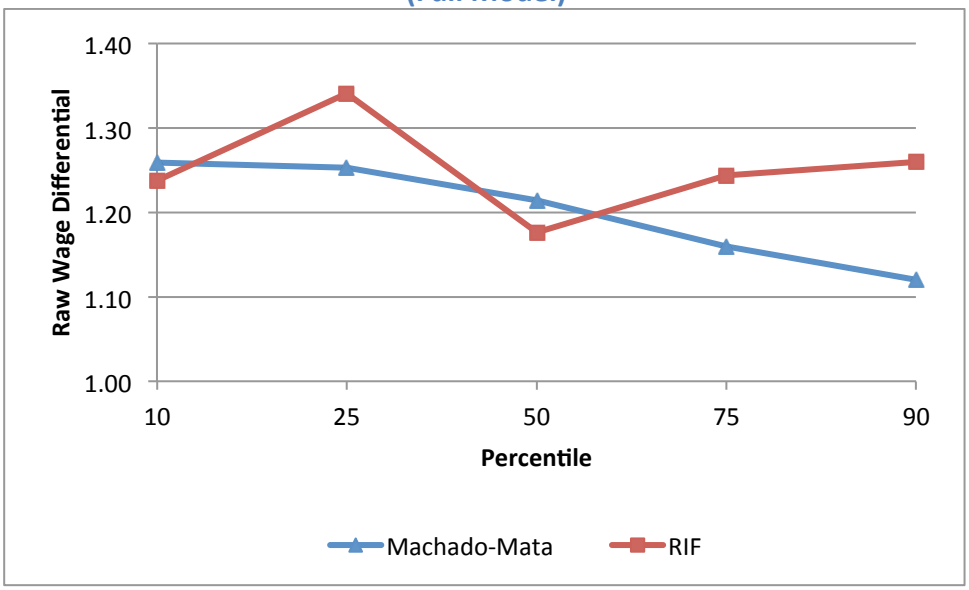


Private Sector

The most noticeable differences in the results for the decompositions based on the RIF-OLS technique and the Machado and Mata/Melly technique are for the private sector. RIF regressions show that in the full model the raw gender pay gap peaks at

the 25th percentile, is lowest at the median, and then increases as you move higher up along the wage distribution. On the other hand, the MM/Melly results show the private sector pay gap continually decreasing as you move towards the top of the wage distribution (Figure 4.5).

Figure 4.5: Raw Wage Gaps Private Sector (Full Model)



In the human capital model, the total explained component shows that women have more favourable productive characteristics (throughout the wage distribution, all coefficients are less than unity) – Table 4.13. However, when controls for occupation and industry are included, the explained component of the gender wage gap widens (coefficients are greater than unity) – Table 4.14. Those occupations (such as Machine Operators and Craft Workers) and industries (like Mining and Quarrying, and Construction) that have a greater male intensity account for some of the explained component of the wage differential (Table 4.14).

Turning to the returns to characteristics (unexplained component), private sector employers reward men's work experience more than they reward women for their work experience – both at the low and high end of the wage distribution, men are rewarded more than women for their labour market experience (Figure 4.5).

Unlike in the public sector, in the full model, at the extreme ends of the wage distribution men do not appear to have a "male" advantage given that the constant terms are less than one at the 10^{th} and 90^{th} percentile (Table 4.15). This male advantage favours men in the middle of the wage distribution between the 25^{th} and 75^{th} percentiles. At the lower end, at the 25^{th} percentile, men receive the largest premium of 28.9 per cent over women when they enter the labour market. At the top of the wage distribution, men and women are rewarded similarly regardless of their characteristics and productivity levels.

Table 4.13: Wage Decompositions in the Private Sector (using RIF-regressions) - Human Capital Model

	Q10	Q25	Q50	Q75	Q90
Difference	**1.238*** **	**1.340*** **	**1.174*** **	**1.241*** **	**1.252*** **
Explained Component					
Potential Experience	1.002	0.998	0.997	0.997	0.995
	(0.006)	*(0.006)*	*(0.006)*	*(0.007)*	*(0.013)*
Potential Experience^2	0.998	0.999	1.000	0.999	1.000
	(0.008)	*(0.005)*	*(0.004)*	*(0.005)*	*(0.008)*
Lower Secondary	1.008	1.009	1.009	1.010	1.005
	(0.006)	*(0.007)*	*(0.006)*	*(0.007)*	*(0.005)*
Upper Secondary	0.985*	0.978**	0.975**	0.972**	0.975**
	(0.008)	*(0.011)*	*(0.012)*	*(0.013)*	*(0.013)*
Tertiary	0.982**	0.965***	0.95***	0.918***	0.86***
	(0.007)	*(0.010)*	*(0.013)*	*(0.021)*	*(0.035)*
Married	0.999	0.999	0.999	0.999	0.999
	(0.003)	*(0.004)*	*(0.004)*	*(0.004)*	*(0.003)*
Indian	1.014*	1.005	1.003	0.997	0.993
	(0.007)	*(0.006)*	*(0.005)*	*(0.005)*	*(0.010)*
African	0.995	0.998	1.000	1.004	1.010
	(0.005)	*(0.004)*	*(0.004)*	*(0.004)*	*(0.008)*
Total	**0.982***	**0.952*** **	**0.934*** **	**0.899*** **	**0.840*** **
	(0.010)	*(0.012)*	*(0.013)*	*(0.019)*	*(0.033)*
Unexplained Component					
Potential Experience	0.712	0.729	0.949	1.090	0.780
	(0.190)	*(0.171)*	*(0.190)*	*(0.208)*	*(0.333)*
Potential Experience^2	1.299*	1.275*	1.035	0.996	1.255
	(0.198)	*(0.183)*	*(0.124)*	*(0.124)*	*(0.279)*
Lower Secondary	1.187***	1.031	0.977	1.034	1.004
	(0.063)	*(0.054)*	*(0.042)*	*(0.042)*	*(0.064)*
Upper Secondary	1.090**	0.984	0.943**	0.990	1.022
	(0.036)	*(0.033)*	*(0.027)*	*(0.031)*	*(0.058)*
Tertiary	1.020*	0.999	0.986	0.974**	1.014
	(0.012)	*(0.011)*	*(0.009)*	*(0.011)*	*(0.032)*
Married	1.085**	1.073**	1.092***	1.032	0.971
	(0.037)	*(0.035)*	*(0.033)*	*(0.034)*	*(0.054)*
Indian	0.984	1.044	1.014	1.034	1.127
	(0.049)	*(0.045)*	*(0.039)*	*(0.045)*	*(0.092)*
African	0.985	1.034	0.991	1.071*	1.205***
	(0.044)	*(0.039)*	*(0.034)*	*(0.040)*	*(0.087)*
Constant term	0.981	1.236*	1.284*	1.115	1.108
	(0.185)	*(0.240)*	*(0.190)*	*(0.169)*	*(0.270)*
Total	**1.260*** **	**1.347*** **	**1.257*** **	**1.381*** **	**1.490*** **
	(0.046)	*(0.051)*	*(0.041)*	*(0.048)*	*(0.087)*

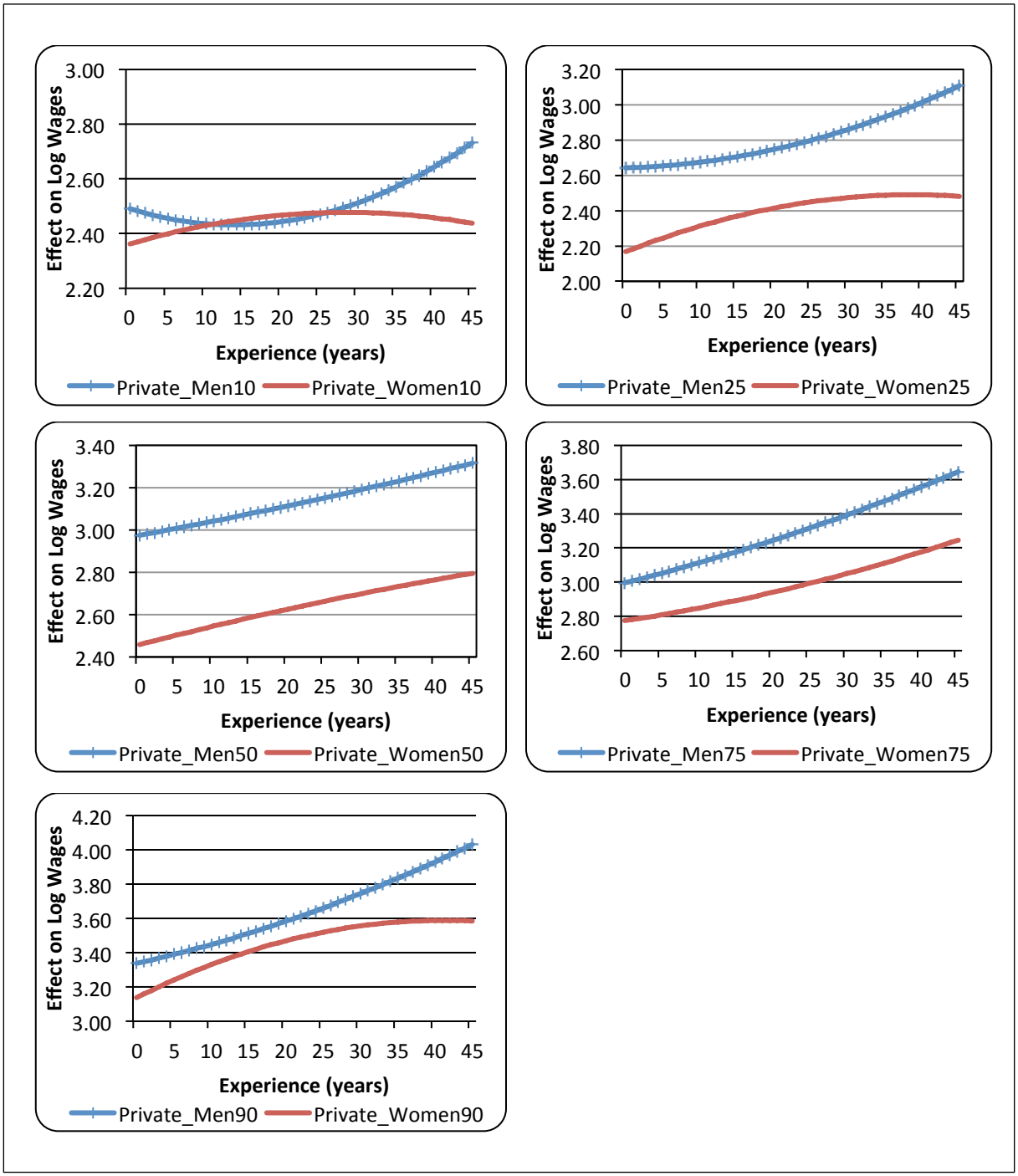
Table 4.14: Wage Decompositions in the Private Sector (using RIF-regressions) (Explained Component)
Full Model

	Q10	Q25	Q50	Q75	Q90
Raw Difference	**1.238*** **	**1.341*** **	**1.176*** **	**1.244*** **	**1.260*** **
	(0.048)	*(0.053)*	*(0.043)*	*(0.048)*	*(0.092)*
Potential Experience	1.001	0.998	0.997	0.998	0.997
	(0.006)	*(0.006)*	*(0.006)*	(0.008)	*(0.010)*
Potential Experience^2	0.999	1.000	1.000	0.999	1.000
	(0.007)	*(0.004)*	*(0.003)*	(0.004)	*(0.007)*
Education					
Lower Secondary	1.005	1.006	1.006	1.007	1.000
	(0.005)	*(0.005)*	*(0.004)*	(0.006)	*(0.004)*
Upper Secondary	0.990*	0.986**	0.986**	0.983**	0.989
	(0.006)	*(0.007)*	*(0.007)*	(0.008)	*(0.008)*
Tertiary	0.988	0.983**	0.976***	0.954***	0.928***
	(0.007)	*(0.007)*	*(0.008)*	(0.013)	*(0.023)*
Marital Status					
Married	0.999	0.999	0.999	0.999	1.000
	(0.002)	*(0.002)*	*(0.003)*	(0.002)	*(0.002)*
Ethnicity					
Indian	1.011	1.001	1.000	0.993	0.99
	(0.007)	*(0.005)*	*(0.004)*	(0.005)	*(0.010)*
African	0.994	0.996	0.997	1.002	1.008
	(0.005)	*(0.004)*	*(0.003)*	(0.004)	*(0.008)*
Occupation					
Machine Operator	1.032***	1.047***	1.043***	1.039***	1.025
	(0.010)	*(0.010)*	*(0.010)*	(0.011)	*(0.015)*
Craft Worker	1.064***	1.091***	1.082***	1.066***	1.042*
	(0.021)	*(0.019)*	*(0.016)*	(0.016)	*(0.022)*
Sales Worker	0.977	0.985	0.986	1.004	1.028**
	(0.017)	*(0.015)*	*(0.012)*	(0.011)	*(0.014)*
Clerical	0.975**	0.941***	0.943***	0.974***	1.023
	(0.012)	*(0.012)*	*(0.012)*	(0.013)	*(0.015)*
Technician	0.986**	0.973***	0.966***	0.959***	0.957***
	(0.006)	*(0.009)*	*(0.010)*	(0.014)	*(0.015)*
Professional	1.000	0.998	0.998	0.997	0.993
	(0.002)	*(0.003)*	*(0.004)*	(0.007)	*(0.015)*
Manager	0.996	0.990*	0.988**	0.984***	0.974*
	(0.003)	*(0.005)*	*(0.006)*	(0.009)	*(0.014)*
Industry					
Agriculture/Fishing	0.993***	1.001	1.001	0.999	0.997
	(0.006)	*(0.004)*	*(0.002)*	(0.002)	*(0.004)*
Mining/Quarrying	1.021	1.029***	1.030***	1.038***	1.077***
	(0.005)	*(0.007)*	*(0.007)*	(0.009)	*(0.020)*
Manufacturing	1.008	1.012*	1.008	1.008	1.012
	(0.005)	*(0.007)*	*(0.005)*	(0.005)	*(0.007)*
Electricity/Gas/Water	1.000	1.001	1.002	1.002	1.005
	(0.001)	*(0.002)*	*(0.002)*	(0.002)	*(0.006)*
Wholesale/Retail	0.961**	0.962***	0.978*	0.999	0.975
	(0.017)	*(0.014)*	*(0.011)*	(0.012)	*(0.016)*
Transport/Communication	1.005	1.006	1.005	1.004	1.004
	(0.003)	*(0.004)*	*(0.003)*	(0.004)	*(0.005)*
Finance/Insurance	0.973***	0.963***	0.967***	0.974***	0.948***
	(0.009)	*(0.010)*	*(0.009)*	(0.009)	*(0.016)*
Construction	1.112***	1.138***	1.092***	1.078***	1.087***
	(0.025)	*(0.022)*	*(0.017)*	(0.018)	*(0.026)*
Total (explained component)	**1.081*** **	**1.093*** **	**1.039**	**1.054**	**1.046**
	(0.025)	*(0.028)*	*(0.028)*	(0.034)	*(0.059)*

Table 4.15: Wage Decompositions in the Private Sector (using RIF-regressions) (Unexplained Component) Full Model

Unexplained Component	**Q10**	**Q25**	**Q50**	**Q75**	**Q90**
Potential Experience	0.788	0.719**	0.879	1.024	0.837
	(0.144)	*(0.111)*	*(0.112)*	*(0.122)*	*(0.217)*
Potential Experience^2	1.185	1.236**	1.052	1.001	1.156
	(0.124)	*(0.113)*	*(0.079)*	*(0.091)*	*(0.175)*
Education					
Lower Secondary	1.093**	1.020	0.980	1.011	0.984
	(0.038)	*(0.035)*	*(0.028)*	*(0.028)*	*(0.041)*
Upper Secondary	1.047*	1.010	0.975	1.004	1.031
	(0.025)	*(0.024)*	*(0.021)*	*(0.023)*	*(0.036)*
Tertiary	1.027*	1.013	0.991	0.971**	0.99
	(0.015)	*(0.013)*	*(0.011)*	*(0.015)*	*(0.034)*
Marital Status					
Married	1.039*	1.042*	1.059***	1.017	0.973
	(0.023)	*(0.022)*	*(0.021)*	*(0.023)*	*(0.034)*
Ethnicity					
Indian	0.966	1.006	0.997	1.005	1.075
	(0.030)	*(0.027)*	*(0.023)*	*(0.027)*	*(0.052)*
African	0.979	1.002	0.982	1.045*	1.141***
	(0.032)	*(0.027)*	*(0.023)*	*(0.028)*	*(0.056)*
Occupation					
Machine Operator	1.022*	0.998	0.994	1.004	0.994
	(0.012)	*(0.008)*	*(0.008)*	*(0.008)*	*(0.015)*
Craft Worker	1.008	0.989	0.99	0.996	1.01
	(0.009)	*(0.008)*	*(0.008)*	*(0.010)*	*(0.014)*
Sales Worker	1.039	1.006	1.012	1.022	1.03
	(0.028)	*(0.025)*	*(0.020)*	*(0.019)*	*(0.026)*
Clerical	1.008	0.984	0.997	1.004	1.006
	(0.012)	*(0.011)*	*(0.010)*	*(0.012)*	*(0.017)*
Technician	1.025	0.988	0.994	1.008	0.97
	(0.018)	*(0.016)*	*(0.014)*	*(0.018)*	*(0.031)*
Professional	0.994	0.990*	0.995	1.002	1.007
	(0.007)	*(0.005)*	*(0.004)*	*(0.005)*	*(0.016)*
Manager	0.999	0.992*	0.998	1.002	1.012
	(0.004)	*(0.004)*	*(0.004)*	*(0.006)*	*(0.017)*
Industry					
Agriculture/Fishing	0.998	1.002	1.001	0.999	0.999
	(0.002)	*(0.002)*	*(0.001)*	*(0.001)*	*(0.001)*
Mining/Quarrying	1.004*	1.002	1.001	1.002	1.001
	(0.002)	*(0.001)*	*(0.001)*	*(0.002)*	*(0.008)*
Manufacturing	1.033**	0.997	1.005	1.011	1.022
	(0.017)	*(0.013)*	*(0.013)*	*(0.015)*	*(0.023)*
Electricity/Gas/Water	1.008*	1.005*	1.004*	1.002	1.004
	(0.004)	*(0.003)*	*(0.002)*	*(0.002)*	*(0.004)*
Wholesale/Retail	1.086**	1.016	0.996	1.014	0.984
	(0.037)	*(0.028)*	*(0.022)*	*(0.023)*	*(0.030)*
Transport/Communication	1.003	0.999	0.996	1.003	1.010
	(0.005)	*(0.005)*	*(0.005)*	*(0.007)*	*(0.009)*
Finance/Insurance	1.036*	1.001	0.996	0.987	1.007
	(0.020)	*(0.015)*	*(0.014)*	*(0.016)*	*(0.032)*
Construction	1.012*	1.009	0.996	0.994	0.991
	(0.006)	*(0.007)*	*(0.005)*	*(0.008)*	*(0.013)*
Constant term	0.811	1.289*	1.278**	1.041	0.992
	(0.131)	*(0.175)*	*(0.134)*	*(0.147)*	*(0.179)*
Total	**1.145*****	**1.227*****	**1.132*****	**1.180*****	**1.204*****
	(0.037)	*(0.034)*	*(0.027)*	*(0.031)*	*(0.059)*

Figure 4.5: Wage-Experience Curves – Private Sector (HC model)



4.6 Conclusions

This study builds upon previous work by exploring the gender wage gap not only at the mean, but also throughout the entire wage distribution. Previously, research focussed on the mean gender wage gap (for example, Olsen and Coppin, 2001 and Coppin and Olsen, 2007), but substantial variations in the gap will be hidden in such analyses. Two recent quantile decompositions techniques (Machado and Mata

(2005)/Melly (2006), and Firpo, Fortin and Lemieux (2009)) were used to analyse the wage gaps for the overall working population but also between the public and private sectors. These techniques, just like with the Blinder-Oaxaca decompositions, allow us to isolate the wage differential into a portion due to differences in endowments and a portion due to differences in the returns to these endowments, but at different points (other than the mean) along the wage distribution.

In terms of the two quantile decomposition methodologies used for our analysis, the one based on the unconditional quantile regressions (that is, Firpo *et* al, 2009) is preferred. This methodology focuses on the difference between quantiles of the marginal *un*conditional distribution of wages, whereas as the Machado and Mata (2005) approach provides a full characterization of the conditional distribution of wages given ***X***; it does not provide the *marginal density* of the wage observations. This is because the marginal density depends on both the conditional quantile function and the distribution of the covariates. Firpo *et al* (2009) use of RIF-regressions allows the calculation of unconditional quantiles and provides a straightforward way of estimating unconditional quantile treatment effects. This method is preferred given that, in general, we are more interested in the effect of covariates on the unconditional (marginal) distribution of wages rather than on the conditional distribution. Although the Machado-Mata method provides an estimate of the effect of covariates on the marginal wage distribution, it is cumbersome and typically requires numerical integration. The Firpo *et al* technique gives an appealing alternative.

Furthermore, the interpretation of the regression coefficients $\beta(\theta)$, is easier and more straightforward with the RIF-regressions (Firpo *et al)* than with the quantile regression approach (Machado-Mata). For instance, if *X* is a dummy variable for tertiary education versus secondary schooling, the estimate of $\hat{\beta}(50)$ following a quantile regression is *not* the effect of tertiary education on the 50th percentile wage earner; rather, it is the effect of tertiary education on the 50th percentile of the wage distribution. However, the use of linearization in the RIF-regression technique generates a simple regression, which is easy to interpret – the regression coefficients

$\hat{\beta}(\theta)$ provide the effect of a unit increase in *X* on the unconditional value of *W* (wages).

Lastly, a major drawback of the Machado-Mata decomposition approach is that the individual contribution of each covariate (individual and firm-level characteristics) on the gender wage gap cannot be disaggregated, which makes it less useful for policy recommendations. The use of the RIF-regressions in the Firpo *et al* decomposition technique allows for such disaggregation. Also, the Machado-Mata methodology focuses on the impact of differences in the returns to characteristics on the gender wage gap and may understate the effects of characteristics. The Firpo *et al* decomposition technique was able to elucidate the importance of education for the "explained" component of the gender wage gap and marital status and work experience for the "unexplained" component. The effect of these covariates across the wage distribution is discussed in more detail below.

Previous research based on 1993 data for Trinidad and Tobago measured the gender wage gap at 19.2 per cent (Olsen and Coppin, 2001). In this current study, for 2012, the pure wage gap decreased to 11.4 per cent. This reduction in the gender wage gap may be due in part to the passing of the Equal Opportunity Act in 2000. The previous study by Olsen and Coppin (2001) used the standard Oaxaca-Blinder decomposition methodology, but this approach was unable to pick up the vast differences in the wage gap for low and high-income earners. For instance, for the overall working population at the lower end of the wage distribution, the gender wage gap is much larger (25.1 per cent) compared to the higher end of wages where no gap exists. Additionally, the unexplained component of the gender wage gap, which can (cautiously) be used as an indication of the extent of discrimination in the labour market, reveals that lower-waged women face greater discrimination. At the 10^{th} percentile, if women received the same rate of return as men for their characteristics, their wages are estimated to increase by 33 per cent whereas at the 90^{th} percentile their wages are estimated to increase by 11.8 per cent (based on the MM/Melly approach). As such, women in higher paid jobs in Trinidad and Tobago seem to not be as disadvantaged as lower paid women.

The Blinder-Oaxaca decomposition measured the average wage gap in the public sector at only 3.2 per cent. But, the quantile decomposition estimates that the public sector gender wage gap is much higher at the lower end of the wage distribution – 22.8 per cent at the 10th percentile – and there is no wage gap at the upper end of wages (MM/Melly decomposition). Again, at the lower end of the wage distribution women appear to face greater discrimination (unexplained component) - in the public sector, their wages are estimated to increase by 32.3 per cent at the 10th percentile while they enjoy similar rates of return to characteristics as men at the higher end of the wage distribution.

The pure wage gap is much larger in the private sector, at 22.9 per cent at the mean (Blinder-Oaxaca methodology), but at the lower end of the wage distribution the gap is more than twice that of the gap at the higher end of the distribution. In the private sector, at the 10th percentile the gender wage gap is 25.9 per cent compared to 12.0 per cent at the 90th percentile (MM/Melly decomposition). In the private sector it appears that female workers, regardless of their position along the wage distribution, face a similar degree of discrimination - the unexplained component reveals that throughout the wage distribution, if women were to receive the same rate of return as men for their characteristics, their wages would increase by 23 per cent (MM/Melly). However, based on the detailed decompositions using RIF-regressions, the extent of discrimination varies along the distribution of wages. If women received the same rates of return to their characteristics as do men, their wages are estimated to increase by 14.5 per cent at the 10th percentile, 22.7 per cent at the 25th percentile, 13.2 per cent at the median, 18.0 per cent at the 75th percentile, and 20.4 per cent at the 90th percentile.

The detailed decomposition results (based on RIF-regressions) provide a more nuanced analysis for the main drivers of both the explained and unexplained components of the wage differential at different points along the distribution. Overall, with the advancement of women's education in Trinidad and Tobago's

recent history and the provision of free education by the government up to the tertiary level[49], women now have better characteristics ("endowments") than men, especially at the top of the wage distribution.

In terms of the "explained" component, if women had the same characteristics as men, their wages are estimated to increase slightly (by 3.0 per cent and 1.0 per cent) at the lower end of the wage distribution (10^{th} and 25^{th} percentiles), but to *decrease* along the higher end of the wage distribution.

Meanwhile, the unexplained component, which can be indicative of discrimination, shows that: 1) lower paid men enter the labour market at an advantage over their female counterparts (this premium is markedly higher at the lower end of the wage distribution – men receive a premium of 43.3 per cent at the 25^{th} percentile, 33.0 per cent at the 75^{th} percentile, and 0.6 per cent at the top of the distribution); 2) lower paid men are rewarded more if they are married (they receive an estimated 6.6 per cent premium at the 10^{th} percentile over married females, but higher-salaried married men do not appear to receive a premium because of their marital status); and 3) men's work experience is valued more than women's work experience from the lower end of the wage distribution up to the 75^{th} percentile; at the 90^{th} percentile, employers seem to reward women more for their work experience.

In conclusion, although female workers have better endowments than male workers, and hence *should be* paid more than their male counterparts, men's wages are higher, owing to a large, positive unexplained difference in the returns to these characteristics. The results of the quantile decompositions show that Trinidad and Tobago's labour market does not have a *glass ceiling*, but female workers face a *sticky floor* instead as the wage gap is much larger for low-paid women compared to

[49] The government of Trinidad and Tobago introduced the Dollar for Dollar Education Plan in September 2001 whereby the government funded 50 per cent of tuition fees that applied to all new enrolments at (public) institutions of higher learning. In 2004, the Dollar for Dollar Education Plan was replaced by the GATE (Government Assistance for Tuition Expenses) programme. The GATE programme is a funding mechanism that provides 100 per cent financial support for tuition fees for students pursuing higher education at both public and private institutions.

their high-income counterparts. Notwithstanding this, the glass ceiling in Trinidad and Tobago may be masked by the fact that on average at the higher end of the pay scale women have more years of education than men – at the 90th percentile, women have three more years of education than men. It is likely that these women feel compelled to educate themselves further to compete with their male counterparts for higher paying jobs.

Apart from employer-based discrimination, the *sticky floors* phenomena facing working women in Trinidad and Tobago may be due, in part, because of the challenges these low-paid women face in having to manage family-life and bearing the major share of responsibilities in the home. Some of these women tend to prefer to maintain a low paying job as long as the salary is stable. Men in lower-paying jobs, just as the professional male, are more likely to ask for a raise or leave a job seeking a higher salary than would women given the fact that women tend to be more risk-averse.[50]

[50] Based on the interview with a business consultant operating in Trinidad (see Appendix III: Interview with Business Consultant Operating in Trinidad and Tobago for full details.)

4.7 References

Akerlof, G.A. (1982). Labor Contracts as Partial Gift Exchange. *The Quarterly Journal of Economics,* Vol. 97, No. 4, pp. 543-569.

Anderson, T., Forth, J., Metcalf, H. and Kirby, S. (2001). The Gender Pay Gap: Final Report to the Women and Equality Unit. London: The Cabinet Office.

Appleton, S., L. Song and Q. Xia (2014). Understanding Urban Wage Inequality in China 1988-2008: Evidence from Quantile Analysis.*World Development*, Vol. 62, pp. 1-13.

Arulampalam,W., Booth A.L. and Bryan, M.L. (2007). Is there a glass ceiling over Europe? Exploring the gender pay gap across the wages distribution, *Industrial and Labor Relations Review*, Vol. 60, pp. 163-186.

Bellony, Annelle, Hoyos, A. and Ñopo, H. (2010). *Gender Earnings Gaps in the Caribbean: Evidence from Barbados and Jamaica.* IDB Working Paper Series No.IDB-WP-210 (August).

Booth, A.L., Francesconi, M. and Frank, J. (2003). A Sticky Floors Model of Promotion, Pay, and Gender. *European Economic Review*, Vol. 47, pp. 295–322.

Chichilnisky, G. and Frederiksen, E.H. (2008). An equilibrium analysis of the gender wage gap. *International Labor Review*, Vol. 147, No. 4, pp. 297–320.

Christofides, L.N., Polycarpou, A., and Vrachimis, K. (2010). The Gender Wage Gaps, 'Sticky Floors' and 'Glass Ceilings' of the European Union. IZA Discussion Paper Series, No. 5044.

Coppin, A. and R.N. Olsen (2007). Public vs. Private Sector Earnings Differentials in the Caribbean Region: Evidence from the Economy of Trinidad and Tobago. *The Journal of Developing Areas*, Vol. 40, No. 2, pp. 51-74.

Coppin, Addington (1997). Women's Earnings in Trinidad and Tobago: An Analysis by Household Status and Ethnicity. *Social and Economic Studies,* Vol. 46:4, pp. 61-82.

Deaton, Angus (1992). The Analysis of Household Surveys. Baltimore: John Hopkins.

Frieze, I. H., J.E. Parsons, P.B. Johnson, D.N. Ruble, and G. Zellman (1978). Women and sex roles. New York: Norton.

Kahneman, D. P. Slovic, and A. Tversky (1982). Judgement Under Uncertainty: Heuristics and Biases (Eds.). Cambridge: Cambridge University Press.

Kee, H.J. (2006). Glass Ceiling or Sticky Floor? Exploring the Australian Gender Pay Gap. *The Economic Record*, Vol. 82, No. 259, December, pp. 408–427.

Koenker, R. and G. Basset Jr. (1978). Regression Quantiles. *Econometrica*, Vol. 46, pp. 33-50.

Kuhn, P. (1987). Sex Discrimination in Labour Markets: The Role of Statistical Evidence. *American Economic Review*, Vol. 77, pp. 567-583.

Maccoby, E. E. and C. Jacklin (1974). The psychology of sex differences. Stanford, CA: Stanford University Press.

Machado, J. A. F. and J. Mata (2005). Counterfactual Decomposition of Changes in Wage Distributions Using Quantile Regression. *Journal of Applied Econometrics*, Vol.20, No.3, pp. 445-465.

Mahabir, Reshma, Vishana Jagessar, Crystal Neptune and Delvin Cox (2013). Understanding Wages in a Small Open Economy: The Case of Trinidad and Tobago. *Central Bank of Trinidad and Tobago Working Papers, WP 11/2013, February*.

Melly, B. (2005). Decomposition of Differences in Distribution using Quantile Regression. *Labour Economics*, Vol. 12, pp. 577-90.

Melly, B. (2006). Estimation of Counterfactual Distributions using Quantile Regression. Mimeo, Swiss Institute for International Economics and Applied Economic Research (SIAW), University of St. Gallen.

Olsen, R.N. and A. Coppin (2001). The Determinants of Gender Differences in Income in Trinidad and Tobago. *The Journal of Development Studies*, Vol. 37:5, pp. 31-56.

Reiman, C. (2001). The Gender Wage Gap in Australia. NATSEM Discussion paper 54, National Centre for Social and Economic Modelling, Canberra, March.

Roopnarine, Karen, and Dindial Ramrattan (2012). Female Labour Force Participation: the Case of Trinidad and Tobago. *World Journal of Entrepreneurship, Management and Sustainable Development*, Vol.8, No. 2/3, pp. 183-193.

Sookram, Sandra and Watson, Patrick K. (2008). The Informal Sector and Gender in the Caribbean: The Case of Trinidad and Tobago. *Journal of Eastern Caribbean Studies*, 33(4): 42-66.

Van der Velde, L., J. Tyrowicz and K. Goraus (2013). What is the True Gender Wage Gap? A Comparative Analysis Using Data from Poland. Working Papers 2013-28, Faculty of Economic Sciences, University of Warsaw.

Appendix III: Interview with Business Consultant Operating in Trinidad and Tobago[51]

Factors in the private sector that contribute to the gender wage gap:

1) Perception – male workforce is easier to handle in terms of less issues relating to the balance of family-life.
2) Businesses especially family-owned business still very male-dominated environment at the board and executive/management level.
3) Both men and women prefer to report to a male leader – women leaders have a "chip" on their shoulders when they become managers (based on consistent feedback from employees).
4) Women themselves – not as confident as men when negotiating their pay packages; women tend to become disillusioned and de-motivated in the workforce when they believe they are not getting rewarded for their "worth". Women undersell themselves in the workforce – projecting insecurity and as a consequence employers will only pay them what they think they are "worth".
5) Men find it easier to land a job that they are possibly not qualified for because they "market" themselves very well. Women will be more concerned if they are qualified for the position.

Women tend to "job hop" less (HR recruitment term); male professionals take more risk with changing jobs:

- Responsibilities: single mothers, single professional women are usually not able to take as many risks and jeopardise their families. On the other hand, men regardless if they have children or not, may not be living with the children so are able to "jump" jobs/roles more often than women.

[51] Interview entailed several open-ended questions and was conducted in person in July 2015.

- Enrolment in tertiary education institutions: more women pursue tertiary education, so they are more educated than men academically but lack the soft skills such as confidence and leadership qualities.
- Women in the market tend to have more dependents than men, and so have less tolerance for risk.
- Glass ceiling: agrees that Trinidad and Tobago does not have a glass ceiling. Women get more education because of lack of confidence; status oriented. Sometimes being so educated is working against them because employers are looking for good talent for less – more educated women may be viewed as too expensive to employers in addition to women not forcefully negotiating for their pay packages or raise/promotion.
- Networking: men use networking and relationships to advance themselves more so than women; women tend not to use their relationships to advance their careers, and tend to be more institutionalised in their approach to get a promotion and follow formal channels in the organisation, whereas men may tend to have more of a "buddy" relationship with senior colleagues.
- Professional men have less fear in going after the positions they want. Sometimes, the perception of a driven-woman being called a "bitch" prevents some women from striving to the positions they really want.
- Sticky floors: primarily because of the challenges of having to manage family-life and the tendency of having to take on a lot of responsibilities in the home, these women tend to prefer to maintain a low paying job as long as the salary is stable; also, they probably would not get more education and/or training. Men in lower paying jobs, just as the professional male, will more likely ask for a raise or leave a job seeking a higher salary than would women since women will tend to be more risk-averse. Generally, there is a greater number of older women working blue collar jobs and younger females as professionals.
- Disparity in wages, why? : Because of discriminatory practices by employers but also self-imposed by employees. Industrial Relations laws ensure that there is a level playing field now compared to the past, with more opportunities available to both men and women.

- Women more likely to complain to their family and feel like a victim in the workplace; men just tend to negotiate more or leave the job and seek employment elsewhere.
- Men are less loyal to employers than women are.

Solutions

- Secondary education should prepare students with life skills and soft skills like budgeting, goal planning, leadership, etc.

Raising a family in Trinidad and Tobago:

- Women are not in a position to leave the workforce to raise a family; a high number of single mothers in Trinidad and Tobago prevents them from leaving employment.
- Blue-collar couples: these women do not have the option to leave the workforce because they tend to be the more responsible and stable parent.
- Men in Trinidad and Tobago do not leave employment to have a family.

Leaving employment, why?

- Men leave for more money; women tend to stay in their jobs, as they are more risk-averse.
- Women will tend to leave their jobs if their family dynamics change, for instance, her husband opens his own business and she leaves to join the business or stay at home with the children.

Does age play a role in hiring a man versus a woman?

- Depends on the job, field, sector, and level (employers do look at a woman's age in terms of being married and wanting children, maternity leave, etc.).
- Retired males seem to negotiate for consultancy positions after they retire whereas retired females show a preference to remain at home and enjoy family-life with the grandchildren.
- Stereotypical gender roles still prevalent in Trinidad and Tobago.
- Youth in the workforce:
    - Less tolerant, loyal, committed to anything outside of themselves (jobs, company, etc.).
    - More confident and willing to take more risks than their elders. More young folks driven to be entrepreneurs instead of an employee.
    - Less work ethic and disciplined than older generations.
    - Gender dynamic: young females are more arrogant, less tolerant, less caring, impatient, and passive aggressive. Young female professionals (well qualified) have an "entitlement" view in the workforce and when they get promoted or in higher levels of authority they are bossy instead of being a leader (this adds to the perception in the workplace that females, especially female bosses are difficult to work with). Young professional females (compared to older female professionals) will quicker "jump" jobs instead of staying with the same organisation for a long time.

Marital status

- Employers do consider the marital status of prospective employees, especially in this new age of uncertainty, but it does depend on the role; employers prefer a young single educated female over a young and newly married educated female employee. Some roles need travel so family life (including marital status) is always a consideration when hiring for particular roles/positions.

Married vs. unmarried male wage premium

- Married men tend to negotiate for a higher salary often times citing he has a family to demand a higher salary. More pressure on a married man in his relationship at home to earn more and provide for his family; his ego also plays a role in his earning status.

Education vs. work experience

- There is a perception of a greater reliance on education, but work ethic seems to very important as well. Persons with institutional knowledge with less formal education might end up staying and running an organisation since the highly educated staff might have higher turnover. However, if the business were to downside, persons with institutional knowledge tend to have more of an entrepreneurial spirit compared with the professional staff.

Collective bargaining

- Public sector and manufacturing rely more on collective bargaining. Most of the private sector is not unionised.

Performance-related pay/promotion

- Many organisations do not have proper performance management systems in place.

Occupational Segregation

- Stereotypical jobs as ‘male’ and ‘female’ still exists, e.g. female housekeepers and male garbage collectors. Some roles, a man’s ego will simply not allow

him to take the job and would rather be unemployed. Discrimination on the part of employers for particular traditional gender roles still exists.

Appendix IV: Measuring the Gender Wage Gap using Pooled Quantile and Pooled RIF Regressions

Table AIV.1
Earnings Functions – Pooled Quantile Regressions
(Human Capital Model)

	q10	q25	q50	q75	q90
Potential Experience	0.0111*	0.0125***	0.0134***	0.0153***	0.009
	(0.006)	*(0.004)*	*(0.004)*	*(0.004)*	*(0.007)*
Potential Experience^2	-1.67E-05	-1.32E-05	-5.34E-05	-6.93E-05	6.97E-05
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
Education					
Lower Secondary	0.221***	0.240***	0.208***	0.234***	0.280***
	(0.045)	*(0.043)*	*(0.046)*	*(0.034)*	*(0.050)*
Upper Secondary	0.534***	0.563***	0.553***	0.605***	0.736***
	(0.056)	*(0.043)*	*(0.052)*	*(0.034)*	*(0.056)*
Tertiary	1.202***	1.262***	1.238***	1.225***	1.247***
	(0.073)	*(0.056)*	*(0.054)*	*(0.045)*	*(0.067)*
Marital Status					
Married	0.143***	0.102***	0.0802***	0.0695***	0.0808**
	(0.043)	*(0.028)*	*(0.027)*	*(0.027)*	*(0.036)*
Ethnicity					
Indian	0.050	-0.024	-0.020	-0.028	-0.034
	(0.052)	*(0.044)*	*(0.036)*	*(0.035)*	*(0.052)*
African	0.029	0.001	-0.015	-0.012	-0.033
	(0.058)	*(0.045)*	*(0.035)*	*(0.034)*	*(0.052)*
Female	-0.309***	-0.276***	-0.252***	-0.233***	-0.225***
	(0.039)	*(0.026)*	*(0.026)*	*(0.026)*	*(0.033)*
Constant	2.079***	2.345***	2.652***	2.872***	3.119***
	(0.087)	*(0.066)*	*(0.061)*	*(0.052)*	*(0.083)*

Bootstrapped standard errors using 200 replications in parentheses. * p<0.1, ** p<0.05, *** p<0.01
Dependent variable is the log of hourly wages. Base dummy variables are: Education - primary school; Marital Status – unmarried; Ethnicity - mixed/other.

Table AIII.2
Earnings Functions – Pooled Quantile Regressions
(Full Model)

	q10	q25	q50	q75	q90
Potential Experience	0.011*	0.009***	0.010***	0.004	0.007
	(0.006)	*(0.003)*	*(0.003)*	*(0.004)*	*(0.005)*
Potential Experience^2	-3.66E-05	-1.90E-05	-4.78E-05	4.05E-05	-4.02E-06
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
Education					
Lower Secondary	0.133***	0.144***	0.126***	0.114***	0.133**
	(0.046)	*(0.040)*	*(0.030)*	*(0.036)*	*(0.052)*
Upper Secondary	0.343***	0.341***	0.301***	0.293***	0.383***
	(0.050)	*(0.043)*	*(0.034)*	*(0.045)*	*(0.059)*
Tertiary	0.689***	0.697***	0.637***	0.524***	0.612***
	(0.087)	*(0.058)*	*(0.049)*	*(0.053)*	*(0.071)*
Marital Status					
Married	0.105***	0.0764***	0.0711***	0.0887***	0.053
	(0.032)	*(0.024)*	*(0.022)*	*(0.024)*	*(0.034)*
Ethnicity					
Indian	0.0353	0.00264	-0.00791	-0.0357	-0.0424
	(0.051)	*(0.035)*	*(0.035)*	*(0.038)*	*(0.050)*
African	0.0159	0.00142	0.00586	0.0155	0.0106
	(0.052)	*(0.037)*	*(0.034)*	*(0.036)*	*(0.046)*
Sector of Employment					
Public Sector	-0.259***	-0.240***	-0.302***	-0.251***	-0.190***
	(0.044)	*(0.038)*	*(0.031)*	*(0.027)*	*(0.047)*
Occupation					
Machine Operator	0.221***	0.274***	0.275***	0.349***	0.333***
	(0.068)	*(0.048)*	*(0.052)*	*(0.050)*	*(0.071)*
Craft Worker	0.310***	0.248***	0.270***	0.255***	0.270***
	(0.052)	*(0.047)*	*(0.038)*	*(0.037)*	*(0.067)*
Sales Worker	0.107	0.153***	0.189***	0.239***	0.249***
	(0.072)	*(0.042)*	*(0.037)*	*(0.043)*	*(0.045)*
Clerical	0.313***	0.288***	0.301***	0.241***	0.222***
	(0.079)	*(0.051)*	*(0.042)*	*(0.041)*	*(0.051)*
Technician	0.478***	0.492***	0.500***	0.557***	0.498***
	(0.058)	*(0.046)*	*(0.046)*	*(0.046)*	*(0.061)*
Professional	0.623***	0.738***	0.682***	0.780***	0.716***
	(0.101)	*(0.076)*	*(0.058)*	*(0.076)*	*(0.081)*
Manager	0.523***	0.595***	0.670***	0.735***	0.806***
	(0.079)	*(0.089)*	*(0.064)*	*(0.089)*	*(0.138)*
Industry					
Agriculture/Fishing	-0.445**	-0.19	-0.133	-0.0827	0.0188
	(0.188)	*(0.141)*	*(0.118)*	*(0.141)*	*(0.105)*
Mining/Quarrying	0.394***	0.318***	0.313***	0.332***	0.534***
	(0.092)	*(0.070)*	*(0.058)*	*(0.105)*	*(0.150)*
Manufacturing	0.125*	0.0493	0.0974**	0.147***	0.149**
	(0.065)	*(0.055)*	*(0.039)*	*(0.056)*	*(0.072)*
Electricity/Gas/Water	0.0669	0.146	0.230***	0.335***	0.288***
	(0.138)	*(0.128)*	*(0.071)*	*(0.075)*	*(0.108)*
Wholesale/Retail	0.0913	-0.0613	-0.0201	-0.104***	-0.133**
	(0.074)	*(0.052)*	*(0.033)*	*(0.040)*	*(0.067)*
Transport/Communication	0.165*	0.0627	0.0988	0.0969*	0.0758
	(0.087)	*(0.065)*	*(0.069)*	*(0.051)*	*(0.114)*
Finance/Insurance	0.281***	0.178***	0.160***	0.102**	0.0795
	(0.090)	*(0.059)*	*(0.040)*	*(0.048)*	*(0.092)*
Construction	0.0464	-0.0735*	-0.0411	-0.0651**	-0.0936
	(0.053)	*(0.040)*	*(0.031)*	*(0.032)*	*(0.069)*
Female	-0.255***	-0.211***	-0.211***	-0.182***	-0.195***
	(0.041)	*(0.031)*	*(0.025)*	*(0.029)*	*(0.044)*
Constant	2.177***	2.508***	2.783***	3.082***	3.226***
	(0.095)	*(0.076)*	*(0.071)*	*(0.055)*	*(0.083)*

Bootstrapped standard errors using 200 replications in parentheses. * p<0.1, ** p<0.05, *** p<0.01
Dependent variable is the log of hourly wages. Base dummy variables are: Education - primary school; Marital Status – unmarried; Ethnicity - mixed/other; Occupation - Elementary Occupations; Industry - Social/Personal Services.

Table AIV.3
Inter-Quantile (90^{th} -10^{th}) Regression based on Pooled Earnings Functions

(90^{th} – 10^{th} differences)	HC Model	Full Model
Potential Experience	-0.002	-0.004
	(0.009)	*(0.008)*
Potential Experience^2	0.000	0.000
	(0.000)	*(0.000)*
Education		
Lower Secondary	0.059	0.000
	(0.059)	*(0.068)*
Upper Secondary	0.202***	0.040
	(0.073)	*(0.077)*
Tertiary	0.045	-0.077
	(0.085)	*(0.101)*
Marital Status		
Married	-0.063	-0.052
	(0.053)	*(0.051)*
Ethnicity		
Indian	-0.084	-0.078
	(0.064)	*(0.073)*
African	-0.062	-0.005
	(0.066)	*(0.066)*
Female	0.0841*	0.060
	(0.047)	*(0.050)*
Sector of Employment		
Public Sector		0.069
		(0.063)
Occupation		
Machine Operator		0.112
		(0.087)
Craft Worker		-0.040
		(0.073)
Sales Worker		0.141*
		(0.082)
Clerical		-0.091
		(0.086)
Technician		0.019
		(0.085)
Professional		0.093
		(0.136)
Manager		0.283*
		(0.170)
Industry		
Agriculture/Fishing		0.464**
		(0.198)
Mining/Quarrying		0.141
		(0.162)
Manufacturing		0.024
		(0.092)
Electricity/Gas/Water		0.221
		(0.152)
Wholesale/Retail		-0.224**
		(0.100)
Transport/Communication		-0.089
		(0.138)
Finance/Insurance		-0.201
		(0.140)
Construction		-0.140*
		(0.084)
Constant	1.040***	1.048***
	(0.118)	*(0.138)*

Bootstrapped standard errors using 200 replications in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table AIV.4
Earnings Functions – Pooled RIF-Regressions
(Human Capital Model)

	rif_10	rif_25	rif_50	rif_75	rif_90
Potential Experience	0.005	0.004	0.00852**	0.0191***	0.0286***
	(0.007)	*(0.005)*	*(0.004)*	*(0.006)*	*(0.006)*
Potential Experience^2	0.000	0.000	0.000	0.000	-3.44E***
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
Education					
Lower Secondary	0.239***	0.239***	0.284***	0.296***	0.120***
	(0.072)	*(0.052)*	*(0.038)*	*(0.051)*	*(0.043)*
Upper Secondary	0.522***	0.582***	0.596***	0.842***	0.376***
	(0.070)	*(0.051)*	*(0.038)*	*(0.061)*	*(0.058)*
Tertiary	0.710***	0.898***	1.070***	2.006***	1.514***
	(0.077)	*(0.053)*	*(0.037)*	*(0.071)*	*(0.100)*
Marital Status					
Married	0.0779*	0.116***	0.121***	0.041	0.011
	(0.041)	*(0.032)*	*(0.026)*	*(0.042)*	*(0.042)*
Ethnicity					
Indian	0.081	0.060	0.013	-0.105*	-0.103*
	(0.059)	*(0.044)*	*(0.035)*	*(0.058)*	*(0.057)*
African	0.082	0.100**	0.009	-0.055	-0.115*
	(0.058)	*(0.044)*	*(0.034)*	*(0.058)*	*(0.059)*
Female	-0.322***	-0.305***	-0.213***	-0.277***	-0.168***
	(0.045)	*(0.032)*	*(0.025)*	*(0.038)*	*(0.037)*
Constant	2.111***	2.350***	2.656***	2.808***	3.418***
	(0.104)	*(0.076)*	*(0.057)*	*(0.089)*	*(0.088)*
No. of observations	2006	2006	2006	2006	2006
R-squared	0.081	0.166	0.257	0.320	0.239

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

Table AIV.5
Earnings Functions – Pooled RIF-Regressions
(Full Model)

	rif_10full	rif_25full	rif_50full	rif_75full	rif_90full
Potential Experience	0.006	0.003	0.00586*	0.00969*	0.0227***
	(0.006)	*(0.005)*	*(0.003)*	*(0.005)*	*(0.006)*
Potential Experience^2	0.000	0.000	0.000	0.000	-2.8E-
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
Education					
Lower Secondary	0.104	0.142***	0.179***	0.158***	0.057
	(0.072)	*(0.051)*	*(0.036)*	*(0.050)*	*(0.044)*
Upper Secondary	0.249***	0.341***	0.313***	0.467***	0.221***
	(0.073)	*(0.055)*	*(0.041)*	*(0.061)*	*(0.058)*
Tertiary	0.325***	0.455***	0.544***	1.062***	0.887***
	(0.091)	*(0.066)*	*(0.052)*	*(0.101)*	*(0.115)*
Marital Status					
Married	0.056	0.0986***	0.106***	0.035	0.018
	(0.039)	*(0.030)*	*(0.024)*	*(0.039)*	*(0.040)*
Ethnicity					
Indian	0.078	0.049	0.006	-0.086	-0.076
	(0.058)	*(0.041)*	*(0.032)*	*(0.054)*	*(0.055)*
African	0.0948*	0.0967**	0.011	-0.052	-0.0975*
	(0.057)	*(0.041)*	*(0.032)*	*(0.055)*	*(0.055)*
Sector of Employment					
Public Sector	-0.218***	-0.322***	-0.246***	-0.415***	-0.208***
	(0.056)	*(0.039)*	*(0.029)*	*(0.049)*	*(0.049)*
Occupation					
Machine Operator	0.374***	0.349***	0.367***	0.331***	0.051
	(0.071)	*(0.060)*	*(0.052)*	*(0.084)*	*(0.068)*
Craft Worker	0.419***	0.315***	0.343***	0.296***	0.122**
	(0.070)	*(0.055)*	*(0.043)*	*(0.057)*	*(0.048)*
Sales Worker	0.303***	0.0966*	0.242***	0.350***	0.030
	(0.085)	*(0.058)*	*(0.039)*	*(0.056)*	*(0.049)*
Clerical	0.558***	0.441***	0.437***	0.053	-0.127***
	(0.084)	*(0.063)*	*(0.046)*	*(0.062)*	*(0.046)*
Technician	0.478***	0.455***	0.579***	0.789***	0.239***
	(0.077)	*(0.055)*	*(0.043)*	*(0.079)*	*(0.074)*
Professional	0.401***	0.400***	0.553***	1.164***	0.985***
	(0.109)	*(0.069)*	*(0.052)*	*(0.108)*	*(0.177)*
Manager	0.527***	0.504***	0.636***	0.873***	0.736***
	(0.077)	*(0.067)*	*(0.061)*	*(0.142)*	*(0.166)*
Industry					
Agriculture/Fishing	-0.373	0.054	0.039	-0.153	-0.153***
	(0.235)	*(0.136)*	*(0.104)*	*(0.109)*	*(0.059)*
Mining/Quarrying	0.204***	0.296***	0.372***	0.648***	0.440**
	(0.061)	*(0.064)*	*(0.058)*	*(0.135)*	*(0.176)*
Manufacturing	0.183**	0.158***	0.064	0.267***	0.139**
	(0.072)	*(0.058)*	*(0.047)*	*(0.074)*	*(0.066)*
Electricity/Gas/Water	-0.026	0.062	0.191***	0.708***	0.651***
	(0.070)	*(0.058)*	*(0.059)*	*(0.148)*	*(0.225)*
Wholesale/Retail	0.047	0.012	-0.059	0.031	0.113**
	(0.081)	*(0.057)*	*(0.039)*	*(0.055)*	*(0.049)*
Transport/Communication	0.073	0.071	0.0835*	0.247**	0.235**
	(0.068)	*(0.059)*	*(0.050)*	*(0.104)*	*(0.111)*
Finance/Insurance	0.310***	0.309***	0.101**	0.174**	0.269***
	(0.069)	*(0.057)*	*(0.045)*	*(0.073)*	*(0.085)*
Construction	0.053	0.155***	0.022	0.001	-0.031
	(0.079)	*(0.054)*	*(0.039)*	*(0.054)*	*(0.038)*
Female	-0.350***	-0.274***	-0.195***	-0.192***	-0.0918**
	(0.051)	*(0.035)*	*(0.026)*	*(0.042)*	*(0.044)*
Constant	2.076***	2.430***	2.725***	3.037***	3.532***
	(0.116)	*(0.083)*	*(0.062)*	*(0.096)*	*(0.086)*
No. of observations	2004	2004	2004	2004	2004
R-squared	0.142	0.259	0.377	0.432	0.309

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

Table AIV.6
Wald Tests – Gender Dummy[1]
(Pooled RIF-Regressions)

90th-10th: Human Capital Model
chi2(1) = 14.58
Prob > chi2 = 0.0001
90th-10th: Full Model
chi2(1) = 34.36
Prob > chi2 = 0.0000

1 Test of the equality of gender coefficients between the 90th and 10th quantiles.

Appendix V: RIF-Regression Results

Table AV.1
RIF-Regressions Human Capital Model

VARIABLES	male25	female25	male50	female50	male75	female75
Potential Experience	0.006	0.004	0.006	0.012*	0.015*	0.029***
	(0.006)	(0.009)	(0.005)	(0.006)	(0.008)	(0.009)
Potential Experience^2	7.12E-05	7.44E-05	6.63E-05	-2.68E-05	2.63E-05	-3.17E-04*
	(1.13E-04)	(1.87E-04)	(9.12E-05)	(1.39E-04)	(1.52E-04)	(1.79E-04)
Lower Secondary	0.180***	0.321***	0.257***	0.339***	0.277***	0.298***
	(0.053)	(0.109)	(0.043)	(0.073)	(0.065)	(0.070)
Upper Secondary	0.417***	0.786***	0.517***	0.776***	0.831***	0.812***
	(0.052)	(0.103)	(0.044)	(0.073)	(0.077)	(0.092)
Tertiary	0.583***	1.058***	0.822***	1.423***	1.855***	2.124***
	(0.056)	(0.099)	(0.046)	(0.065)	(0.102)	(0.097)
Married	0.191***	0.023	0.192***	-0.001	0.113**	-0.09
	(0.037)	(0.054)	(0.033)	(0.045)	(0.055)	(0.065)
Indian	0.035	-0.012	0.021	0.003	-0.09	-0.112
	(0.051)	(0.074)	(0.043)	(0.061)	(0.075)	(0.091)
African	0.068	0.088	0.02	-0.002	-0.028	-0.07
	(0.051)	(0.071)	(0.044)	(0.060)	(0.078)	(0.089)
Constant	2.456***	1.992***	2.696***	2.317***	2.817***	2.523***
	(0.088)	(0.132)	(0.071)	(0.100)	(0.118)	(0.132)
Observations	1,154	842	1,154	842	1,154	842
R-squared	0.129	0.179	0.212	0.337	0.267	0.399

Robust standard errors in parentheses.

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

Table AV.2
RIF-Regressions Full Model

VARIABLES	male25	female25	male50	female50	male75	female75
Potential Experience	0.002	0.009	0.002	0.014**	0.006	0.020**
	(0.006)	(0.008)	(0.004)	(0.006)	(0.007)	(0.008)
Potential Experience^2	6.68E-05	-5.71E-05	6.10E-05	-8.95E-05	5.58E-05	-1.78E-04
	(1.11E-04)	(1.76E-04)	(8.71E-05)	(1.27E-04)	(1.44E-04)	(1.63E-04)
Lower Secondary	0.096*	0.167	0.155***	0.194***	0.103	0.214***
	(0.053)	(0.111)	(0.042)	(0.067)	(0.064)	(0.068)
Upper Secondary	0.241***	0.376***	0.277***	0.326***	0.447***	0.425***
	(0.057)	(0.116)	(0.048)	(0.079)	(0.078)	(0.088)
Tertiary	0.297***	0.386***	0.393***	0.646***	0.972***	1.034***
	(0.076)	(0.125)	(0.064)	(0.097)	(0.148)	(0.142)
Married	0.168***	0.009	0.166***	0.008	0.083	-0.048
	(0.036)	(0.052)	(0.031)	(0.042)	(0.052)	(0.057)
Indian	0.027	0.013	0.01	0.027	-0.09	-0.079
	(0.048)	(0.070)	(0.040)	(0.057)	(0.074)	(0.081)
African	0.051	0.11	0.015	0.02	-0.048	-0.053
	(0.049)	(0.069)	(0.041)	(0.056)	(0.077)	(0.080)
Public Sector	0.273***	0.353***	0.202***	0.359***	0.350***	0.458***
	(0.041)	(0.071)	(0.034)	(0.060)	(0.059)	(0.088)
Agriculture/Fishing	0.031	0.005	0.045	0.088	-0.098	-0.183**
	(0.141)	(0.291)	(0.113)	(0.227)	(0.135)	(0.085)
Mining/Quarrying	0.349***	0.013	0.368***	0.288	0.670***	0.222
	(0.058)	(0.262)	(0.058)	(0.209)	(0.138)	(0.322)
Manufacturing	0.169***	0.132	0.079	0.124	0.293***	0.283**
	(0.061)	(0.124)	(0.053)	(0.102)	(0.090)	(0.139)
Electricity/Gas/Water	0.137**	-0.029	0.194***	0.319**	0.565***	1.368***
	(0.056)	(0.141)	(0.063)	(0.133)	(0.164)	(0.269)
Wholesale/Retail	0.059	-0.044	-0.014	-0.087	0.007	0.082
	(0.071)	(0.097)	(0.053)	(0.068)	(0.077)	(0.081)
Transport/Communication	0.077	0.207*	0.076	0.231*	0.350***	-0.08
	(0.061)	(0.110)	(0.051)	(0.134)	(0.118)	(0.208)
Finance/Insurance	0.238***	0.307***	0.025	0.212***	0.07	0.254**
	(0.072)	(0.091)	(0.063)	(0.076)	(0.111)	(0.104)
Construction	0.178***	-0.260*	0.071*	-0.219**	0.011	0.036
	(0.055)	(0.133)	(0.042)	(0.096)	(0.061)	(0.116)
Machine Operator	0.264***	0.376	0.336***	0.122	0.300***	0.201
	(0.058)	(0.256)	(0.052)	(0.201)	(0.086)	(0.266)
Craft Worker	0.198***	0.681***	0.278***	0.698***	0.290***	0.096
	(0.055)	(0.205)	(0.043)	(0.190)	(0.057)	(0.227)
Sales Worker	0.209***	0.101	0.302***	0.222***	0.513***	0.187***
	(0.066)	(0.108)	(0.053)	(0.067)	(0.091)	(0.065)
Clerical	0.270***	0.525***	0.423***	0.540***	0.105	0.043
	(0.088)	(0.103)	(0.072)	(0.075)	(0.114)	(0.073)
Technician	0.328***	0.570***	0.505***	0.746***	0.629***	0.994***
	(0.059)	(0.105)	(0.052)	(0.083)	(0.107)	(0.113)
Professional	0.221**	0.632***	0.454***	0.801***	0.954***	1.506***
	(0.089)	(0.111)	(0.070)	(0.088)	(0.148)	(0.160)
Manager	0.387***	0.642***	0.579***	0.812***	0.789***	1.029***
	(0.057)	(0.141)	(0.060)	(0.136)	(0.194)	(0.215)
Constant	2.274***	1.760***	2.556***	2.058***	2.712***	2.304***
	(0.098)	(0.153)	(0.071)	(0.110)	(0.118)	(0.145)
Observations	1,154	840	1,154	840	1,154	840
R-squared	0.201	0.293	0.326	0.48	0.372	0.541

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

Table AV.3
RIF-Regressions Human Capital Model – Public Sector

VARIABLES	pub_m25	pub_f25	pub_m50	pub_f50	pub_m75	pub_f75
Potential Experience	0.003	0.015	0.012	0.035***	0.023**	0.049***
	(0.008)	(0.011)	(0.011)	(0.010)	(0.010)	(0.010)
Potential Experience^2	5.72E-05	-2.11E-04	-1.41E-05	-4.73E-04**	-2.21E-04	-0.001***
	(1.61E-04)	(2.47E-04)	(1.93E-04)	(2.17E-04)	(1.81E-04)	(2.10E-04)
Lower Secondary	0.163*	0.410**	0.330***	0.600***	0.112	0.111
	(0.088)	(0.171)	(0.094)	(0.126)	(0.071)	(0.072)
Upper Secondary	0.525***	0.814***	0.956***	0.946***	0.563***	0.412***
	(0.079)	(0.150)	(0.083)	(0.112)	(0.085)	(0.086)
Tertiary	0.638***	1.136***	1.301***	1.639***	1.263***	1.080***
	(0.083)	(0.142)	(0.086)	(0.095)	(0.116)	(0.088)
Married	0.106**	-0.048	0.094	-0.072	0.004	-0.1
	(0.053)	(0.063)	(0.067)	(0.070)	(0.065)	(0.072)
Indian	-0.043	0.036	0.034	-0.113	0.1	-0.047
	(0.069)	(0.098)	(0.099)	(0.108)	(0.090)	(0.099)
African	-0.052	0.057	-0.009	0.053	0.05	-0.084
	(0.068)	(0.093)	(0.097)	(0.095)	(0.090)	(0.092)
Constant	2.728***	2.145***	2.552***	2.080***	2.965***	2.949***
	(0.125)	(0.180)	(0.181)	(0.146)	(0.158)	(0.139)
Observations	388	345	388	345	388	345
R-squared	0.209	0.26	0.343	0.389	0.322	0.314

Robust standard errors in parentheses.

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

Table AV.4
RIF-Regressions Full Model – Public Sector

VARIABLES	pub_m25	pub_f25	pub_m50	pub_f50	pub_m75	pub_f75
Potential Experience	0.003	0.025**	0.008	0.024**	0.022**	0.036***
	(0.008)	(0.011)	(0.010)	(0.010)	(0.010)	(0.010)
Potential Experience^2	1.47E-05	-4.03E-04*	-3.41E-05	-2.70E-04	-2.40E-04	-0.001***
	(1.61E-04)	(2.38E-04)	(1.83E-04)	(2.08E-04)	(1.83E-04)	(1.99E-04)
Lower Secondary	0.045	0.086	0.107	0.454***	-0.002	0.05
	(0.085)	(0.173)	(0.080)	(0.129)	(0.071)	(0.068)
Upper Secondary	0.187**	0.187	0.393***	0.450***	0.374***	0.157*
	(0.089)	(0.181)	(0.097)	(0.137)	(0.098)	(0.090)
Tertiary	0.240**	0.428**	0.576***	0.845***	0.830***	0.415***
	(0.099)	(0.182)	(0.131)	(0.152)	(0.166)	(0.117)
Married	0.099**	0.022	0.101*	0.083	0.011	0.033
	(0.050)	(0.063)	(0.058)	(0.061)	(0.062)	(0.065)
Indian	-0.011	0.021	0.081	-0.036	0.139	0.061
	(0.062)	(0.089)	(0.090)	(0.085)	(0.096)	(0.084)
African	0.001	0.026	0.117	0.082	0.116	0.023
	(0.063)	(0.089)	(0.089)	(0.081)	(0.095)	(0.083)
Machine Operator	0.485***	0.575***	0.427***	0.496**	0.143	1.092***
	(0.088)	(0.174)	(0.137)	(0.220)	(0.107)	(0.260)
Craft Worker	0.417***	0.171	0.241***	0.441	0.181**	-0.217
	(0.092)	(0.231)	(0.088)	(0.267)	(0.078)	(0.145)
Sales Worker	0.452***	0.388**	0.696***	0.622***	0.123	0.255**
	(0.091)	(0.185)	(0.107)	(0.165)	(0.119)	(0.106)
Clerical	0.350***	0.515***	0.270*	0.214*	0.014	0.044
	(0.122)	(0.151)	(0.141)	(0.119)	(0.103)	(0.056)
Technician	0.480***	0.559***	0.530***	0.946***	0.227**	0.683***
	(0.092)	(0.161)	(0.128)	(0.131)	(0.112)	(0.105)
Professional	0.454***	0.628***	0.576***	1.110***	0.441**	1.189***
	(0.092)	(0.162)	(0.137)	(0.141)	(0.186)	(0.132)
Manager	0.453***	0.173	0.467**	0.593***	0.115	0.999***
	(0.111)	(0.240)	(0.199)	(0.190)	(0.194)	(0.184)
Agriculture/Fishing	-0.006	-0.187	-0.077	0.135	-0.145**	0.088*
	(0.198)	(0.306)	(0.185)	(0.183)	(0.069)	(0.046)
Mining/Quarrying	0.03	-0.344	0.365*	0.133	0.176	0.030
	(0.107)	(0.388)	(0.191)	(0.154)	(0.241)	(0.382)
Manufacturing	0.014	0.360***	0.436***	0.961***	0.357**	0.592
	(0.093)	(0.132)	(0.128)	(0.179)	(0.142)	(0.389)
Electricity/Gas/Water	0.052	0.231**	0.294***	0.749***	0.192	0.498*
	(0.069)	(0.092)	(0.112)	(0.195)	(0.150)	(0.257)
Wholesale/Retail	-0.062	0.286**	0.071	0.387	0.527*	0.343
	(0.194)	(0.118)	(0.299)	(0.399)	(0.304)	(0.229)
Transport/Communication	-0.006	0.338***	0.388***	0.364*	0.332***	0.036
	(0.051)	(0.102)	(0.074)	(0.200)	(0.117)	(0.127)
Finance/Insurance	-0.489***	-0.231	-0.301	0.301	0.086	0.134
	(0.159)	(0.200)	(0.183)	(0.205)	(0.191)	(0.150)
Construction	-0.155*	-0.652***	-0.310***	-0.167*	-0.141***	0.052
	(0.086)	(0.157)	(0.078)	(0.090)	(0.050)	(0.059)
Constant	2.674***	2.212***	2.594***	1.990***	2.945***	2.850***
	(0.136)	(0.211)	(0.165)	(0.144)	(0.157)	(0.137)
Observations	388	345	388	345	388	345
R-squared	0.368	0.430	0.523	0.57	0.402	0.514

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

Table AV.5
RIF-Regressions Human Capital Model – Private Sector

VARIABLES	pri_m25	pri_f25	pri_m50	pri_f50	pri_m75	pri_f75
Potential Experience	0.001	0.017*	0.006	0.009	0.011	0.007
	(0.007)	(0.009)	(0.006)	(0.008)	(0.007)	(0.007)
Potential Experience^2	2.05E-04	-2.14E-04	2.47E-05	-3.46E-05	7.93E-05	8.60E-05
	(1.27E-04)	(1.97E-04)	(1.24E-04)	(1.68E-04)	(1.43E-04)	(1.58E-04)
Lower Secondary	0.254***	0.181*	0.205***	0.260***	0.292***	0.211***
	(0.064)	(0.103)	(0.057)	(0.086)	(0.061)	(0.075)
Upper Secondary	0.430***	0.490***	0.406***	0.624***	0.553***	0.589***
	(0.068)	(0.098)	(0.062)	(0.085)	(0.072)	(0.089)
Tertiary	0.636***	0.650***	0.777***	0.968***	1.253***	1.604***
	(0.080)	(0.109)	(0.074)	(0.091)	(0.107)	(0.097)
Married	0.181***	0.013	0.239***	0.03	0.164***	0.088
	(0.046)	(0.059)	(0.045)	(0.055)	(0.054)	(0.057)
Indian	0.069	-0.032	0.021	-0.011	-0.016	-0.093
	(0.062)	(0.074)	(0.057)	(0.069)	(0.066)	(0.077)
African	0.071	-0.021	-0.006	0.019	0.026	-0.160**
	(0.065)	(0.075)	(0.060)	(0.071)	(0.069)	(0.075)
Constant	2.340***	2.120***	2.651***	2.391***	2.791***	2.677***
	(0.105)	(0.142)	(0.093)	(0.122)	(0.102)	(0.115)
Observations	766	497	766	497	766	497
R-squared	0.114	0.105	0.149	0.19	0.182	0.377

Robust standard errors in parentheses.

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

Table AV.6
RIF-Regressions Full Model – Private Sector

VARIABLES	pri_m25	pri_f25	pri_m50	pri_f50	pri_m75	pri_f75
Potential Experience	-2.89E-04	0.023**	0.005	0.014*	0.008	0.007
	(0.007)	(0.009)	(0.006)	(0.007)	(0.007)	(0.007)
Potential Experience^2	1.90E-04	-3.37E-	4.70E-06	-1.21E-04	5.60E-05	5.37E-05
	(1.23E-04)	(1.95E-	(1.16E-	(1.55E-	(1.30E-	(1.53E-
Lower Secondary	0.155**	0.083	0.098*	0.172**	0.170***	0.131*
	(0.062)	(0.107)	(0.057)	(0.087)	(0.058)	(0.074)
Upper Secondary	0.268***	0.216**	0.207***	0.344***	0.314***	0.291***
	(0.071)	(0.108)	(0.066)	(0.097)	(0.071)	(0.087)
Tertiary	0.434***	0.240*	0.347***	0.482***	0.511***	0.953***
	(0.122)	(0.141)	(0.113)	(0.129)	(0.179)	(0.144)
Married	0.128***	-0.018	0.191***	-0.01	0.108**	0.048
	(0.044)	(0.060)	(0.043)	(0.054)	(0.052)	(0.054)
Indian	0.033	0.009	-0.005	0.007	-0.055	-0.073
	(0.058)	(0.078)	(0.053)	(0.067)	(0.063)	(0.073)
African	0.081	0.072	0.008	0.074	0.037	-0.127*
	(0.061)	(0.079)	(0.054)	(0.071)	(0.065)	(0.070)
Machine Operator	0.277***	0.328	0.257***	0.427**	0.244***	0.141
	(0.070)	(0.210)	(0.066)	(0.205)	(0.079)	(0.204)
Craft Worker	0.232***	0.466***	0.226***	0.455***	0.170***	0.268
	(0.064)	(0.166)	(0.054)	(0.170)	(0.054)	(0.195)
Sales Worker	0.189**	0.158	0.163**	0.095	0.134*	0.01
	(0.090)	(0.110)	(0.077)	(0.083)	(0.077)	(0.056)
Clerical	0.359***	0.582***	0.412***	0.454***	0.289**	0.239***
	(0.109)	(0.106)	(0.108)	(0.096)	(0.131)	(0.082)
Technician	0.410***	0.512***	0.518***	0.567***	0.671***	0.600***
	(0.072)	(0.117)	(0.073)	(0.101)	(0.100)	(0.110)
Professional	0.173	0.607***	0.395***	0.606***	0.800***	0.707***
	(0.158)	(0.139)	(0.131)	(0.124)	(0.174)	(0.143)
Manager	0.335***	0.645***	0.554***	0.632***	0.866***	0.801***
	(0.102)	(0.117)	(0.100)	(0.131)	(0.178)	(0.166)
Agriculture/Fishing	0.074	-0.635***	0.022	-0.151*	-0.190*	-0.011
	(0.231)	(0.118)	(0.158)	(0.090)	(0.112)	(0.075)
Mining/Quarrying	0.474***	0.299***	0.534***	0.422***	0.699***	0.48
	(0.079)	(0.081)	(0.076)	(0.091)	(0.108)	(0.308)
Manufacturing	0.293***	0.320***	0.206***	0.154	0.217***	0.106
	(0.081)	(0.102)	(0.073)	(0.105)	(0.083)	(0.113)
Electricity/Gas/Water	0.212	-1.086***	0.364**	-0.696***	0.312	-0.222
	(0.200)	(0.227)	(0.164)	(0.221)	(0.258)	(0.223)
Wholesale/Retail	0.199**	0.124	0.084	0.103	0.023	-0.042
	(0.084)	(0.091)	(0.068)	(0.076)	(0.069)	(0.070)
Transport/Communication	0.195*	0.252*	0.133	0.282*	0.210*	0.096
	(0.108)	(0.147)	(0.096)	(0.159)	(0.121)	(0.189)
Finance/Insurance	0.373***	0.366***	0.312***	0.344***	0.181*	0.292***
	(0.092)	(0.086)	(0.082)	(0.083)	(0.097)	(0.092)
Construction	0.394***	0.185	0.232***	0.328***	0.194***	0.334*
	(0.073)	(0.134)	(0.061)	(0.107)	(0.064)	(0.174)
Constant	2.032***	1.647***	2.447***	2.075***	2.665***	2.605***
	(0.113)	(0.173)	(0.093)	(0.134)	(0.105)	(0.132)
Observations	766	495	766	495	766	495
R-squared	0.21	0.239	0.261	0.33	0.306	0.495

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

Chapter 5 Conclusion

5.1 Summary of Findings

The Caribbean region has historically been an understudied region in the economics literature in terms of gender wage gaps, and the present study sought to fill some of that gap in the literature. Labour markets can provide an effective mechanism to enhance (or hinder) economic growth (Reilly and Bellony, 2009). Given the fact that the last set of substantial research done on Trinidad and Tobago's gender wage gap was based on 1993 data, this current research explored how the gap has evolved since then, especially in light of the country's economic boom years post-1993. Knowledge of the labour market determining process, and more specifically, details surrounding the nature and causes of gender wage differentials (and by extension, "discrimination" in the labour market), is invaluable to the formulation, design, and implementation of public policy.

This study contributes to previous work exploring gender pay differentials in Trinidad and Tobago (Olsen and Coppin, 2001; Coppin and Olsen, 2007) by exploring the gender wage gap not only at the mean, but also throughout the entire wage distribution. The main objectives of the thesis included measuring the magnitude of the wage gap for the overall working population (and separately for sector of employment, namely, the public and private sectors); and to ascertain if working women face a *glass ceiling* and/or *sticky floor* in Trinidad and Tobago.

The gender wage gap narrowed over the past twenty years, moving from an estimated gap of 19.2 per cent in 1993 (Olsen and Coppin, 2001) to 11.4 per cent in 2012. The corresponding gender wage gaps in the public and private sectors also narrowed over the time period, moving from 6.3 per cent and 31.6 per cent in 1993 (Coppin and Olsen, 2007), respectively, to 3.2 per cent and 23.0 per cent in 2012.

While it is still unclear what were the main drivers that led to the narrowing of the gender pay gap, the passing of the Equal Opportunity Act in 2000 may be one such factor that has contributed to this improvement. The Act states that an employer or a prospective employer cannot discriminate against a person's "status" (where status refers to his/her sex, race, ethnicity, geographical origin, religion, marital status, or any disability) in terms of hiring, and in the terms or conditions on which employment is offered. However, the law in its current form does not address the issue of *equal pay for work of equal value*.

The private sector gender pay gap was found to be twice as large as the gap for the overall working population, and almost eight times more than the gap in the public sector. The Blinder-Oaxaca decomposition revealed that the largest contributor to the "unexplained" (differences in coefficients) component of the private sector gender pay gap is the difference in the intercepts – if female private sector employees were rewarded to the same extent as male private sector employees, women's wages would increase by over 50 per cent. This means that men employed in the private sector in Trinidad and Tobago appear to have a clear advantage over women when they enter the labour market regardless of their level of productivity. The wider pay differential in the private sector compared to that in the public sector might be due to lack of labour regulations and/or enforcement in the private sector compared to the public sector.

The standard Blinder-Oaxaca decomposition methodology is unable to detect the vast differences in the wage gap for low- and high-income earners; therefore we also employed quantile decompositions. For instance, we found that for the overall working population at the lower end of the wage distribution, the gender wage gap is much larger (25.1 per cent) compared to the higher end of wages where no gap exists. Additionally, the "unexplained" component of the gender wage gap, which

can (cautiously) be used as an indicator of the extent of discrimination in the labour market, reveals that lower-waged women face greater discrimination. For example, at the 10th percentile, if women received the same rate of return as men for their characteristics, their wages are estimated to increase by 33 per cent whereas at the 90th percentile their wages are estimated to increase by 11.8 per cent (based on the Machado and Mata/Melly approach). As such, women in higher paid jobs in Trinidad and Tobago seem to not be *as* disadvantaged as lower paid women.

The detailed decomposition results (based on RIF-regressions) provide a more nuanced analysis for the main drivers of both the "explained" and "unexplained" components of the wage differential at different points along the distribution of wages. Overall, with the advancement of women's education in Trinidad and Tobago's recent history and the provision of free education by the government up to the tertiary level, women now have better characteristics ("endowments") than men, especially at the top of the wage distribution.[52] In terms of the "explained" component, if women had the same characteristics as men, their wages are estimated to increase only slightly (by 3.0 per cent and 1.0 per cent) at the lower end of the wage distribution (10th and 25th percentiles), but to *decrease* along the higher end of the wage distribution.

Meanwhile, the "unexplained" component, which can be indicative of discrimination, shows that: 1) lower paid men enter the labour market at an advantage over their female counterparts[53]; 2) lower paid men are rewarded more if they are married compared to their married female counterparts[54]; and 3) men's work experience is valued more than women's work experience at the lower end of

[52] At the 90th percentile, on average, women have three more years of education than men.

[53] This premium is markedly higher at the lower end of the wage distribution – men receive a premium of 43.3 per cent at the 25th percentile compared with a 0.6 per cent premium at the 90th percentile.

[54] Married men receive an estimated 6.6 per cent premium at the 10th percentile over married females.

the pay scale.[55] In short, although female workers have better endowments than male workers, and hence *should be* paid more than their male counterparts, men's wages are higher, owing to a large, positive unexplained difference in the rates of return to these characteristics. The results of the quantile decompositions show that Trinidad and Tobago's labour market does not have a *glass ceiling*, but female workers face a *sticky floor* instead as the wage gap is much larger for low-paid women compared to their high-income earning counterparts.

Notwithstanding this, the glass ceiling in Trinidad and Tobago may be "hidden" by the fact that on average at the higher end of the pay scale women have more years of education than men. It is likely that these women feel compelled to educate themselves further to compete with their male counterparts for higher paying jobs.

The foregoing analysis did not take into account the possible presence of sample selection bias in the models' estimates. Heckman's two-step procedure was used to test for the presence of sample selection in the OLS regressions and it was (tentatively) concluded there was no selection in the OLS models. Although, given the weak identification of the Heckman estimator because of the lack of *exclusion restrictions* due to data limitations, the "uncorrected" OLS estimates are more robust and are considered to be the more appropriate models for analysis. Furthermore, some researchers (Stolzenberg and Relles, 1997) have noted that only if selection bias is very severe and the samples are large, does Heckman's two-step correction method improve estimates compared to the "uncorrected" OLS estimates.

Finally, in terms of the labour supply decision of women, the results from the probit model were broadly in line with *a priori* expectations. In Trinidad and Tobago, fewer women compared to men are in wage employment – in 2012, the percentage of men

[55] From the lower end of the wage distribution up to the 75th percentile, men's work experience is rewarded more; at the 90th percentile, employers seem to reward women more for their work experience.

in wage employment was 66.3 per cent compared to 53.5 per cent for women. Furthermore, the predicted probability of women participating in the labour market increases with higher levels of education. Education has a larger (positive) impact on a woman's decision to engage in wage employment than it does for men. Like in many other societies, on average, having a partner (married/common law) decreases a woman's probability of participating in the labour market. Meanwhile, as much as ethnicity is not a significant determining factor for wages for both men and women, it does play a role in women's labour supply decision. Women of Indian descent in Trinidad and Tobago are the least likely to participate in the labour market. We hypothesise that this may be due to historical and cultural customs and norms still practiced within that sub-ethnic grouping.

5.2 Policy Implications

From a policy perspective, the results of this study show that public policy needs to be flexible enough to deal with the full range of women's experiences both at the top and at the bottom of the wage distribution. It is important to understand the nature of the phenomenon of gender wage discrimination, and in the case of Trinidad and Tobago, the *sticky floor* effect, in order to design adequate policy actions. It can be argued that sticky floors are related to the start of "job ladder" climbing and may be seen as women having lower probabilities of getting promoted in several dimensions including occupational level, job authority, and wages (Deschacht *et al*, 2011).

In addition, even though female labour force participation has increased steadily over the last two decades from just over 40 per cent in the 1980s to just over 50 per cent in the mid-2000s, there is still a role for the government to create an enabling environment that supports even greater gender equality in the labour market. The government has already been successful in implementing universal education at both the primary and secondary school levels. However, additional policies, such as

ones that reduce the likelihood of discrimination on the part of employers, and measures to assist parents to reconcile work and family may lead to further increases in female labour force participation. Social norms surrounding Indian and Hindu families which inhibit females from seeking employment may be outside the gambit of the government, and may instead need a shift in the mind-set of the overall populace of the country.

5.3 Limitations

In any analysis of the gender wage gap several major methodological issues arise. Firstly, ensuring that the male and female earnings equations are estimated consistently, paying particular attention to the methodological problems of self-selection, heterogeneity, and endogeneity. Secondly, the choice of the decomposition technique of the wage gap is critical for meaningful interpretation of its components. Not all of these issues could have been adequately addressed in this research due to data limitations in the data set used for analysis. Nonetheless, these issues are discussed below.

Sample Selection

Heckman *et al* (2003) showed that the underlying assumptions of the Mincer wage equation may no longer hold and may in fact underestimate the returns to education. The sample of working people excludes those who do not participate in the labour market and may not be a random selection of the overall population. Moreover, if the labour market participation decision is correlated with the earnings function, the expected value of the error term in the earnings function may not be zero. To deal with this selectivity bias, a sample selection model of earnings can be applied which takes the participation decision into account. However, the use of *exclusion restrictions* in the selection equation is imperative for identification. Due to data restraints, the selection model was run without *exclusion restrictions* and was shown to be weakly identified.

Heterogeneity

Earnings may also be influenced by a host of unobservable factors like intelligence, innate ability, and motivation; however, these are difficult to measure. Heterogeneity arises if unobserved individual characteristics, which affect wages, are correlated with the explanatory variables. In effect, the presence of unobserved individual heterogeneity may yield biased coefficient estimates of the observed variables that are generated from OLS. For example, it is well established that if ability is correlated with both the level of education and earnings, the rate of return estimates based on OLS display an upward bias. Panel data techniques, such as instrumental variables, could be used to circumvent the issue of heterogeneity. However, even though there is consensus about the direction of the bias when heterogeneity is ignored, there is less agreement on its magnitude. Card (1999) presented evidence to suggest that the extent of the bias may be modest. Nevertheless, it should be noted that our dataset, like many other labour force surveys, contained little information that could have been sensibly used to proxy ability, and the estimated returns to education are thus subject to this caveat.

Endogeneity

The underlying wage equations can also be mis-specified due to the endogeneity of the explanatory variables. For example, work experience may be a function of previous earnings as well as present earnings; or even the returns to education since the wage equations do not capture (unobserved) ability. To remove this bias, the endogenous variables should be instrumented (e.g. suggested instruments for the years of schooling could include family background variables like parents' education and income). The instrumented variable (IV) cannot be correlated with the error term, but should have a high correlation with the endogenous variable. The labour force survey used in Trinidad and Tobago does not include any questions relating to family background variables such as parents' income, education, and the like. Therefore, the OLS/IV approach to address the endogeneity of work experience or education could not have been employed.

Decomposition Technique

Decomposition can be sensitive to which wage structure is used as the non-discriminatory wage structure. Under *nepotism*, women are paid the competitive wage, but men are overpaid. Here, the coefficients from the women's earnings functions provide an estimate of the non-discriminatory wage structure. Under *discrimination*, employers pay men competitive wages but underpay women. In this case, the male coefficients should be taken as the non-discriminatory wage structure. In reality, employers may practice both nepotism and discrimination.

A possible solution to this dilemma, as proposed by Neumark (1988) was used for our analyses, which is to use a "pooled" wage structure, which is a weighted average of the male and female wage structures. One should note however, that the Neumark decomposition technique tends to overstate the explained component by inappropriately transferring some of the unexplained parts to the explained portion of the gap.

Potential Experience

The labour force survey used in Trinidad and Tobago does not include any questions relating to job experience and/or tenure, and as is customary in applied work, we used potential experience as a proxy for actual experience. Potential experience was calculated as age minus years of education minus age at which formal schooling begins, which in Trinidad and Tobago is five years old. Potential experience is usually a good measure of actual experience for men (since men tend to have continuous employment since leaving school), but less so for women (since women typically spend some time out of the labour force, for example, to care for young children, etc.). Consequently, the potential experience measure in reference to women tends to overestimate their actual years of experience and underestimate the impact of work experience on earnings (Tzannatos and Sapsford, 1993). Additionally, the use of potential experience in lieu of actual experience in the wage earnings regressions for women may have overestimated the unexplained portion of the wage gap. Based on a meta-analysis of gender wage gaps in several countries, Weichselbaumer

and Winter-Ebmer (2005) found that using potential experience instead of actual experience overestimates the unexplained gender wage gap, on average, by 1.8 log points.

– END –