HOW FIRM CHARACTERISTICS INCREASE THE EXPLANATORY POWER OF THE EARNINGS FUNCTION: GENDER WAGE INEQUALITY IN MALAYSIA

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ABSTRACT

This study investigates the role firm characteristics plays in explaining gender wage inequality. Prior research has mainly explored two strands to explain inequality in the labour market. The first, carried out primarily by sociologists and feminists, attempts to explain gender discrimination by showing that females are segregated into lower paying occupations while higher paying occupations are being dominated by males. This strand usually does not consider the workers' endowment. The second strand, mainly by economists, measures discrimination based on wage differentials after accounting for workers endowment. Recent evidence worldwide shows that females are outstripping males in the pursuit of higher education, suggesting that females find greater opportunities in high paying occupations. Hence, it becomes important to relook segregation using more current data. While studies have shown that firm characteristics do play a significant role in determining workers' wages, researchers generally disregard these variables in their analysis thereby resulting in a lack of studies that attempt to show how individual firm-related characteristics can affect wage inequality. Besides relooking at the distribution of occupations, this study also looks at the impact of the firm-related characteristics on gender wage inequality, and attempts to asses if studies that do not include firm-related variables in the analysis possibly suffer from bias as a result of this exclusion.

The research framework blends the relevant literatures to create an empirically testable methodology for investigating the roles played by occupational segregation, worker endowment and various firm characteristic in explaining gender wage inequality. The analysis is conducted on a large primary employer-employee linked dataset from Malaysia.

The results, firstly, indicate that females in the dataset have a superior occupational distribution in Malaysia which is reflective of their superior educational attainment. Secondly, the inclusion of firm characteristics in the Mincerian earnings equation provided a different set of coefficients for the human capital variables as compared to when only the latter were used as the explanatory variables. With the inclusion of the firm-related variables, the coefficients of the human capital variables became significantly smaller. This suggests that the widely used form of Mincer's equation is incorrectly specified for it over-estimates the coefficients to compensate for missing variables.

The study finds that gender composition at a workplace affects female and male workers' wages differently. It also finds that while the larger firms generally offer higher wages, the gender wage differentials are also larger. The greatest differentials are among firms with foreign equity. Also, more than half of the employees in the firms with foreign shareholding are female. While it may be argued that the results suggest that large firms and FDI recipient firms may be more discriminatory against females, a significant portion of these differentials can be explained by analysing the firm and industry specific human capital of workers. Larger firms and FDI recipient firms have higher capital-labour ratios, and as such demand more skilled workers. Female workers should develop and upgrade their firm or industry specific skills to reduce wage differentials.

ABSTRAK

Kajian ini bertujuan untuk menyelidik samada aspek jantina mempengaruhi firma dalam sistem penggajian. Kajian-kajian sebelum ini tertumpu kepada aspek mengapa perbezaan penggajian diantara jantina dan kajian sebegini didominasi oleh dua kelompok utama. Kelompok yang pertama terdiri dari pihak Sosiologi dan pertubuhan yang memperjuangkan hak asasi wanita. Kelompok ini menumpukan kajian mereka dalam menguraikan diskriminasi terhadap kaum wanita yang diberikan pekerjaan berpangkat rendah sementara pihak lelaki diberikan peluang untuk mendominasi perkerjaan berpangkat tinggi. Kelompok ini telah mengabaikan aspek kualiti dalam menentukan peluang pekerjaan dan juga kerjaya sessorang individu. Kumpulan yang kedua pula terdiri dari pakar pakar ekonomi yang menyatakan bahawa kualiti terutama dari segi pendidikan menpengaruhi kerjaya dan pengajian seseorang. Sementara itu terdapat banyak bukti bahawa sejak kebelakangan ini pihak wanita telah lebih berjaya dan mengatasi pihak lelaki dalam pendidikan. Seandainya aspek kualiti ini benar, maka kenyataan yang mengatakan pihak lelaki mendominasi perkerjaan and kerjaya adalah sama sekali tidak benar. Justeru itu adalah penting untuk melihat kembali aspek ini dalam menentukan faktor penggajian yang merupakan tema utama kajian ini. Walaupun sudah terdapat beberapa kajian yang menyatakan bahwa faktor dan karektor sesebuah syarikat itu merupakan aspek utama dalam menentukan sistem penggajian tapi masih banyak kajian masih dijalankan dengan mengendahkan faktor dan karektor syarikat ini. Disamping itu, terdapat banyak kekurangan kajian yang menganalisa tingkah-laku sesebuah syarikat atau firma dalam menentukan ala tuju dan perbezaan dari segi penggajian diantara jantina. Mengambil kesemua aspek ini maka kajian ini bukan sahaja tertumpu kepada jenis pekerjaan sahaja

malah faktor tingkah-laku syarikat atau firma dalam menentukan sistem penggajian. Selain dari itu, kajian ini juga telah menganalisa factor-faktor lain dengan mengecualikan tingkah-laku firma untuk memastikan tidak ada kepincangan akibat pengecualian ini.

Rangka kerja kajian ini telah melibatkan pelbagai kajian sebelum ini untuk mendapatkan sebuah metodologi yang menggabungkan perbezaan pekerjaan, endowmen pekerja serta beberapa ciri syarikat dalam menentukan sistem pengajian. Kajian in menggunakan data dari Malaysia yang menggaitkan pekerja dengan syarikat. Hasil kajian ini telah mendapati bahawa kaum wanita mempunyai kelebihan yang besar dalam hala-tuju kerjaya. Ini selaras dengan mencapaian pendidikan pihak wanita yang lebih berjaya berbanding dengan pihak lelaki. Hasil kajian yang kedua pula telah mencerminkan bahawa ciri-ciri syarikat, turut serta dengan endowmen pekerja, memainkan peranan dalam model Mincerian. Ini dengan jelas menunjukkan kepincangan dalam model berkenaan apabila pekali memberikan lehih anggaran apabila angkubah ciri ciri syarikat tidak dimasukkan. Kajian ini menunjukkan bahawa komposisi jantina memainkan peranan penting dalam menentukan gaji pekerja. Ia juga menunjukkan bahawa syarikat syarikat besar memberikan gaji yang lebih tinngi dan juga mengamalkan diskriminasi terhadap kaum wanita berbading dengan syarikat-syarikat kecil. Diskriminasi ini banyak tertumpu dikalangan syarikat yang mempunyai dana atau pelaburan dari luar negara. Lebih separuh daripada pekerja-pekerja syarikat pelabur asing ini terdiri dari kaum wanita. Walaupun syarikat syarikat berkenaan memberikan pekerjaan kepada kaum wanita tetapi progresif kaum wanita ini menghadapi pelbagai halangan untuk terus maju keeringkat yang lebih tinggi dalam syarikat-syarikat berkenaan.

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For any errors or inadequacies that may remain in this work, the responsibility is entirely my own.

Puvanesvaran Sanjivee

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CES	Current Employment Statistics
CPS	Current Population Survey
FDI	Foreign Direct Investment
GED	General Educational Development
GLS	Generalised Least Squares
GSS	General Social Survey
HIS	Household Income Survey
ILO	International Labour Organization
IWS	Industry Wage Survey
LFS	Labour Force Survey
LINDA	Swedish Longitudinal Individual Data
MDG	Millennium Development Goals
NEP	New Economic Policy
NER	National Employment Return
NSCW	National Survey of Changing Workforce
OLS	Ordinary Least Squares
PATC	National Survey of Professional, Administrative, Technical, and Clerical Employees
PSID	Panel Study of Income Dynamics
SIPP	Survey of Income and Program participation
SVP	Standard Vocational Preparation
TFP	Total Factor Productivity
UNDP	United Nations Development Programme
US	United States

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CHAPTER 1

INTRODUCTION

1.1 Background

Gender discrimination in the labour market is a very emotive issue especially in developed countries since it relates to gender equality. Often, very little scientific scepticism is applied on feminist claims. This is not a recent phenomenon either as Gross (1968) observed that much of the literature that dealt with female related issues even then had a strong advocacy note to them. More recently, the UNDP's (2011) report claimed that 66 per cent of the world's work was carried out by females besides producing 50 per cent of the food; yet they earn only 10 per cent of total income and own but one per cent of all the property. Although this statistic is widely cited by those who are sympathetic to females' rights (World Bank, 2012; Relief, 2014), no papers or articles were published that questioned the basis for the UNDP figures. Neither did the United Nations Development Programme (UNDP) present their basis for the estimates. Sometimes persons in power also exaggerate the impact of gender discrimination in public presentations. For instance, in the 2012 US presidential campaign, Barack Obama ran an advertisement which claimed that female workers are paid 77 cents for every dollar a male worker earns for equal work (PolitiFact.com, 2013). The report from which the 77 cents was retrieved from instead stated that, in 2010, the male-to-female median earnings ratio for full time year round workers was 0.77 (DeNavas-Walt et al., 2011). Looking at the developing economies, The

Economist (2011) pressed the claim that females are “second class citizens” in much of the emerging markets and, as a result earn lower pay. This study hopes to expand the literature on gender wage discrimination by relooking some of the previous findings in light of more recent employer-employee linked data.

Previous studies on gender wage inequality can be divided into two distinct aspects from which discrimination is permeated. The first aspect deals with the allocation of occupations among males and females, and the lower wages earned by workers in occupations which employ a large proportion of females. This framework, as presented by (Tam, 1997), is reproduced in Figure 1.1. This literature began in the early part of the twentieth century when male dominated labour unions prevented female workers from gaining access into many occupations in order to maintain their wage levels by controlling the supply of labour in these occupations (Edgeworth, 1922). Bergmann (1974) argued that the exclusion of females in from “male” occupations or industries resulted in an “overcrowding” of females in these areas, driving wages down. The extension of this argument, the devaluation perspective, suggested that the general aversion towards females due to their lower social status was the reason why female-dominated occupations paid lower wages (England, Allison, & Wu, 2007). The notion that occupations which are highly represented by females become less valuable due to the low social status of females was called devaluation theory. The theory argues that the greater the proportion of females in an occupation, the lower the average wage within the occupation is. Many studies have since supported this claim (Bielby & Baron, 1986; Hegewisch et al., 2010; Reskin, 1993).

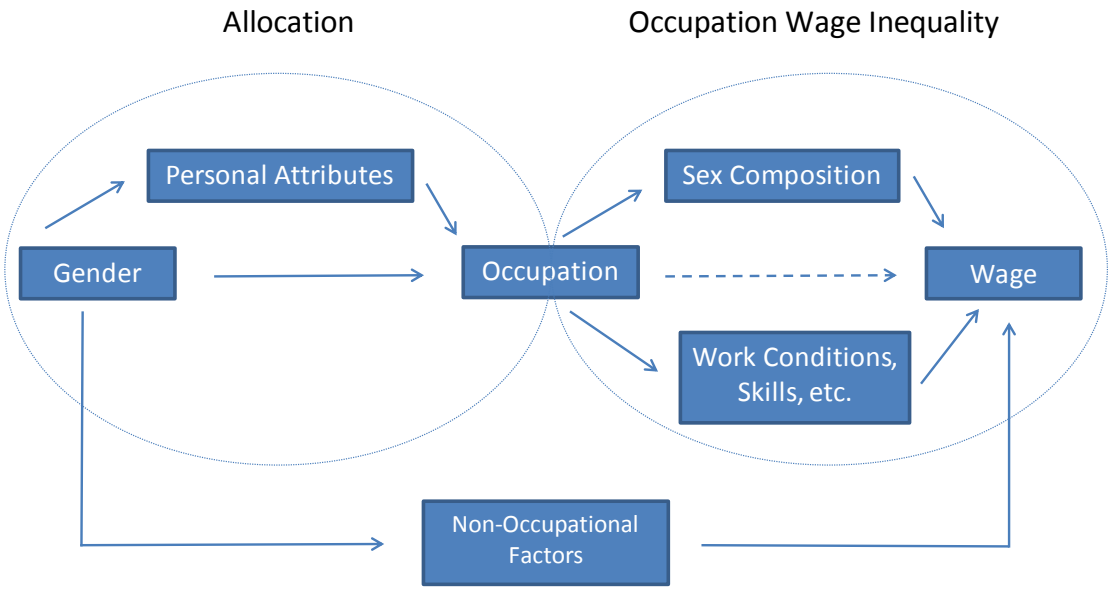

Figure 1.1: Allocation, occupational wage and gender inequality

Source: Tam (1997)

While the first aspect looked at how occupations were allocated among gender groups, the second aspect relates to how gender wage differences among males and females within an occupation are explained. For this, researchers generally draw on Becker's (1971) suggestion that discrimination could be the difference between an individual's contribution to output and his or her wages. The measure of worker's productivity regularly used in the literature is the "human capital earnings function" which was introduced by (Mincer, 1958, 1974); the term "human capital" refers to the augmentation of education in an individual (Schultz, 1960). Mincer's function consisted of workers' earning in logarithmic form with schooling and the concave function of experience as explanatory variables. Within this framework, a decomposition procedure similar to the one proposed by Oaxaca (1973) and Blinder (1973) is often used to breakdown gender wage differences into an explainable portion related to productivity and an unexplainable portion possibly due to discrimination.

There appears to be serious contradiction between what has been discussed above and the implications of the statistics on female educational attainment worldwide. In 1970, 3,119,000 female US residents were enrolled in undergraduate degree programmes in the country compared to 4,250,000 for males (Aud, 2011). In 2009, the enrolment figures were 9,970,000 and 7,595,000 respectively. In other words, the share of US resident females enrolled in undergraduate programmes increased from 42.3 per cent in 1976 to 56.8 per cent in 2009. Furthermore, during the 1970 to 2010 period, the female participation in the US labour force increased from 39 per cent to 47 per cent (ILO, 2013). At a global scale, the United Nations (2013) found that in 62 per cent of countries, the enrolment of females in higher education exceeded that of male enrolment. It is in countries with low tertiary enrolment rates are where male enrolment exceeded that of females.

Table 1.1 displays the educational attainments of the labour force in Malaysia, a middle income country. Between 2001 and 2009, the labour force participation of females increased from 35.4 per cent to 36.2 per cent. Looking at the above statistics, not only were the proportion of working without any formal education falling faster for females than males during this period, the proportion of workers with tertiary education was also higher among females compared to males through this period. Furthermore, male workers with tertiary education rose by only 5.9 per cent from 13.8 per cent to 19.7 per cent during this period compared to a rise of 11.6 per cent for female workers from 18.2 per cent to 29.8 per cent. The proportion of female workers who possessed a minimum of secondary school education overtook the proportion of male workers with such endowments. In 2001, 70.7 per cent of female workers had a minimum of secondary school education compared to

70.9 per cent for male workers. In 2009, the figures were 80.1 per cent and 77.9 per cent respectively.

Herein lays the contradiction. Schultz (1961) made the point that individuals make substantial investments in themselves by foregoing present earnings in order to enhance themselves by increasing their levels of education and on-the-job training, while Kenneth Arrow (1973) opined that if employers are nor favourable towards the hiring of any demographic group then members of that group would not have the incentive to invest in human capital. In Becker and Chiswick's (1966) general equilibrium model, individuals invest in human capital to the point it maximises their economic welfare. Also, Mincer and Polachek (1974) suggested that families evaluate the prospective returns on the investment in human capital by any family member before making any such investment. If we accept the above propositions as reasonable, then females who choose to attain higher levels of education would have believed that they would earn higher wages in the future. The question that needs to be asked is that if females are only able to be employed in low paying occupations irrespective of personal endowments, and there too they receive wages below what their productivity entails them to, why then has the educational attainment levels of females not only been higher than male attainment levels but continue to rise. Not only that but larger proportions of females are entering the workforce annually as well. This scenario contradicts the human capital theory. Either the theory is flawed or perhaps there is a need to relook at the problem. This is the motivation for the study.

Table 1.1: Educational Attainments in Malaysian Workforce by Gender, 2001-2009

A. Males									
	2001	2002	2003	2004	2005	2006	2007	2008	2009
No Formal	232.1	245.8	237.8	230	240.1	206.4	221.9	269.6	242.8
	3.7%	3.9%	3.6%	3.5%	3.6%	3.0%	3.2%	3.8%	3.4%
Primary	1,593	1,576	1,552	1,532	1,474	1,486	1,429	1,404	1,353
	25.4%	24.8%	23.7%	23.2%	22.0%	21.7%	20.5%	19.9%	18.7%
Secondary	3,573	3,579	3,760	3,799	3,898	4,031	4,114	4,139	4,198
	57.0%	56.4%	57.3%	57.5%	58.2%	58.9%	59.1%	58.5%	58.2%
Tertiary	867	950	1,009	1,049	1,088	1,120	1,194	1,261	1,424
	13.8%	15.0%	15.4%	15.9%	16.2%	16.4%	17.2%	17.8%	19.7%
Total	6,266	6,351	6,559	6,610	6,699	6,843	6,958	7,075	7,218
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
B. Females									
	2001	2002	2003	2004	2005	2006	2007	2008	2009
No Formal	262	277	250	253	236	197	211	219	196
	7.6%	7.9%	6.8%	6.8%	6.4%	5.2%	5.4%	5.5%	4.8%
Primary	744	750	738	716	671	687	675	612	617
	21.7%	21.2%	20.1%	19.2%	18.1%	18.2%	17.2%	15.5%	15.1%
Secondary	1,798	1,805	1,905	1,900	1,898	1,958	2,020	2,047	2,064
	52.4%	51.1%	51.8%	50.9%	51.1%	51.7%	51.5%	51.8%	50.4%
Tertiary	625	701	786	860	907	942	1,016	1,075	1,220
	18.2%	19.8%	21.4%	23.1%	24.4%	24.9%	25.9%	27.2%	29.8%
Total	3,429	3,534	3,679	3,730	3,712	3,785	3,922	3,954	4,097
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Note: The frequencies displayed above are in millions.
Source: (Malaysia, 2010)

1.2 Firm characteristics

The workhorse of wage discrimination analysis is the human capital earnings function of Mincer (1958, 1974), with the term "earnings function" representing any regression of individual worker's wage rates on a vector of variables that is believed to influence the wage (Willis, 1986). The total earnings of an individual can be defined as equal to the sum of the individual's earnings from the human capital investment plus the earning from the "original" human capital (Becker & Chiswick, 1966). Many researchers still rely solely on

the human capital variables, with years of schooling as an important measure of human capital to account for the explained portion of the wage differentials. This has three intrinsic problems. Firstly, as pointed out by Griliches (1977), the human capital function has a major specification problem as it excludes a measure of ability, which is correlated to schooling.

Secondly, using schooling assumes that both male and female students have similar distribution of courses taken in school or university. However, Brown and Corcoran (1997) showed that boys were more likely to have studied engineering and business in college than girls, and girls were more likely to have studied education, liberal arts, and social sciences (excluding economics). It is therefore evident that the distribution of courses among males and females is dissimilar. Hence schooling is not a suitable proxy.

Thirdly, firm characteristics, including size, location, ownership and industry too should also be included to help explain the differentials as these variables do effect workers' wages as well. The inclusion of firm-related characteristics could themselves change the results of the econometric exercise just as the inclusion of intelligence measures in the human capital function changed the coefficient for schooling in Griliches (1977). This is especially so as Abowd and Killingsworth (1983) found that the standard human capital variables used in regressions only provided 20-30 per cent of the variations when data possessed by human resource departments in firms were able to explain 60-80 per cent of these variations.

The above mentioned factors do suggest that there are weaknesses in employing only the human capital variables as the explanatory variables in wage analysis. In summarising previous research on wage differentials in the labour market, Altonji and Blank (1999)

recommended that the better measures of worker ability can be provided by utilising firm specific studies. Although Blau and Kahn (2007) included union status and industry in their analysis of PSID data, which is a longitudinal household survey, as they argued that human capital variables possibly only provided part of the explanation of the gender wage gap, the inclusion of firm characteristics into the earnings function has not been widely incorporated in the literature. This is probably the outcome resulting from most studies relying mainly on household surveys. This linking of firm characteristics to the workers endowment in the analysis would be a significant feature of this analysis.

1.3 Previous research on the occupational segregation of females

A large body of research has suggested that one of the major causes of the gender wage gap has been the occupational segmentation of males and females; this resulting in females earning lower wages (Bielby & Baron, 1986; Hegewisch et al., 2010; Reskin, 1993). This relationship implied that females could earn more by investing in education and training that could lead them into male-dominated occupation by over-qualifying themselves for the occupation (Reskin, 1993). Upon examining 46 different industries, Fuch (1971) found most men to work in occupations that employ very few women while women tended to work in occupations with fewer men, which resulted in an "overcrowding" of females in these areas, driving female wages down. Indeed, after analysing the 1970 and 1980 United States CPS, Fields and Wolff (1991) suggested that the rapid employment growth in male-dominated occupations led to an expansion of female participation in these occupations, thus reducing gender inequality and occupational segregation.

Using a dissimilarity index on longitudinal census data, Gross (1968) showed that gender segregation persisted between 1900 and 1960 as a result of resistance in male occupations. This was in spite of an increase in female to male worker ratio during this period. However, Buckley (1971) found gender wage differences for the same occupation to diminish in firms that employed males and females, an observation which was not extended by later researchers.

Some sociologists have also used the notion that since females are less valued by society, as expressed in the devaluation theory, occupations which are highly represented by females become less valuable (Reskin, 1988). This view posits that female occupations pay less simply because of the culturally lower status of females who fill up these occupations (England, Allison, & Wu, 2007). As a result, the greater the proportion of females in an occupation, the lower the average wage is.

Drawing on Edgeworth (1922) observation that male dominated trade unions pushed for the exclusion of females from many occupations resulting in the crowding of females in certain occupations, Bergmann (1971, 1974) argued that the crowding effect of females in certain occupations as a result of the aversion against them in some occupations was the result of their lower social status. This resulted in females earning lower wages compared to males for two reasons. Firstly, the crowding of females in certain occupations created an excess supply of female worker. Secondly, females were forced to take up jobs that were unrepresentative of their qualification, and as a result earn wages lower than their training or talent would have entitled them to in the absence of such segregation.

The proponents of devaluation theory argue that discrimination is driven by the desire of males to "preserve their advantaged position and their ability to do so by establishing rules to distribute value resources in their favour" (Reskin, 1988). Researchers generally take the view that "female occupations" pay less that "male occupations" as a priori, with Tomaskovic-Devey and Skaggs (2002) claiming that devaluation is "a well-received explanation for part of the process that leads to gender wage inequality." However, Blau and Kahn (1994) viewed men and women as being imperfect substitutes in the labour market due to the differences in the occupations and industries in which they work in, as well as, the significant differences in pay, in spite of similar measured characteristics. Besides relative qualifications and discrimination, they suggested that market factors and institutional arrangements also help determine the returns that workers receive.

Recent papers by Magnusson (2009) and Grönlund and Magnusson (2013) in Sweden showed that, while females there continued to earn less than males, there is no lack of prestige in the occupations that have high female participation. This included care work, which is predominantly female, causing the authors to conclude that devaluation theory does not explain gender wage gaps.

1.4 Previous research on gender wage discrimination

To Becker (1971), discrimination is the difference between an individual's contribution to output and his or her wages, while Aigner and Cain (1977) defined discrimination to exist when equal productivity was not rewarded with equal wages which Krueger (1963) had shown to lead to market-based inefficiency even if the employer profited at the expense of

the employee. Although there were no significant improvements in the average human capital among females, Blau and Kahn (1994) noted that the gender wage gap in the US fell between 1975 and 1987. They reasoned that this was either the result of an increase in unmeasured female worker characteristics or a fall in discrimination against females.

Fuchs (1971), basing his analysis on the 1960 US Census data, showed that the average female workers earned 60 per cent of average male hourly wages. The largest differentials were among self-employed and the lowest among government employees. He found that females who never married were more likely to stay in the labour force, and seek to enhance their educational levels, while maintaining an age-wage profile similar to males.

Since the pioneering work of Mincer (1958, 1974), Schultz (1960, 1961) and Becker (1971) and others, wage differentials were compared against the workers "human capital" in an attempt to create a portion of the wage differentials that is explained by the human capital variables and another portion that is unexplained. The human capital theory argued that the investment of workers in education increased their future income, and a rational individual would invest in human capital based on the prospective return on investment. The unexplained portion became generally considered to be the consequence of discrimination.

Even as previous research has shown that firm characteristics do influence workers' wages, researchers in the area of gender inequality have ignored the necessity to caveat the limitations resulting from the unavailability of firm related data in their analysis. Instead, especially when decomposition of wages is carried, researchers have relied solely on the supply side variables of the equation proposed by (Mincer, 1958, 1974). This would almost

certainly result in misrepresentative studies that then lead to misadvised policy recommendations.

1.5 Problem Statement

There is an extensive literature on gender inequality. At the same time, many countries are experiencing long-term economic growth, with increasing participation of females in the workforce coupled with rising educational levels of females. The third Millennium Development Goal (MDG) of the United Nations is to "Promote gender equality and empower women." In 2011, 40 per cent of global non-agriculture wage-earning jobs were held by females compared to 35 per cent in 1990 (United Nations, 2013). The same report finds that, except for Western Asia, Southern Asia and sub-Saharan Africa, the enrolment of females worldwide has at least match male enrolment. Also, gender issues being a focus of the MDG itself is evidence of institutional change worldwide to reduce discrimination against women and pursue gender equality.

While in the past, females may have been desegregated at the workplace, but changing conditions including greater female formal employment participation, increased educational achievement of females and greater institutional support for females suggest that gender-based segregation may be limited in a middle income country, such as, Malaysia, much less so in advanced economies like the United States. If the returns from education were not satisfactory, females would not have at an increased rate pursued higher education except for non-economic reasons. However, there is no evidence to assign any reason for the large number of female enrolment in tertiary education except for economic reasons.

Although worker endowments are extensively used in wage equations and decompositions while ignoring firm characteristics, it has not been explained why firm characteristics should not be included in these models. Empirical evidence has, on the contrary, shown that firm characteristics such as industry, size, location and foreign ownership do play a role in wage differentials. My conjecture is that this has to do with the data source, and researchers are very often limited by the data they have on hand. As most of the studies utilise data from household surveys such as Census and Current Population Survey (CPS), information related to occupation and industry is more likely to suffer from non-sampling error (Bowler & Morisi, 2006). The CPS thus does not link employers to employees, and limits its capability to provide reliable firm related data. Abowd and Killingsworth (1983) found that CPS based data only provide between 20-30 per cent of the variables available to human resource departments in firms.

The formulation of the wage equation is important as misspecification would bias econometric results. I conjecture that there should be two components in the econometric models, a human capital component and a firm characteristics component. The inclusion of firm characteristics does provide proxy input of the demand side variables, which is missing in the human capital variables only model. While the aim is to have parsimonious econometric models, the absence of variables that possess significant explanatory powers in the models could create a bias in the coefficients of the included variables (Abowd & Killingsworth, 1983; Griliches, 1977).

While the econometric models related to the earnings equation and decomposition measurements do not influence the results of measuring the distribution of occupations among

males and females, they affect the measurement of inequality between these two groups. Besides providing equal access to work, the aim of gender equality programmes is to ultimately ensure that males and females are paid equal wages for equal work. Since all work is not equal, it is important to have as much of the relevant variables as possible. Thus, this study sets out to investigate, firstly, if gender- based occupational segregation is evident at present and, secondly, if using firm characteristics as a component of wage and decomposition models will provide significant value in accounting for wage differentials. Thirdly, it aims to show how individual firm related variables may affect wage levels and gender inequality.

1.6 Research Questions

Although gender inequality at the workplace is an important issue among both economists and sociologists, the literature on occupational segregation does not explain why female educational levels have exceeded male attainment levels if segregation continues. The literature also continues to focus on human capital variables when decomposing wages even though firm related variables should also affect workers' wages. This study aims to explore these gaps in the literature. Therefore, the following research questions that need further analysis are explored in the study:

1. Is occupational segregation a cause of gender discrimination?
2. Does the absence of firm related characteristic in an earnings equation bias the results?

3. How do firm size, gender composition and foreign-ownership affect gender wage differentials?

The first research question aims to test the presence of occupational segregation in a developing country where the average female worker has higher educational levels than the average male worker. If segregation exists, the reasons for continued female "investment" in education are examined.

The second and third research question study the explanatory powers of firm characteristics in explaining wage differentials. While the second question deals with a general introduction of firm specific characteristics into the analysis, the third question explores at a deeper level how individual firm related variables can explain inequality at the workplace.

1.7 Objectives of the Study

Using employer-employee linked data from Malaysia, this study has the following specific objectives:

1. to examine if occupations that consist of large proportions of females are paid lower wages than those occupations that have lower proportion of females.
2. to examine if gender wage inequality is significant in Malaysia.
3. to examine if and how firm characteristics such as firm size, gender composition and foreign direct investment (FDI) provide significant explanatory powers in measuring gender wage inequality.

1.8 Significance of Study

The study, which aims to examine wage discrimination by means of a scientific approach, is expected to add new knowledge to the existing literature on the discrimination of females at the workplace. This study will specifically contribute in the following manner:

Firstly, the literature review found that most of the literature was analysed using household survey data. Such data does not link employees to their employers resulting in unmeasured human capital which is firm-specific being not observed in such surveys (Altonji & Blank, 1999; Tam, 1997). Labour productivity too differs across firms and industry, which leads to firm and industry related wage differentials (Blau & Kahn, 2007; Dickens & Katz, 1986; Standing, 1999), and household surveys that attempt to collect such data are likely to suffer from significant non-sampling error (Bowler & Morisi, 2006). As the earnings function surveyed in the literature predominantly used human capital related data only as explanatory variables, these studies do make the assumption that human capital is homogenous across workers and influences workers' productivity homogenously across all occupations and firms (Willis, 1986). Hence, the coefficients in these studies could have suffered from missing variables bias if firm characteristics did indeed offer significant explanatory powers. This study will empirically examine this.

Secondly, studies related to gender mostly advocate females (Gross, 1968). This could lead to bias. Besides the various reports advocating female issues such as Economist (2011), UNDP (2011) and World Bank (2012), several of the scholarly work reviewed sometimes appeared not to be rooted on strong methodological foundations. For instance, Cohen and

Huffman (2003) displayed only values of the intercepts from the various regressions and compared these intercepts to derive at their conclusion. Comparisons between equations cannot be based on the intercept alone; the slope, which is a function of the various exploratory variables, too needs to be taken into account. Besides, a large significant intercept in a model without dummy variables suggest that there might be missing variables and as such misspecified. Seguino (2000) ran cross-country regressions with 20 observations. Another example being Levanon et al. (2009) who ran panel regressions on decennial census data using lag lengths for which no selection criteria was given. This study will employ robust statistical methodologies in the analysis to minimise any form of bias.

Thirdly, the literature says very little on how firm-specific characteristics affect gender inequality within firms. Firm characteristics such as ownership, management, industry, location and size would influence the choice and combination of resources used in the firm. These would also play a role in the determining the firm's labour policy, including gender preferences even though some preferences may not be explicit. As an example of a lack in follow-up research, the study by Buckley (1971) found that gender composition in firms tends to affect wage differentials within these firms. However, no subsequent studies aimed at testing Buckley's observation were undertaken. It is possible that gender composition, firm structure and other firm characteristics do indeed impact gender wage inequality at the firm level. This study seeks to establish if the various firm characteristics do individually and collectively help explain gender inequality at the firm level.

Fourthly, neoclassical theory (Becker, 1971) predicts that FDI into an economy would result in greater gender equality as firms have to be more competitive in the international markets. However, recent studies on concentrated industries in Taiwan, South Korea and

India have suggested otherwise (Berik et al., 2004; Menon and Rodgers, 2009). This study will also weigh into this debate by comparing inequalities between fully locally owned firms and firms with foreign shareholding.

Finally, much of the scholarly work on gender inequality has been studies based on the United States and other developed countries. Very little deep country level analysis in developing countries work has been carried out. Instead, they often appear in cross country regressions, which are deceptive for development research (Ravallion, 2001). This study aims to get some insights through a deep developing country level analysis where, according to Economist (2011), females are "second class citizens."

1.9 Research Boundaries

This study uses employer-employee linked data from Malaysia, which is a middle income country. Wages in Malaysia are calculated on a monthly basis and, as such, the explanatory variable will be monthly wages instead of hourly wages used in much of the literature. Ethnicity plays a significant role in wage determination in Malaysia. However, this aspect is not analysed here. Ethnicity is instead used as a control variable in the study.

1.10 Organisation of the Study

This study is organised as follows. The literature review in chapter two previews the relevant theories on gender wage inequalities and gender-based occupational discrimina-

tion, which includes previous studies on Malaysia to provide some background into inequality in Malaysia. The research questions for this study are also discussed at length in this chapter. Chapter three presents the overview of the methodology employed in the study along with the research framework. It also describes the data source in detail and discusses the variables employed in the study.

Chapter four is the first of three analytical chapters. This chapter examines if occupational segregation of females is evident in the data, and if occupational segregation is a source of wage inequality in Malaysia. Chapter five empirically tests if firm characteristics provide significant explanatory powers of in the earnings function. Chapter six discusses the relationship between firm size and gender wage inequality at the firm. It also examines if foreign ownership has any impact on wage inequality. The methodologies are discussed in detail within these analytical chapters.

Finally, chapter seven presents the conclusions of the study. Besides providing a synthesis of the findings of this study, this chapter also discusses the implications of the findings towards both theory and policymakers, the limitations of the study and recommendations for future research.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Models for discrimination can be grouped into competitive or collective models, the former studying individual maximising behaviour and the latter analyse how groups act collectively against one another. Competitive models have generally been grouped into either taste-based (Becker, 1971) or statistical (Arrow, 1973; Phelps, 1972) models. As collective models concern themselves with how groups collectively act against one another often relying on legal methods or the threat of violence as their enforcement mechanism (Altonji & Blank, 1999), this review focuses on competitive models.

A substantial portion of the literature on gender segregation is contributed by sociologists, who suggest that occupations which have a higher representation of females pay lower than those with lower representation (Cohen & Huffman, 2003). There are two hypotheses that attempt to explain this phenomenon. The first is devaluation, which suggests that female occupations pay lower wages as females are valued less by society due to their socially inferior. It refers to a "general cultural devaluation of women's labor" (Tam, 1997). The other is queuing where although both males and females prefer higher paying occupations, employers who prefer male workers list females at the back of the hiring queue; this resulting in females crowding around lesser paying jobs (Levanon et al., 2009).

This chapter explores the themes of the three research questions with a brief review of the existing theories, empirical findings and methodology. While gender wage discrimination at the workplace is the research subject of this study, a major concern is the non-inclusion of firm characteristics in the analysis of discrimination. If firm characteristics possess explanatory powers on wage differentials, exclusion of this component from the analysis would bias the results unless it is mitigated by valid arguments. The chapter also explores the devaluation hypothesis and previous research relevant to Malaysia.

2.2 Gender Wage Inequality

Webb (1891) observed that females earned lower wages than males. While noting males and females in the labour market struggled for jobs that paid better wages, Webb suggested that female workers earned lower wages due to their general inefficiency and the lower prices that their produce fetch. Even where females could master much of an industrial process, they were always lacking the ability to master higher skills. For instance, females could set their own looms. Male workers, on the other hand, were stronger, had greater industrial experience and were more resourceful. This resulted in the division of occupations by gender, with male occupations being paid higher wages.

Mincer (1958) studied how human capital affects income inequality, and aimed to provide a rational expectations model for predicting inequality based on the differences in investment on human capital by individuals. This later resulted in a model which, though entirely supply-side oriented, utilised workers skill and job experience for measuring the distribution of wages. He also suggested that the individual's age "measures both the process of

acquiring experience and biological growth and decline." He also suggested that in occupational groups where training levels were high, wages grew more steeply with experience than in groups where training requirements were lower. Mincer (1962) showed that the returns to on-the-job training declines with age as the worker has fewer number of active working life remaining. He also suggested females invested less in on-the-job training compared to males as the average females spent less of her working life in the labour force compare to males. Mincer (1974) introduced the "human capital earnings function," which relates workers' earning in logarithmic form with schooling and the concave function of experience. Though Mincer provided a descriptive relationship between wages, age and schooling or occupation, his model assumed that the rate of capital accumulation was exogenously determined.

Schultz (1960) suggested that education should be treated as an investment and its consequences as a form of capital, thereby coining the term "human capital" to refer to the augmentation of education in an individual. He further argued that between 1900 and 1956, human capital had been growing at a faster rate than gross physical capital formation. Schultz (1961) refined human capital to consist of the skills and knowledge that individuals acquired. The high growth rate of "deliberate investment" in human capital had been the principal source of the fast economic expansion experienced by western societies and the rising real earnings of workers. He argued that although economists had considered people as an important component of the wealth of nations, the former had failed to understand that individuals to make substantial investments in themselves by foregoing present earnings in order to enhance themselves by increasing their levels of education and on-the-job training. Schultz work significantly contributed to the purely supply-side view for the earnings equation. He also failed to recognise that "it is helpful to work from a theoretical

and econometric viewpoint that explicitly recognizes the possibility that returns to education may vary across the population, depending on such characteristics as family background and ability" (Card, 2001).

Rumberger (1987) attempted to introduce some variability into the returns from schooling. He divided workers education into two portions, the first being the portion of an individual's that is required for his or her occupation, and a second portion called "surplus schooling." Rumberger argued that since surplus schooling is not fully utilised in fulfilling the worker's occupational role and as such offers lower productivity, it brings lower returns to the worker. However, Rumberger's (1987) model is still too simplistic an attempt to introduce the role of education in earnings determination, which is not just affected by the time spent in education but also the type of education or course pursued. Heckman, Lochner and Todd (2003), using decennial Census data for the US from 1940 to 1990, showed that the logarithm of earning did not move linearly with schooling. They also question the usefulness of the internal rate of return (IRR) on schooling, which is used in human capital analysis, as a policy tool when uncertainty was introduced into the model. Contrary to the significance laid out to education by many authors, Becker (1983) argued that education did not indeed directly influence wages. Rather the effects were indirect, through workers' skill and knowledge enhancement.

Becker (1971) produced an economic analysis of taste-based discrimination after first suggesting that the discriminatory taste of employers, co-workers and customers resulted in discrimination. In his model, he treated the interaction between whites and blacks in the economy as though they were separate countries where whites would export capital and blacks export labour. In this model, at least some of the whites have a taste of discrimina-

tion or prejudice towards black and as such prefer to use white labour. As a way of compensating these employers, Becker argued that black workers are forced to accept lower wages for equal productivity as other workers or show greater productivity when offered equal wages. This model also shows that discrimination is detrimental to both the employer and the discriminated workers because the employers behave as though they have paid a higher wage to the discriminated workers than they actually have. Becker and Chiswick (1966) introduced the assumption of welfare maximisation into an individual's investment in human capital. This allowed investment in human capital to be analysed in term of the general equilibrium model. Becker (1983) pointed out that the theories of firms ignore the differing productive processes within firms, and aimed to formalise firm effects into economic analysis. Becker (1985) suggested that since motherhood is effort intensive, married women prefer work that requires less effort. Although they may possess similar human capital as males, females seek less demanding jobs in order to economise on effort.

The models based on Schultz's (1960, 1961) and Becker's (1975) work ignored the role of an individual's ability in contributing towards his or her earnings growth. Towards this, Griliches (1977) pointed out a major specifications issue related to the human capital earnings function being the leaving out of workers ability as an explanatory variable. As individuals and jobs or multidimensional, "jobs differ in their fringe benefits, in their conditions of work, and in their opportunities for training and advancement." He also argued that the reality is that no one believes that "one grand final test score" especially if they view schooling and training as production processes for human capital. By introducing IQ test scores or other measures of ability, Griliches showed that the coefficient for schooling changes and this suggested that there is a correlation between schooling and ability, the latter being a measure not included in the earnings function.

Krueger (1963) pointed out that Becker assumes that both the Whites and Blacks have identical production functions. While Becker focused on the distastefulness experienced by Whites when working with Blacks, instead of the effects of discrimination on income level, Krueger (1963) showed that discrimination led to market based inefficiencies. By expanding on Becker's (1971) model, she also showed that although the Whites in an economy may benefit from discrimination under certain circumstances at the expense of Blacks, the gains of the combined white-black community will be less under discrimination than if there was no discrimination.

Fuchs (1971), basing his analysis on the 1960 US Census data, showed that the average female workers earned 60 per cent of the average male worker's hourly wages. He opined that the differentials could be explained mainly by the different roles assigned to males and females, and the balance by discrimination. The largest differentials were among self-employed and the lowest among government employees. He found that females who never married were more likely to stay in the labour force, and seek to enhance their educational levels, while maintaining an age-earnings profile similar to males. Fuchs also showed that females working in industries which are dominated by males tend to earn higher wages than females employed in other industries. Fuchs (1974) makes the point that most employers would be unable to risk the loss to their business as a result of the 40 per cent wage differential. As such, he opined that the major explanation for the gender wage differentials would be the role differentiation between males and females rather than discrimination.

Phelps's (1972) argued that the labour market operates imperfectly due to the scarcity of information related to "the existence of characteristics of workers and jobs." Phelps showed that if information was expensive and the number of applicants was many, a profit maximising employers would discriminate against blacks or females if they believed that whites or males were on the average better qualified than the blacks or females respectively. This could be the result of prior experience of the employer with the demographic groups or as a result of social prejudice. This form of discrimination is generally referred to as statistical discrimination. Aigner and Cain (1977) suggested that Phelps's (1972) model did not deal with any form of discrimination, statistical or otherwise. Instead, according to them Phelps's model dealt with the reliability of productivity indicators among demographic groups. The authors also introduced employer uncertainty on worker productivity into Phelps's model. Another problem with statistical discrimination is that the models are very static in the sense that they do not allow for employers to update their information on the ability of groups that employers discriminate. Although based on some strong assumptions in their econometric model, Altonji and Pierret (2001) found that firms that discriminate tend to learn over time on the productivity of workers resulting on the coefficients of the easily observable variables, such as education, falling.

Spence (1973) presented as endogenous market model where potential employees transmit information to employers to influence the allocation of jobs among workers. This job market signalling process enables higher ability workers to differentiate themselves from others by acquiring education, which employers correlate with productivity. As the cost of education is less for higher ability individuals, the education signal serves as a separating equilibrium for higher ability workers to differentiate themselves. However since education is used as a proxy for ability, for signalling to be able to work, there can only be two

distinct types of workers where the "good" worker is able to use education to create a separating equilibrium for "bad" workers.

Although Arrow (1973) presented a rational expectations model of discrimination where an employer has some preconception of the productive of different demographic groups, the author made the point that an employer would only be able to know workers capabilities sometime after the hiring process. However, this information will not be available to other employers, and as such the employer could count on keeping any qualified worker he hired. This determines the willingness of employers to hire, which in turn determines human capital investment by workers, and the subsequent skill level of workers belonging to different demographic groups. Arrow (1998) pointed out that neoclassical assumptions would drive out all firms except the least discriminatory ones. Instead, he felt that a network model is better suited to explain labour market discrimination as personal interactions occur throughout the hiring process, evidenced by a large proportion of jobs being offered through referrals. As such, social segregation promotes labour market segregation through network referrals. Here, the profit maximisation motive of the employer is superseded by the social rewards it brings.

Blinder (1973) and Oaxaca (1973) proposed a robust procedure for wage decomposition between male and female wages with the incorporating of human capital variables to measure the portion of the wage differential attributed to the "average extent" of wage discrimination against female workers. Their procedure provides a quantitative assessment of gender wage differentials by breaking the wage differential into two portions. The first portion is explained by the explanatory variables, while the unexplained residual could be attributed to discrimination as suggested by Becker (1971). The Blinder-Oaxaca decompo-

sition procedure is the most commonly used tool in measuring wage differentials. An explanation of the techniques involved is presented in Jann (2008).

Mincer and Polachek (1974) looked at how the division of labour within a family unit results in females having less work experience, and lower market related education and on-the-job training. They suggested that families evaluate the prospective returns on the investment in human capital by any family member before making any such investment. Since female members are more likely to work for a shorter period with a more discontinuous working life, families have a lower incentive to invest in investing in the human capital of females members. They also discuss the possibility of "atrophy" or depreciation of human capital among females due to the non-use of human capital stock.

After studying a sample of 2,000 workers in a travel and insurance company, Abowd and Killingsworth (1983) showed that CPS based regression data can only account for 20-30 per cent of wages variation while data from personnel data can account for 60-80 per cent of this variation. Though the personnel records of workers provided detailed measures for compensation and worker characteristics, the study only detailed a single firm. Firms themselves cannot be homogenous; they differ in various ways including philosophy, structure, industry, size and location. Abowd, Kramarz, and Margolis (1999) looked at both human capital and firm heterogeneity among using longitudinal employer-employer linked data of a sample of more than a million workers employed across half a million firms. They found that that both worker and firm characteristics showed significant explanatory powers on wage variations, with worker characteristics the more important determinant of worker compensation.

Bielby and Baron (1986) analysed data, collected by the U.S. Employment Service, on the gender composition across 290 firms in California between the years 1964 and 1979. Besides finding that only a few occupations employed male and female workers in proportion to the labour force composition, they also found that lines of authority and career ladders were segregated as well; female supervisors almost always supervised other females. Their findings supported statistical discriminatory models which claim that employers reserve some jobs for males and others for females. Bielby and Baron (1986) analysis, however, only looked at the distribution of male and female workers across occupations. They did not address the mediating effect education and training would have had in occupational segregation.

The human capital theory was summarised as follows by Willis (1986): Individuals who increase schooling levels face an opportunity cost that entails both loss of income and direct expenses related to schooling. As an inducement, the worker is compensated with higher lifetime income stream. However, to command the higher wage levels, more educated workers need to be sufficiently more productive than lesser educated workers. Willis (1986), however, criticised the Mincerian model which assumes that human capital is homogenous across workers, and influences workers' productivity homogenously across all occupations and firms. He made the point that as a result of the development of agency theories regarding employee-employer relationships, "future progress in this area" required the development of data that linked both employers and employees.

Lester (1967) reviewed the effects of establishment size on workers' wages. Although, as admitted by the author, Lester (1967) availed himself to whatever limited data he could use from the U.S. Bureau of Labor Statistics' reports between 1945 and 1964 and the Census of

Manufacturing from 1939 onwards, and reported that worker compensation in large firms establishments were double that in small establishments on a nationwide basis. Masters (1969) modelled a regression where the average hourly earnings for production workers was the dependent variable with firm size (which was measured as a percentage of total employment occurring in establishments of at least 1,000 workers), concentration, unionisation, the ratio of total wages to value added and a dummy variable for durable goods manufacture on the right-hand side of the equation. Masters's (1969) result produced a positive coefficient for firm size suggesting that average wages and plant size were correlated. Masters's (1969) results are highly unreliable as neither the distribution of wages among employees nor the workers endowments and other firms-related variables in this study are known. Idson and Oi (1999) investigated the reasons why larger firms pay higher wages. As bigger firms tend to choose larger capital-labour ratio and are able to purchase other productive inputs at lower prices than smaller firms due to quantity discounts, the output per worker is greater in the bigger firms. Using data from the 1977 United Stated Census for Manufacturers, the authors verified previous findings that labour wages and productivity are correlated.

Dickens and Katz (1986) and Krueger and Summers (1988) measured inter-industry wage differentials and their work provides empirical support for efficiency wage theory, which posits that workers are paid above market clearing rates in order to increase productivity or reduce worker turnover. While Dickens and Katz (1986) worked on a cross-sectional sample of 109,735 non-union workers and 25,193 union workers extracted from the United States CPS dataset of 1983, Krueger and Summers (1988) used longitudinal CPS data for the years 1974, 1979, and 1984. After controlling for union status and worker and job characteristics, both papers showed significant wage differentials across industries. They

also noticed that industry wages had a positive correlation with the average educational level of an industry, establishment size, capital intensity, location and worker's job tenure. Krueger and Summers (1988) doubted that industry wage differentials are based on un-measured worker ability. Krueger and Summers's (1988) results showed that workers who move from higher wage industries to lower wages industries experience a reduction in wages, while workers who switch from lower to higher wage industry earn higher wages. Dickens and Katz (1986) also noted the possibility that increased unionisation in an industry would increase the threat of unionisation by the non-unionised workers, which would lead to an increase in the latter's wages by firms to prevent unionisation of these workers.

Gibbons and Katz (1992) provides evidence to support the claim that wages rise with job seniority. Their study tracked the earnings and employment history of 1,540 workers between 1968 and 1983 drawn from the Panel Study of Income Dynamics (PSID) of the United States. Their study also provided support for the role job tenure plays in job-specific human capital and wage determination. They found that male workers who stayed at the same firm for 10 years were likely to earn 25 per cent more than if they had moved to another firm, while workers who lost their jobs on the average earned 14 per cent less in their new jobs. They argued that a longer tenure in a firm enhanced workers job-specific human capital, which accounted for the earnings rise. However, Dickens and Katz (1986), Krueger and Summers (1988) Gibbons and Katz (1992) all relied on CPS data, the limitations of which were exposed by Abowd and Killingsworth (1983) and Willis (1986).

Using data from the Survey of Income and Program Participation (SIPP) and the National Longitudinal Study of the High School Class of 1972, Brown and Corcoran (1997) showed that the courses taken by boys and girls at high school did not make any significant differ-

ence to their wages even though boys preferred science and mathematics and females preferred foreign language. However, they concluded gender-based differences in students' major at college account for 20 per cent of the wage differentials.

Heckman (1998) provided a criticism on the usage and interpretation of data in studies on discrimination especially with regards to the audit pair method. He also argued that disparities in labour market outcomes are not necessarily a result of discrimination as a careful reading of the literature on wage differentials between whites and blacks in the 1990s would point towards skill differentials rather than discrimination. Heckman criticised the use of the phrase "human capital variable" as a productivity measure in economic literature without proper definition although it generally means "education and various combinations of education and age" based on the available CPS data while, on the other hand, personnel departments in firms have more detailed workers characteristic data.

In summarising previous research on wage differentials in the labour market, Altonji and Blank (1999) opined that more effective methods for the measurement of school quality and better data for measuring worker skills were required if the returns to unobserved skills were to play a major role in wage determination. It would also be useful for knowing how less skilled workers can overcome negative wage effects. They suggested that firm specific research could be a significant contributor to this understanding.

Black and Strahan (2001) studied the effects of deregulation of the banking industry in the United States during the 1970s on gender wage inequality. Using a sample of banking employees' data from the CPS covering 1969-1997, the authors noted that though mean wages in banking declined as a result of deregulation and affected lower skilled workers

more than higher skilled ones, the gender wage gap in the banking industry too declined during this period. Black and Strahan (2001) suggested that the relative rise in female wages was the result of the improved occupational status of females as more females entered managerial ranks while male wages declined more compared to female wages. Since the study covered three decades, there would have been other external effects on the labour markets, some of them institutional. The authors' failure to compare their results against the experience of other sectors limits the usefulness of this study.

Using a random effects model and United States PSID data for 1976-1993, Cotter et al. (2001) examine the presence of a glass ceiling which prevents females from moving freely to the upper echelons of their profession. They analysed inequalities at the 25th, 50th and 75th percentile levels as inequalities accelerates at higher percentiles when females face the glass ceiling effect, and their results suggest the presence of a glass ceiling. Cotter et al. (2001) do not present their results for scrutiny and, since PSID data would not include firm level information, there is a significant possibility that their results are biased.

Albrecht et al. (2003) too investigated the presence of a glass ceiling in Sweden using primarily the LINDA dataset, which is based on a longitudinal sample of three hundred thousand people of all ages compiled by Statistics Sweden, for 1994 and 1998. They showed the gender wage gap is minimal at the bottom of the wage distribution and rises steadily towards the top of the distribution. From the 80th percentile onwards, the wage gaps rises steeply. The decomposition of wage differentials showed that this was due to the differential rewards females receive compared to males towards the top of the distribution. They opined that, although Sweden had a set of policies suitable for female workers with children, motherhood may cause females to choose or be tracked into less demanding jobs.

Like Cotter et al. (2001), Albrecht et al. (2003) too do not present their regression results in the paper.

Saunders and Darity Jr (2003) suggested that discrimination was persistent because there were material incentives, such as maintaining group linked privileges, for such behaviour. While neoclassical methodology is the same for all discriminatory situations, they argued that the assessments and decisions of employers are unique for each gender-ethnic group and situation.

Berik et al. (2004) explored how increased competition from international trade affected gender inequality in South Korea and Taiwan. In Becker's (1971) context, increased competition from economic openness should result in significant reductions in discrimination as the latter is inefficient and thus negatively impact profits. The neoclassical argument is that Foreign Direct Investment (FDI) would seek cheaper labour thereby increasing the demand for female labour. The substitution effect of replacing the more expensive male labour with female labour would push female wage levels higher thus reducing gender wage inequality. The model of Berik et al. (2004) attempted to identify the effects of FDI on wage inequality by studying inequality in concentrated industries, which face less competition in domestic markets but greater competition in international, as any reduction in wage inequalities in firms with foreign equity can be easily attributed to FDI. Using data for 1981-1999 from the Manpower Utilization Survey for Taiwan and Occupational Wage Survey between 1980 and 1998 for Korea, the authors found that foreign competition in concentrated industries actually drew increased gender wage discrimination in these industries. Menon and Rodgers (2009) conducted a similar test on concentrated manufacturing industries in India, using household survey data for 1983–2004. Like Berik et al.

(2004), Menon and Rodgers's (2009) analysis, which also utilised OLS and generalised least squares (GLS) regressions, found increasing trade openness to be correlated with larger gender wage gaps.

Goldberg and Pavcnik (2007) discussed the recent literature on the effects of globalisation on income inequality in developing countries. They found that the literature was overwhelming contrary to the neoclassic belief that globalisation would reduce inequality. Instead lower skilled workers were worse off relative to higher skilled workers. The reason for this being that globalisation not only affected trade in final goods but also trade in intermediate goods, the latter being skill intensive. Furthermore, the introduction of new technologies favoured skilled workers as well.

Lipsey and Sjoholm (2001) investigated the effects foreign firm have on the Indonesian labour market based on survey of 19,911 manufacturing firms there. They found foreign-owned firms to pay higher wages than locally-owned firms after controlling for size, location and industry. Lipsey and Sjoholm (2001) also suggested that the entry of foreign manufacturing firms resulted in the rise of general wage levels within provinces and industries concerned. This study though divided workers' occupations into blue-collar and white-collar only, with the dependent variable being the mean wage levels of blue-collar and white-collar workers within these firms. As such it did not link the individual characteristics of workers to the employer.

Söderbom and Teal (2004), after analysing a panel data of manufacturing firms in Ghana between 1991 and 1997 into a Total Factor Productivity (TFP) model, found larger firms tended to hire workers with greater human capital and as such incurred higher relative labour costs compared to smaller companies. They also found that their variables measuring human capital did not appear to explain productivity in these firms. However, the authors plugged in additional variables in what is essentially a closed TFP model which causes significant econometric problems as these additional variables would bias the elasticities.

Kanazawa (2005) argued that discrimination was an unnecessary concept in attempting to explain discrimination if male and female workers valued the desire to earn money differently. From the perspective of evolutionarily economic psychology, the goal of all living organisms is reproductive success, and not financial success. This is more so for females than males, for whom financial success could lead to reproductive success. As evidence, Kanazawa used General Social Survey (GSS) 1991 data to show that there were no wage gaps between unmarried male and female workers below the age of 40.

Bowler and Morisi (2006) compared the CPS, which is a household survey, against the Current Employment Statistics (CES) survey, which is also known as the establishment or payroll survey. The former is a sample about 60,000 households while the latter is a sample survey of 160,000 businesses and government establishments of various sizes. While the CPS includes agricultural workers and unpaid family workers, with a minimum wage of 16, the CES includes all workers who receive payment but excludes agricultural workers. Besides having CPS has a broad definition of employment, the CPS also collects occupations and industry information from the survey respondents. The authors claim that the

occupational and industry data in the CPS is more subject to non-sampling error compared to the CES. Furthermore, the smaller sample size of the CPS limits its usefulness in producing reliable analysis at geographical areas below the national level.

Ma (2006) traced the cause of wage inequalities between coastal and inland provinces in China. He argued that the market and supplier access were important factors for attracting investment, and that distance accounted for one third of the regional wage differentials. Ma (2006) concluded that workers employed in firms in export-oriented firm which could access their markets efficiently and that were close to the suppliers earned higher wages. Ma's (2006) methodology utilise predicted values for market access and supplier access gotten from a gravity equation through Tobit and OLS regressions as input into their wage equation, while the measure for education is the proportion of workers in a region who have secondary or higher education. Hering and Poncet (2010) pointed out that such use of average educational figures fails to account for the distribution of education within the labour force. This method also fails to include worker endowments and firm or industry specific information.

Autor, Katz, and Kearney (2008) tracked the cause of increasing wage differentials between higher and lower wage earners in the United States during the 1990s compared to the 1980s. This, they argued, was the result of expansion on employment below the 25th and above the 65th percentiles compared to the middle wage group, resulting in the labour market being polarised by the divergence of high and low wage occupations at the expense of medium skilled occupations. The authors believed that this was an outcome of the rapid advancements in information technology, which promoted international outsourcing. They suggested that this observation could be reconciled with the skills-based technical change

hypothesis which emphasised the role of information technology in complementing highly skilled workers while substituting lesser skilled workers employed in routine tasks. The authors used CPS data from 1963 to 2005 and the decennial Census data from 1960 to 1980, and measured occupational skill in terms of the mean of years of education within the occupational groups. The paper found similarity in education and experience among workers to be a factor in determining the level of substitutability among workers. Although U.S. wage structure widened since the 1980s, Autor et al. (2008) found declining gender wage differentials during this period.

Fally et al. (2010) attempted to understand wage disparities across states and industries in Brazil based using the economic geography framework, which treats labour as a homogenous factor of production. Although labour mobility could in theory arbitrage away geographical wage differentials, this was not the case for Brazil even though the country had higher internal migration level compared to Europe. Besides worker and firm characteristics, they found supplier access and market access to possess very strong positive correlation to wages. The R2 of Fally et al. (2010) wage regression is 0.88 while the R2 of the aggregate gravity equation with trade flows as the dependant variable is 0.98; this suggests that there are serious econometric issues with the model employed by the authors.

Hering and Poncet (2010) also used the economic geography framework to study the effects of geography on wages by analysing workers' wages in 56 cities in China. They found highly skilled workers to benefit more from market access compared to less skilled workers. They found wages in private firms, especially those that were foreign owned, to be sensitive to market access while wage levels among state-owned firms were unaffected by market access. Hering and Poncet's (2010) sample had only 6,079 observations, which

appear rather low when analysing 56 cities in China. The authors did not also provide a summary table of the variables for scrutiny. The R2 of the regressions, which ranged between 0.15 and 0.22, appears too low for wage regression.

Aud (2011) was the 2011 edition of the annual report of the National Center for Education Research, and the report provides various statistics on "participation and persistence in education, student performance and other measures of achievement, the environment for learning, and resources for education" in the US. The statistics show that the enrolment of US resident females in undergraduate degree programmes rose from 3,119 in 1970 to 9.970 in 2009. During the same period, resident male enrolment rose from 4,250 to 7,595.

The study by DeNavas-Walt et al. (2011) for the US Census Bureau, which was based on the CPS of 2012, observed that the real median wages of male and female workers for 2011 were $48,202 and $37,118 respectively. The median female wage was thus 0.77 the median wage of males with the gender wage gap, which is the difference between male and female wages expressed as a percentage of male wages, being 23 per cent.

2.3 Gender-based Occupational Segregation

Edgeworth (1922) suggested that the pressure of male trade unions excluded females from many occupations, and was the most likely cause for females getting "crowded" into a few occupations resulting in low wages within female dominated occupations. Bergmann (1971) drew on Edgeworth's (1922) crowding analogy to explain the low wages associated with Black workers in the United States. She opined that the low status of Black workers

drove white employers to “dislike associating with them” out of fear that the employers themselves might lose their self-esteem and social status thereby, resulting in an exclusion of Blacks from many occupations. Bergmann (1974) suggested that, besides earning lower wages after accounting for differences in education, both blacks and females were employed in occupations that were distributed different from whites and males respectively. She argued that the crowding effects of occupational segregation created an excess of supply in blacks and females related occupations, resulting in lower wages for these groups. Bergmann (1971,1974) together have little empirical support and both rely on strong neoclassical assumption to derive at the conclusions, including crude assumptions on the quality of education received by Blacks in order to prevent perfect substitutability between Whites and Blacks in the labour market.

Using a dissimilarity index on longitudinal census data, Gross (1968) showed that while gender segregation persisted between 1900 and 1960 as a result of resistance in male occupations, female occupations became less segregated to males. He also noted that literature that dealt with women issues tended to advocate females. Gross (1968), however, does not track the relative educational levels of females during this period nor does he discuss the significant structural changes that occurred during this period. Also, the reliability of data, especially during the early period, was not discussed and addressed.

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Buckley (1971) compared wages of male worker in eight office and two plant occupations of 85 US metropolitan areas during 1969-1970 conducted by the Bureau of Labor Statistics. Although the average male wages exceed average female wages in all occupations, he noted that the highest wage differences within occupations were between firms that employed only male workers and firms that employed only female workers. The occupational

wage differences significantly diminished in firms that hired both males and females. Buckley (1971) though compared only mean wages within the firms, and did not consider either workers endowments or firm characteristics in the analysis.

Reskin (1988) argued that since the wage gap is a result of males setting rules that promote gender segregation in order to preserve their advantage in the labour market, females must be provided access into the traditional male occupations and a wage system that compensates females for their "worth" irrespective of their occupation. In Reskin (1993), she noted that social and economic forces both perpetual and reduce gender segregation. The author did not provide any empirical evidence of her own, relying instead on reviewing previous works that appear to support her theory.

Fields and Wolff (1991) examined the 1970 and 1980 United States Current Population Survey data to examine changes in gender segregation across industries and occupations, and analyse how this affects female wages. They found that gender-based occupational segregation declined during this period, and the high employment growth within any occupation accelerates desegregation. Relative wages of females too rose in occupations that experienced reduced segregation. They argued that employment growth reduces gender segregation, and the wage gap, as barriers for females into high wage occupations are reduced. The econometrics in this study utilises average educational levels within occupations, and since the data contained no information on workers age or experience, the authors created a proxy based on the average increase in female to male employment within occupations. Also, as CPS data was used, there were no controls for firm related characteristics either.

Blau and Kahn (1994) attempted to analyse the relationship between decreasing gender wage gaps and rising wage inequalities in the United States between 1975 and 1987. After controlling for human capital in a wage decomposition framework, they found that if there had not been any female specific improvements in human capital, the gender wage gap would have instead risen during this period. This they reasoned was either the result of an increase in unmeasured female worker characteristics or a fall in discrimination against females. Blau and Khan also suggested that changes in labour demand benefitted females at the lower skills job levels, while males benefitted at higher skill job levels. In Blau and Kahn (2007), the authors argued that human capital variables possibly only provided part of the explanation of the gender wage gap, and as such other variables should be included while decomposing wage differences into explained and "potentially due to discrimination" components. As such they included other variables such as union status and industry in their analysis of PSID data which is a longitudinal household survey, while worker's ethnicity was included as a control variable.

In their analysis of the relationship between city size and inequality, Long et al. (1977) observed that the occupation variable was highly correlated to their measure of education. Furthermore, the regressions using occupation instead of education as exploratory variables provided greater explanatory powers leading the authors to report only the regressions with occupation.

Macpherson and Hirsch (1995) used monthly CPS data to examine the relationship between gender-specific occupational segregation and wage for the period 1973 to 1993 in the United States. They included a ratio of females to total employment in the worker's Mincerian wage equation to test if wages rose with a rise in the proportion of females in an

occupation. They argued that if taste models of discrimination were true there will be a weaker relationship for males, compared to females, with the proportion of females in an occupation, and a larger wage gap in occupations with strong female participation. Although they found that female occupations paid lower wages, they suggested that this was the result of lower levels of training required for such occupations plus the greater likelihood of larger proportions of part-timers in such occupations. They suggested that if occupation-level tenure, training and work hours were included into a wage model, the gender wage gap would be lower. It should also be noted that firm related characteristics were not controlled for in the analysis.

Petersen and Morgan (1995) suggested that wage discrimination was a result of any one or more of three processes. The first process, which is known as "allocative discrimination," involves females being allocated work in low paying occupations or firms. In the second process, known as "valuative discrimination," occupations that are held primarily by females are paid lower than those occupations held by males although the occupations may require equivalent skill levels and possess the same other wage related factors. In the third process, "within-job wage discrimination" results in female workers receiving lower wages than males although both are employed in the same firm and are in the same occupation. The authors used two different sets of data, being 16 Industry Wage Survey (IWS) during 1974-1983 and the National Survey of Professional, Administrative, Technical, and Clerical (PATC) employees of 1981. Although they found there to be "virtually no difference between males and females" wages at occupation-establishment level, occupational segregation tended to be extensive. Basing their analysis on regression and decomposition techniques, the authors concluded that while gender wage differentials at the firm level were small, establishment and occupational segregation played significant roles in explain-

ing discrimination. However, a serious drawback in this study is that the authors did not control for other worker specific characteristics such as race, age, experience, or education.

In his overview of theories connected to the occupational segregation of females, Anker (1997) provides with a stylised argument that gender based organised segregation is extensive throughout the world and that organised segregation is one of the most important and enduring facets of labour markets worldwide. Although providing no robust analysis, Anker reaches the conclusion that a majority of occupations in the world can be classified as either "male" or "female" occupations. Anker et al. (2003) opined that the general patterns and regional differences in occupational segregation in year 2000 were non-different from what was observed during 1970-1990 period.

Tam (1997) investigated the cause of occupational segregation between males and females, and the reason behind occupations with a large proportion of females being paid lower wages than male dominated occupations. In Tam's (1997) framework, displayed in Figure 1.1, the allocative process determines the occupation a worker gains entry into, while the wage differentials are the result of the linkage between occupations and wages. The former related to the devaluation hypothesis while the latter is explained, according to Tam, in the specialised human capital hypothesis which posits that the same worker should receive different wages for occupations which require differing specialised human capital. These may be occupation, industry, or firm specific. He pointed out that firm-specific human capital varies across firms while occupation specific human capital does not. On the other hand, industry captures work setting and product. In other words, females who were employed in lower paying occupations were paid lower because the jobs required less specialisation.

Tam (1997), however, argued that previous research supporting devaluation hypothesis was dubious as the research was "plagued by the problems of measurement error that are aggravated by fixed-effects models and correlated control variables". Using 1988 CPS data, Tam showed that while on the average there was no evidence of wage discrimination against female occupations, other forms of gender discrimination existed that affected the allocation of females across occupations. The main reason female dominated occupations paid lower wages than male dominated occupations was due to the former requiring less occupation specific training. England et al. (2000) argued that by adding a measure for general educational development (GED), Tam's (1997) result would instead show that female occupations pay lower wages. However, the former's regression model had both GED and standard vocational preparation (SVP) variables which are highly correlated. Tomaskovic-Devey and Skaggs (2002) also point out that England et al. (2000) did not provide a theoretical explanation for their results.

Tomaskovic-Devey and Skaggs (2002) pointed out that much of the attention of work related to gender inequality is focused on the investment choices of individuals within the human capital framework with little interest in the organisational context of the problem. They used job level data from the 1989 North Carolina Employment and Health Survey for their analysis in a model that followed closely with Tam's (1997) including the inclusion of firm specific characteristics such as industry, establishment size, location and unionisation. They find weak evidence for a relationship between gender composition of occupations and wages, and support Tam's finding that there is no direct devaluation of female work.

Following a survey of country level labour data, Standing (1999) suggested that there had been a global trend toward gender-based occupational segregation. He argued that income security in developed countries and export-led industrialisation in low-income countries had forced more females into the formal labour market. This had also led to greater flexibility in the labour markets where the external labour markets become more important than internal labour markets due to weaker labour institutions, reduction in craft skills learned through apprenticeships and skill polarisation as firms now need less specialised skill workers but more workers who require little training. According to Standing, the resulting "feminisation" of male occupations was mainly the result of the weakening position of male workers rather than any dramatic increase in occupational opportunities accorded to females. Standing (1999) used data from various sources for years from the early 1970s to the mid-1990s, and he admits to some of the data being "patchy." His analysis looks at gender-centric employment trends without addressing the endowment levels of workers; the latter would have been very difficult due to the limited availability and reliability of such data.

Seguine (2000), using total factor productivity (TFP) approach based on a Cobb-Douglas production function, where output is a function of capital stock, female labour supply, male labour supple and human capital, analysed a cross-country panel of selected Asian countries covering the period 1997 to 1990. Her results indicated that the Asian countries with the widest gender wage gaps grew the fastest, and that investment was positively correlated to gender wage inequality. She concluded that the low wages earned by female workers was the stimulant for exports from Asia during this period. Furthermore, she suggests the "gender norms and stereotypes that convince women to accept their low status curb labor and political unrest, stimulating investment." There are several issues though with Se-

guine's (2000) methodology. Although eight countries were analysed, there were only 20 data points. The panel thus consisted of four countries with three periods and four countries with two periods. Hence, the econometric models in the study, with up to six explanatory variables in a model, had 20 observations. Secondly, the proxy for human capital was average years of secondary education per person over 15. This is too simplistic a measure of human capital. Furthermore, the regression results showed that human capital stock in these countries did not grow during this period. Neither did the growth in labour force contribute to GDP growth. Also, as Ravallion (2001) advises, cross-country regressions can be deceptive.

Sloane and Williams (2000), using a decomposition analysis on the 1986 Social and Economic Life Initiative household survey, which had a sample of 6,110 respondents across six geographical areas in United Kingdom, focused on gender differences in job satisfaction. The authors pointed out that while there is considerable evidence that females face discrimination at the workplace, other studies have shown females to be more satisfied that males in their jobs. Their results also showed that females had different criteria for job satisfaction compared to males, with males paying a greater importance to wage than females. As such, the authors reasoned that the idea of equal pay for equal work might leave both groups worse off. Although the sample size used in the study was relatively small and it did not control for industry variances, it addresses an important issue in inequality analysis. Another observation by Sloane and Williams (2000) was that the job satisfaction of females increased in environments that had higher proportions of female workers. This led the author to propose that females preferred workplaces which were "dominated" by females, and that any effort aimed at reducing segregation would lead to lower satisfaction among female employees. These findings were corroborated by Bender

et al. (2005) using US data. Economic literature on the subject of discrimination has overwhelmingly been carried out on the assumption that financial rewards for the disutility of work alone matters; it also assumes that education itself is a disutility as individuals.

Bender et al. (2005) made the point that non-wage characteristics could have explanatory powers in explaining gender wage gaps as job satisfaction also entails fringe benefits, working conditions, effort requirement, the chance of promotion, the quality of colleagues and supervisors, and intrinsic value of the job being done. Their own research using the US National Survey of Changing Workforce (NSCW) 1997, limited by a sample size of 1,854, showed that females were willing to forgo part of their wages in return for greater flexibility.

Idson (1990) analysed the relationship between firm size and job flexibility, and the extent to which wage differentials resulting from firm size can be accounted for by job flexibility. Using a cross-sectional Quality of Employment Survey data from 1977, Idson (1990) found work structure in larger firms to be more formal and regimented than in smaller firms. The models used in the study were, however, not clearly defined leaving little room for review.

Catanzarite (2003) investigated how changes in race-gender composition influenced occupational pay. Although Catanzarite (2003) opined that the devaluation argument is consistent with Becker's taste-based argument, the proponents of the devaluation have argued that discrimination is driven by the desire of males to "preserve their advantaged position and their ability to do so by establishing rules to distribute value resources in their favour" (Reskin, 1988). She also suggested that white males faced erosion in their wages when the proportion of females or minority groups in an occupation rose. Catanzarite

(2003) used two panel regressions covering different time periods with cross-sections based on occupations, with the only educational input being the mean education of whites for the base year. The author did not explain the theoretical reason for this nor did she display the regression results in the paper.

Cohen and Huffman (2003), in order to prove devaluation theory, tested three hypotheses; firstly, that occupations that are highly represented by females will have lower average wages, secondly, that gender inequality is higher in occupations with high female representation and, thirdly, that the negative effects against females are weaker in integrated labour markets. They derived a sample from the 1990 United Stated, and ran separate regressions, which controlled for worker specific and firm related characteristics, for males and females. The authors claimed that their results supported the first two hypotheses. However, their presentation and interpretation of the results is spurious. Firstly, they only displayed values of the intercepts from the various regressions. Secondly, the authors only compared the values of the intercepts in the various regressions to derive at their conclusion. Comparisons between equations cannot be based on the intercept alone; the slope, which is a function of the various exploratory variables, too needs to be taken into account.

England, Allison, and Wu (2007) attempted to test the "devaluation" view of discrimination, which posits that female occupations pay less simply because of the culturally lower status of females who fill up these occupations. They used a fixed-effects model, with cross-sectional dummy variables for occupation, on United States data for the period from 1982 to 2000 to investigate if changes in sex composition of occupations during this period had any significant impact on wages. They found only "very modest evidence" to support the devaluation hypothesis because only 17 of the 32 logit models they tested returned a

significant result. The independent variables in the models here had lags of between two and nine years, whereas in Levanon, England and Allison (2009) used decennial census data from 1950 to 2000. Using a short panel series, they found support for devaluation. The robustness of the econometrics in these two papers is questionable. Firstly, there was no clear explanation for the basis of lag selection decisions. Models need to be parsimonious; else the results would be unstable. Secondly, the data series in both papers are short.

Magnusson (2009a) aimed to show a negative relationship between the female composition of an occupation and the occupation's prestige. Though paper did not include measures of human capital, it tested the premise of devaluation theory, which is founded on the notion that society values females less than males, by investigating if the proportion of females in an occupation reduced its prestige. Using employment data from Sweden, where the rate of female employment is high, she found that occupations which had between 41 and 60 per cent females possessed the highest prestige. However, females still earned lower wages compared to males in spite of attaining occupational prestige. She also found that care work, which is predominantly female, did not suffer from low prestige; suggesting that devaluation theory does not explain gender wage gaps. Later, using regression models with specific human capital measures, Grönlund and Magnusson (2013) did not find any evidence to challenge the earlier findings.

Magnusson (2009b) attempted to explore if family obligations of males and females contributed to gender wage differences by analysing wage data from Sweden, a country with a high female employment rate due to its dual earner family policy model., where in 2000, 77 per cent of all women between the age of 16 and 64 years were employed. A key independent variable in this study was the prestige of an occupation, defined as the general

desirability of an occupation. Her results showed that the gender wage gap for couples with children grew with occupational prestige, whereas the relationship was insignificant for couples without children, and single males and females. Her conclusion was that the unequal distribution of family responsibilities, evidenced by couples with children where female members are unable to dedicate as much time to work as others, resulted in a lower pay-off to prestige for females.

Hegewisch et al. (2010) attempted to link the relationship between occupational segregation and gender wage gap by studying the trend in occupational segregation in the United States from the 1970s till the mid-1990s. They presented an argument which showed that occupational segregation was correlated with the gender wage gap. Their methodology is however questionable. Using data from the Bureau of Labor Statistics, they defined without any justification that a highly skilled occupation if at least 50 per cent of its members had a bachelor's degree. Carrying this out on 503 different occupational groups, the "highly skilled" occupational group represented 30.3 per cent of the workforce, with proportion male and female workers in this cohort being 27.2 per cent and 34.0 per cent respectively. Although females were better represented in this group, the authors presented a table which displays occupations by skill level and gender domination. The table presents chief executives, computer software engineers and construction managers as highly skilled male-dominated occupations and elementary and middle school teachers, registered nurses and social workers as highly skilled female-dominated occupations. The authors then compared weekly median wages between these occupations and showed that female occupations pay less than male occupations through "precise statistical analysis."

Economist (2011) published a largely unsupported article where they firstly argue that females earn less than males and have lower employment rates in high earning jobs. The article notes that several European governments are setting female quotas for female Board position in companies. The also suggest that females in developing countries "remain second-class citizens, lacking basic rights and suffering violence and many kinds of disadvantage."

2.4 Past Research on Malaysia

Hirschman (1983) examined ethnic inequality in Malaysia drawing on a two per cent sample of the 1970 Population Census. The study that ethnicity was strongly identified with economic sector and occupation. On the one hand, Hirschman found that 61.3 per cent of ethnic Malays were employed in the agricultural sector, 64.6 per cent of whom were self-employed. On the other hand, only 24.2 per cent of ethnic Chinese and 33.6 per cent of ethnic Indians were employed in agriculture, with self-employment being 37.6 per cent and 10.7 per cent respectively. In the services sector, Hirschman's data showed that ethnic Malays were active in education, ethnic Chinese were well placed in manufacturing, and ethnic Indians were positioned in government services. Chinese, and to a lesser extent Indians, had greater opportunities for employment in urban areas than Malays. This study brings out the point that ethnicity is an important explanatory variable in analysing Malaysian wage data.

Chapman and Harding (1985) analysed data from the ITM Tracer Study covering 733 Bumiputeras who entered and graduated from Institut Teknologi Mara during 1976 and

1977. Females in the sample earned lower mean wages than males, with the latter on the average earning 0.212 log points more than females in the private sector. Contrary to literature, their wage equation showed that females received higher returns to schooling than males after controlling for human capital. There are two distinct issues with this study. Firstly, although the authors appeared satisfied that their sample size was large and well distributed across the occupations, nine of the twelve female occupations had small sample sizes of observations less than 30. Secondly, as the age of the respondents were around 27 years, they would all be recent entrants to the labour market. Work experience would therefore play a limited role in measuring wage differentials.

Lee and Nagaraj (1995) analysed a 1991 survey covering a total of 1,434 employees in 120 manufacturing firms located in the Klang Valley area, which is the most developed and industrialised region in Malaysia. The utilised a wage regression that included both educational level and occupation. There was also a dummy variable to record if the worker had more than one instance of establishment-based training. Lee and Nagaraj (1995) argued that males had a more favourable occupational distribution whereas females were concentrated in subordinate roles. Females were also paid less than males for similar human capital endowments, with 46 per cent of the average wage disparity between males and females being the result of discrimination. However, the wage regression in the study appears to suffer from multicollinearity as there are highly correlated variables. The regression includes educational level and occupational group. For instance workers who are professionals are more likely to receive a university degree while semi-skilled workers would possess less schooling. This is topped by a variable which recorded if a worker received more than one instance of establishment-based training.

Schafgans (2000), using the Second Malaysian Family Life Survey of 1988-1989, aimed at comparing the gender wage differentials using both parametric and semi-parametric estimation methods, the latter being used with as it relaxes the distributional assumptions of the errors. He results showed that there was increasing returns to secondary school education for both males and females, with significant gender wage discrimination against females in the Malaysian labour force. His regressions also produced coefficients which showed that urban workers earn higher wages than rural workers. Schafgans (2000) analysis did not control for employer related variables, which can have significant impact on results, especially since Hirschman (1983) had shown that ethnicity was strongly identified with economic sector and occupation.

Rasiah and Shari (2001) reviewed the implementation and outcomes of government intervention in Malaysia vis-à-vis the New Economic Policy (NEP). They argued that both government interventionist policies and market coordination activities had been major influencers of economic growth, poverty alleviation and distributional outcomes. Although ethnocentric distributional policies of the NEP sapped the economy of rents, they argued that the poverty alleviation and distribution programmes ensured political stability. On the whole, however, they opined that poor institutional oversight created substantial rent seeking while lacking technology-deepening potential undermined the country's ability to compete with the emergence of cheap cost sites like China.

Jomo (2004) believed that the NEP played a major role in influencing, among others, corporate wealth distribution, education and occupation. Ethnic discrimination was principally aimed at the business community and middle class. This resulted inter-ethnic business

coalitions where the Malay partners secured government-determined business opportunities, while the Chinese partners invested capital and business know how.

Table 2.1 displays the educational attainments of the labour force in Malaysia from Malaysia (2010). Between 2001 and 2009, the labour force participation of females increased from 35.4 per cent to 36.2 per cent. While females continued to have higher illiteracy compared to males, the proportion of working females without any formal education fell faster for females than males during this period. The proportion of workers with tertiary education was higher among females compared to males throughout this period. Furthermore, male workers with tertiary education rose by only 5.9 per cent from 13.8 per cent to 19.7 per cent during this period compared to a rise of 11.6 per cent for female workers from 18.2 per cent to 29.8 per cent. During this period, the proportion of female workers who possessed a minimum of secondary school education overtook the proportion of male workers with such endowments. In 2001, 70.7 per cent of female workers had a minimum of secondary school education compared to 70.9 per cent for male workers. In 2009, the figures were 80.1 per cent and 77.9 per cent respectively. These figures suggest that females in the labour market should be well represented in the higher paying occupations.

Table 2.1: Educational Attainments in Malaysian Workforce by Gender, 2001-2009

A. Males									
	2001	2002	2003	2004	2005	2006	2007	2008	2009
No Formal	232.1	245.8	237.8	230	240.1	206.4	221.9	269.6	242.8
	3.7%	3.9%	3.6%	3.5%	3.6%	3.0%	3.2%	3.8%	3.4%
Primary	1,593	1,576	1,552	1,532	1,474	1,486	1,429	1,404	1,353
	25.4%	24.8%	23.7%	23.2%	22.0%	21.7%	20.5%	19.9%	18.7%
Secondary	3,573	3,579	3,760	3,799	3,898	4,031	4,114	4,139	4,198
	57.0%	56.4%	57.3%	57.5%	58.2%	58.9%	59.1%	58.5%	58.2%
Tertiary	867	950	1,009	1,049	1,088	1,120	1,194	1,261	1,424
	13.8%	15.0%	15.4%	15.9%	16.2%	16.4%	17.2%	17.8%	19.7%
Total	6,266	6,351	6,559	6,610	6,699	6,843	6,958	7,075	7,218
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
B. Females									
	2001	2002	2003	2004	2005	2006	2007	2008	2009
No Formal	261.9	277.4	250.4	253.3	236.2	197.3	210.6	219.4	196.2
	7.6%	7.9%	6.8%	6.8%	6.4%	5.2%	5.4%	5.5%	4.8%
Primary	743.9	750.3	738.1	716.3	671.2	687.2	675.2	612.2	617.1
	21.7%	21.2%	20.1%	19.2%	18.1%	18.2%	17.2%	15.5%	15.1%
Secondary	1798	1804.8	1905.1	1900.3	1897.8	1958.4	2020.1	2047.3	2063.8
	52.4%	51.1%	51.8%	50.9%	51.1%	51.7%	51.5%	51.8%	50.4%
Tertiary	625.2	701.2	785.5	860.2	906.8	941.9	1016.3	1074.6	1220.1
	18.2%	19.8%	21.4%	23.1%	24.4%	24.9%	25.9%	27.2%	29.8%
Total	3429	3533.7	3679.1	3730.1	3712	3784.8	3922.2	3953.5	4097.2
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Note: The frequencies displayed above are in millions.
Source: Malaysia, 2010

Fernandez (2006), using earnings decomposition and quantile regressions on Malaysian 1995 Labour Force Survey (LFS) and 1995 Household Income Survey (HIS) analysed, firstly, labour force participation, employment status and earnings of both wage earners and self-employed individuals and, secondly, gender earnings differential across occupational groups. She suggests that males are over-represented in agriculture, sales and services, and blue collar occupations, while females are over-represented in white collar occupations especially clerical but less so in professional and technical. Fernandez also claimed that females were under-represented in the managerial group without stating that males were

over-represented in this group. She also found males to earn more across all occupations. These findings however did not control for industry or other firm related characteristics, while the various regressions had differing values for "number of observations" without any explanation being offered.

2.5 Research Questions

This preceding section provided an overview of the literature on gender wage inequality and devaluation. Most of the analytics on gender wage inequality is based on the Mincer's (1962, 1974) earnings function. The Mincerian earning equation, which relies solely on the human capital variables, has several limitations besides the neoclassical assumptions attached to it. Firstly, as the human capital variables are supply side variables, the models do not include any demand side variables, some of which the firm related characteristics can provide. Secondly, using number of years of schooling alone is not a sufficient measure of educational investment; the course of study is also important. This would have been consistent if the distribution of educational courses among males and females were similar. However, Brown and Corcoran (1997) showed that males and females on the average study differing courses in college, and this could affect the occupation of an entrant into the labour market. When hiring workers especially professionals, firms have to first ensure if the prospective workers have the relevant educational background rather than hire on the basis of number of years of schooling even though such qualifications may require as many years of school. The wage models that use the number of years of schooling as a determinant of wages intrisically assume that both males and females have the same educational distribution; this leads to a biased model.

Although there have been numerous studies (Abowd and Killingsworth, 1983; Willis, 1986; Heckman, 1998; Abowd et al. 1999; Altonji and Blank, 1999; Bowler and Morisi, 2006) that provided empirical evidence to show the significance of incorporating firm characteristics in the wage equation, even recent works fail to address these concerns. The continued failure to include firm characteristics in the earnings equation in gender inequality studies in the labour market when the effects of these variables are significant would lead to missing variable bias in the econometric models, thereby resulting in biased coefficients in the employed models.

Interestingly, labour economists who research wage inequality do not include devaluation in their analysis. Research on devaluation is often carried out by feminist economists and sociologists instead. There is however a paradox that overlaps both areas of research. On the one hand, it is argued that female-dominated occupations pay less than male-dominated occupations. This implies that irrespective of the level of schooling, the distribution of females among occupations will be lopsided with greater participation in lower waged occupations. On the other hand, human capital earnings function based econometrics, which is used by both labour economists and feminists, use schooling as a key measure of human capital. While the devaluation literature implies that occupations determine wages, the human capital function implies that schooling is the key determinant.

In 2011, 40 per cent of global non-agriculture wage-earning jobs were held by females compared to 35 per cent in 1990 (United Nations, 2013). The same report finds that, except for Western Asia, Southern Asia and sub-Saharan Africa, the enrolment of females world-wide has at least match male enrolment. If the returns from education were not satisfactory,

females would not have pursued higher education except for non-economic reasons. However, there is no literature that suggests why females would want to pursue higher education for non-economic reasons.

Another observation is that several studies equation (England et al., 2000; Lee & Nagaraj, 1995) used regression models that included both schooling and occupations. As the amount of time workers spend on schooling as being strongly correlated to their occupation (Becker, 1962; Mincer, 1958), there is the risk of a high degree of multicollinearity. The use of occupation (Autor, Katz, & Kearney, 2008; Long, Rasmussen, & Haworth, 1977) as first suggested in Mincer (1958) instead of schooling is in my opinion the more robust option.

The literature is highly concentrated on developed countries and relies mainly on population surveys, which provide little information on firm characteristics. There is thus greater need for studies from developing countries where, according to Economist (2011), females are second-class citizens with less rights compared to males. Seguine (2000) had earlier attributed the export performance of Asian countries to low female wages, while the low economic and social status of females ensured investors that there would be no labour strife by female workers. Within the context of the Millennium Development Goal (MDG), it is of global interest to see how gender discrimination pans out in a steady growth developing country like Malaysia. The usage of employer-employee linked data should also make the analysis more robust if the claims of its proponents are true.

This study aims to explore several gaps in the literature. Therefore, the following research questions will serve as a guide for this study:

1. Is occupational segregation a cause of gender discrimination?
2. Does the absence of firm related characteristic in an earnings equation bias the results?
3. How do firm size, gender composition and foreign-ownership affect gender wage differentials?

The first research question aims to test the presence occupational segregation in a developing country where the average female worker has higher educational levels than the average male worker. If segregation exists, the reasons for the continued female "investment" in education need to be re-examined. The second research question analyses the explanatory powers of firm characteristics in explaining wage differentials, and if so what the effects are in the earnings equation. The third question explores how specific firm related characteristics affect wage inequality. In the subsequent three sections the theoretical guides to the above three research questions, along with their related hypotheses, are discussed in detail.

2.6 Theoretical Guide to Research Question One: Is occupational segregation a cause of gender discrimination?

This section examines the key theories dealing with occupational segregation among gender groups and discrimination. Two hypotheses are then advanced from the review.

2.6.1 Occupational Segregation

In contrast to Edgeworth's (1922) observation that male dominated trade unions pushed for the exclusion of females from many occupations that resulted in the crowding of females in certain occupations, Bergmann (1974) argued that the crowding effect was instead a result of the aversion against females due to their lower social status compared to males. This resulted in females earning lower wages compared to males for two reasons. Firstly, the crowding of females in certain occupations created an excess supply of female worker. Secondly, females were forced to take up jobs that were unrepresentative of their qualification, and as a result earned wages that were lower than what their qualifications would have entitled them to in the absence of such segregation.

Devaluation theory argues that one of the features of gender inequality is that occupations have traditionally been divided along gender lines (Bergmann, 1974; Bielby & Baron, 1986), and this resulted in lower average wages for both males and females in occupations that have high female participation (Bergmann, 1974; Fields & Wolff, 1991; Reskin, 1988). Empirical evidence to support the devaluation argument has not been without dispute. Looking at the 1939-1940 United States Manufacturing Census, Slichter (1950) noticed a "not pronounced" tendency for male hourly wages to be low in occupations that had high proportions of female workers. Fields and Wolff (1991), after analysing the 1970 and 1980 CPS data, showed greater segregation at the detailed occupation and industry level. Likewise, using United States wage data for the period 1974-1983, Petersen and Morgan (1995) showed that much of the gender discrimination occurred at the occupation within firm level; a study which Tam (1997) subsequently criticised as being irrelevant for utilis-

ing an extremely detailed level of analysis while failing to account for the gender composition effects. Tam also opined that devaluation only exists at the very detailed occupational level as detailed by Tomaskovic-Devey and Skaggs (2002).

Blau and Kahn (1994) viewed males and females as imperfect substitutes in the labour market who participate in different occupations and industries, which result in different wage settlements, even though they might share other similar characteristics. Besides relative qualifications and discrimination, they suggested that market factors and institutional arrangements also influence the determination of the returns that workers receive.

Fields and Wolff (1991) observed that gender based occupational segregation in the United States declined during the 1970s and 1980s as the employment growth within occupations increased. They thus speculated that periods of high growth lead to a reduction in gender wage gaps as barriers of entry to females into occupations reduce. On the contrary, Standing (1999) argued that the feminisation of "male" occupations was instead the main cause of the reduction of barriers to females. Standing's claim was that the position of male workers was weakened as a result of external labour markets becoming more important than internal labour markets due to weaker labour institutions, reduction in craft skills learned through apprenticeships and skill polarisation as firms now need less specialised skill workers but more workers who require little training.

More recently, there has been an alternate suggestion that females face a glass ceiling that limits their progress after a certain point in their career. As a result, females fall behind males at an increasing rate as they approach the top of the wage distribution. Evidence for the glass ceiling phenomenon has been provided for United States by Cotter et al. (2001),

and for Sweden by Albrecht et al. (2003). Hoobler, Wayne, and Lemmon (2009) argued that these outcomes were due to the perception of bosses, both male as well as female, that female worker were subjected to greater family-work conflict compared to male workers. Psychological experiments also showed females as being more risk averse and aim to avoid competition, something that males embrace (Niederle & Vesterlund, 2007).

Wages are less of a determinant of job satisfaction for women compared to males as job flexibility offers females greater job satisfaction than it does for males (Sloane & Williams, 2000; Bender et al., 2005). These studies also observed that job satisfaction of females increased in environments that had higher proportions of female workers. Sloane and Williams (2000) therefore suggested females preferred workplaces which were female "dominated," and any effort aimed at reducing segregation would lead to lower satisfaction among female employees. Bender et al. (2005) also noted that females were willing to forgo part of their wages in return for greater flexibility, which was more likely in smaller firms as compared to larger firms which are more formal and structured (Idson, 1990). Female Malaysian workers are also possibly more transient at the workplace than their male colleagues as in 2009, 3.6 per cent of males and 5.8 per cent of females worked less than 30 hour a week (Malaysia, 2011).

Although there is substantial evidence for increasing equality in occupational distribution and reducing gender wage differentials (Blau, 1998), studies such as that of Hegewisch et al. (2010) continue to argue that females are still occupationally segregated at the work-place. The Economist (2011) pressed the claim that females are "second class citizens" in much of the emerging markets and are thus rewarded with lower pay. Even if segregation was previously present, recent literature and the increasing educational level of female

workers in Malaysia and most other countries suggest the possibility that occupational segregation may not be a significant issue in the labour market. It is therefore important to first establish if females are occupationally segregated in Malaysia before we proceed with other enquiries. As such, the following hypothesis will be tested:

H1.1 There is occupational segregation of female workers in Malaysia.

2.6.2 Gender Wage Discrimination

Models for discrimination can be grouped into competitive or collective models, the former studying individual maximising behaviour and the latter analyse how groups act collectively against one another. Competitive models are generally grouped into taste-based (Becker, 1971) or statistical (Arrow, 1973; Phelps, 1972). Since wages are linked to productivity, Becker (1971) opined that the portion of the wage gap between workers that cannot be accounted for by productivity could be the result of discrimination.

Phelps (1972) suggested that labour markets can be imperfect as a result of imperfect information regarding availability and characteristics of individuals and jobs. Although Phelps was uncertain of the prevalence of statistical discrimination, he reasoned that if information is expensive then the employer would hire members of the demographic group whose members the employer felt would on the average be more productive and reliable. Arrow (1973) presented a rational expectations model of discrimination where an employer has some preconception of the productive of different demographic groups. In Arrow (1998), he opined that a network model is perhaps better suited to explain labour market

discrimination as personal interactions occur throughout the hiring process while the profit maximisation motive of the employer is superseded by the social rewards it brings.

Mincer (1958) showed that the amount of time spent on schooling and training differed among occupations, and those occupations which offer generally higher earnings had shorter working life as they required greater schooling and training. Although Mincer's aim was to operationalise the principle of compensating differences, later neoclassical theorists have explained the relationship between schooling and occupation to be the consequence of the increase in productivity that more educated individuals bring to the workplace. The correlation between schooling levels and wages has been identified in numerous other works (Autor et al., 2008; Bayard et al., 1999; Fally et al., 2010; Long et al., 1977). Rumberger (1987) and Psacharopoulos (1994) showed that the rate of return can decline at higher levels of schooling. However, Becker (1962) suggested that workers' productivity was itself dependent on their occupation, and on-the-job acquired skills. He also suggested that the average investor in human resource, being more impetuous, is more likely to err than the average investor in real capital.

Researchers have also suggested other reasons for gender wage differentials. Becker (1985) suggested that since motherhood is effort intensive, married females tend to look for jobs that are less demanding than their human capital qualifies them to in order to economise on effort. Macpherson and Hirsch (1995) suggested that if job tenure, proportion part-time, occupational training requirements, hazards, and physical and environmental conditions were included into a wage model, the gender wage gap would be lower. Magnusson (2009b) found that, where married or cohabiting males and females had similar occupational prestige, the wage gap within the couple was greater when they had children.

Heckman (1998) opined that gender wage differentials are not necessarily a result of discrimination, and that there was a staggering gap in the "human capital variables" known to the personnel department of firm but not available to economists' that could account for these discrepancies. According to Tam (1997), the significance of occupation-specific and industry-specific training in the labour market was sufficient to explain the gender and ethnic wage differentials.

Whether or not females are segregated occupationally, it is important to test for the presence of gender wage discrimination. It is possible for females to be segregated occupationally but not discrimination on the wage they receive. Alternatively, there is the possibility that females may be "free" to enter any occupation but might experience injustice within the occupation, workplace or firm. Both factors could also jointly contribute to females being discriminated in the labour market. Evidence of discrimination is also important in justifying the need for studying the relevance of firm size in the analysis of discrimination. Therefore, the following hypothesis is tested:

H1.2: There is evidence of gender wage discrimination in the Malaysian labour market.

2.7 Theoretical Guide to Research Question Two: Does the absence of firm related characteristic in an earnings equation bias the results?

This section examines the key theories dealing with human capital theory, discrimination and firm characteristics. Three hypotheses are then advanced from the review.

2.7.1 Human Capital Variables and Firm Characteristics

Becker and Chiswick (1966) defined the total earnings of an individual to be the sum of the individual's earnings from the human capital investment plus the earning from the "original" human capital. This is clearly operationalised in Mincer's (1958, 1974) human capital earnings function. Willis (1986) pointed out that the Mincerian model assumes that human capital is homogenous across workers, and influences workers' productivity homogenously across all occupations and firms. He opined that as a result of the development of agency theories regarding employee-employer relationships, employer-employee linked data was crucial for progress in the area. After analysing a sample of 2,000 workers in a travel and insurance company, Abowd and Killingsworth (1983) showed that CPS based regression data can only account for 20-30 per cent of wages variation whereas personnel data in the possession of employers can account for 60-80 per cent of this variation. Abowd et al. (1999) looked at both human capital and firm heterogeneity among using longitudinal employer-employer linked data of a sample of more than a million workers employed across half a million firms. They found that that both worker and firm characteristics showed significant explanatory powers on wage variations.

According to Heckman (1998), the phrase "human capital variable" does not have any clear definition as its usage varies across studies but has generally come to represent some combination of education and experience, and which came to be dependent on the available CPS data. Heckman pointed out that the standard models used in estimating discrimination omitted variables available to the firms, and used by these firms, in making labour market

decisions. Using decennial Census data of the US from 1940 to 1990, Heckman et al. (2003) also showed that the logarithm of earning does not move linearly with schooling.

Another issue relates to specialised firm or occupation specific training which provides increasing returns to workers as opposed to general training (Becker, 1985). The specialised human capital hypothesis instead posits that the same worker should receive different wages for occupations which require differing specialised human capital (Tam, 1997). He pointed out that firm-specific human capital varies across firms while occupation specific human capital does not. On the other hand, industry captures work setting and product. As a result, Tam suggests that females who were employed in lower paying occupations were paid lower because the jobs required less specialisation.

A large body of work has shown that firm characteristics do contribute to wages disparity among workers. Workers in large firms earn more for they are more productive (Lester, 1967; Masters, 1969; Idson & Oi, 1999; Söderbom & Teal, 2004), as do that urban workers compared to rural workers (Schafgans, 2000), and in firms at locations that provide better market access and supplier access locations (Fally et al., 2010; Hering & Poncet, 2010; Ma, 2006). Inter-industry wage differences exist due to unmeasured differences in the productive endowments of workers (Gibbons & Katz, 1992). Furthermore, on the average, foreign firms in all countries appear to pay higher wages than domestic firms (Lipsey & Sjoholm, 2001).

Although there has been much criticism of using the human capital variables alone, studies continue to be produced that do not address the criticisms. Even Tam's (1997) support for a specialised human capital model does not suffice. Firstly, firm characteristics such as size,

industry, location and ownership are still ignored. Secondly, Heckman does not address how the firm-specific human capital data can be captured. At best we can assume that within a large sample, as this study suggests, firms with similar characteristics in the same industry will on the average have similar firm-specific human capital. This I believe is a fair assumption as otherwise workers mobility within an industry would be expensive. Workers would face the opportunity cost of having to accept a reduction in wages as some of their human capital would be specific to a different firm, and the workers' earlier acquired firm-specific capital might suffer from "atrophy" or depreciation as suggested by Mincer and Polachek (1974). In the meanwhile, workers would have to invest in "new" firm specific training.

In summarising previous research on wage differentials in the labour market, Altonji and Blank (1999) opined that more effective methods for the measurement of school quality and better data for measuring worker skills were required if the returns to unobserved skills were to play a major role in wage determination. It would also be useful for knowing how less skilled workers can overcome negative wage effects. They suggested that firm specific research could be a significant contributor to this understanding.

As employer-employee linked data is required to study the significance of using firm characteristics in analysing wage differentials, the large workplace survey dataset provided by NER 2009 allows for the investigation into the discussion above. As such, the following two hypotheses will be tested:

H2.1: Firm characteristics contribute significantly to the explanatory powers of the wage function.

H2.2: Including firm characteristics significantly alters the results of wage function and decompositions.

2.7.2 Gender Composition in Firms

Although proponents of devaluation theory proposed that gender composition in an occupation affect workers' wages, Magnusson (2009a) and Grönlund and Magnusson (2013) show that this is not the outcome of low social standing as argued by the former. Buckley (1971) did observe that gender composition at the firm level does affect wages; firms hiring greater proportions of males tended to pay higher wages. As such, the third hypothesis tests if gender composition within a firm affects male and female workers' wages. If this hypothesis is true, and if the effects are significantly greater for females compared to males, it could suggest that some of the causes for discrimination might be entirely firm related rather than being viewed as systemic within the labour market. As such, the following hypothesis will be tested:

H2.3: Gender composition at a workplace affects gender wage differentials.

2.8 Theoretical Guide to Research Question Three: How do firm size and foreign-ownership affect gender wage differentials?

This section examines the key theories dealing with gender wage discrimination. Five hypotheses are advanced from the review.

2.8.1 Gender Composition at the Workplace

An area that has not been well explored within the literature is whether the gender composition within a firm plays a significant role in determining wage differences. Although Buckley (1971) makes the important observation that firms which hired all male workers paid higher occupational wages than firms that hired only female workers with the wage differences significantly diminishing in firms that hired both males and females, others have not sought to investigate Buckley's (1971) observation. Feminist literature since Bergmann (1974) has instead been suggesting that it is the occupations with high proportions of females offer lower wages. Hence, the second hypothesis tests Buckley's (1971) finding that gender composition within a workplace affects male and female workers' wages.

H3.1: The ratio of male workers to total workers at a workplace contributes to gender wage inequality at the workplace.

2.8.2 Firm Size and Inequality

Since the output per worker is greater in the larger firms as these firms tend to choose a greater capital-labour ratio, larger firms also seek more skilled workers to complement their capital intensive operations (Idson & Oi, 1999). Using a panel study of manufacturing firms in Ghana between 1991 and 1997, Söderbom and Teal (2004) are also able to show that

larger firms tended to hire workers with greater human capital and as such incurred higher relative labour costs compared to smaller companies.

The difference between large and small firms is not merely a matter of scale; they are both also structurally different. Unlike large firms, the small firms tend to possess simple and highly centralised structures (Thong, Chee-Sing, & Raman, 1996). Moreover, the larger firms also have a greater tendency to formalise ethical practices compared to smaller ones (Singhapakdi, Sirgy, & Lee, 2010), leading to more transparent hiring practices. These firm related characteristics provide evidence that firm size plays a significant role in the management structure and practice. While gender-based discrimination could be practiced by any employer, firm size should affect the extent of gender wage inequalities. Based on the preceding discussion, the following hypotheses will be tested:

H3.2: Large firms offer significant wage premiums over small firms.

H3.3: There is a correlation between firm size and gender wage inequality.

2.8.3 FDI and Gender Inequality

Neoclassical economic theory predicts that the increase in competition resulting from the opening up of countries to foreign investors would result in the elimination of taste-based discrimination in these countries (Becker, 1971). In support in this, Black and Strahan (2001) show that the deregulation of the banking sector during the 1980s in the US led to a reduction in the gender wage gap within the industry. This, according to Black and Strahan (2001), is due mainly to the rise in status of females employed in the banking sector, and

the greater fall in male wages compared to female wages as a result of deregulation. On the contrary, Berik, Rodgers and Zveglich (2004) find that greater trade openness in concentrated industries in Taiwan and Korea increases gender discrimination against females in these industries. Likewise, concentrated manufacturing industries in India display a rise in the gender wage gap with an increase in trade openness (Menon and Rodgers, 2009). Menon and Rodgers (2009) suggest that rather than helping females achieve greater equality, pressures to cut costs due to international competition are actually hurting women's relative wages. In view of the opposing views, the study also tests the following hypothesis:

H3.4: Firms with foreign shareholding exhibit lower gender wage discrimination.

2.9 Summary

Although there is a large literature on gender wage inequality, it is evident from the literature review that significant gaps exist in the research. With the evolving demography of workers, social institutions and economic development, much of what was true in the past could have changed today. The research questions in this study aim to investigate two strands of gender inequality, them being occupational segregation of females and the role of firm characteristics in gender wage inequality.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter provides an overview of the methodology employed in the study. It also discusses the overall research framework, data and variables that are to be used in this study. The specific research will be discussed within the relevant analytical chapters. Firstly, the research framework is discussed. The analytical framework used in this study expands on Tam's (1997) framework (see Figure 1.1), which attempted to answer why males and females were occupationally segregated, and why predominantly female occupations paid lower wages. The framework used in this study, instead, first aims to identify if females were segregated into lower paying occupations, and subsequently examine if and how firm characteristics contributes towards wage determination and inequality. It is well documented in the literature that human capital plays a significant role in wage determination, and as such will not be explored in this study. A brief explanation on the NER survey and variables are subsequently presented in this chapter.

3.2 Research Framework

This study develops on the framework proposed by Tam (1997), which is presented in Figure 1.1. Tam's framework first investigates the allocations of occupations by gender

followed by an investigation into the relationship between the gender composition of occupations and wages. His objective was to identify if discrimination was against female workers or female work.

The framework of this study is schematically displayed in Figure 3.1. It proposes two sources of discrimination for females; occupational allocation and firm characteristics. The study would investigate if occupational segregation, whereby females dominate low paying occupations whereas higher paying occupations are occupied by males, is evident. As occupational segregation is a major contributor of gender discrimination according to its proponents, analyses of gender discrimination must include within the study if and how occupations are allocated by gender. As firms generally fill up job vacancies by occupation, it is the occupation of the worker that often determines which firm he or she works in. The exceptions to this are the new entrants into the job market who might not have had occupation related training, and those opting to change their occupations. The characteristics of the firm such as size, location, ownership characteristics and industry should play a role in determining wages. As such, the framework also formally introduces firm characteristics into the worker's earnings function along with the worker's human capital. The study will statistically examine if firm characteristics contribute significantly as an explanatory variable in the wage function. The introduction of the glass ceiling into the framework accommodates recent studies that suggest that there are barriers that make it difficult for females to progress beyond a certain point in their occupation or firms.

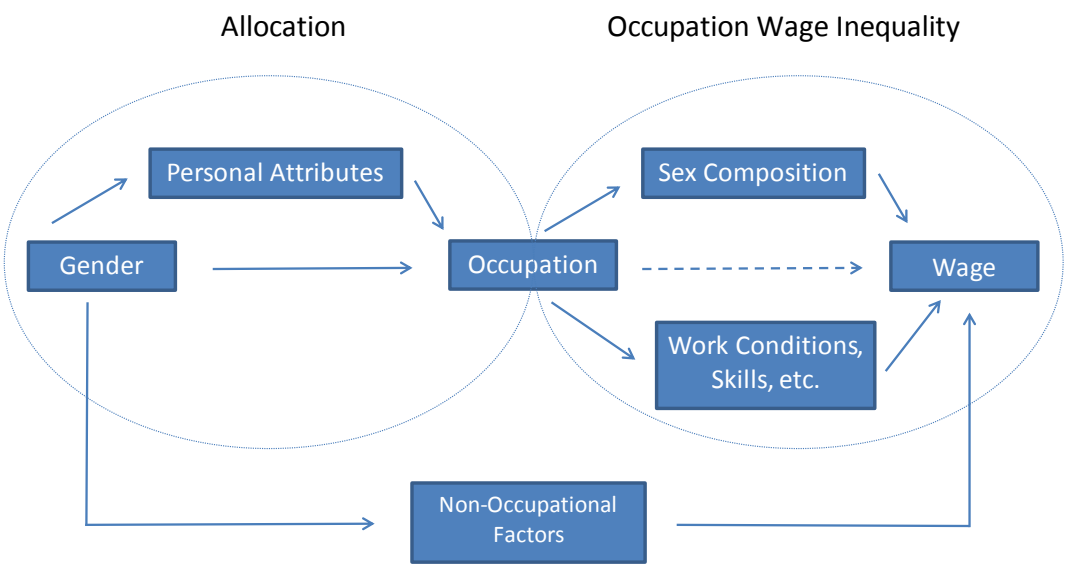

Figure 3.1: Occupational allocation, firm characteristics, wages and gender inequality

3.3 National Employment Returns 2009

The National Employment Return 2009 (Malaysia, 2012) was the second such survey conducted by the Labour Department of the Ministry of Human Resources, Malaysia. The previous survey of 2007 had very limited fields of inquiry, and as such it was not possible to combine both surveys in the study. As such this study did not request the Ministry for the 2007 survey data, while much of the 2009 survey data was made available for the present use.

Survey forms of the National Employment Return (NER) are sent to relevant workplaces by the Labour Department, and firms are required to complete and return these forms as per Section 63 of the Employment Act 1955 of Malaysia. Failure to comply could result in a

conviction under the Act, with a maximum fine of RM10,000. The cover page of NER 2009 is attached under Appendix A of the study. The data is classified as an official secret under the Malaysian Official Secret Act 1972; and special permission was required for access to the data.

The NER 2009 was a workplace survey that linked 847,130 male workers and 469,562 female workers employed at 24,458 workplaces across Malaysia, with the government's expressed aim of gathering information on the labour market. This sample is 35.6 per cent female, which approximates the Department of Statistics Malaysia estimate (Malaysia, 2010) of 36.2 per cent female in the Malaysian workforce.

Data was stored on a multi-dimensional database at the Labour Department, and output was provided for this study in two MS Excels files, one with workplace information and the other with worker information. The worker information file had a field for workplace identification which allowed me to subsequently include the workplace details to the worker records. Employee's age and salary were collected as grouped data. There were 10 groups for age and 16 for salary, and the mid-point of each group was used as the group mean. The workplace data provided included location, industry, ownership details and compensation policy. There was a frequency field to record duplicate records. Econometric analysis was carried out using the data analysis and statistical software Stata SE Version 11.2 as it was not just able to efficiently handle large dataset but it also allowed for frequency weights to be used even for decomposition.

3.4 Measurements and Variables

The variables used in the analysis are discussed herewith:

3.4.1 Wages

Although most researchers used hourly wage rates, in Malaysia wages are offered to workers as monthly salaries, and paid monthly. Employers are required by law to pay workers' salaries by the seventh day after the last day of the wage period.

Since workers in some firms work five days, and five and a half days in other firms, it is cumbersome and unnecessary to calculate wages on an hourly basis as is practiced in much of the literature. The study uses the logarithm of monthly wage in US dollar equivalent.

3.4.2 Age

Experience is often measured as age less years of schooling. However, it was not possible to tabulate experience since workers' education levels were not provided in the dataset. Hence, *Age* was used as the proxy. Experience is a function of age (Mincer, 1958).

3.4.3 Age_squared

Mincer (1974) introduced the concave function of experience in his human capital earnings function. The positive value for the coefficient of *Age* and negative value of the coefficient of *Age_squared* suggest that the logarithm of wages rise at a reducing rate with increases in experience

3.4.4 Ethnicity

Ethnicity is included as a control variable (see Altonji and Blank, 1999) as it plays a significant role in wage determination in Malaysia. Structure of employment, government policy and equity ownership are skewed along ethnic lines, and as such influence wage inequalities (Hirschman, 1983; Jomo, 2004).

According to the Population and Housing Census of Malaysia 2010 (Malaysia, 2010), the Malaysian citizenry is made up primarily of Bumiputeras consisting of Malays and aboriginal tribes, Chinese and Indians whose population are 17.5 million, 6.4 million, and 1.9 million respectively. The balance 0.18 million of the total 26 million in the population is classified as "Other".

3.4.5 Ratio Male

This variable measures the ratio of male workers to total workers at a workplace. It is useful in examining if gender composition at a workplace affects wage inequality at the workplace.

3.4.6 Location

The location of a firm affects workers' wages. Schafgans (2000) showed that urban workers in Malaysia earned higher wages than rural workers. Fally, Paillacar, and Terra (2010) found supplier access and market access to possess very strong positive correlation to wages for Brazil, and the results were similar for China as well (Hering & Poncet, 2010; Ma, 2006).

Most urban areas, as well as firms with good supplier access and market access, are located on the West Coast of Peninsular Malaysia. This is followed by the East Coast of the peninsular. The states of Sabah and Sarawak in Borneo are the least urban, with firms generally having poor access to both suppliers and markets to the extent that list prices of goods sold in these two states are higher than the list prices in the peninsular.

3.4.7 Firm Size

Workers in large firms earn more for they are more productive (Idson & Oi, 1999). However, the only reliable proxy for firm size in the NER 2009 data was company structure. Other

options such as revenue, profit or total employee in firm were not collected while the data for paid-up capital was incomplete. *Non_Ltd* firms relate to firms that are not limited in liability such as sole proprietorship, partnerships and associations. *Pte_Ltd* firm are private limited firms where number of shareholders is limited to 50. *Ltd* companies are public limited companies with unlimited number of shareholders. On average, *Ltd* companies are the largest, followed by *Pte_Ltd* companies.

3.4.8 Foreign Investment

On the average, foreign firms in all countries appear to pay higher wages than domestic firms (Lipsey & Sjoholm, 2001). To account for this, the dummy variable, FO, is introduced where a value of one indicates that the firm has foreign investment.

3.4.9 Occupational Variables

There is a paradox in the research on gender wage inequality. On the one hand, it is often argued that female-dominated occupations pay less than male-dominated occupations. This implies that irrespective of the level of schooling, the distribution of females among occupations will be lopsided with greater participation in lower waged occupations. On the other hand, earnings function based regressions and decompositions use schooling as a key measure of human capital. While the first set of literature suggests that occupation determines wages, the way the function is often structured schooling seems to be more important. Even though the amounts of time workers spend on schooling as being strongly

correlated to their occupation (Becker, 1962; Mincer, 1958), the distribution of courses of study among males and females is dissimilar (Brown & Corcoran, 1997). Schooling also ignores on-the-job training, which is loosely associated with occupation.

This study uses occupation instead of schooling in earnings function. Both Mincer (1958) and Becker (1962) viewed that the amount of time workers spends on schooling as being strongly correlated to their occupation. Spence (1973) opined that although employers use education as an observable attribute of a worker during the pre-hiring process, the employers will only be aware of a worker's productivity after some period since the hiring has taken place. Upon facing high correlation between occupation and schooling, Long, Rasmussen, and Haworth (1977) dropped schooling as an explanatory variable from their analysis as they noted that occupation possessed greater explanatory powers in their wage equations. There are also no consistent methods for introducing education into the wage equation. Autor, Katz, and Kearney (2008) measured occupational skill level in terms of the mean number of years invested in schooling by an occupation's workforce whereas Fally, Paillacar, and Terra (2010) simply defined any worker who had completed high school as skilled. The models presented in Bayard, Hellerstein, Neumark, and Troske (1999) used schooling and occupation in separate equations.

The US Bureau of Labor Statistics classifies occupations into 23 major groups (United States, 2010), whereas the Malaysian Department of Labour divides occupations into 10 major groups. As Armed Forces occupations are excluded from this study, occupations are divided into nine categories as presented in Table 3.1.

Table 3.1: Definition of Occupational Variables

Variable	Occupational Group
Manager	Managers
Prof	Professionals
Tech	Technician and Associate Professionals
Clerk	Clerical Support Workers
Sales	Service and Sales Workers
Agriworker	Skilled Agricultural, Forestry and Fishery Workers
Craft	Craft and Related Trades Workers
Plant	Plant and Machine Operator and Assemblers
Elementary	Elementary Occupations

Source: (Malaysia, 2012)

3.4.10 Industry Variables

Wage differences exist across industries due to unmeasured differences in the productive endowments of workers (Gibbons & Katz, 1992). As such a set of industry variables as listed in Table 3.2 are included in the analysis.

Table 3.2: Definition of Industry Variables

Variable	Industry Group
Agri	Agriculture, Forestry and Fishing
Mining	Mining and Quarrying
Manufacturing	Manufacturing
Utilities	Electricity, Gas or Water
Construction	Construction
Trade	Wholesale and Retail Trade
Hospitality	Accommodation and Food Service Activities
Transport	Transport, Storage and Communication
Finance	Finance and Insurance
Education	Education
Health	Health and Social Work
Property	Property
Public	Public Administration, Defence and Social Security
OB	Other Business Activities

Source: (Malaysia, 2012)

3.5 Descriptive Statistics

The descriptive statistics of the sample by gender is presented in Table 3.3. The mean male workers' age is 34.9 years compared to 33.6 years for female workers, suggesting that males stay slightly longer in the workforce or that female entry into the workforce has increased in recent years or both.

Table 3.3: Definition and Summary Statistics of the Variables by Gender, 2009

		Male		Female	
		N = 847130		N = 469562	
Variable	Definition	Mean	Std Dev	Mean	Std Dev
ln(Y)	Log of monthly USD wages	5.693	0.828	5.680	0.799
Age	Age of worker	34.925	9.751	33.594	9.456
Age_squared	Square of Age	1314.810	748.118	1217.961	696.491
Bumiputera	1 if ethnic Bumiputera worker	0.803	0.398	0.692	0.462
Chinese	1 if ethnic Chinese worker	0.128	0.334	0.204	0.403
Indian	1 if ethnic Indian worker	0.061	0.239	0.097	0.296
Other	1 if Other ethnic worker	0.008	0.088	0.007	0.083
Ratio_Male	The ratio of males workers to total workers at workplace	0.665	0.249	0.639	0.261
West_Coast	1 if firm located in West Coast of Peninsular Malaysia	0.638	0.481	0.731	0.444
East_Coast	1 if located firm in East Coast of Peninsular Malaysia	0.105	0.307	0.068	0.251
Borneo	1 if located in Sabah or Sarawak	0.257	0.437	0.202	0.401
Non_Ltd	1 if worker is employed in a non-limited enterprise	0.091	0.288	0.115	0.319
Pte_Ltd	1 if worker is employed in a Private Limited company	0.809	0.393	0.783	0.412
Ltd	1 if worker is employed in a Public Limited company	0.100	0.300	0.102	0.302
Foreign	1 if there is Foreign investment in firm	0.112	0.315	0.217	0.412
Manager	1 if occupation is Manager	0.068	0.251	0.049	0.217
Prof	1 if occupation is Professional	0.069	0.253	0.095	0.294
Tech	1 if occupation is Technician and Associate Professional	0.106	0.308	0.072	0.258
Clerk	1 ifoccupation is Clerical Support Worker	0.056	0.230	0.180	0.384
Sales	1 if occupation is Service and Sales Worker	0.097	0.296	0.102	0.303
Agriworker	1 if occupation is Skilled Agricultural, Forestry and Fishery Worker	0.043	0.203	0.024	0.152
Craft	1 if occupation is Craft and Related Trades Worker	0.061	0.240	0.041	0.198
Plant	1 if occupation is Plant and Machine Operator and Assembler	0.180	0.384	0.223	0.417
Elementary	1 if Elementary Occupation	0.319	0.466	0.213	0.410
Agri	1 if firm's business is in Agriculture, Forestry and Fishing	0.246	0.431	0.133	0.339
Mining	1 if firm's business is in Mining dan Quarrying	0.015	0.122	0.005	0.071
Manufacturing	1 if firm's business is in Manufacturing	0.351	0.477	0.433	0.496
Utilities	1 if firm's business is in Electricity, Gas or Water	0.019	0.135	0.010	0.097
Construction	1 if firm's business is in Construction	0.050	0.217	0.031	0.174
Trade	1 if firm's business is in Wholesale and Retail Trade	0.071	0.257	0.092	0.289
Hospitality	1 if firm's business is in Accomodation and Food Service Activities	0.038	0.191	0.049	0.216
Transport	1 if firm's business is in transport, Storage and Communication	0.049	0.215	0.036	0.186
Finance	1 if firm's business is in Finance and Insurance	0.024	0.154	0.048	0.214
Education	1 if firm's business is in Education	0.007	0.083	0.020	0.141
Health	1 if firm's business is in Health and Social Work	0.008	0.088	0.041	0.198
Property	1 if firm's business is in Property	0.048	0.213	0.047	0.212
Public	1 if firm's business is in Public Administration, Defence and Social Security	0.034	0.182	0.015	0.120
OB	1 if firm's business is in other actvities	0.041	0.197	0.040	0.197

Source: Calculated by author using Malaysia (2012)

3.6 Summary

In this chapter, the research framework and variables used in the analysis were presented. Age and occupation are used as human capital variables, while location, firm size, foreign ownership and industry are used to represent firm characteristics. Ethnicity is used as a control variable in the study. As the methods employed in the analytical chapters differ, a Methodology section is integrated into the individual analytical chapters four, five and six.

CHAPTER 4

TESTING DEVALUATION AS A CAUSE OF GENDER DISCRIMINATION

4.1 Introduction

A large body of research has suggested that one of the major causes of the gender wage gap has been the occupational segmentation of males and females; this resulting in females earning lower wages (Bielby & Baron, 1986; Hegewisch et al., 2010; Reskin, 1993). This relationship implied that females could earn more by investing in education and training that could lead them into male-dominated occupation. Indeed, after analysing the 1970 and 1980 United States CPS, Fields and Wolff (1991) suggested that the rapid employment growth in male-dominated occupations led to an expansion of female participation in these occupations, thus reducing gender inequality and occupational segregation. The ILO considers occupational segmentation as one of the most enduring facets of global labour markets where female-dominated occupations offer low wages and poorer working conditions (Anker et al., 2003)

Economic discrimination occurs when equal productivity among workers is not rewarded with an equal reward (Aigner & Cain, 1977). Competitive models of discrimination are generally grouped into taste-based (Becker, 1971) or statistical (Arrow, 1973; Phelps, 1972). Since there is a positive wage gap between male and female workers who are equally productive, a profit maximising employer would hire more female workers at lower wage rates. On the one hand, proponents of taste based discrimination argued that employ-

ers who choose to discriminate against females forsake profits to hire fewer females. On the other hand, statistical discrimination occurs as a result of imperfect information in the labour market. If information is expensive to the employer, the latter would hirer males instead of females as they believed that on the average male workers tended to be more productive compared to female workers.

Some sociologists have also used the notion that since females are less valued by society, as expressed in the devaluation theory, occupations which are highly represented by females become less valuable (Reskin, 1988). This view posits that female occupations pay less simply because of the culturally lower status of females who fill up these occupations (England et al., 2007). As a result, the greater the proportion of females in an occupation, the lower the average wage is.

Although Catanzarite (2003) suggested that the devaluation argument is consistent with Becker's taste-based argument, the proponents of the devaluation argue that discrimination is driven by the desire of males to "preserve their advantaged position and their ability to do so by establishing rules to distribute value resources in their favour" (Reskin, 1988). Drawing on Edgeworth (1922) observation that male dominated trade unions pushed for the exclusion of females from many occupations resulting in the crowding of females in certain occupations, Bergmann (1971, 1974) argued that the crowding effect of females in certain occupations as a result of the aversion against them in some occupations was the result of their lower social status. This resulted in females earning lower wages compared to males for two reasons. Firstly, the crowding of females in certain occupations created an excess supply of female worker. Secondly, females were forced to take up jobs that were unrepre-

sentative of their qualification, and as a result earn wages lower than their training or talent would have entitled them to in the absence of such segregation.

Empirical evidence to support the devaluation argument has however been weak. Using United States wage data for the period 1974-1983, Petersen and Morgan (1995) showed that much of the gender discrimination occurred at the occupation within firm level, a study which Tam (1997) criticised as being irrelevant for utilising an extremely detailed level of analysis while failing to account for the gender composition effects. Cohen and Huffman (2003) ran wage regressions for males and females with gender and firm characteristic explanatory variables, and they presented discussions to show that occupations that are highly represented by females have lower average wages, and that gender inequality is higher in occupations with high female representation. However, their analysis appears spurious as they only presented the values of the intercepts from the various regressions, which they then compared to derive at their conclusion. Comparisons between equations cannot be based on the intercept alone; the slope coefficient, which is a function of the various exploratory variables, too needs to be taken into account. England et al. (2007) instead suggested that there is an "original sin" which resulted in a scenario where feminised occupations offered lower wages but since which rises in the proportion of females within occupations did significantly affects wages.

More recent work by Magnusson (2009a) and Grönlund and Magnusson (2013) in Sweden showed that, while females there continued to earn less than males, there is no lack of prestige in the occupations that have high female participation. This included care work, which is predominantly female, and these results concluded that devaluation theory does not explain gender wage gaps.

Researchers take the view that "female occupations" pay less that "male occupations" as a priori, with Tomaskovic-Devey and Skaggs (2002) claiming that devaluation is "a well-received explanation for part of the process that leads to gender wage inequality." Even if Anker et al.'s (2003) and Tomaskovic-Devey and Skaggs's (2002) explanation may have been applicable a decade ago, with the advancement of social institutions and the increased levels of female education and empowerment worldwide, would this view still hold?

Educational attainment by females has also been rising, and in high income and much of the middle income countries overtaken male attainment levels. Table 1.1 showed that the 29.8 per cent of females in the Malaysian workforce has tertiary qualifications in 2009 compared to 19.7 per cent for males. In 2001, the figures were 18.2 per cent and 13.8 per cent respectively suggesting a rise of 11.6 per cent for females and 5.9 per cent for males. United Nations (2013) found that in 62 per cent of countries, the enrolment of females in higher education exceeded that of male enrolment. For instance, in the United States the enrolment of US resident females in undergraduate degree programmes rose from 3.1 million in 1970 to 10.0 million in 2009. During the same period, resident male enrolment rose from 4.3 million to 6.0 million (Aud, 2011). According to Schultz (1960), education is an investment that augments the human capital and as Kenneth Arrow (1973) pointed out in his rational expectations model, the willingness of employers to hire determines human capital investment. As such, the "rational" female would only invest in education if they anticipated future employment that provided an acceptable rate of return.

While past research on devaluation theory has relied primarily on data from developed country, would the devaluation argument at the labour market hold in a developing econo-

my scenario? This chapter investigates the continued relevance of devaluation at the present time, and points towards possible different explanations for gender inequality. This is carried out by testing two hypotheses.

Firstly, we test a key prediction of devaluation theory being that occupations that have a large proportion of females offer lower average wages? Macpherson and Hirsch (1995) suggested that a situation where the results are significant for females but not for males suggests that discrimination is taste-based. Secondly, we test for the presence of gender discrimination in Malaysian data. It is possible that discrimination still occurs within occupations even though females may not face barriers to entry into certain occupations.

While much of the empirical research into discrimination on Census and Current Population Survey (CPS) data, this chapter utilises workplaces level survey data. Although the CPS also collects occupations and industry information from the survey respondents, Bowler and Morisi (2006) showed that the occupational and industry data in the CPS is more subject to non-sampling error compared to firm level surveys.

This chapter examines research question one being "Is occupational segregation a cause of gender discrimination?" As indicated in the literature review, the following hypotheses are tested:

H1.1 There is occupational segregation of female workers in Malaysia.

H1.2: There is evidence of gender wage discrimination in the Malaysian labour market.

The rest of the chapter is organised as follows: Section 4.2 discusses the methodology employed. Section 4.3 presents the results, and the final section provides the summary.

4.2 Methodology

In this section, the procedures for analysing the dataset to test the two hypotheses presented above are discussed. Workers' are analysed at the main occupation level, while the natural logarithm of worker's monthly wages in United States dollars is used as the dependent variable. Graphical analysis, statistical methods and a decomposition procedure are used to test the hypotheses.

4.2.1 Testing for Skewness

By definition, occupational segregation results in a greater proportion of female workers being employed in lower paying occupations compared to males. If occupations were plotted in ascending order of the mean wages, such a condition should then result in a distribution where the bulk of female occupations should be more oriented to the left of the distribution compared to males. In other words, the shape of the distribution of female workers would be more skewed to the right than for the distribution of male workers. This study exploits this relationship to test the hypothesis, **H4.1**, that there is occupational segregation of female workers in Malaysia.

The nine occupations are given an ordinal value between one and nine, with the occupation with the lowest mean wage having value of one and the occupation with the highest mean wage assigned a value of nine. The statistical expression for skewness, and its standard error, used in this paper follows Weinberg and Abramowitz (2008):

$$\text{Skewness} = \frac{\text{N}}{(\text{N}-1)(\text{N}-2)} \frac{\sum(\text{X}_\text{i} - \overline{\text{X}})^3}{(\text{SD})^3}$$

where X_i represents the observed ordinal value of a worker's occupation, $\overline{\text{X}}$ represents the mean ordinal value in the distribution, while SD is defined as the standard deviation with $(\text{N}-1)$ as the denominator. A negative value would suggest a left skewed distribution, while a positive value would suggest that the distribution is skewed to the right. The Standard Error of Skewness (SES) is represented by:

$$\text{SES} = \frac{6\text{N}(\text{N}-1)}{(\text{N}-2)(\text{N}+1)(\text{N}+3)}$$

The 95 per cent confidence intervals of the population skewness of occupations for both males and females is derived from

$\text{Skewness} \pm 2\ \text{SES}$.

The hypothesis **H1.1** is accepted if the confidence interval of the population skewness for female workers is at a higher range than that of male workers. If the male and female workers' confidence intervals overlap, then there is no significant difference in the distribution of occupations between gender groups. A confidence interval for female workers in a lower range than the one for male workers would, instead, suggest that females are more favourably distributed in higher income occupations than males.

4.2.2 Decomposition

Equation (1) presents Mincer's (1974) human capital earnings function, which has been the building block for many studies on wage distribution:

$$\ln(Y_i) = \beta_0 + \beta_1 S_i + \partial_1 t_i + \partial_2 t_i^2 + \varepsilon_i \quad (1)$$

where $\ln(Y)$ is the natural logarithm of earnings. β_0 and S are the initial earnings and years of schooling respectively. t is the potential labour market experience. The quadratic nature of labour market experience explores the concave relationship between earnings and experience where earnings rise more steeply for younger workers than older workers. i carries a value of 1 for male and 2 for female. β_0 is the intercept, and the other $\beta's$ and $\partial's$ are coefficients of the covariates. ε_i is the error term.

We use occupation instead of schooling in Mincer's earnings function. Both Mincer (1958) and Becker (1962) viewed that the amounts of time workers spend on schooling as being strongly correlated to their occupation. Spence (1973) opined that although employers use education as an observable attribute of a worker during the pre-hiring process, the employers will only be aware of a worker's productivity after some period since the hiring has taken place. Upon facing high correlation between occupation and schooling, while noting that occupation and schooling were highly correlated, Long, Rasmussen, and Haworth (1977) dropped schooling as an explanatory variable from their analysis as they noted that occupation possessed greater explanatory powers in their wage functions. There are also no consistent methods for introducing education into the wage function. Autor, Katz, and Kearney (2008) measured occupational skill level in terms of the mean number of years

invested in schooling by an occupation's workforce whereas Fally, Paillacar, and Terra (2010) simply defined any worker who had completed high school as skilled. On the other hand, Hegewisch, Liepmann, Hayes, and Hartmann (2010) defined any occupation where more than half its members had a college degree as skilled.

As our data presents itself with nine occupational groups, we replace schooling with a set of occupational dummy variables, represented by D. This is presented in Equation (2) below:

$$\ln(Y_i) = \beta_0 + \sum \beta_k D_{ik} + \partial_1 t_i + \partial_2 t_i^2 + \varepsilon_i \qquad (2)$$

The widely used decomposition procedure introduced by Oaxaca (1973) and Blinder (1973) is applied to analyse the differences in the means of ln(Y) between males and females. This method breaks-down the gender wage differential into a portion that is explained by productivity factors and a residual portion which is unexplained. This residual is often used to explain discrimination based on Becker's (1971) assumption that discrimination is the difference between an individual's contribution to output and his or her wages. Neumark's (1988) approach to the Oaxaca-Blinder decomposition as presented in Equation (3) is used in our analysis:

$$\ln(\overline{Y}_1) - \ln(\overline{Y}_2) = (\overline{X}_1 - \overline{X}_2)\overline{\beta}^p + [\overline{X}_1(\overline{\beta}_1 - \overline{\beta}^p) - \overline{X}_2(\overline{\beta}_1 - \overline{\beta}^p)] \quad (3)$$

where $\overline{\beta}^p$ is the non-discriminatory wage structure coefficient of the pooled male-female workers, and $\overline{X}_1$ and $\overline{X}_2$ are vectors of the characteristics of male and female workers respectively. The first term on the right hand side of the equation represents differences resulting from worker characteristics, while the second term represents the unexplained wage characteristics which is used to measure wage discrimination.

4.3 Results

A scatter diagram of the percentage of females in 144 occupation-sectors against mean $\ln(Y)$ in the occupation-sector is presented in Figure 4.1. There does not appear to be any distinct pattern in the proportion of females in an occupation-industry and the mean wages there. The largest female representation is among clerical support staff in mining where they constitute 81.1 per cent of the workers, and the mean wages are 5.9 log-points. The highest mean wage of 6.6 log points was earned by professionals in agriculture, where females constitute 53.9 per cent of the workers.

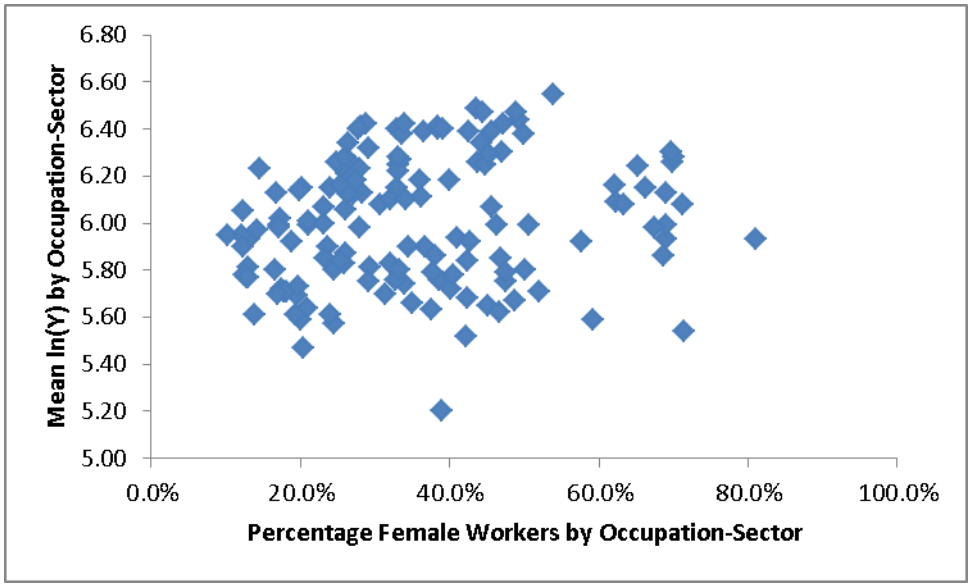

Figure 4.1: Scatter Diagram of Percentage Female Worker vs. Mean Wages by Occupation-Industry

Source: Calculated by author using Malaysia (2012)

Figure 4.2 presents a relative frequency distribution of male and female workers across occupational groups, which are arranged on the x-axis in ascending order of mean wages. The most glaring observation is the strongly representation of females in the clerical support group, where they make up 66.4 per cent of the work force having employed 31.7 per cent of them. The result is not unexpected as Bielby and Baron (1986) have suggested that employers felt that females were better suited for clerical work while males were preferred for jobs that required mathematical ability. However, females do have a strong participation in professional groups, although there are more males employed as managers and technicians.

Of the bottom five paying occupations, a larger proportion of males are employed in all these occupations except for service and sales. It also appears that a greater proportion of females are employed in occupations that require higher schooling and training attainment than males since the four highest paying occupations are 45.2 per cent females, although the survey sample is only 40 per cent female.

According to Diebold (2004), the human eye is a far more sophisticated tool for data analysis in many ways compared to modelling techniques. The observations based on Figure 4.1 and Figure 4.2 themselves are sufficiently strong to contradict the devaluation theory's prediction that occupations with higher female participation offer lower wages. A statistical analysis on the skewness of the occupational distribution of both male and female workers is displayed in Table 4.1 to support these observations. The 95 per cent confidence interval for males is between 0.54 and 0.55, and the 95 per cent confidence interval for females is between 0.19 and 0.21. The distribution of the occupations of females is less skewed to the right than that for males. The finding rejects the hypothesis **H1.1** which

states that there is occupational segregation of female workers in Malaysia. Since the confidence interval for the skewness of the occupational distribution of female workers is less than that for male workers, the results instead suggest that the female workers have a more favourable occupational distribution compared to males. Although there may be specific occupational sub-groups which females find difficulty in finding employment, the observations presented here strongly suggest that at the occupational segregation of females is not present in Malaysia.

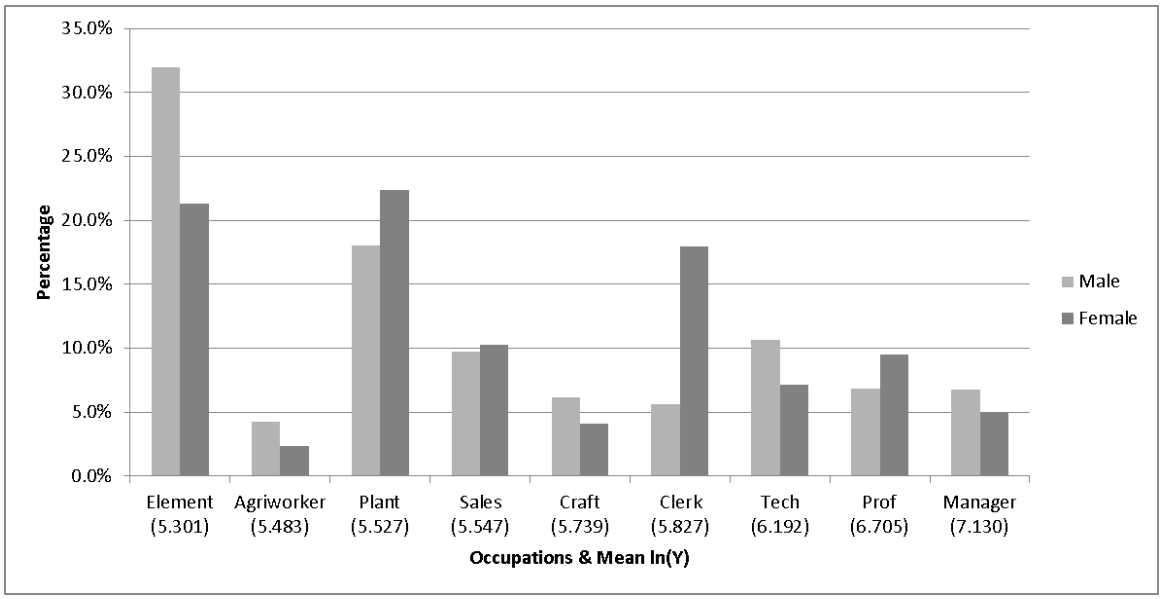

Figure 4.2: Relative Frequency Histogram by Occupation

Source: Calculated by author using Malaysia (2012)
Note: Mean of logarithm of wages is provided below the occupational labels.

Table 4.1: Skewness of Occupational Distributions

Gender	Skewness	Standard Error of Skewness	Confidence Interval (95%)	
			Lower Limit	Upper Limit
Male	0.548	0.003	0.543	0.554
Female	0.202	0.004	0.194	0.209

Source: Calculated by author using Malaysia (2012)

In Table 4.2, the Blinder-Oaxaca decomposition of the sample is displayed. Mean male wage is 5.70 log points and mean female wage is 5.68 log points, resulting in the mean wage of males exceeding mean female wage by 0.02 log points. However, the explained portion of the decomposition returns a negative value of -0.03, implying that if females were paid equal wage for the same worker characteristic as males, females would earn a mean wage higher than males. As a result, the unexplained portion of the male-female gender wage difference is 0.05 log points. Following Becker's (1971) opinion that the portion of the wage differential unexplained by productivity possibly represents discrimination, this finding suggests that gender wage discrimination is present in the labour market. As such, the evidence supports the hypothesis H1.2 that gender wage discrimination is present in the Malaysian labour market.

Table 4.2: Aggregate Blinder-Oaxaca Decomposition

Dependent Variable: ln(Y)				
Males	5.702	0.001	4593.920	0.000
Females	5.682	0.001	6538.510	0.000
Difference	0.020	0.002	13.010	0.000
Explained Characteristics	(0.027)	0.001	(37.590)	0.000
Unexplained Characteristics	0.046	0.001	33.550	0.000
Percentage Unexplained	234.7%			
Number of Observations	1316692			

Source: Calculated by author using Malaysia (2012)

4.4 Summary

This chapter was set out to investigate, firstly, if occupational allocation by gender groups affect mean wages in the occupation and, secondly, if gender wage discrimination was present.

The results do not point towards any segregation of females into low paying occupations. On the contrary, the opposite appears to be the case. Although females occupy 64.0 per cent of clerical and support workers, this cannot construed as segregation as these workers earn a mean wage of 5.8 compared to the sample mean of 5.7. Furthermore, the five occupations that paid mean wages higher than the sample mean employed a total of 44.6 per cent of the female workers and 36.7 per cent of the male workers in the sample. These observations are statistically supported by the occupational distribution of females being significantly less skewed to the right compared to the occupational distribution of males, which suggests that females on the average are employed in better paying occupations than males. The results support Tam's (1997) finding that occupational gender composition does not have a significant effect on wages. When reflected in terms of Schultz's (1961) and Arrow's (1973) arguments that individuals invested in education in anticipation of higher future earnings, the superior educational attainment of working females in Malaysia suggest that females in the Malaysian labour force chose to invest in tertiary education because of their expectations that they will be able to find employment in high paying occupations.

The Malaysian evidence does not support the view that females are occupationally segregated, much less the devaluation hypothesis that "female occupations" pay less. However,

the data provides evidence of significant wage inequalities facing female workers. The wage decomposition, after controlling for worker characteristics, left 0.1 log points of wage differences faced by female workers unexplained by worker characteristics. As suggested by Becker (1971), this could be construed of as possibly being due to discrimination.

CHAPTER 5

FIRM CHARACTERISTICS AND THE MEASUREMENT OF WAGE DIFFERENTIALS

5.1 Introduction

The measurement of differentials in wages among males and females workers, known as the gender wage gap, has been an important tool in the analysis of gender wage discrimination in the labour market. It is generally equated to the logarithmic difference between the mean of male and female workers' wages; this usually resulting in a positive value as males often earn higher mean wages than females. This alone is not sufficient, and there exists though the problem of identifying if these wage differences were in some sense "fair" or if females or some other demographic group were in fact being discriminated against in the labour market. Since the pioneering work of Mincer (1958, 1974), Schultz (1960, 1961) and Becker (1971) and others, wage differentials ware compared against the workers "human capital" in an attempt to create a portion of the wage differentials that is explained by the human capital variables and another portion that is unexplained. The unexplained portion became generally considered to be the consequence of discrimination.

One of the limitations in most research in this area is the type of data available. Most researchers typically utilise CPS or some other household survey data which are more easily available compared to data that link employers and workers, which require firm level

surveys. The occupational and industry data provided in the CPS is more prone to non-sampling error than employer-employee linked data (Bowler & Morisi, 2006).

Although all the "human resource variables" available to employers are not known to researchers (Heckman, 1998), employer-employee linked data could provide higher predictive capabilities as firm related traits such as size (Idson & Oi, 1999), location (Fally et al., 2010; Hering & Poncet, 2010; Ma, 2006; Schafgans, 2000) , industry (Gibbons & Katz, 1992; A. B. Krueger & Summers, 1988) and foreign ownership firms (Lipsey & Sjoholm, 2001) do produce variations in workers' wages. However, due to the lack of microeconomic data linking workers to employers (Abowd et al., 1999), labour economists have instead used worker characteristics only in their research.

An area that has not been well explored within the literature that was reviewed was whether gender composition within a firm plays a significant role in determining wage differences. Although Buckley (1971) made the observation that firms that hired all male workers paid higher wages than firms that hired only female workers, there has not been any significant follow-up research on Buckley's observation. As such, the third hypothesis tests if gender composition within a firm affects male and female workers' wages. If this hypothesis is true, and if the effects are significantly greater for females compared to males, we need to look beyond devaluation for an explanation. Discrimination may be more of a firm-centric phenomenon.

As a result, the wage gap has traditionally been explained only in terms of worker endowments and rewards by the human capital theory which focuses on the returns on the investments in human capital (Becker, 1975; Mincer, 1974; Schultz, 1961), The human

capital theory argued that the investment of workers in education increased their future income, and a rational individual would invest in human capital based on the prospective return on investment. Even as previous research has shown that firm characteristics do influence workers' wages, researchers research in the area of gender inequality have ignored the necessity to caveat the limitations resulting from the unavailability of firm related data in their analysis. Instead, especially when decomposition of wages is carried, researchers have relied solely on the demand side variables of the function proposed by (Mincer, 1958, 1974). This could result in misrepresentative studies that lead to false policy recommendations.

Using employer-employee linked data from Malaysia (2012), this chapter aims to investigate if the inclusion of firm characteristics in the analysis increases the explanatory powers of the wage analysis, and if the non-inclusion of firm characteristics from gender inequality analysis significantly misrepresents the degree of gender wage inequality. This methodological setup also allows us to also test Buckley's (1971) claim that gender composition in a firm affects workers' wages within the firm.

This chapter examines research question one being "Does the absence of firm related characteristic in an earnings equation bias the results?" This is a reasonable question as Griliches (1977) has previously shown that the inclusion of intelligence measures in the human capital function changed the coefficient for schooling in the earnings equations thereby suggesting a missing variable bias in the widely used form of the function. As indicated in the literature review, the following hypotheses are tested:

H2.1: Firm characteristics contribute significantly to the explanatory powers of the wage function.

H2.2: Including firm characteristics significantly alters the results of wage function and decompositions.

H2.3: Gender composition at a workplace affects gender wage differentials.

The rest of the chapter is organised as follows. The next section presents the methodology employed. Section 5.3 presents the empirical results, and Section 5.5 summarises the findings of this chapter.

5.2 Methodology

In this section, the procedures for testing the three hypotheses presented above are discussed. Workers' are analysed at the main occupation level, while the natural logarithm of worker's monthly wages in United States dollars is used as the dependent variable. Econometric methods are used to test the hypotheses.

5.2.1 Restricted Least Squares

The restricted least square procedure (Gujarati, 2003) is used to test if firm characteristics significantly contribute towards increasing the explanatory powers of wage regressions and decompositions. It can be used to analyse models containing any number of explanatory variables comparing an unrestricted number of variables regression against a restricted number of variables regression. The restricted regression reflects the null hypothesis that the firm characteristics do not contribute significantly to the wage function, whereas the

unrestricted regression reflects the alternate hypothesis that firm characteristics contribute significantly to the wage function.

$$F = \frac{(RSS_R - RSS_{UR})/m}{RSS_{UR}/(n-k)} \qquad (5.1)$$

where RSS_R is the residual sum of squares of the restricted regression, RSS_{UR} represents the residual sum of squares of the unrestricted regression, *m* is the number of linear restrictions, *k* is the number of parameters in the unrestricted regression and *n* is the number of observations. The above statistic follows the F-test with *m*, *(n-k)* degrees of freedom.

The above test can also be expressed using R^2 of the two regressions:

$$F = \frac{(R^2_{UR} - R^2_R)/m}{(1-R^2_{UR})/(n-k)} \qquad (5.2)$$

where R^2_{UR} and R^2_R represent the R^2 values of the unrestricted and restricted equations respectively. It needs to be noted that R^2_{UR} will be greater that R^2_R as the unrestricted regression will have all the explanatory variables contained in the restricted equation plus any number of other variables. In this study the restricted regression will contain the human capital variables whereas the unrestricted regression will contain both the human capital variables and the firm characteristics.

5.2.2 Earnings Function

Equation (5.3) presents Mincer's (1974) human capital earnings function, which has been the building block for many studies on wage distribution:

$$\ln(Y_i) = \beta_0 + \beta_1 S_i + \partial_1 t_i + \partial_2 t_i^2 + \varepsilon_i \quad (5.3)$$

where $\ln(Y)$ is the natural logarithm of earnings. β_0 and S are the initial earnings and years of schooling respectively. t is the potential labour market experience. The quadratic nature of labour market experience explores the concave relationship between earnings and experience where earnings rise more steeply for younger workers than older workers. i represents the worker . β_0 is the intercept, and the other $\beta's$ and $\partial's$ are coefficients of the covariates. ε_i is the error term.

We use occupation instead of schooling in Mincer's equation. Both Mincer (1958) and Becker (1962) viewed that the amounts of time workers spend on schooling as being strongly correlated to their occupation. Spence (1973) opined that although employers use education as an observable attribute of a worker during the pre-hiring process, the employers will only l be aware of a worker's productivity after some period since the hiring has taken place. Upon facing high correlation between occupation and schooling, Long et al. (1977) dropped schooling as an explanatory variable from their analysis as they noted that occupation possessed greater explanatory powers in their wage functions. There are also no consistent methods for introducing education into the wage function. Autor et al. (2008) measured occupational skill level in terms of the mean number of years invested in schooling by an occupation's workforce whereas Fally et al. (2010) simply defined any worker

who had completed high school as skilled. The models presented in Bayard et al. (1999) used schooling and occupation in separate equations.

As the Malaysian Labour Department divides occupations into nine groups, we replace schooling with a set of occupational dummy variables, represented by O. The human capital is presented in Equation (5.4) below:

$$\ln(Y_i) = \beta_0 + \sum \beta_i O_i + \sum \alpha_{ik} D_{ik} + \partial_1 t_i + \partial_2 t_i^2 + \varepsilon_i \qquad (5.4)$$

Ethnicity dummies, D, are introduced into the wage function as control variables where *k* represents the *k*th dummy. Equation 5.4 will be the restricted model. The unrestricted model will include variables representing firm characteristics in the wage function as provided in equation 5.5, where F represents the firm's variable, and *j*, the *j*th variable:

$$\ln(Y_i) = \beta_0 + \sum \beta_i O_i + \sum \alpha_{ik} D_{ik} + \sum \theta_{ij} F_{ij} + \partial_1 t_i + \partial_2 t_i^2 + \varepsilon_i \qquad (5.5)$$

5.2.3 Decomposition

The widely used decomposition procedure introduced by Oaxaca (1973) and Blinder (1973) is applied to analyse the differences in the means of ln(Y) between males and females. This method breaks-down the gender wage differential into a portion that is explained by productivity factors and a residual portion which is unexplained. This residual is often used to explain discrimination based on Becker's (1971) assumption that discrimination is the difference between an individual's contribution to output and his or her wages. Neumark's

(1988) approach to the Oaxaca-Blinder decomposition as presented in Equation 5.6 is used in our analysis:

$$\ln(\overline{Y}_1) - \ln(\overline{Y}_2) = (\overline{X}_1 - \overline{X}_2)\overline{\beta}^p + [\overline{X}_1(\overline{\beta}_1 - \overline{\beta}^p) - \overline{X}_2(\overline{\beta}_1 - \overline{\beta}^p)] \qquad (5.6)$$

where $\overline{\beta}^p$ is the non-discriminatory wage structure coefficient of the pooled male-female workers, and $\overline{X}_1$ and $\overline{X}_2$ are vectors of the characteristics of male and female workers respectively. In this analysis, the results of decompositions with only worker characteristics will be compared against decompositions with both worker and firm characteristics. The first term on the right hand side of Equation (5.6) represents differences resulting from worker characteristics, while the second term represents the unexplained wage characteristics which is used to measure wage discrimination.

5.3 Results

Table 5.1 presents the restricted least squares results comparing the unrestricted wage models, which combine both the human resource variables with the firm characteristics, against the restricted wage models, which only utilise the human resource variables. The first pair of tests is carried out on the full dataset, followed by the tests on the female and male datasets respectively. The dummy variables Bumiputera, Borneo, Non-Ltd, Elementary and Agri were dropped from the regressions to avoid multicollinearity issues. As such, the intercepts carry a large value and are highly significant in all the regression models as they are representative of the Bumiputera elementary workers employed in agriculture in Borneo. All the models also have a positive t-statistic for the variable "Age" and negative t-

statistic for the "Age_sq" variable. This suggests that wages increase with workers' age but at a reducing rate; thus being consistent with the expected concave returns to experience.

The human resource variables show that ethnicity plays a significant role in the Malaysian labour market. Although this study does not address ethnic wage inequalities, in the combined male and female model the mean Chinese workers earn on the average in excess of 0.3 log points more than Bumiputera workers of similar endowment. From the same regression results, it is also evident that males on the average earn a wage premium of 0.15 log points over females.

Among occupations, managers earn the highest mean wages followed by professionals and technicians. Elementary and agricultural workers on the other hand, earn the lowest wages. Female Agriworkers are the lowest earners, while among males it is the elementary workers who earn the lowest wage. The female Sales and Support workers earn a wage premium over female craft workers, while the reverse is the case among male workers.

The result in the unrestricted models show that almost all the variables included are significant, the exception being the wages of workers in Wholesale and Retail Trade are non-different from those in agriculture. When analysed by gender, females in Wholesale and Retail Trade earn less than those females employed in Agriculture while the reverse is thru among male workers. The largest wage premiums were offered to workers in Mining, where the mean worker earns a wage premium of 0.54 log points more than a worker in the same occupation with other characteristics being the same as well but employed in Agriculture. Mining workers are followed by Finance and Utilities industries workers in wage

premiums. The preceding results support the presence of inter-industry wage differentials (Gibbons & Katz, 1992).

Public limited companies which are often the largest companies by paid-up capital pay a wage premium of 0.07 log points over firms that do not have limited shareholdings such as sole proprietorships, partnerships and associations. Private limited companies offer workers a wage premium of 0.06 log point over the latter employers. The results show that larger firms pay high wages as previously suggested by Idson and Oi (1999). Likewise, as suggested by firms Lipsey and Sjoholm (2001), foreign owned firms do pay higher wages than domestically owned firms. The foreign-owned firms offer a wage premium of 0.04 log points.

As the previous literature have discussed (Fally et al., 2010; Hering & Poncet, 2010; Ma, 2006), firm location plays a significant role in wage determination. Firms located in the least developed part of Malaysia, being the states of Sabah and Sarawak on the island of Borneo, offer the lowest wages. The firms on the west coast of Peninsular Malaysia, which is the most developed, offer the largest wage premiums. Interestingly, the results also show that females employed in the east coast receive a 0.02 log points wage premium over those employed on the west coast.

The values of almost all the variables representing firm characteristics in the unrestricted equations are significant. The high F-statistic in the Wald tests provides significant evidence that the unrestricted models provide greater predictive power compared to the restricted models in all three cases investigated. The test statistic suggests that firm characteristics provide a significant contribution to the wage functions. The results support the

hypothesis **H2.1** that firm characteristics provide significant explanatory powers in the wage regressions.

The results presented in combined model in Table 5.1 also point towards gender wage differences being overestimated in the Malaysian case when the standard human capital model is used. The dummy variable for male workers has a coefficient of 0.15 in the standard model, but reduced to 0.11 when firm characteristics were included in the equation. This works out to an over-estimation of 39.6 per cent in the coefficient when firm characteristics are not included in the equation.

Table 5.2 displays the results of the Blinder-Oaxaca decomposition by occupation of firstly, the traditional method where only worker endowments are analysed and secondly, both the human capital variables and firm characteristics are included in the decomposition. The dummy variables Bumiputera, Borneo, Non-Ltd, Elementary and Agri are not included in the decompositions as well. In the full sample, mean male monthly wages exceed mean female monthly wages by 0.02 log points. In the decomposition with worker characteristics only, the accounting for human capital for wage differentials shows a difference of -0.027 log points. This suggests that the mean female wage should have exceeded the mean male wage by -0.03 log points. As such, 0.05 log points of the wage differential in unexplained. When firm characteristics are included in the decomposition, the characteristics in the decomposition explains -0.01 log points of the wage differentials thereby reducing the unexplained portion of the wage differentials to 0.03 log points.

When the comparison is carried out by occupations, in all the occupations except for the technicians and associate professionals group the unexplained portion of the wage differen-

tials have decreased significantly when firm characteristics is included in the analysis. Consistent with the results and arguments presented by Abowd and Killingsworth (1983), Abowd et al. (1999) and Heckman (1998), the F-statistics results in Table 1 had shown that firm characteristics offer strong explanatory powers in explaining wage differentials. Excluding firm characteristics in the decomposition would lead to biased results in the decomposition. In the Malaysian case, excluding the firm characteristics would be likely to over-estimate the unexplained portion of the wage differential which would, as per Becker (1971), over-estimate gender wage discrimination within the occupations.

The above results produce strong support for including firm characteristics in the wage decomposition, and as such support the hypothesis **H2.2** that including firm characteristics provides significant information useful for gender wage decomposition.

Table 5.1: Test Using Restricted and Unrestricted Regressions

	A. Combined Male & Female				B. Female Only				C. Male Only			
	Restricted Model		Unrestricted Model		Restricted Model		Unrestricted Model		Restricted Model		Unrestricted Model	
	Coef.	t-statistics	Coef.	t-statistics	Coef.	t-statistics	Coef.	t-statistics	Coef.	t-statistics	Coef.	t-statistics
Age	0.017	55.21***	0.013	46.05***	0.022	40.69***	0.017	34.49***	0.017	44.5***	0.014	38.24***
Age_sq	-0.0002	-44.99***	-0.0001	-38.27***	-0.0003	-34.98***	-0.0002	-30.27***	-0.0002	-36.48***	-0.0001	-31.98***
Dummy_male	0.154	90.26***	0.110	63.17***								
Chinese	0.309	211.06***	0.307	214.49***	0.286	129.42***	0.278	129.44***	0.310	158.18***	0.311	161.85***
Indian	0.063	34.25***	0.026	14.77***	0.028	10.46***	-0.033	-12.81***	0.092	36.84***	0.063	25.94***
Others	0.028	5.17***	0.062	11.81***	-0.023	-2.40**	0.027	3.02***	0.033	4.91***	0.064	9.96***
Manager	1.919	856.52***	1.811	801.95***	1.886	462.04***	1.740	416.88***	1.927	713.03***	1.829	671.64***
Prof	1.430	715.98***	1.310	621.24***	1.393	432.27***	1.251	358.01***	1.472	569.65***	1.349	498.46***
Tech	0.872	485.25***	0.749	398.57***	0.973	284.7***	0.801	220.49***	0.831	392.60***	0.725	326.2***
Clerk	0.582	321.96***	0.464	248.1***	0.602	233.07***	0.461	163.59***	0.522	193.75***	0.420	152.53***
Sales	0.268	152.51***	0.207	107.41***	0.343	113.69***	0.292	84.74***	0.218	100.29***	0.165	69.99***
Craft	0.373	168.88***	0.287	129.24***	0.306	72.69***	0.218	50.76***	0.391	150.79***	0.302	115.53***
Plant	0.157	113.73***	0.085	55.88***	0.144	60.89***	0.035	12.85***	0.171	99.06***	0.101	55.03***
Agriworker	0.089	33.93***	0.111	42.49***	-0.007	-1.35	0.068	12.84***	0.117	38.76***	0.131	43.65***
Sdnbhd			0.060	38.56***			0.102	41.01***			0.047	23.46***
Bhd			0.074	34.35***			0.110	30.55***			0.066	24.39***
Foreign			0.037	26.31***			0.053	25.35***			0.033	16.8***
Westcoast			0.192	154.77***			0.252	109.5***			0.167	112.15***
Eastcoast			0.171	96.02***			0.124	36.15***			0.185	88.02***
Ratio_Male			0.142	63.46***			0.200	51.19***			0.096	29.57***
Mining			0.539	121.58***			0.439	40.14***			0.554	113.82***
Manu			0.012	7.55***			0.023	7.49***			0.013	7.03***
Utilities			0.332	84.51***			0.324	39.68***			0.337	75.27***
Const			0.197	76.88***			0.139	27.29***			0.212	71.31***
Trade			-0.001	-0.57			-0.034	-8.66***			0.010	3.76***
Hosp			0.104	38.55***			0.073	16.15***			0.126	36.76***
Transport			0.218	84.19***			0.162	32.41***			0.238	78.16***
Finance			0.422	134.19***			0.422	82.8***			0.436	103.06***
Education			-0.129	-28.06***			-0.193	-30.23***			0.015	2.13**
Health			0.237	63.27***			0.198	37.86***			0.287	42.62***
Property			0.054	21.54***			0.126	27.69***			0.029	9.63***
Public			-0.137	-44.79***			-0.043	-6.43***			-0.138	-39.76***
Other_Industry			0.068	25.81***			0.106	22.39***			0.056	17.44***
Intercept	4.693	816.01***	4.514	765.01***	4.718	503.98***	4.444	457.75***	4.861	691.69***	4.675	623.84***
N	1316692		1316692		469562		469562		847130		847130	
R2	0.568		0.600		0.553		0.590		0.577		0.606	
Wald Test (F-statistics)			5382.0***				2294.0***				3415.31***	

Source: Calculated by author using Malaysia (2012).
Note: ** represents significance at five per cent level; *** represents significance at one per cent level.

Table 5.2: Blinder-Oaxaca Decomposition by Occupation

	Worker characteristics only		Worker and firm characteristics	
A. Full Sample				
Dependent Variable: ln(Y)	Coef.	z-statistics	Coef.	z-statistics
Males	5.702	4593.92***	5.702	4593.92***
Females	5.682	6538.51***	5.682	6538.51***
Difference	0.020	13.01***	0.020	13.01***
Explained Characteristics	-0.027	-37.59***	-0.012	-10.32***
Unexplained Characteristics	0.046	33.55***	0.031	19.73***
Number of Observations	1316692			
B . Manager				
Dependent Variable: ln(Y)	Coef.	z-statistics	Coef.	z-statistics
Males	7.238	1697.11***	7.238	1697.11***
Females	7.327	2034.34***	7.327	2034.34***
Difference	-0.089	-15.92***	-0.089	-15.92***
Explained Characteristics	-0.017	-8.1***	-0.069	-19.49***
Unexplained Characteristics	-0.072	-12.3***	-0.020	-3.33***
Number of Observations	80640			
B. Professonal				
Dependent Variable: ln(Y)	Coef.	z-statistics	Coef.	z-statistics
Males	6.796	1093.54***	6.796	1093.53***
Females	6.762	2980.69***	6.762	2980.69***
Difference	0.034	5.12***	0.034	5.12***
Explained Characteristics	-0.021	-9.10***	0.019	4.87***
Unexplained Characteristics	0.055	8.13***	0.015	2.31**
Number of Observations	103069			
D. Technician and Associate Professional				
Dependent Variable: ln(Y)	Coef.	z-statistics	Coef.	z-statistics
Males	6.160	1815.78***	6.160	1815.78***
Females	6.138	2506.22***	6.138	2506.21***
Difference	0.022	5.21***	0.022	5.21***
Explained Characteristics	-0.008	-7.41***	-0.033	-11.45***
Unexplained Characteristics	0.030	7.21***	0.055	12.51***
Number of Observations	123611			
E. Clerical Support Worker				
Dependent Variable: ln(Y)	Coef.	z-statistics	Coef.	z-statistics
Males	5.810	1026.92***	5.810	1026.92***
Females	5.817	3297.21***	5.817	3297.21***
Difference	-0.007	-1.14	-0.007	-1.14
Explained Characteristics	0.009	3.95***	-0.020	-6.59***
Unexplained Characteristics	-0.016	-2.61***	0.013	2.11**
Number of Observations	131958			

	Worker characteristics only		Worker and firm characteristics	
F. Service and Sales Worker				
Dependent Variable: ln(Y)	Coef.	z-statistics	Coef.	z-statistics
Males	5.458	1914.24***	5.458	1914.24***
Females	5.527	2827.24***	5.527	2827.23***
Difference	-0.068	-19.73***	-0.068	-19.73***
Explained Characteristics	-0.060	-39.90***	-0.062	-22.59***
Unexplained Characteristics	-0.008	-2.38**	-0.006	-1.67
Number of Observations	130572			
G. Craft and Related Trades Worker				
Dependent Variable: ln(Y)	Coef.	z-statistics	Coef.	z-statistics
Males	5.700	1793.86***	5.700	1793.86***
Females	5.500	1838.27***	5.500	1838.27***
Difference	0.200	45.80***	0.200	45.8***
Explained Characteristics	0.030	25.16***	0.043	10.14***
Unexplained Characteristics	0.170	39.00***	0.157	27.4***
Number of Observations	71118			
H. Craft and Related Trades Worker				
Dependent Variable: ln(Y)	Coef.	z-statistics	Coef.	z-statistics
Males	5.460	3051.95***	5.460	3051.95***
Females	5.303	5422.37***	5.303	5422.37***
Difference	0.157	76.95***	0.157	76.95***
Explained Characteristics	0.019	39.48***	0.118	62.49***
Unexplained Characteristics	0.138	68.57***	0.039	16.49***
Number of Observations	257686			
I. Elementary Workers				
Dependent Variable: ln(Y)	Coef.	z-statistics	Coef.	z-statistics
Males	5.320	4440.51***	5.320	4440.51***
Females	5.142	7234.32***	5.142	7234.32***
Difference	0.178	127.63***	0.178	127.63***
Explained Characteristics	0.001	2.79***	0.105	97.43***
Unexplained Characteristics	0.177	127.72***	0.073	43.59***
Number of Observations	370592			
J. Agriworker				
Dependent Variable: ln(Y)	Coef.	z-statistics	Coef.	z-statistics
Males	5.428	1742.95***	5.428	1742.95***
Females	5.185	1962.86***	5.185	1962.86***
Difference	0.243	59.41***	0.243	59.41***
Explained Characteristics	0.011	10.43***	0.123	39.23***
Unexplained Characteristics	0.232	56.79***	0.119	21.68***
Number of Observations	47446			

Source: Calculated by author using Malaysia (2012).

Note: ** represents significance at five per cent level; *** represents significance at one per cent level.

Note: Industry characteristics are not included for Agriworker to void multi-collinearity.

The third hypothesis that was tested regards the effects of gender composition within a firm on firm level wages. The independent variable Ratio_Male in Table 1 aims to measure the significance of male composition within a firm with this regards. In the full sample, the coefficient for this variable was 0.14. This implies that male workers in an all-male firm would on the average receive a wage premium of 0.14 natural log points over the equivalent female worker in an all-female firm after controlling for other characteristics. This finding is as per the first observation of Buckley (1971) that the highest wage differences were between all male firms and all female firms. The variable Ratio_Male was 0.20 in the regression with only female workers and 0.10 in the regression with only male workers. This suggests that females benefit significantly more than males as a result of moving from a female-dominated firm to a male-dominated firm. This becomes consistent with Buckley's (1971) other observation that gender wage differentials significantly diminished in firms that hired both males and females. As females gained employment in a male dominated firm, their wage premiums rise. On the other hand, the wage premium of the males in the firm decline as a result of the entry of female workers into the firm. These observations strongly support hypothesis H2.3 that gender composition at a workplace affects gender wage differentials.

5.4 Summary

This chapter set out to investigate if firm characteristics could provide significant explanatory powers in explaining gender wage differentials. It set out to test three hypotheses. The first two hypotheses being that firm characteristics has significant explanatory powers, and that including firm characteristics in the analysis alters the results were supported with

strong supportive evidence from the analysis. It also agreed with Abowd and Killingsworth's (1983) point that employer-employee linked data is crucial for analysis in wage inequality research.

The results in the preceding section provided evidence that firm characteristics were not only statistically significant but that the coefficients in the wage regressions and decompositions were biased when firm characteristics were excluded. In the Malaysian case, the tendency was for the human capital models to overstate discrimination. With only the human capital variables, the unexplained portion of the gender wage differential in the wage decomposition of the full sample was 0.05 log points. With the introduction of industry, location, gender composition and firm size, the unexplained portion was reduced to 0.03 log points.

By ignoring firm characteristics from the wage analysis from the outset (see Becker & Chiswick, 1966), researchers have been making the implicit assumption that the conditions and rewards of employment of male and female workers were similar across firms and industries. They also assume that human capital is homogenous across workers, and influences workers' productivity homogenously across all occupations and firms (Willis, 1986). However, the results presented in the preceding section rejects this assumption. Firm characteristics affect wages, and since wages are associated with productivity, the mean productivity of workers with similar observed human capital in different industries would vary. As Tam (1997) pointed out, although occupation specific human capital might not vary, firm specific human capital does vary across firms.

The empirical analysis showed that the exclusion of firm characteristics from the wage function and decomposition creates a bias in the coefficients due to missing variables, and were consistent with the observations and arguments of Abowd and Killingsworth (1983), Heckman (1998), Abowd et al. (1999) and Altonji and Blank (1999). Introducing firm characteristics had an effect on the coefficients in the wage regressions. Except for Others and Agriworker, the coefficients for Age and the other occupations was larger in the equations that had only human capital variables. Since firm characteristics possess significant explanatory powers, the human capital regressions generally overestimate the coefficients of its explanatory variables. In the wage regression, using the human capital variables alone generally tend to over-estimate their respective coefficients.

The decomposition results for Manager, Clerical Support Worker, and Service and Sales Worker produced negative unexplained characteristics when worker characteristics alone were used. This implies that in these occupations males face discrimination, which is highly unlikely. Once firm characteristics were included in the decomposition, the coefficients for Clerical Support Worker and Service and Sales Worker turned negative while the coefficient for Manager was non-different from zero.

The third hypothesis tested if the gender composition of a firm affected average wages in the firm. This was based on Buckley's (1971) observation that the highest wage differences within occupations were between firms that employed only male workers and firms that employed only female workers, and that the wage differences significantly diminished in firms that hired both males and females. The results showed that firms that were male dominated offered wage premiums to their workers compared to those workers employed in female dominated firms. This effect was also significantly greater for females compared to

males. As females gained employment in a male dominated firm, their wage premiums rise while the wage premium of the males in the firm decline as a result of the entry of females into the firm. This causes wage differentials in firms that hired both males and females to be lower.

The evidence that firms were willing to pay wage premiums to attract male workers shows a general preference among employers for male workers. The results suggest either that employer preference affects discrimination at the firms or, alternately, there may be other variables that have not been included in the analysis. However, based on the evidence presented here, female workers especially stand to gain more by working in environments that had high concentrations of male workers.

The evidence that firms were willing to pay wage premiums to attract male workers shows a general preference among employers for male workers. Based on the evidence presented here, female workers especially stand to gain more by working in environments that had high concentrations of male workers. One possible explanation for this result is that employer preference affects discrimination, but this would adversely affect the profitability of firms. Instead, the source is more likely linked to worker preferences, and firm and workplace characteristics. Becker (1985) suggested that since motherhood is effort intensive, married females might seek less demanding jobs in order to economise on effort. More recent work by Sloane and Williams (2000) observed that wages are less of a determinant of job satisfaction for females compared to males, while females also are also more willing to forego higher wages in return for job flexibility (Bender et al., 2005). This observations do appear to be supported by Malaysian government statistics which showed that in 2009, 3.6 per cent of males and 5.8 per cent of females worked less than 30 hour a

week (Malaysia, 2011) thereby suggesting that females are also possibly more transient at the workplace than males. As such choices males and females make in the labour market are probably also a key component of wage inequalities.

CHAPTER 6

EFFECTS OF FIRM SIZE AND FOREIGN DIRECT INVESTMENT ON GENDER WAGE INEQUALITY

6.1 Introduction

Empirically, the problem of gender wage inequality is often addressed from two principal factors that lead to these inequalities. The first relates to the allocation of occupations between the gender groups as wages are strongly correlated with occupation. Secondly, factors associated with the firms and workplace also determine how workers within a particular occupation are rewarded for their effort. The findings in Chapter Four have shown that female workers are more favourably distributed among higher paying occupations than male workers, while the results from Chapter Five make the point that the non-inclusion of firm related characteristics in the earning equations lead to missing variable bias. The information asymmetry in using employer-employee linked data as compared to household survey data is significant. In this chapter, we analyse the effects of firm size and foreign direct investments (FDI) on gender wage inequality at the firm or workplace level.

Idson and Oi (1999) observe that larger firms are more capital intensive than smaller firms, and as such hire better skilled workers to complement their high capital-labour ratio. As a result, Idson and Oi (1999) make the point that workers in larger firms are more productive and thus command higher wages. It therefore goes to reason that if firm size had an effect on workers' wages, inequality to could also be affected by firm size. Furthermore, larger

firms are more vertically organised, with workers being more likely earning wages according to their pay grade instead of a separately negotiated wage for each worker. Such firms are also led by professional managers, and have greater resources in the form of human resource personnel, who are also better able to define the firm's human resource requirements and devise means of fulfilling these requirements at the lowest cost and risk to the firm. Singhapakdi, Sirgy, and Lee (2010) also suggest that bigger firms have a greater tendency to formalise ethical practices compared to smaller ones.

Since the organisational structures and practices of firms are influenced by firm size, there would therefore be significant differences in the hiring and compensation practices between larger and smaller firms. This should result in firm size having a significant effect on gender wage inequality, if such inequalities do indeed exist.

Neoclassical economic theory posits that taste-based discrimination is negatively correlated with increasing competition, and as such an increase in competition resulting from the opening up of economies to foreign investors would result in the elimination of discrimination in these countries (Becker, 1971). As such, firms with FDI injection especially those involved in export-oriented businesses would be more likely to hire female workers who are priced lower in the domestic market compared to male workers with similar endowments thereby pushing female wages up.

Based on the review of literature, this is the first study to examine gender wage inequalities by firm size. While studies on the impact of foreign investment on gender wage discrimination in firms within specific industries have been carried, no studies were observed to have analysed this issue after controlling for all industries. This analysis is performed at the

census occupational level, drawing from the National Employment Return of Malaysia 2009 (Malaysia, 2012) which provides a large workplace dataset covering 847,130 male workers and 469,562 female workers employed in 24,458 establishments. The dataset also allows us to overcome the limitations in previous research (Autor, Katz, & Kearney, 2008; Blau, 1998; Fields & Wolff, 1991; Macpherson & Hirsch, 1995) which utilise Census and Current Population Survey (CPS) data that do not link workers to their employers.

This chapter examines research question one being "How do firm size and foreign-ownership affect gender wage differentials?" As indicated in the literature review, the following hypotheses are tested:

H3.1: Large firms offer significant wage premiums over small firms.

H3.2: There is a correlation between firm size and gender wage inequality.

H3.3: Firms with foreign shareholding exhibit lower gender wage discrimination.

The rest of the chapter is organised as follows. Section 2 discusses the methodology employed. Section 3 presents the results and analysis, while the final section provides the summary.

6.2 Methodology

Recent literature has challenged conventional methods in the employment of econometric techniques in data analysis. Although econometric models are also required to provide strong predictive capabilities, the focus has been overwhelmingly on modelling fit on a given set of data without any consideration for the predictive capabilities of the models.

Unfortunately, achieving high model fit does not necessarily lead to high ex-ante predictive ability (Gigerenzer and Brighton, 2009; Armstrong, 2012). On the contrary, Gigerenzer and Brighton (2009) tell us that a good fit in a model could instead lead to low predictive capabilities. Armstrong (2012) goes to the extent of recommending the avoidance of the use of t-statistics, p-values, F-statistics and R2 as these fit-related statistics create the illusion of accuracy to the reader even as it can be demonstrated that a data set consisting of random numbers could be easily manipulated to produce an econometric model with high R2.

To overcome the limitations associated with current econometric practice, the methodology in his study follows the procedure proposed by Woodside (2013) who suggests that re-searchers should never report fit validity alone when employing multiple regression analysis but also validate the findings by testing the models on holdout samples.

6.2.1 Procedures for testing

The data is divided into two randomly selected sub-samples of 650,318 and 666,374 observations. The first sample consists of 421,353 males and 228965 females while the second sample, being the holdout sample, is made up of 425,777 males and 240,597 females. Although the full data sample is 35.7 per cent female, the first and second samples are 35.2 per cent and 36.1 per cent female respectively.

As Woodside (2013) suggests, the results from the earnings regression models using the first sample are initially used to predict the value of the dependent variable in the second sample. The Pearson's correlation between the predicted values and the actual values is

used to establish the predictive validity of the model. The reverse is then carried out using the results from the second sample to predict the values of the dependent variable in the first sample in order to cross-validate the results. In the decomposition models, the two sub-samples are decomposed separately and the results are compared for consistency.

6.2.2 Decomposition

The measure of worker's productivity regularly used in the literature is the "human capital earnings function" of Mincer (1958, 1974) where the term "human capital" refers to the augmentation of education in an individual. Mincer's function consists of workers' earning in logarithmic form with schooling and the concave function of experience as explanatory variables. Within this framework, a decomposition procedure similar to the one proposed by Oaxaca (1973) and Blinder (1973) is often used to breakdown gender wage differences into a explainable portion related to productivity and an unexplainable portion possibly due to discrimination.

Equation 6.1 presents Mincer's (1974) human capital earnings function, which has been the building block for many studies on wage distribution:

$$\ln(Y_i) = \beta_0 + \beta_1 S_i + \partial_1 t_i + \partial_2 t_i^2 + \varepsilon_i \qquad (6.1)$$

where $\ln(Y)$ is the natural logarithm of earnings. β_0 and S are the initial earnings and years of schooling respectively. t is the potential labour market experience. The quadratic nature of labour market experience explores the concave relationship between earnings and experience where earnings rise more steeply for younger workers than older workers. i

carries a value of 1 for male and 2 for female. β_0 is the intercept, and the other $\beta's$ and $\partial's$ are coefficients of the covariates. ε_i is the error term.

This study uses occupation instead of schooling in Mincer's equation. Both Mincer (1958) and Becker (1962) view the amount of time workers spend on schooling as being strongly correlated to their occupation. Upon facing high correlation between occupation and schooling, Long, Rasmussen, and Haworth (1977) drop schooling as an explanatory variable in their analysis as they found occupation to possess greater explanatory powers in their wage equations. There are also no consistent methods for introducing education into the wage equation. Autor, Katz, and Kearney (2008) measure occupational skill level in terms of the mean number of years invested in schooling by an occupation's workforce whereas Fally, Paillacar, and Terra (2010) simply define any worker who had completed high school as being skilled. The models presented by Bayard et al. (1999) use schooling and occupation in separate models.

As our data presents itself within nine occupational groups, we replace schooling with a set of occupational dummy variables, represented by D. This is presented in Equation 6.2 below:

$$\ln(Y_i) = \beta_0 + \sum \beta_k D_{ik} + \partial_1 t_i + \partial_2 t_i^2 + \varepsilon_i \qquad (6.2)$$

The widely used decomposition procedure introduced by Oaxaca (1973) and Blinder (1973) is applied to analyse the differences in the means of ln(Y) between males and females. This method breaks-down the gender wage differential into a portion that is explained by productivity factors and a residual portion which is unexplained. This residual is often used

to explain discrimination based on Becker's (1971) assumption that discrimination is the difference between an individual's contribution to output and his or her wages. Neumark's (1988) approach to the Oaxaca-Blinder decomposition as presented in Equation 6.3 is used in our analysis:

$$\ln(\overline{Y}_1) - \ln(\overline{Y}_2) = (\overline{X}_1 - \overline{X}_2)\overline{\beta}^p + [\overline{X}_1(\overline{\beta}_1 - \overline{\beta}^p) - \overline{X}_2(\overline{\beta}_1 - \overline{\beta}^p)] \qquad (6.3)$$

where $\overline{\beta}^p$ is the non-discriminatory wage structure coefficient of the pooled male-female workers, and $\overline{X}_1$ and $\overline{X}_2$ are vectors of the characteristics of male and female workers respectively. The first term on the right hand side of the equation represents differences resulting from worker characteristics, while the second term represents the unexplained wage characteristics which is used to measure wage discrimination.

6.2.3 Earnings Equation

Wages are then modelled against the human capital earnings function and a set of variables representing firm characteristics, the latter being used as control variables, to investigate wage differences among gender and ethnic groups. Equation 6.4 presents the OLS estimate where $\ln(Y)$ is regressed against a vector of individual characteristics represented by X, and D, a vector of occupational and employer characteristic dummy variables:

$$\ln(Y_i) = \beta_0 + \sum \beta_j X_{ij} + \sum \beta_k D_{ik} + \varepsilon_i \qquad (6.4)$$

6.3 Results

In Table 6.1a, the Blinder-Oaxaca decomposition of the first subsample is displayed. Mean male wage is 5.702 log points and mean female wage is 5.697 log points, resulting in the mean wage of males exceeding mean female wage by 0.005 log points. However, the explained portion of the decomposition returns a negative value of -0.062, implying that if females in the subsample are paid equal wage for the same worker characteristic as males, they would earn a higher mean wage than male workers. As a result, the unexplained portion of the male-female gender wage difference is 0.057 log points, which is greater than the observed difference of 0.005 log points.

In the decomposition of the second subsample, presented in Table 6.1b, the mean wages of male workers exceed female workers' mean wages by 0.044 log points. Females mean wages too should have been higher that mean male wages due to the negative explained characteristics. The unexplained portion of the decomposition is 0.048, which is which is close to the results for the unexplained portion in Table 5a. The results suggest that at least 0.048 log points in wage differences in favour of males is unaccounted for by the workers endowments and firm characteristics. Following Becker's (1971) recommendation that the portion of the wage differential unexplained by productivity possibly could represent discrimination, these decompositions results strongly suggest the presence of gender wage discrimination. Therefore, the findings from Table 3 support hypothesis H1 that gender wage discrimination is present in the Malaysian labour market.

Table 6.1: Aggregate Blinder-Oaxaca Decomposition

a. First Sample (n= 650,318)		
Wage Decomposition		
Dependent Variable: ln(Y)	Coef.	z-statistics
Males	5.697	3313.78***
Females	5.702	4544.74***
Difference	-0.005	-2.4**
Explained Characteristics	-0.062	-32.72***
Unexplained Characteristics	0.057	34.21***

b. Second Sample (n= 666,374)		
Wage Decomposition		
Dependent Variable: ln(Y)	Coef.	z-statistics
Males	5.707	3184.31***
Females	5.663	4704.17***
Difference	0.044	20.27***
Explained Characteristics	-0.004	-2.22**
Unexplained Characteristics	0.048	27.76***

Source: Calculated by author using Malaysia (2012)
Note: *** represents significance at 0.01 per cent level and ** represents significance at 0.05 per cent level

The earnings equations by gender are displayed in Table 6.2. Model 1 represents the earnings equation for male workers and Model 2 represents the earnings equation for female workers. The value of R2 in the model for male workers in the first subsample is 0.607, while it is 0.606 in the second subsample. The correlation of the predictive values using the first model on the holdout model is 0.776, while it is 0.777 when the opposite is carried out. The squares of the correlations are 0.602 and 0.604 respectively, which are similar to the R2 values of the respective predicted models. In the models for females, the R2 for the first sample is 0.597 and 0.585 in the second sample. The predicted values of results of the first sample on the holdout model produce a correlation of 0.761 with the actual values of the second samples, while the correlation is 0.768 when the second sample results are used to predict the first sample values. The square of these correlations are 0.579 and 0.590 respectively. As the squares of the correlations of the predicted values on the actual values are similar to the R2 of the predicted models, the models display acceptable predictive validity.

The intercepts in these models represent the representative Bumiputera agricultural worker who works in the agricultural sector in Sabah or Sarawak. In both samples, and for both males and females, managers earn the highest mean wages followed by professionals and technicians. Likewise, elementary workers and plant workers earn the lowest mean wages due to their significant negative coefficients. The variable Age has a positive coefficient while the variable Age_sq has a negative coefficient in both the male and female models in both subsamples thereby suggesting that wages increase with age but at a decreasing rate.

The hypothesis H3.1, that large firms offer significant wage premiums over small firms, is investigated using the regression results presented in Table 6.2. The variable Non_Ltd is dropped from the regression to avoid multicollinearity issues. Using the first subsample, the coefficients for Model 1 are 0.05 log points for private limited companies and 0.09 log points for public limited companies. For Model 2, the coefficients are 0.09 log points and 0.11 log points respectively. Using the second subsample, the coefficients are 0.05 log points and 0.04 log points for Model 1 respectively, and 0.12 log points and 0.11 log points for Model 2 respectively. Although, there are no significant differences between private limited and limited companies, these firms offer both male and female workers consistently higher wages compared to the smaller non-limited firms. Those firms with foreign ownership pay a further premium as the coefficient for Foreign is significantly positive in all models. These results support the proposition H6.1 that larger firms pay higher mean wages than smaller firms, after accounting for workers characteristics and other firm characteristics. The wage premium rewarded to female workers is also larger than the premium rewarded to male workers and as such suggests that females benefit more financially compared to males when employed in larger firms or foreign own firms.

For the first sample, the coefficient of the ratio of male workers to total workers at a workplace is 0.10 in Model 1 while it is 0.15 in Model 2. The coefficients for the second subsample are 0.10 and 0.24 respectively. Although the coefficient in Model 2 for the second subsample is very large compared the coefficient for the first sample, there are two important consistencies in the results. Firstly, all four coefficients are significant and positive. Secondly, the coefficients in both the Model 2 results are significantly larger that the respective coefficients for Model 1. These results suggest that workers earn a premium working at workplaces with higher male concentration compared to female dominated workplaces, with the positive effects of working in male dominated workplaces greater for females compared to males. These observations lend support to Buckley's (1971) observations, and are consistent with the results obtained in the previous chapter.

Table 6.2: Earnings Equation

a. First Sample (n= 650,318)

Model 1 - Males			
Dependent Variable	ln(Y)		
Age	0.018	Plant	-0.035
	34.283***		-7.463***
Age_sq	-0.0002	Element	-0.140
	-29.141***		-32.378***
Manager	1.663	Ratio_Male	0.101
	298.243***		22.024***
Prof	1.181	Pte_Ltd	0.048
	213.364***		16.864***
Tech	0.583	Ltd	0.088
	113.207***		22.765***
Clerk	0.264	Foreign	0.034
	47.605***		12.453***
Sales	0.086	Intercept	4.742
	16.447***		425.031***
Craft	0.152	R2	0.607
	27.755***	N	421353

b. Second Sample (n= 666,374)

Model 1 - Males			
Dependent Variable	ln(Y)		
Age	0.010	Plant	-0.025
	19.925***		-5.396***
Age_sq	-0.0001	Element	-0.122
	-16.116***		-29.523***
Manager	1.729	Ratio_Male	0.095
	321.691***		20.731***
Prof	1.252	Pte_Ltd	0.048
	228.995***		17.138***
Tech	0.604	Ltd	0.044
	121.494***		11.658***
Clerk	0.314	Foreign	0.034
	56.983***		12.172***
Sales	-0.014	Intercept	4.865
	-2.874***		434.215***
Craft	0.188	R2	0.606
	35.029***	N	425777

Note: Using the First Sample to predict ln(Y) for the Second Sample: r = 0.776; p-value = 0.000.
Using the Second Sample to predict ln(Y) for the First Sample: r = 0.777; p-value = 0.000.

Model 2 - Females			
Dependent Variable	ln(Y)		
Age	0.022	Plant	-0.087
	31.186***		-9.325***
Age_sq	-0.0002	Element	-0.099
	-27.901***		-11.396***
Manager	1.644	Ratio_Male	0.149
	160.072***		25.944***
Prof	1.151	Pte_Ltd	0.089
	118.188***		24.61***
Tech	0.751	Ltd	0.111
	76.018***		21.587***
Clerk	0.389	Foreign	0.042
	41.954***		13.890***
Sales	0.220	Intercept	4.484
	22.642***		281.213***
Craft	0.165	R2	0.597
	15.815***	N	228965

Model 2 - Females			
Dependent Variable	ln(Y)		
Age	0.012	Plant	0.006
	17.929***		0.917***
Age_sq	-0.0001	Element	-0.052
	-14.9***		-7.802***
Manager	1.687	Ratio_Male	0.243
	194.964***		45.141***
Prof	1.204	Pte_Ltd	0.117
	148.75***		33.596***
Tech	0.705	Ltd	0.111
	86.219***		22.037***
Clerk	0.388	Foreign	0.063
	51.78***		21.998***
Sales	0.218	Intercept	4.548
	27.411***		314.449***
Craft	0.125	R2	0.585
	14.437***	N	240597

Note: Using the First Sample to predict ln(Y) for the Second Sample: r = 0.761; p-value = 0.000.
Using the Second Sample to predict ln(Y) for the First Sample: r = 0.768; p-value = 0.000.

Source: Calculated by authors using Malaysia (2012)
Note: *** represents significance at 0.01 per cent level.

Table 6.3 presents the Blinder-Oaxaca decomposition of wages to analyse the gender wage differentials by firm sizes and foreign ownership operating in Malaysia. The decompositions are carried out for both subsamples. For non-limited firms, mean wage is 5.74 for males and 5.91 for females in the first subsample, while it is 5.75 and 5.77 respectively in the second subsample. The mean wages are significantly higher for females in both samples, though the difference in the first sample is 0.17 compared to 0.03 in the second subsample. If worker endowment and firm characteristics are fully accounted for, the mean wage of female workers employed in non-limited firms in the first subsample would be 0.19 log points more than the mean wages of male workers. The results suggest a small but significant possibility of discrimination of females in the first sample, and of males in the second sample as the coefficient for unexplained characteristics in the second sample was negative.

Among private limited firms, though the wage difference in favour of male workers is larger in the second sample, the unexplained characteristics have a similar coefficient of 0.06 log points in both subsamples respectively. While mean wages were higher among males in private limited firms, females earned higher mean wages among public limited firms. The unexplained portion of the wage difference is 0.16 in the first subsample compared to 0.05 in the second subsample. Overall, the unexplained characteristics among private limited firms and public limited firms are larger than the non-limited firms. These results suggest that females face greater discrimination in larger firms than smaller firms thereby supporting hypothesis H3.2 that there is a correlation between firm size and discrimination.

Table 6.3: Blinder-Oaxaca Decomposition by Firm Size and Foreign Ownership

a. First Sample (n= 650,318)			b. Second Sample (n= 666,374)		
Wage Decomposition			Wage Decomposition		
i.Non-Limited Firms			i.Non-Limited Firms		
Dependent Variable: ln(Y)	Coef.	z-statistics	Dependent Variable: ln(Y)	Coef.	z-statistics
Males	5.742	1155.85***	Males	5.748	1148.85***
Females	5.908	1269.54***	Females	5.773	1364.69***
Difference	-0.166	-24.42***	Difference	-0.025	-3.86***
Explained Characteristics	-0.192	-27.67***	Explained Characteristics	-0.003	-0.450
Unexplained Characteristics	0.026	3.97***	Unexplained Characteristics	-0.022	-3.67***
Number of Observations	63315		Number of Observations	67804	
ii.Private Limited Firms			ii.Private Limited Firms		
Dependent Variable: ln(Y)	Coef.	z-statistics	Dependent Variable: ln(Y)	Coef.	z-statistics
Males	5.673	2974.32***	Males	5.699	2834.31***
Females	5.630	4230.76***	Females	5.589	4371.57***
Difference	0.044	18.78***	Difference	0.110	46.25***
Explained Characteristics	-0.016	-7.74***	Explained Characteristics	0.049	23.34***
Unexplained Characteristics	0.060	33.15***	Unexplained Characteristics	0.061	32.36***
Number of Observations	521591		Number of Observations	531426	
iii. Public Limited Firms			iii. Public Limited Firms		
Dependent Variable: ln(Y)	Coef.	z-statistics	Dependent Variable: ln(Y)	Coef.	z-statistics
Males	5.860	931.37***	Males	5.724	895.95***
Females	6.060	1432.75***	Females	6.114	1512.16***
Difference	-0.200	-26.33***	Difference	-0.390	-51.62***
Explained Characteristics	-0.364	-55.48***	Explained Characteristics	-0.437	-65.80***
Unexplained Characteristics	0.164	29.68***	Unexplained Characteristics	0.047	8.27***
Number of Observations	65412		Number of Observations	67144	
iv. Firms with Foreign Ownership			iv. Firms with Foreign Ownership		
Dependent Variable: ln(Y)	Coef.	z-statistics	Dependent Variable: ln(Y)	Coef.	z-statistics
Males	5.980	737.03***	Males	6.020	692.67***
Females	5.781	1947.42***	Females	5.759	2054.95***
Difference	0.200	23.13***	Difference	0.262	28.66***
Explained Characteristics	0.047	6.32***	Explained Characteristics	0.127	16.88***
Unexplained Characteristics	0.153	27.10***	Unexplained Characteristics	0.135	23.87***
Number of Observations	98128		Number of Observations	98529	

Note: The decompositions for firms with foreign ownership also control for firm size but exclude industries where participation is low to avoid multicollinearity.
Note: *** represents significance at 0.01 per cent level.

Table 6.3 also presents the wage decomposition results for firms which are partially or completely owned by foreign firms. As firm structure is controlled, the results reflect the effects of FDI on gender wage inequality in a firm. In the decomposition for the first

subsample, the mean wages of males exceed mean female wages by 0.20 log points, 0.05 of which is explained by the explanatory variables. This leaves 0.15 log points of male-female wage difference unaccounted for. In the second subsample, the unexplained characteristics portion is 0.14 log points. These results suggest that besides males earning higher mean wages, gender wage discrimination against female workers appears to be highest among firms with foreign equity. As such, the results reject the hypothesis H3.3 that firms with foreign shareholding exhibit lower gender wage discrimination. Instead, females are more likely to experience the highest degree of wage discrimination in such firms.

Table 6.4 presents the coefficients of the variable Ratio_Male of the regression outputs by gender and by firm size. Significant variations in the coefficient across firm size would indicate that the role of gender composition in determining workers' wages is influenced by the size of the firm. On the one hand the effects of male composition in the workplace's workforce are small for males but large for females among non-limited firms. The coefficient in the model for males is insignificant in the first subsample, while it is -0.05 log points in the second subsample. However, the coefficient is larger in the females' model with 0.39 in the first subsample and 0.43 in the second subsample. While the impact is small for males, the wage premiums females receive by working in male dominated non-limited firms can exceed 48 per cent in a workplace that is staffed almost entirely by males. Similarly, the effects are greater for females compared to males in the private limited firms as well, though the quantum is smaller. On the other hand, the effects of male composition in the model for males are larger among limited firms and foreign owned firms. It is especially large in among firms with foreign shareholding included, where the coefficients in the male models are 0.20 and 0.26 for the first and second subsample respectively, while the figures are -0.04 and 0.09 respectively in the females' model.

While the percentage of females in the first subsample is 35.2 and 36.1 in the second subsample, the proportion of females employed among foreign owned firms is 51.2 per cent and 40.4 per cent among non-limited firms. Firstly, the results on firms with foreign shareholding are consistent with Berik, Rodgers and Zveglich (2004) and Menon and Rodgers (2009) finding that FDI leads to greater discrimination of female workers. Secondly, it is possible that female workers accept lower pay in smaller firms where there is greater job flexibility (Idson, 1990) which offers female workers greater job satisfaction (Sloane & Williams, 2000; Bender et al., 2005).

Table 6.4: Gender Composition by Firm Size

a. First Sample (n= 650,318)					b. Second Sample (n= 666,374)				
Structure	**Gender**	**Coefficient of Ratio_Male**	**N**	**Percentage Female**	**Structure**	**Gender**	**Coefficient of Ratio_Male**	**N**	**Percentage Female**
Non Limited	Male	0.010 0.65	33940		Non Limited	Male	-0.046 -3.01**	37602	
	Female	0.394 23.80***	23050	40.4%		Female	0.434 25.94***	24066	39.0%
Private Limited	Male	0.108 19.65***	300192		Private Limited	Male	0.092 16.75***	300528	
	Female	0.132 17.61***	134076	30.9%		Female	0.219 33.53***	143944	32.4%
Limited	Male	0.290 15.43***	39949		Limited	Male	0.219 11.42***	40241	
	Female	0.197 7.15***	20983	34.4%		Female	0.095 3.38**	21464	34.8%
Foreign Owned	Male	0.199 17.38***	47272		Foreign Owned	Male	0.162 14.22***	47406	
	Female	-0.042 -3.66***	50856	51.8%		Female	0.087 7.45***	51123	51.9%

Note: *** represents significance at 0.01 per cent level and ** represents significance at 0.05 per cent level.

6.4 Summary

The chapter has demonstrates that firm structure, worker composition and foreign ownership do affect gender wage inequality at a workplace. Like workers, firms too are heterogeneous, and the various differences between firms could have an impact on wage inequalities as well. As such, the study firstly differentiates firms by size based on their capital structure and subsequently investigates if there is a relationship between firm size and gender wage inequality. Secondly, it looks at the claims of neoclassical economic theory which argues that FDI into a country would reduce gender discrimination. . Thirdly, it examines the interaction between male composition at a workplace and firm size in explaining some portion of the wage differences.

The earnings regression results provide evidence, in line with the observations of Idson and Oi (1999) and Söderbom and Teal (2004), that larger firms pay higher wages than smaller firms. Private limited firms and limited firms in both samples paid higher wages after controlling for workers endowment and firm characteristics. Except for the non-limited firms in the second subsample, the decomposition by firm structure in both samples showed significant wage discrimination against female workers in private and public limited firms. Even within the first subsample, the unaccounted portion of wage differences was higher for the larger limited companies. The coefficients for the unexplained characteristics were 0.03 for non-limited companies, 0.06 for private limited companies and 0.16 for public listed firms. In the second subsample, the coefficients were -0.02, 0.06 and 0.05 log point respectively.

On the one hand, the highest wages are offered by firms with foreign shareholder participation. On the other hand, the results also suggest that such firms do display a greater degree of wage discrimination against female workers compared to wholly Malaysian owned firms. The unexplained characteristics portion of the decomposition of the foreign firms, once worker and other firm characteristics for the first sample was accounted for, returns a coefficient of 0.15 log points compared to 0.14 log points for the second sample.

More females than males too work in firms receiving FDI with the proportion of females in such firms in both subsamples being 52 per cent when females make up only 35 per cent of the first subsample and 36 per cent of the second subsample. The ratio of males in these firms also benefits males more than females, with the difference in coefficient being 0.16 log points in the first subsample and 0.08 log points in the second subsample.

Though the above findings contradict the view of neoclassical economics that an increase in competition resulting from FDI would lead to the elimination of taste-based discrimination (Becker, 1971), they echo the findings of Berik, Rodgers and Zveglich (2004), using concentrated industries in Taiwan and Korea, and Menon and Rodgers (2009), using concentrated manufacturing industries in India, that greater openness to FDI does indeed give rise to a greater gender wage gap in the associated firms. Perhaps as Menon and Rodgers (2009) suggest, the pressure of international competition might actually be hurting the relative wages of females rather than helping them narrow the wage gap. Malaysia, being an export oriented economy, could easily fall into this category. The high proportion of females in these firms could also imply that females may be limited in their ability to bargain for higher wages in the Malaysian labour market.

Females are also well represented in non-limited firms, where they make up 40 and 39 per cent of the first and second subsample respectively. The effects of male composition in the smaller firms significantly affects female workers' wages compared male workers' wages. The difference in coefficients is 0.39 in the first subsample and 0.49 in the second subsample. The results not only support previous findings that females do accept working for lower wages in smaller firms which offer greater job flexibility (Idson,1990; Bender et al., 2005), but they are also willing to accept lower wages to work in firms dominated by females (Sloane and Williams, 2000). This could be supported by Malaysian government statistics which showed that in 2009, 3.6 per cent of males and 5.8 per cent of females worked less than 30 hour a week (Malaysia, 2011), which also possibly suggests that females are more transient than males in the labour market.

CHAPTER 7

CONCLUSION

7.1 Introduction

This thesis set out by suggesting that firm characteristics should be an integral component of wage analysis as previous research has documented how various firm related factors affect wage levels in a firm. These characteristics include firm size (Lester, 1967; Idson & Oi, 1999; Masters, 1969; Söderbom & Teal, 2004), location (Fally et al., 2010; Hering & Poncet, 2010; Ma, 2006), industry (Gibbons & Katz, 1992; Krueger & Summers, 1988) and foreign ownership (Lipsey & Sjoholm, 2001). The human capital variables in the earnings equation (Becker, 1975; Mincer, 1974; Schultz, 1961) assumed that workers' productivity is homogenously across all occupations and firms (Willis, 1986) and it only provides part of the explanation to the wage gap (Blau & Kahn, 2007). If these missing variables have strong explanatory powers, then the analysis with only human capital variables as the missing variables with strong explanatory powers could create a bias in the coefficients of the included variables (Abowd & Killingsworth, 1983; Griliches, 1977).

Much of wage analysis has been based on household surveys, in which the occupational and industry data provided is also more prone to non-sampling error (Bowler & Morisi, 2006). Such data is not only more accurately attained in employer-employee linked dataset is required but also provides other employer related information (Abowd & Killingsworth, 1983; Bowler & Morisi, 2006; Griliches, 1977). CPS thus does not link employers to

employees, and limits its capability to provide reliable firm related data. Abowd & Killingsworth (1983) showed that CPS based data only provided between 20-30 per cent of the variables available to human resource departments in firms

Again this backdrop, this study investigated the explanatory powers of firm characteristics and attempts to bring the research on wage inequality forward by investigating the extent to which these characteristics influence the outcome of analysis. This was done by utilising a recently surveyed Malaysian employer-employee linked primary dataset (Malaysia, 2012).

However, the first issue that needed to be addressed is whether females were segregated into low-paying occupations. Tam (1997) argued that since there was a linkage between occupation and wages, the process allocation of occupations by gender would impact the gender wage differentials. Many have argued that the unfair allocation of occupations have given male workers an advantage in this respect (Acker, 1990; Bielby & Baron, 1986; Cohen & Huffman, 2003; Edgeworth, 1922; Hegewisch et al., 2010; Reskin, 1988), to the extent that female-dominated occupations be held in low esteem or devaluated due to the lower status of females in society (Bergmann, 1971, 1974; England et al., 2007; Levanon et al., 2009).

There has been criticism against the devaluation argument (Fields & Wolff, 1991; Tam, 1997; Tomaskovic-Devey & Skaggs, 2002), while more recent works by Magnusson (2009a) and Grönlund and Magnusson (2013) in Sweden also showed that, while females continued to earn less than males, there is no lack of prestige in the occupations such as day care that have high female participation. Notwithstanding the above, the rate of educational attainment by females has been growing at a faster rate than males in many countries.

Recent statistics showed that a greater proportion of females compared to males undertook tertiary courses in the United States (Aud, 2011) and, that in a middle income country such as Malaysia, the proportions of females in the workforce with tertiary qualifications exceeded that of males (Malaysia, 2010). Indeed, the United Nations (2013) noted that in 62 per cent of countries, the enrolment of females in higher education exceeded that of males. It was only in countries with low tertiary enrolment rates where the United Nations (2013) report found male enrolment to exceed that of females.

The following research questions were explored in this study:

1. Is occupational segregation a cause of gender discrimination?
2. Does the absence of firm related characteristic in an earnings equation bias the results?
3. How do firm size, gender composition and foreign-ownership affect gender wage differentials?

These research questions led to a set of hypotheses that were tested by statistical and econometric procedures. The hypotheses tested were:

H1.1 There is occupational segregation of female workers in Malaysia.

H1.2: There is evidence of gender wage discrimination in the Malaysian labour market.

H2.1: Firm characteristics contribute significantly to the explanatory powers of the wage function.

H2.2: Including firm characteristics significantly alters the results of wage function and decompositions.

H2.3: Gender composition at a workplace affects gender wage differentials.

H3.1: Large firms offer significant wage premiums over small firms.

H3.2: There is a correlation between firm size and gender wage inequality.

H3.3: Firms with foreign shareholding exhibit lower gender wage discrimination.

Despite the vast amount of research on gender wage inequality, the issues related to the non-inclusion of firm characteristics in wage analysis have been largely ignored by many in the literature. The preceding analysis in this study has resulted in the emergence of conclusive empirical evidence on the significance of firm characteristics in both the accounting for and understanding of gender wage inequality.

The findings from the hypotheses led to original contributions in the following areas:

1. Gender occupational segregation.
2. The role of firm characteristics in explaining wage inequality.
3. The interactions of firm size, gender composition and foreign ownership with wage levels.
4. The direct relationship firm size, gender composition and foreign ownership have on gender wage inequality.

The findings challenge some of the literature previously reviewed, and are discussed in the following four sections. The subsequent sections are organised as follows: The implications of this study towards theory is discussed in the next section, followed by the implications to policymakers. This is followed by a section which outlines the limitations of the study and recommendations for future research. The final remarks are presented in the last section of this chapter.

7.2 Theoretical Implications

This section synthesises the findings of the study with respect to the research questions and related these findings to the literature that was reviewed. This will also help situate the main findings with the broader research framework. Although this study uses Malaysian labour force data, the implications are generic enough to be applicable for future studies irrespective of country. The level of gender based occupational segregation at the present time in any country should have declined from the levels a decade or two ago as institutions have evolved. Also, in most countries, female educational enrolment at tertiary level has increased. Secondly, the inclusion of firm related or supply side characteristics into wage analysis becomes necessary if models are not to be misspecified.

To maintain the robustness of the analysis by firm size in Chapter Six, the study accepts the critique of Gigerenzer and Brighton (2009) and Armstrong (2012) who argued that econometric models that achieve high model fit does not necessarily lead to high ex-ante predictive ability, and as such the models must also display high predictive ability. This was implemented by following the procedure proposed by Woodside (2013) who suggested that the sample be divided into two random subsamples with the results from the regression models using the first sample being initially used to predict the value of the dependent variable in the second sample and vice versa. The models are accepted if the correlation between the fitted values and actual values are high. The models in this study have shown high predictive ability as required by Gigerenzer and Brighton (2009) and Armstrong (2012).

7.2.1 Gender occupational segregation

According to Diebold (2004), the human eye is a far more sophisticated tool for data analysis in many ways compared to modelling techniques. As evidence, a graphical analysis of the scatter diagram of percentage female workers against mean wages by occupation-industry in Figure 4.1 itself should itself be sufficient to dispel any notion that occupations in Malaysia with a high proportion of female workers pay lower wages. Although there were no visible correlations, the highest mean wage of 6.6 log points was earned by professionals in agriculture where females constitute 53.9 per cent of the workers, while the occupation-industries with highest and lowest female participation were hovering around the mean of the sample wage.

This study also presented a statistically robust method to compare the occupational distribution of demographic groups. If males had wage-wise superior occupational distribution compared to females, a histogram of occupations that is plotted in the ascending order of the mean wages, should then result in a distribution where the bulk of female occupations should be more oriented to the left of the distribution compared to males. In other words, the shape of the distribution of female workers in this plot would be more skewed to the right than for male workers. The subsequent statistical analysis on the skewness of the occupational distribution of both male and female workers based on the distribution of occupations by gender presented in Figure 4.2 empirically showed that not only were female workers not concentrated in low paying occupations but their distribution among occupations was more favourable compared to male workers.

Although it was quite probable that females were segregated into low paying occupations in the past, the recent evidence from Malaysia does not support the segregation hypothesis as still popularly promoted by Economist's (2011), which claimed that females in emerging countries were "second class citizens" who earned low pay. In fact, females in the Malaysian workforce on the average possess better educational qualifications than males, and the distribution of occupations also favoured females. This does not in any way suggest that discrimination against females does not exist. Rather any evidence of discrimination is not significantly due to occupational segregation. While Edgeworth (1922) made the observation that male-dominated trade unions pushed for the exclusion of females from many occupations in order to protect male wage levels, the increasing flexibility of labour markets due to weaker trade unions as a result of rapid employment growth in both developed and developing countries weakened the position of labour unions and thus allowed more females into the male-dominated occupations (Fields & Wolff, 1991; Standing, 1999).

The other factor that supports this finding is the higher human capital attainment of females compared to males. According to Schultz (1960), education is an investment that augments the human capital and as Arrow (1973) pointed out in his rational expectations model, the willingness of employers to hire determines human capital investment. As such, the neoclassical logic itself should suggest that the "rational" female would only invest in education if they anticipated future employment that provided an acceptable rate of return. The increasing investment in educational attainment by females is evidence for the optimism they possess of their future income.

7.2.2 Explanatory powers of firm characteristics in wage analysis

Becker & Chiswick (1966) defined the total earnings of an individual to be the sum of the individual's earnings from the human capital investment plus the earning from the "original" human capital. Since the seminal work of Mincer (1958, 1974), Schultz (1960, 1961) and Becker (1971), wage differentials have been compared against the workers human capital in an attempt to create a portion of the wage differentials that is explained by the human capital variables and another portion that is unexplained. The unexplained portion became generally considered to be the consequence of discrimination. Towards this, the correlation between schooling levels and wages has been identified in numerous other works (Autor et al., 2008; Bayard et al., 1999; Fally et al., 2010; Long et al., 1977). However, Altonji and Blank (1999) pointed out that measuring unobserved skills such as intelligence required measurement of school quality and better data for measuring worker skills.

Operationally, on the one hand, while the human capital variables does not have any clear definition as its usage varies across industries (Tam, 1997) or even studies (Heckman, 1998), the Mincerian model itself assumes that human capital is homogenous across workers, and influences workers' productivity homogenously across all occupations and firms (Willis, 1986). On the other hand, Abowd and Killingsworth (1983) showed that CPS based regression data can only account for 20-30 per cent of wages variation when the personnel data available to employers can account for 60-80 per cent of this variation. Furthermore, users of Mincer's models have only focused on the incorporation of workers' supply side characteristics while firm side variables such as firm size, industry, location and

ownership have largely been ignored. Even if the authors wanted to, most often they were reliant on household survey data such as the CPS in which any information on occupation or industry is unreliable (Bowler & Morisi, 2006). The literature review did not find any previous research that used a single dataset to display variances in the results of using only human resource variables as against both human resource and firms-related variables.

The restricted least square procedure using the Wald-test confirmed that firm characteristics had significant explanatory powers in wage regressions and decomposition. The wage premiums varied across industries and across firm location, size and ownership. Workers employed in mining, finance and utilities received the largest wage premiums. Also firms located in more urban regions of the country paid higher wages. Larger firms and foreign firms too paid higher wages to both male and female workers. Not just that, the coefficients of the human resource variables took up smaller values when firm characteristics were introduced. Except for agricultural workers, the coefficients associated with all the other occupations took up a significantly smaller value. Likewise, the unexplained portion of the gender wage differential in the wage decomposition of the full sample was 0.05 log points. With the introduction of firm-related variables, the unexplained portion of the differentials was reduced to 0.03 log points (see Table 5.2). As the gender distribution of workers among firms vary, the exclusion of firm characteristics from the analysis leads to missing variables bias. The results from Chapter Five suggest that inequality analyses that do not include firm characteristics tend to over-estimate gender wage discrimination.

7.2.3 Effects of firm size and foreign ownership on gender wage inequality

As firm size and foreign ownership impact workers' wages, the study also investigated if these had any effect on gender wage inequality. Söderbom and Teal (2004) showed that larger firms tended to hire workers with greater human capital. This was because the larger firms were more capital intensive than smaller firms, and as such hired better skilled workers to complement their high capital-labour ratio who were paid higher wages for their higher productivity (Idson & Oi, 1999). On the other hand, small firms "tend to have simple and highly centralised structures" (Thong et al., 1996) and thence a more horizontal organisation. The literature that had been reviewed suggests that previous studies have not addressed the relationship between firm size, foreign ownership and gender wage inequality in firms, and this study aimed to investigate this gap.

The results showed that, after controlling for firm characteristics, female employees of Malaysian-owned firms appeared to on the average possess superior worker characteristic than male workers. This is consistent with the superior educational attainment among female Malaysian workers (see Table 1.2). The decomposition results showed that non-limited firms had the lowest unexplained characteristics portion of 0.03 log points in the first subsample and -0.02 in the second subsample (see Table 6.3). On the other hand, private limited and public limited firms had similar unexplained portions of 0.16 log points and 0.16 log points in the first subsample respectively, while they were 0.05 log points for both firm structures in the second sample. The size of the unexplained portion of the wage differences is highest among firms with foreign ownership firms at 0.15 log points and 0.14 log points in the first and second subsamples respectively. Not only do foreign firms offer

the highest wages, but also the largest unexplained gender wage differentials; this is followed by limited companies. These results allow us the opportunity to conclude that gender wage discrimination is higher among large and foreign firms. One scenario is that since larger firms are likely to have a more vertical organisational structure, it is possible that females in large firms face the glass ceiling effects to career progress after a certain point.

Berik et. al (2004) and Menon and Rodgers (2009) argue that greater openness to FDI actually hurts females' wages relative to males' wage as international competition forces firms to cut costs. Coupled with employer and union preferences for males, the outcome is that female workers have lower bargaining power and are thus discriminated. The authors cite that this argument is supported by Becker's (1971) theory that the demands for lower costs after trade liberalisation would cause firms to hire female workers who cost less.

An explanation, which this study proposes, is that the gender wage differentials observed amongst larger firms and firms with foreign shareholdings is the effect of skill based technological change on wage structure in these firms. Since these firms already offer higher wages, workers here are likely to be more productive as well. Just as larger firms have a higher capital-labour ratio (Idson & Oi, 1999), there is also a positive correlation between FDI and average value added per worker evidenced by the preference of foreign firms to locate in high-productivity industries (Javorchik, 2004). As such, firms with foreign participation also tend to higher workers with a greater degree of human capital than wholly domestically owned firms. Katz and Autor (1999) have presented a strong argument to suggest that it is technological change rather than international trade changes that have caused an increase in demand for more skilled workers. This is substantiated by Chamarabagwala (2006) who empirically found that the skill-deepening in the Indian

economy during the period from 1983 to 2000 was not related to international trade "but mostly due to skill upgrading within industries." Goldberg and Pavcnik (2007) reviewed the recent literature on the effects of globalisation on income inequality in developing countries, and found that the literature overwhelmingly found that the increased trade in intermediate goods and "trade induced skill-biased technological change" favoured more skilled workers, thereby increasing inequalities. Also, Menon and Rodgers (2009) do acknowledge that female workers can improve their relative wages vis-a-vis male workers by "building and up-grading skills" with "firm-specific training."

The findings here suggest the possibility that a significant portion of the observed positive coefficients in larger firms and firms with foreign ownership can be accounted for by male workers possessing a greater amount of human capital, including firm or industry specific skills, than female workers. Although numerous male and female workers may be occupationally grouped together, it is suggested here that on the average male workers in larger firms and firms with foreign ownership possess greater human capital than female workers. Though it is possible for female workers to suffer as a result of the glass ceiling effect, the firm and industry specific human capital would account for some portion of the differentials here.

7.2.4 Relationship between firm size, gender composition and gender wage inequality

Buckley (1971) made the interesting observation that the highest wage differences within occupations were between firms that employed only male workers and firms that employed

only female workers, and firms with mixed gender workforce had the lowest wage differentials. The literature review did not find further research on Buckley's observation, and as such pursued this large gap in the literature. The introduction of male composition of the employees as an explanatory variable at the workplace level allowed this to be analysed, and was covered in the last two chapters. The results do show that gender composition at a workplace does play a significant role in wage inequality. This study looked at how male composition at a workplace affected male and female workers' wages.

In the full sample, the coefficient for variable representing the ratio of male to total workers at the workplace variable was 0.14 thereby implying that male-dominated firms do on the average pay higher wages for both male and female workers as a worker in an all-male firm would on the average receive a wage premium of 0.14 natural log points over an equivalent worker in an all-female firm (see Table 5.1). The effects were, on the average, greater for females than for males as the coefficient in the model for females was 0.20 and that for males was 0.10.

However, when the analysis was carried out by firm size using two subsamples, the results in both subsamples (see Table 6.4) consistently painted significant variations in wage premiums by firm size. On the one hand, the effects of male composition in the workplace's workforce are smaller for males compared to females among non-limited firms and private limited firms. On the other hand, the coefficients were larger for males among limited firms and firms with foreign shareholding. The starkest comparisons were between the non-limited firms and the firms with foreign shareholding. In the first subsample, the coefficient in the model for males was insignificant, while it is -0.05 log points in the second subsample. On the contrary, the coefficients in the females' models were 0.39 and

0.43 in the first and second subsamples respectively. Among the firms with foreign share-holding, the coefficients in the male models were 0.20 and 0.26 for the first and second subsample respectively, while the figures are -0.04 and 0.09 respectively for the females' model. The results for the non-limited firms support the findings of previous research which suggest that females may be willing to forego wages for job-flexibility (Idson, 1990; Sloane & Williams, 2000; Bender et al., 2005) or to work in a female-dominated workplace (Sloane and Williams, 2000). The results obtained could also suggest the possibility that females have little bargaining power in the labour market or, as discussed in the previous section, that female workers lag behind their male counterparts in acquiring firm or industry specific human capital thereby limiting their ability to work in areas where capital-labour ratio is relatively high.

7.3 Policy Implications

The findings from this study offer useful insights both in terms of policy implications and research methodology for policy makers in Malaysia and elsewhere. The theoretical insights have significant implications for policy analysis, while the data and methods used offer important pointers for conduct of policy related research. The following are some of the important implications derived from this study:

The results provide substantial evidence to show that occupational segregation at the main occupational level does not exist in the Malaysian, and this result is consistent even when analysed across the occupation-industry level. Although this does not exclude segregation within certain sub-occupational levels, it is reasonable to assume that occupational segrega-

tion is not a major cause of gender wage discrimination in Malaysia, and probably in many other countries where females workers' educational attainment is high. If females in an emerging economy do not face major barriers of entry into occupations, by extension females in most developed countries should fare at least as well due to the more advanced institutions that these countries possess. Resources spend on researching and introducing policies to tackle occupational segregation could be invested elsewhere.

The results from the unrestricted regression that included firm characteristics in the wage functions and decompositions suggested that firm characteristics have significant explanatory powers in measuring wage inequality but also that the coefficients in the human capital variables are biased in the absence of firm characteristics due to the missing variables. Although it is common for policy makers to use household survey data for analysing inequalities in the labour market, the results in this study show that much of the measured wage differentials using the traditional earnings function can be accounted for by firm related characteristics. This implies that some portion of the inequality can be traced back to the industries firms operate in or some other firm related characteristics.

To ensure greater robustness of findings, research methodology should incorporate the predictive capability of their models, not just the fit. Although the overall results were similar, dividing the sample into two subsamples and testing them independently without replacement offered differing coefficients in the econometric models. This raises two important points. Firstly, comparing coefficients across studies is a spurious activity. Even when the data from a large dataset such as the one used in this study can offer dissimilar coefficients, what more can we expect when we compare results from smaller datasets collected under differing conditions and analysed differently. Secondly, this study recom-

mends that samples be divided into two subsamples and analysed separately for greater robustness of findings.

Although FDI is a major source for capital accumulation, foreign exchange, foreign trade, employment generation and economic growth, policy makers need to address the resulting gender inequalities which theoretically should not be present. The findings here corroborate earlier observations in South Korea, Taiwan and India. As FDI coming into these firms receive significant incentives from the government, policymakers are in a position to implement policies that ensure females are not discriminated against in such firms.

Besides firms with foreign shareholding, higher incidence of gender wage differentials is observed in large domestically-owned firms as well. One reason is that large firms are more vertically organised, where the glass ceiling effect makes it difficult for females to rise to the upper echelons of their occupation within the firm. It could also be that females have not matched males in acquiring specific human capital that would enable them to compete with males for such positions. Policymakers need to understand this phenomenon in greater depth in order to carryout suitable remedial action.

7.4 Limitations and recommendations for future research

Although the study offers deep country level analysis on gender wage inequality, there are limitations in this research project that requires some attention. These limitations exist as a result of the format of the NER 2009 survey.

Firstly, the data was collected as per the classification of the Malaysian Department of Labour which uses 10 main occupational groups compared to the US Bureau of Labor's standards of 23 main occupational groups. This restricted the ability of the study to explore with more occupational groupings even though Tam (1997) had criticised Petersen and Morgan's (1995) results as being irrelevant for utilising an extremely detailed level of analysis. To demonstrate the versatility of the findings in this study, future research using Malaysian data should attempt to undertake similar analysis with occupations divided into a larger number of main occupational groups.

Secondly, defining firm size was a difficult exercise as; firstly, revenue or profit figures were not collected in the survey. Secondly, data on paid-up capital was not complete. Thirdly, being a workplace-based survey, details of the total workforce of the firms were not required in the survey. As a result, the type of registration the workplace possessed was used as the criteria as sole proprietorships and partnerships tended to be smaller than private limited companies, and private limited companies tended to be smaller that public limited companies as the latter can have an unlimited number of shareholders in which shareholding can be offered to the public. Future research may also want to look at better ways of defining firm size, and also how better to introduce foreign ownership into the analysis.

Thirdly, the data in this study is not suitable for studying wage differentials at different points of the wage distribution as the grouped data collected is structured such that the lower groups are narrow, thereby sacrificing accuracy at the higher wage levels. Although there are some inaccuracies resulting from this limitation in the pursuit of this study, the logarithmic scale does mitigate the effects of this limitation. However, the data in this

format is not suitable for studying wage differentials at the upper echelons of an occupation or a firm. As the glass ceiling preventing the progress of females to the higher wage levels in a strong possibility, future studies may want to investigate the glass ceiling phenomena with employer-employee linked appropriate data.

Fourthly, the study ignores non-financial motivations of workers, which appear to be more pronounced for female workers (Idson, 1990; Sloane & Williams, 2000; Bender et al., 2005). This is the result of the limitations set by the assumptions of the Mincerian earnings model. Future research needs to incorporate greater effort into incorporating worker preferences into the analysis. It could also be directed to understanding and analysing the broader social conditions within which wage determination by gender occurs.

7.5 Final remarks

This study has empirically shown and provided arguments that in societies where females have demonstrated higher educational attainment than males, female workers are unlikely to face a systemic barrier of entry into many occupations. Discrimination would probably be, firstly, the result of certain employers preferring male workers to females and, secondly, due to barriers that make it difficult for females to reach the highest rungs within their occupation or firm.

The results have also empirically proven that analysis should link workers with their employers; using worker information alone would lead to a bias in the results due to the missing variables problem.

This study started out by questioning the objectivity of many researchers and policymakers in addressing gender inequality issues. Though this study does not attempt to prove this, the results do question the claims of many. The results show that females face discrimination in the Malaysian labour market, a substantial portion of which is certainly in the internal labour markets of firms. However, nowhere in this study was any indication that females in Malaysia, a country economically in the middle as defined by its middle-income status, could possibly be carrying out two-thirds of the work but earning only ten per cent of total income as claimed by UNDP (2011) or support claims made by Economist (2011) on the status of females in the developing world. Although this study does not include unpaid work, there is no basis for these claims. It should also be noted that males and females do make different choices in the labour market due to their varying preferences. As such, measuring inequality solely in terms of financial reward, in a model where workers are assumed to be homogenous, ignores the differing values humans place on both financial and non-financial preferences.

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APPENDIX A

COVER PAGE OF NER 2009

SULIT
CONFIDENTIAL

AKTA KERJA 1955
(Seksyen 63)
EMPLOYMENT ACT 1955
(Section 63)

Salinan Majikan
Employer's Copy

NO. SIRI

JABATAN TENAGA KERJA SEMENANJUNG MALAYSIA
LABOUR DEPARTMENT PENINSULAR MALAYSIA

PENYATA GUNA TENAGA KEBANGSAAN
NATIONAL EMPLOYMENT RETURN

Nama dan alamat tempat pekerjaan:
Name and address of place of employment:

Tarikh Notis: 1 Julai 2009
Notice Date: 1st July 2009

Tuan,

Perakuan Penerimaan Borang Penyata Guna Tenaga Kebangsaan
Acknowledgement of Receipt of National Employment Return Form

Dengan hormatnya saya merujuk kepada perkara tersebut di atas.
I am honoured to refer to the above matter.

2. Kementerian Sumber Manusia sedang mengumpul maklumat berkaitan guna tenaga di pasaran buruh. Maklumat ini akan digunakan oleh Kerajaan dalam membuat dasar berkaitan keperluan tenaga manusia negara.
The Ministry of Human Resources is gathering information on employment in the labour market. The information will help the government to formulate effective human resources policy.

3. Bersama-sama ini disertakan Borang Penyata Guna Tenaga Kebangsaan untuk dilengkapkan dengan maklumat yang berkaitan syarikat tuan. Kegagalan melengkapkan dan mengembalikan borang penyata ini merupakan satu kesalahan di bawah Akta dan apabila disabitkan boleh didenda tidak melebihi RM10,000.00.
Attached is a copy of the National Employment Return Form to be completed with information related to your company. Failure to complete and return this form is an offence under the Act and shall on conviction, be liable to a fine not exceeding RM10,000.00.

4. Kandungan borang penyata yang diterima adalah SULIT dan tidak akan dihebahkan kepada sesiapa atau mana-mana pihak di luar Kementerian ini.
The contents of this form is CONFIDENTIAL and will not be divulged to any person or any party outside this Ministry.

5. Sila kembalikan borang penyata yang telah dilengkapkan ke alamat Pejabat Tenaga Kerja dengan menggunakan sampul surat yang disertakan selewat-lewatnya 30 hari daripada tarikh notis yang tertera di atas.
Please return the completed form to the Labour Office by using the attached self-addressed envelope not later than 30 days from the date of notice that stated above.

6. Kerjasama tuan sangatlah dihargai dan diucapkan terima kasih.
Thank you for your co-operation.

Sekian.

(DATO' ISMAIL BIN HJ. ABDUL RAHIM)
Ketua Pengarah / *Director General*
Jabatan Tenaga Kerja Semenanjung Malaysia/
Labour Department Peninsular Malaysia