

AN INTERNATIONAL STUDY OF THE GENDER WAGE GAP AND POLITICAL INSTITUTIONS

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CHAPTER ONE

AN INTRODUCTION TO THE GENDER WAGE GAP

“Today, women make up about half our workforce. But they still make 77 cents for every dollar a man earns. That is wrong, and in 2014, it’s an embarrassment.”

–2014 State of the Union Address, President Obama

1.1 An Issue Worth Investigating

The gender wage gap (GWG) is a phenomenally complex issue that can be caused by a spectrum of factors. Scholars have attempted to explain the wage gap for decades, and are still unable to fully comprehend this puzzle that covers multiple fields of research. Closing the gender wage gap is important because it gives greater profitability to the economy, promotes social justice, and creates equal opportunities by improving economic independence.¹ The merits of studying the gender wage gap politically are important because the measure can be used to analyze the progress on equal pay in the international community. While wages are not the only determinant of living standards, because a given income can translate into different standards depending on individual needs, wages are the easiest to measure.

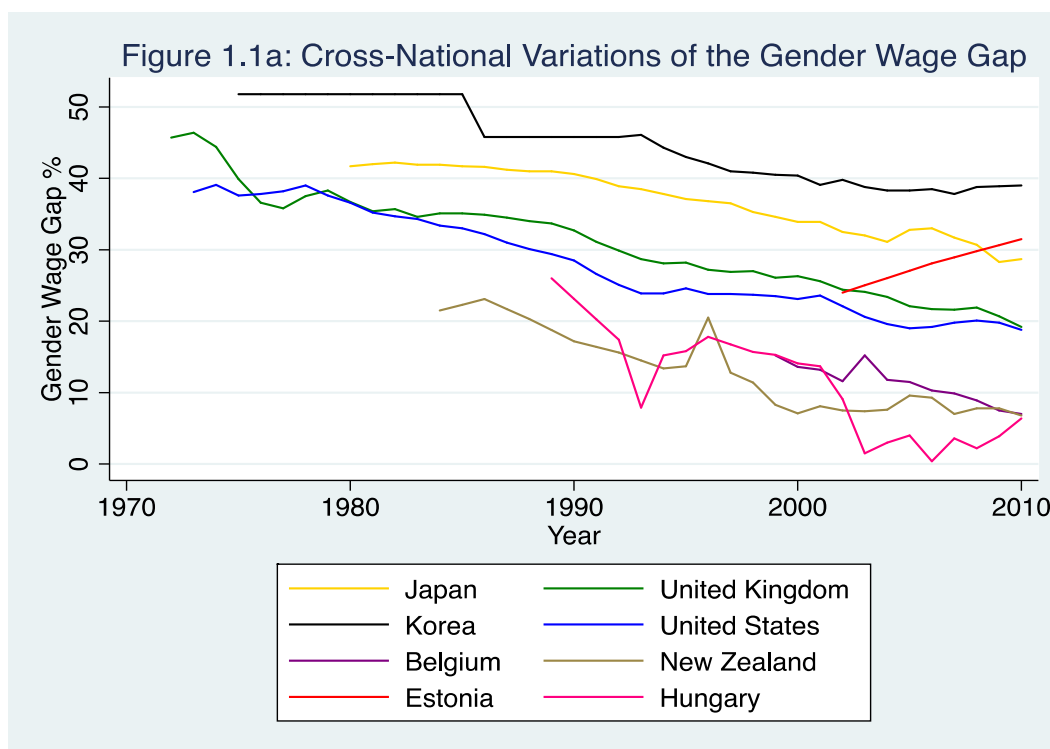
To better understand the international complexity of this issue, a brief examination on variation between countries is necessary. A particular case study that has captured the attention of many scholars is how South Korea’s GWG is one of the largest among OECD nations. This problem is significantly puzzling because the nation has the 15th largest economy, nearly 40% of tertiary educational attainment in individuals age 25-64, and an employment rate of 74% in individuals 25-54². The strength of the nation’s economy, education, and high employment rates are all factors that should distinctly provide an opportunity to narrow the gender wage gap. However, the nation’s inability to

¹ Based on a series of studies by the European Commission on Justice and Gender Equality.

² Statistics are from the World Bank and OECD data.

narrow the staggering gender wage gap of 39%³ highlights the importance of studying this issue and its causal factors.

Similar to South Korea, countries such as Japan (28.7%) may have high gender wage gaps and should be compared with other OECD member states. Economically developed and socialized countries such as the United Kingdom and the United States fluctuate near the OECD average (15.4%) at about 19.2%, and 19.8%, respectively. These industrialized countries, however, can pale in comparison to countries such as Belgium at a mere 7%, New Zealand at 6.8%, and Hungary at 6.4%⁴. Hungary managed to reach a statistical low of .4% in 2006, which was possibly caused by rapid market competition liberalization policies enacted in the 1990's. These variations are significant because they highlight cross-national differences and how labor market and political institutions can affect a country's gender wage gap.



³ The Korea Herald, Park Min-Young via OECD.

⁴ Data from the 2010 OECD gender wage gap metrics.

Variations of the GWG are not based on a unique or idiosyncratic event but on a recurring, patterned set of events in the global community. Despite the large number of studies on this phenomenon, scholars still debate the underlying causes of the gender wage gap. In order to understand why these variances occur, the corresponding research questions would be many and include: Why is the GWG so large in politically, socially, and economically developed countries? What are arguably the dominant factors that cause the GWG in each discipline and field of research? More importantly, how are these dominant factors influenced by labor market and political institutions? These are all important questions that must be examined when attempting to understand this extremely complex issue. However, due to the depth of this topic, we will narrow the scope of these questions significantly. The primary question that will be examined is whether the differences in women's incentive for labor force participation can account for variations in the gender wage gap across countries over time and how labor market and political institutions can affect these incentives.

Examining such effects will require a combination of social, economic, and political variables. Variables such as fertility rates, the age gap between husband and wife at first marriage, the top marginal income tax rate, and female educational attainment may affect women's incentives for labor market participation. Labor market and political institutions such as centralized collective bargaining, economic competition, public-private employment ratios, and measure of earnings dispersions will also be included in this study. Lastly, I will include a newer experimental variable in female political representation and see how it affects the gender wage gap.

Although initially puzzling that such a route is taken to explain variations in the gender wage gap, the selection of the primary question, methodology of an international time series analysis, and variables were carefully selected after examining the vast amount of literature on this complex issue. This study will examine variations of the gender wage gap across countries over a forty-year period from 1970-2010, using wage data provided by the Organization for Economic Cooperation and Development (OECD). It will more specifically focus on labor market and political institutions that are related to female lifetime work that affect the gender wage gap across countries. I hypothesize that cross-national differences in institutional variables that affect lifetime labor force participation are related to differences in the gender wage gap. When a variable such as the gender wage gap can help understand the livelihoods of billions in the global community, the issue is worth investigating.

CHAPTER TWO LITERATURE REVIEW ON THEORIES AND CROSS-NATIONAL STUDIES

Any discussion examining the effects of labor market and political institutions regarding the gender wage gap should begin with an analysis of various theoretical approaches. The GWG has been attributed to a number of factors including human capital endowments, career interruptions of women, discrimination by employers through horizontal and vertical frameworks, job characteristics, occupational self-selection and labor market institutions. As a result, different theories have been posited to explain such factors of the wage gap. Four main theories that have been used most extensively include the human capital theory, the theory of equalizing or compensating differentials, segmented labor market theories, and the discrimination theory. This study will individually examine each theory and assess whether they can be used in combination, in a large, cross-national time-series analysis. Not all theories and approaches may be applicable because they may focus on lower level, individual statistics and survey data.

2.1 Human Capital Theory

One early approach to explaining the gender wage gap is the Human Capital Model. According to this theory, human capital corresponds to any stock of knowledge or characteristics (either innate or acquired) the worker has that contributes to his or her “productivity.”⁵ This definition is very broad and has both advantages and disadvantages. The advantages are clear. This theory allows us to examine years of schooling in addition to the variety of other characteristics as part of human capital investments. These include school quality, attitudes towards work, work motivation, additional training, etc. One’s incentive to invest in training is directly proportional to the time one expects to work over

⁵ Professor Steve Pischke from the London School of Economics.

a lifetime. The theory contends that because females anticipate less time in the labor market due to child rearing or other career interrupting issues, they invest less time and money into education and training, and therefore do not reap rewards compared to males. As a result, employers anticipate this tendency and the resulting effects. This type of reasoning helps us progress towards understanding differences in earnings across workers that are not accounted by schooling differences alone.

Scholar Solomon W. Polachek argues the value of the Human Capital Model and claims that it explains why the GWG has narrowed. According to Polachek (2004), “Secularly rising women’s labor force participation relative to men’s implies that women’s human capital investments should intensify compared to men’s.” The rise in female relative human capital investments to males suggests a narrowing in the gender wage gap. In support of this claim, this narrowing can be seen during the period 1890-2001 and how women’s relative earnings grew during this period. Overall since 1890, Polachek argues that female earnings rose from just over 30% of male earnings to about 80% in 2001, just as the human capital model predicts.⁶ This may be in part due to women’s labor force participation rising dramatically from 4.6% in 1890 to 61% in 2003 in the United States. At the same time, men’s labor force participation declined moderately from 84.3% in 1890, to 73.5% in 2003.⁷ In relation to these labor force participation trends, the female-to-male wage ratio rose from 34% in 1890, to about 76%

⁶ This growth is argued based on natural trends and changes in US labor and equality policies.

⁷ The 1890 data are from Historical Statistics of the United States from Colonial Times Until 1970, Series D 49-62, p. 133. The data from 2003 are from the 2004-5 Statistical Abstract of the US, Table 570 (p. 371) for males and Table 578 (p. 376) for females.

in 2003.⁸ These claims are extremely bold and subject to error, but provide an important foundation for related trends when examining the GWG.

The disadvantages are related and clear. Every difference in remuneration that we observe in the labor market cannot possibly be caused by the acquisition of human capital. The unobserved heterogeneity issue accounts for other skills, in some other dimensions, that are not being measured by years of schooling.⁹ The presumption that all pay differences are related to skills is too broad and can be subject to errors by not accounting for compensating differentials, labor market imperfections, and workplace/hiring discrimination.¹⁰

Although the Human Capital Theory alone contains several deficiencies, the theory is an important foundation for this study and can be used to examine differences that begin within a household. As examined in chapter 1, demographic and institutional factors may help explain how women's relative labor market success varies. One can use these international differences to better understand the gender wage gap, to the extent that some of these demographic differences are exogenous and affect the labor market perhaps through incentives to invest in human capital. Applying the Human Capital Theory allows us to examine social variables such as the family wage gap; which yields significant results.

Male-female wage differences are relatively minor for single (especially never married) men and women. The wage differences 10%, however, expand dramatically (roughly 40%) for married men and women (Blau and Kahn ,1992), even further for men

⁸ The 1830 figure is based on Claudia Goldin (1990), pp 60-61; and the 2003 figure is based on June O'Neill and Dave O'Neill (2006).

⁹ Analysis by Professor Steve Pischke.

¹⁰ Each theory will be individually examined in the following sections.

and women with children (Harkness and Waldofofel, 2003), and especially children spaced widely apart (Polachek, 1975). To explain these patterns, Becker (1985) examines the division of labor in the home. Division of labor implies married men expect to work more years over their lifetime than married women. As a result, married men purchase more human capital than married women (especially married women with children), and thus married men have higher wages. This of course is not an impregnable theory, but it does help explain dominant trends that have occurred since men have been considered as primary providers in many families. It is important to examine this social variable and trend because single men and women earn roughly similar wages and exhibit roughly comparable work histories.

Rather than relying on a person's observed past and present work history, which can be difficult to measure, one method examines the estimation of future work expectations. Current and past employment translates directly to the acquisition of human capital (Mincer, 1974), but future work expectations are important because they alter human capital investments in school and in the workforce (Polachek, 1975b and Weiss and Gronau, 1981). Expectations such as exiting the labor market (perhaps to raise children), reduces lifetime work and decreases potential accumulation of human capital and its rewards. In contrast, those who expect work longer hours, and foresee the greatest number of years at work, have the highest expected returns. As a result, one's incentive to invest in training is directly proportional to the time one expects to work over his or her lifetime. Estimating future work behavior can be imprecise, and as a result, most studies concentrate solely on observable current and past labor market experience. However,

there is merit in examining future work behavior because it can be used to study cross-national differences in institutional variables.

The difficulty of estimating future work behavior requires we analyze the division of labor through different methods. One method is to examine whether the theory's predictions regarding lifetime work and wages are supported by data. There is a direct link between lifetime work and earnings, as demonstrated by the relationship between the gender wage gap and marital status as previously mentioned (Blau and Kahn, 1992). Another method is to test whether the theory's inferences hold between countries. This can be conducted by examining whether cross-national differences in institutional variables that affect lifetime labor force participation are related to cross-country differences in the gender wage gap. It is important to clarify how these cross-national differences by themselves do not directly determine wages. Measuring how numerous cross-national differences (GDP, labor laws, etc) directly affect wages and such enormous complexities will not be examined in this study.

This study will expand on the Human Capital approach to explore whether differences in women's incentives for labor force participation can account for variations in the gender wage gap internationally and over time. Women's incentives for lifetime work may be an important determinant of female wages in relation to that of males. As a result, we expect women who work in countries with fewer incentives for work to have lower wages relative to men, and vice versa.

2.2 Compensating Wage Differential Theory

The theory of compensating or equalizing differentials originates from the first ten chapters of Book I of *The Wealth of Nations*, and refers to observed wage

differentials required to equalize the total monetary and nonmonetary advantages or disadvantages among work activities and among workers themselves. This theory has been widely used as a theory of supply of workers to labor activities that are differentiated by various attributes such as working environments, worker skills, and other job requirements. Measurable job attributes on which compensating wage differentials have been shown to rise empirically include: (i) onerous working conditions such as health risks, exposure to pollution, etc.; (ii) intercity and interregional wage differences associated with differences in climate, crime, pollution, and crowding; (iii) special work-time scheduling, flexible work schedules, and possible risks of layoff and subsequent unemployment; (iv) the composition of pay packages, vacations, pensions, and other substitutes for direct cash wage payments (Rosen, 1986). As Filer (1985) asserts, since one's chosen job may have different characteristics from other jobs that could potentially have been taken, wages act both as returns to human capital characteristics and compensation for the "disagreeable aspects of a job" (1985: 427). Consequently, according to Rosen (1986), the more undesirable a job is, the higher the wages an employer would have to offer for that job. This theory is significant because it examines lifetime labor force participation and can be used to analyze incentives for working in a specific occupation.

Several studies have tested the theory of compensating differentials, and as with the human capital theory, there have been mixed results. Hersch (1998) found in a study of blue-collar workers that both men and women received a compensating differential for the risk of injury. These manufacturing and construction jobs, in which workers carried a risk of physical harm, were positively associated with wages. In a study of Australian

women, Edwards (2006) found that there were negative compensating wage differentials for the eligibility for maternity leave. Since maternity leave is a benefit, women were willing to accept lower wages in exchange for eligibility (Edwards 2006). Here we can see a special differentiation in compensation by gender, whereas the Hersch study showed there was lateral compensation. Based on these studies, we can analyze how compensating differentials may cause variances in the gender wage gap.

In opposition, some other research has contradicted the predictions of compensating differentials. Kilbourne, Farkas, Beron, Weir and England (1994: 708) did not find substantial evidence that work with “physical disamenities” would provide wage premiums. Also contrary to the predictions of this theory, Jacobs and Steinberg (1990: 459) found that “neither men nor women are positively compensated for working in unpleasant or unsafe conditions.” In another contradiction to the assertion that women, especially those with children, would sacrifice higher earnings for flexibility in working hours, McCrate (2005) found that in the US, the people with the most rigid schedules were neither men nor workers without children. Workers with more authority had more flexible hours than those who did not. The compensation for the inflexibility is small and is offset by returns to authority. As a result, we can see that the theory of compensating differentials may be intangible and that it does not affect the gender wage gap.

Finally, an underlying assumption of the theory of compensating differentials is that workers would be sorted into the jobs that they prefer. However, Quintana-Domeque (2011) states that a mismatch between worker’s preferences and the characteristics of a job can exist as to where the workers whose preferences are mismatched with their job characteristics could lead to lower productivity and lower earnings. Their study shows

signs that workers do not necessarily gravitate towards jobs with the characteristics that they prefer.

As a result, the theory of compensating differentials can help explain the gender wage gap in some cases, while they cannot in others. Overall, the theory predicts that women are more likely than men to end up in occupations that are more desirable either in flexibility or in status. It is useful to the study of the gender wage gap because it can help determine what kinds of jobs women select, why they select them, and what types of policies (such as increased child care policies) can be used to aid women in the labor force. This theory can be used alongside the human capital theory and focus on the observation that women expect to have more interruptions in their careers. Compensating differentials focusing on these career interruptions can highlight the importance of examining women's incentives for labor force participation. In addition, they can be used to examine how political variables such as bargaining centralization, and differences in female representation can effect negotiations for influential policies.

2.3 Segmented Labor Market Theory

One of the most commonly cited explanations for the GWG is the occupational segregation of sexes, where women tend to be in lower paid occupations than men. According to Reich, Gordon and Edwards (1973), labor market segmentation is the “historical process whereby political-economic forces encourage the division of the labor market into separate submarkets, or segments, distinguished by different labor market characteristics and behavior rules.” In essence, labor market segmentation leads to people in similar occupations or industries receiving different earnings or protection regardless of having the same levels of productivity (Pignatti, 2010). In this case, labor market

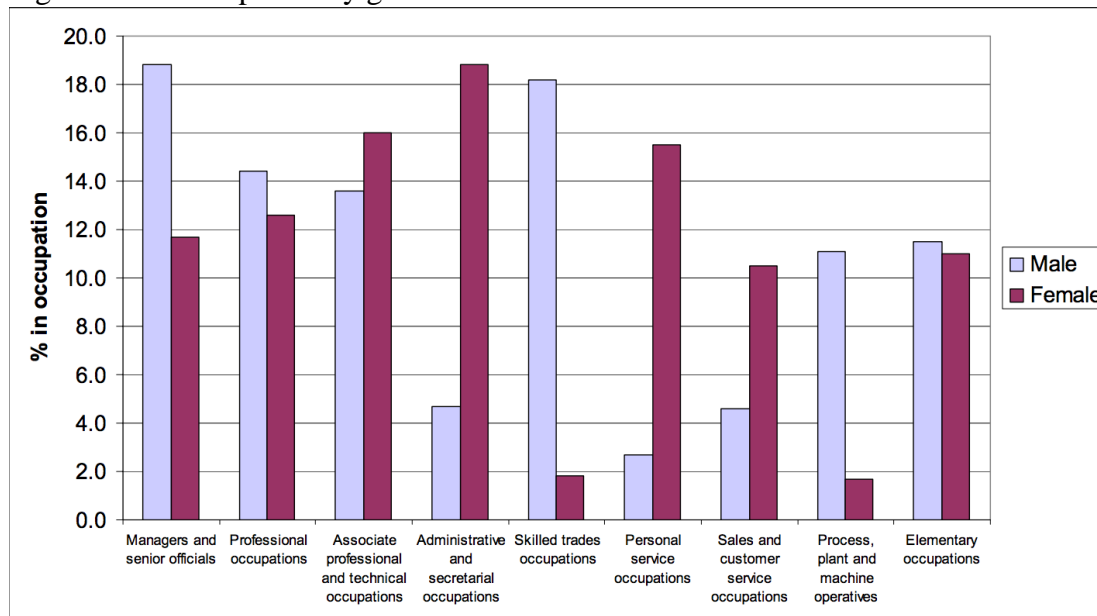
segmentation would result in occupational sex segregation, which occurs as a result of certain jobs being characterized as ‘female’ jobs and other jobs are characterized as being ‘male’ jobs. Economists suggest that wages tend to be depressed in ‘female’ occupations because the greater prevalence of part-time opportunities and labor market discrimination can result in an over-supply of female labor for these jobs (Blau and Kahn, 2000).

Neoclassical economic theory suggests that occupational sex segregation is due to women’s lower human capital investments in relation to their expectation to start families and be the primary caregivers of families (Polachek 1979). Thus, what are so-called women’s jobs should actually be classified as low-skill jobs. In contrast, Steinmetz (2012) states that even with the increase of women’s educational attainment and labor force commitment, occupational segregation still persists. Workers with similar qualifications and human capital are still prone to segregation. The feminist explanation suggests that occupational sex segregation comes as a result of the power dimensions in the wage-setting process, which have led to definitions of certain work as “women’s work.” This type of work is devalued, deemed unskilled, and ultimately leads to less pay than men’s work (Figart, 2005). As a result, women have been historically given jobs that were more secretarial and administrative which resulted in lower pay. In comparison, jobs characterized as being male jobs were generally managerial or supervisory occupations. This type of segregation can be deconstructed into two variations.

Labor segregation can be defined as horizontal and vertical segregation, which focus on how men and women are ultimately given different jobs; leading to different pay. Horizontal segregation refers to the existence of, usually lower-paid, ‘women’s jobs’, where women are disproportionately represented. Due to the lack of international

databases that combine the labor segregation statistics of countries, we will briefly examine the United Kingdom and the United States. In doing so, we obtain a glimpse of what trends are among OECD countries and other nations. In the case of the United Kingdom, an ITUC (2008) report that looked at GWGs internationally found that occupational segregation in the UK is more pronounced than most of its European comparators, as a result of the high proportion of women in part-time work. According to the Kingsmill Report on Women’s Employment and Pay, 60% of females in the United Kingdom occupied ten out of a total of 77 recognized occupations.

Figure 2.3a: Occupation by gender 2009



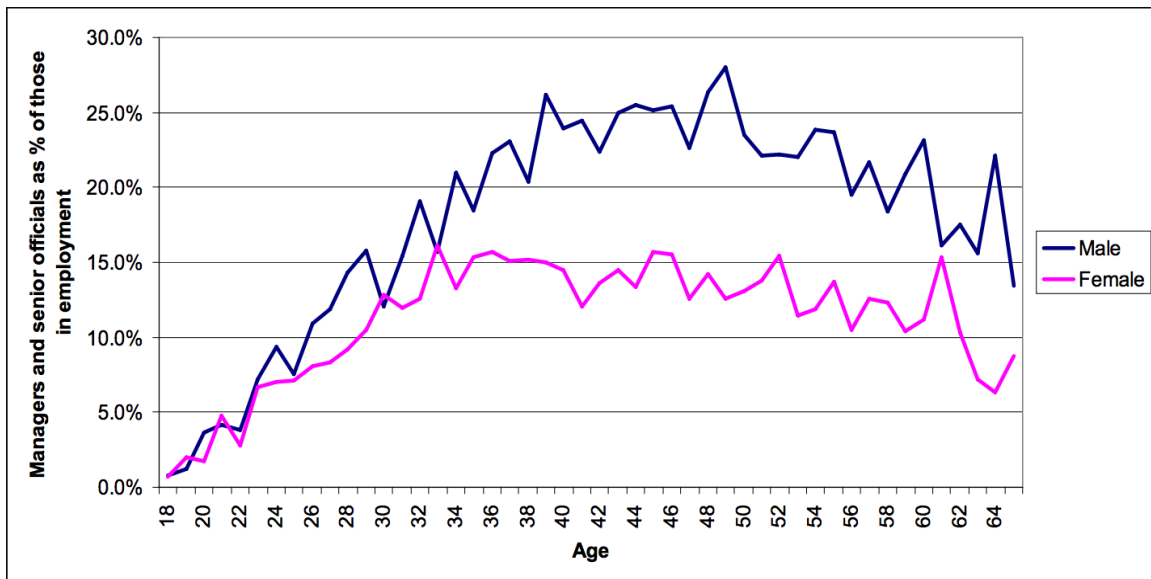
Source: Annual Population Survey, Jan-Dec 2009

The International Labor Organization lists 110 major occupation groups in their classification of occupations. Of these groups, half of all women work in eleven or fewer of these occupations in OECD countries.¹¹ Gender stereotyping, societal norms, and occupational location of part-time work opportunities among others, are identified contributors to the replication of horizontal segregation.

¹¹ OECD Fact Sheet- Women and Men in OECD Countries.

In contrast, vertical segregation refers to the low representation of women among higher paid senior positions within a given occupation. Only one-third of managers in companies in the European Union and 12.2% of FTSE 100 companies in the London Stock Exchange directors are female.¹² Manning and Petrongolo (2005) suggest that the ‘glass ceiling’ may be a critical factor contributing to the rapid increase in the GWG in later careers. Figure 2.3b shows how the percentage of females in employment in managerial positions roughly keeps pace up until 34 years of age, at which the proportion of males who are managers continues to increase, while the proportion of females who are managers increases at a slower rate until leveling off between ages 35 to 50.

Figure 2.3b: Percentage of female and male managers in the working life cycle (aged 18-65), April-June 2010

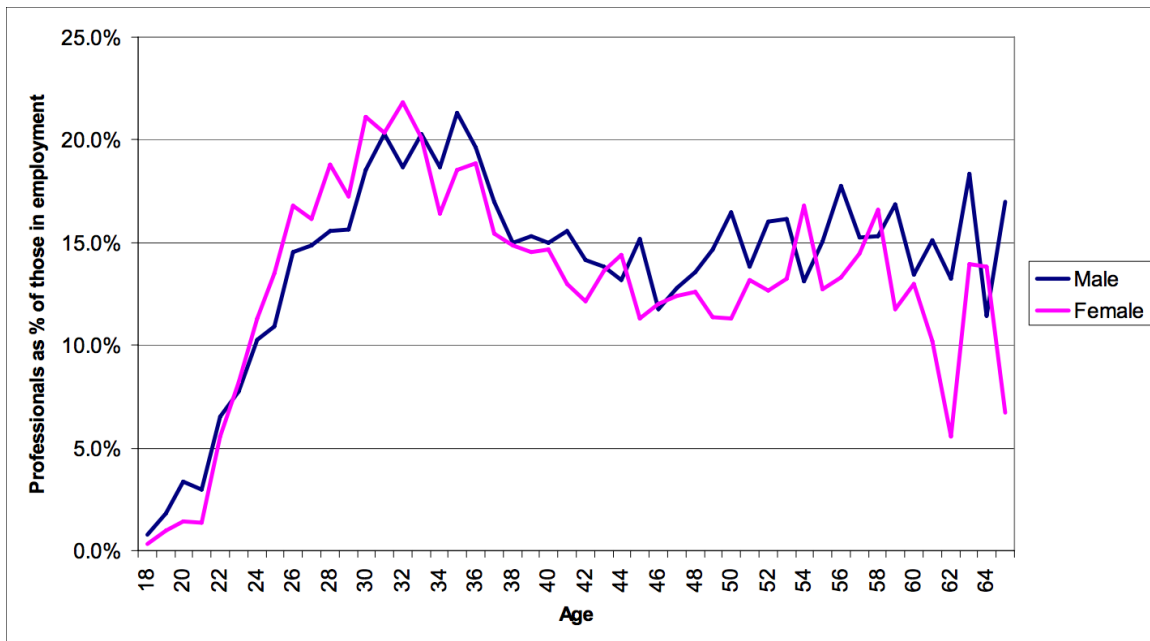


Source: Labor Force Survey, April-June 2010, updated from Manning, 2006.

¹² Data found on European Foundation for the Improvement of Living and Working Conditions (2006), ‘The Gender Pay Gap: Background Paper’.

The same analysis of those employed in professional occupations in the careers shows a different scenario in which the proportion of males and females in these jobs are roughly equivalent as shown in Figure 2.3c.

Figure 2.3c: Percentage of female and male professionals in the working life cycle (aged 18-65), April- Jun 2010

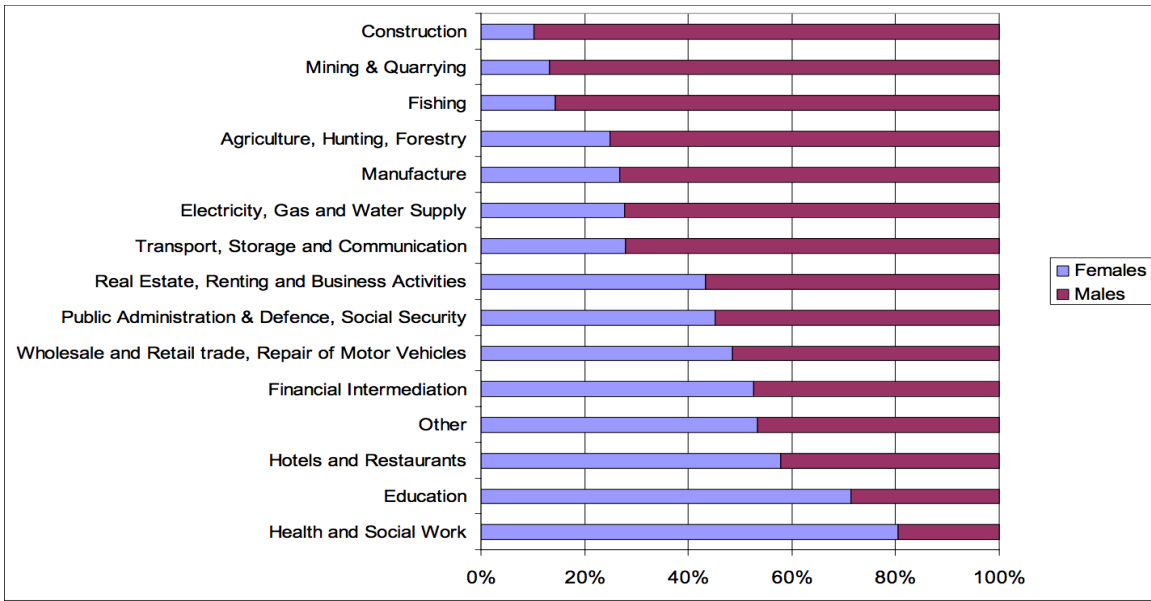


Source: Labor Force Survey, April-June 2010

Although these figures represent cases in the United Kingdom, they highlight trends that are occurring in OECD countries. Similar trends can be found when examining countries on an individual basis among member states.

As with occupations, sectoral segregation produces significant disparities. Figure 2.3d shows women are considerably more likely to work in industries such as health and social work than are men, who are likely to work in construction and mining and quarrying.

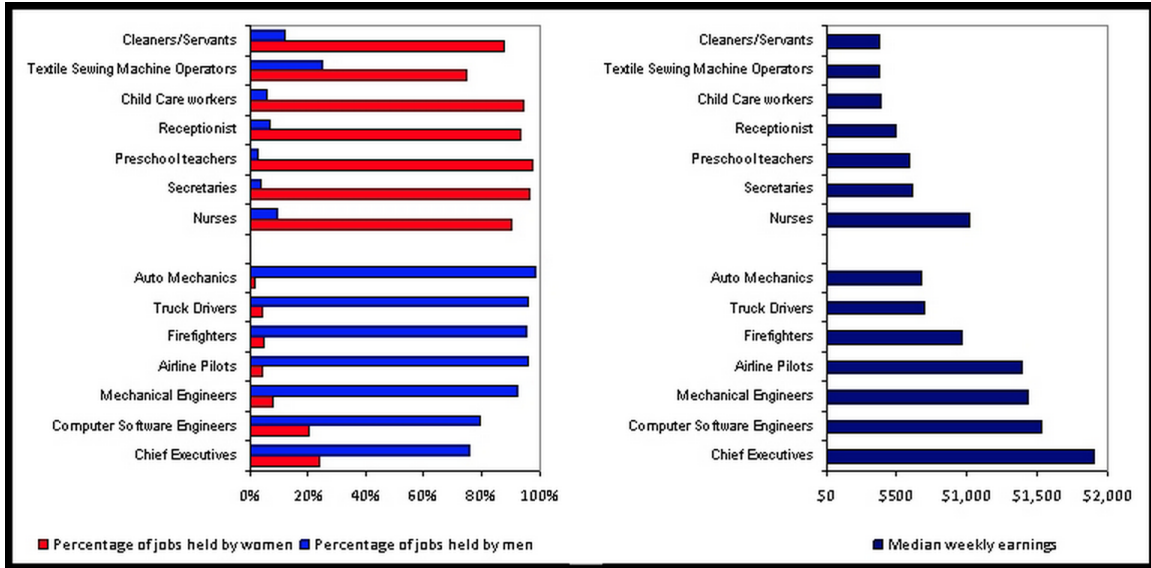
Figure 2.3d: Industry of employment by gender, England and Wales, 2001



Source: Census, 2001.

In comparison, these trends can also be seen in other countries such as the United States.

Figure 2.3e: Gendered Occupations and Unequal Rewards in the US



Source: U.S. Department of Labor, Bureau of Labor Statistics. 2009. Highlights of Women's Earnings in 2008. Report 1017

The theories of labor market segmentation are important because they explore elements of the gender wage gap in ways the human capital and compensating

differentials theories do not. Studying labor segmentation and the subsequent effects on the gender wage gap can help scholars fully understand why wage differentials exist within individual countries. However, examining levels of segmentation in each industry, and each country is not what this study will examine. A study of labor market segmentation and its effects on the GWG would require country-level, industrial, and case specific data. This approach would not appropriately apply in a large cross-national time series examining the institutions that affect the incentives of women's lifetime work. As a result, variables pertaining to this theory will not be applied in conjunction with variables of the human capital theory and the theory of compensating differentials.

2.4 Discrimination Theory

After examining human capital differences, occupational, and industrial structures, a portion of the gender pay gap remains unexplained. According to Becker, it has been argued that this unexplainable portion is due to discrimination. Becker (1985) developed a theory of discrimination to formalize the racial discrimination found among male workers in the U.S. Becker's model states that due to a 'taste' for discrimination, the following three channels could exhibit discrimination: the employer, the employees or the customers. When someone has a 'taste' for discrimination', he or she acts as if there was a non-pecuniary cost of hiring, working with or buying from the other person. In this particular case, it would be women who are discriminated against based on human capital investments or elements of job segregation as previously discussed.

In addition, the Theory of Statistical Discrimination was developed by Phelps (1972) and Arrow (1973). This theory analyzes the perceptions of gender differences in productivity and ability, and suggests that if employers believe that certain workers (such

as women) generally have low levels of productivity and ability, they are not likely to hire them or will pay them less. This type of discrimination is based on individual level hiring practices and is a result of survey data analysis. Although gender discrimination still exists today, it is difficult to gather data on personal prejudices and quantify such hiring practices. As a result, Steinmetz (2012) comments on this approach and how it “seeks to explain the gender wage gap without assuming that employers have such preferences or prejudices.” Instead, Steinmetz suggests that the employer’s lack of perfect information, and not personal prejudice, leads to the perceived discrimination. This kind of discrimination reinforces ideas of low productivity or the lack of women in a certain occupation or industry (female loggers, construction workers, etc.). This is important to analyze because these prejudices, ideas of stereotyped low productivity, or lack of women in certain occupations can contribute to the status quo and labor market segmentation.

Institutional theories of discrimination can also be used to examine gender wage differentials. Institutional theories are concerned with the interrelations of unions, monopolistic industries, government regulation and community prejudices (Cain, 1984). Figart (2005) asserts that labor market discrimination should be seen as a “multidimensional interaction of economic, social, political and cultural forces in both the workplace and the family, resulting in differential outcomes involving pay, employment, and status. In the instance of political institutions such as unions, the bargaining power and representation of a union may help define the wages women earn, benefits they receive, or clauses against discrimination that are vital to employment and tenure. Considerable research has discovered that much of the difference between gender

wage gaps between countries is due to structural differences such as union density and patterns of wage bargaining, rather than differences in the characteristics of females in the workplace. Such theories suggest that improvements in the wage gap have recently been due to structural changes in the labor market, more so than in organization behavior or other individual level causes.

The theories of general discrimination and statistical discrimination are important to understanding a portion of the gender wage gap that cannot be clearly explained by previously discussed theories. Although vital to the absolute understanding of the GWG, examining levels of discrimination in companies, and individual cases is not what this study will examine. A study on the effects of discrimination in the workplace on the GWG would require lower-level, company specific, and individual case level survey data. As a result, this approach would not appropriately apply to a large, cross-national study on the institutions that affect women's incentives of lifetime work. Variables pertaining to general and statistical discrimination will not be applied in conjunction with the variables of the human capital theory and the theory of compensating differentials. Variables of institutional discrimination, however, will definitely be examined and applied. This study will examine the multi-dimensional interaction of economic, social, and political institutions on the women's incentives of lifetime work.

2.5 Cross-National Gender Wage Studies

Donald Treiman and Patricia Roos (1983) were the first to investigate gender wage gap differences within a cross-national framework. They conducted standard loge-linear wage regressions for full-time workers aged 20-64 in each of nine industrialized countries. They decomposed wage differences in each country and examined the gap

between education, potential experience and occupation, and find significant “unexplained” differences in each country. Rachel Rosenfeld and Arne Kalleberg (1990) adopted a similar approach, but chose to concentrate specifically on the United States, Canada, Norway, and Sweden. Using more refined demographic variables and concentrating on two sets of countries with different labor market structures (centralized wage determination vs. decentralized wage systems), they found significant unexplained wage differences in each country. Although significant to the study of cross-national frameworks, both these studies confine their analysis to decomposing wage differences within each country, rather than across countries.

Blau and Kahn were the first to compare gender wage gap differences systematically across countries in a series of works (1992, 1995, 1996b, 2003). They focused on cross-national variations in market returns to skills that were both measured and unmeasured. Blau and Kahn discovered that gender wage gaps tend to be higher in countries with a larger overall wage inequality because female workers are more likely to be located at the bottom of wage distributions. To demonstrate their findings, Blau and Kahn (1996b) adopt the Juhn, Murphy and Pierce (1993) methodology to decompose national differences in the gender wage gap into a number of components reflecting gender differences in worker attributes, and what they call “wage structure” (1992: 538). They reaffirm this result by stating, “More compressed wage structures are associated with a lower gender wage gap (2003: 138-9).” Since a country’s wage structure is determined by its wage setting institution, Blau and Kahn focus on labor market institutions. They found that collective bargaining coverage is significantly, negatively related to the gender wage gap (2003: 106).

To analyze wage structures, Blau and Kahn model earnings (Y_{ij}) for males and females ($i=m,f$) in each country j to be proportional to observable individual attributes, X_{ij} , (where the factor of proportionality B_j represents market rewards for individual attributes applied equally to both males and females) plus a residual. The residual is divided into two components: a country-specific standard deviation of wage (σ_j) and a standardized (mean zero and variance one) residual for each gender and country (θ_{ij}).

The male-female earnings gap within a particular country is

$$Y_{mj} - Y_{fj} = (\Delta X_j)B_j + \sigma_j\theta_j$$

and the gender earnings gap difference between countries j and k is

$$Y_{mj} - Y_{fj} - (Y_{mk} - Y_{fk}) = (\Delta X_j - \Delta X_k)B_k + \Delta X_j(B_j - B_k) + (\Delta\theta_j - \Delta\theta_k)\sigma_k + \Delta\theta_j(\sigma_j - \sigma_k)$$

The latter two terms reflect earnings structure differences. The first of these depicts cross-country differences in the relative residual wage positions for men and women. This term is taken to measure discrimination because it reflects differences in male and female positions in a country's wage distribution, holding constant individual earnings function attributes. However, this term can also reflect the effect of unmeasured individual characteristics. It can result from biases of the implicit assumption of a gender-neutral reward structure. The second depicts inter-country differences in residual earnings inequality.

Although quite significant, there are at least two problems with this type of decomposition. First, this decomposition can lead to erroneous conclusions if the standard deviation and percentile ranks are dependent (Suen, 1997). For example, one could attribute gender wage differences to a country's wage structure when those differences can occur because male earnings are becoming more dispersed. This can be

true, based on how countries are widening male wage distributions. Second, these decompositions can lead to erroneous conclusions because it assumes a common earnings function B_j for both men and women, when different pay structures may be warranted (Yun, 2007). This is true if measured female and male characteristics have different meanings for the two. For example, being married may imply steeper wage gradients for men because division of labor in the home causes them to specialize in market human capital investment. In contrast, being married may yield flatter wage gradients for women because division of labor could imply specialization in household human capital rather than marketable human capital (Polachek, 1975a).

These potential biases, which preclude one from distinguishing between discrimination and wage structure, cause us to identify particular country institutions, and directly test their effect on the gender wage gap. Blau and Kahn do this by examining the role of a particular wage scheme in collective bargaining. They find collective bargaining to be negatively associated with the gender wage gap because they tend to set high wage floors thereby equalizing earnings. Collective bargaining is one institutional variable that will be examined in this study.

Weichselbaumer and Winter-Ebmer (2003) adopt a different approach. Their meta-analysis combines the results of 363 papers from which they obtain 1,532 data points on 67 countries. They regress the wage gap on a host of variables and find that ratification of international conventions supporting equal treatment of male and female workers has a negative and significant effect on the gender wage gap. Countries with great economic competition measured by the Economic Freedom Index display lower gender

pay gaps based on Becker's (1957) argument that competitive markets eliminate gender discrimination when firms try to minimize costs.

Although significant, neither of these studies examine the implications of the expected lifetime labor force participation model. Ben-Porath (1967) originally developed this model and later modified it to account for how interrupted lifetime work links expected lifetime labor force participation to one's incentive to acquire marketable human capital. In turn, this human capital in training and school, determines earnings potential. As a result, the approach of lifetime work history is the important motivating component in one's ability to eventually achieve high earnings.

Examining this approach is important because it helps solve another labor economics paradox. The GWG is narrowing in spite of the growing overall wage inequality. This is questionable because, Blau and Kahn (2003) show that wide wage inequality leads to a wider gender wage gap. Polachek and Xiang (2009) offer an explanation. They claim the diminishing gender wage gap is a result of women's increased incentives to participate over their lifetime in the labor market during the past decades. As a result, higher expected participation leads to larger female rates of return to education, steep female earnings profiles, greater female wage dispersion, higher female wages relative to males, and small overall gender wage differences.

CHAPTER 3

DIVISION OF LABOR AND LIFETIME LABOR FORCE PARTICIPATION

The 2010 OECD GWG may have been only about 15.2%, but a unique pattern occurs for different marital status groups. As briefly mentioned in section 2.1, the wage gap for single men and women is less than 10%. However, married women earn far less than married men. The wage ratio for married women is typically 60% to 70%, implying a 30-40% wage gap. Harkness and Waldfogel (2003) deconstruct the role of children and find that married women with children earn less than married women without children. In addition, married women who space their births widely apart receive even lower wages (Polachek 1975a). Other studies show that opposite patterns regarding marital status and family hold for men. Married men with children earn more, and spacing children at wide intervals is associated with even higher husband earnings (1975b). As a result, the wage gap varies by marital status, children, and the spacing of children. These demographic and social variables are more important predictors of the gender wage gap than any other explanatory factors.

In support of these claims, many studies have examined these family effects. Korenman and Neumark (1992) find that cross-sectional ordinary least squares and first-difference estimates understate the negative effect of child on wages. Waldfogel (1998) shows that having children lowers a woman's pay by about 10%, after controlling for age, education, experience, race, ethnicity and marital status. Using the National Longitudinal Survey Panel, Baum (2002) confirms the finding that "interrupting work to give birth has a negative effect on wages" but that "this negative effect is at least partially

eliminated when [controlling for] whether the mother returns to work at her childbirth job.” These studies collectively show that a “motherhood” penalty seemingly does exist.

A significant component of women’s labor force participation is intermittent periods of work and non-work over the lifetime. According to Mincer and Polachek (1974), never-married white women 30-44 years old in the U.S., in 1967, worked 14.5 years out of a possible 16 years. In contrast, married-spouse-present women only worked 6.4 out of about 16.8 years. These patterns are similar to a study by Carole Miller (1993) using 1980 Panel Study of Income Dynamics Data. Miller found that married women average 10.04 years out of the labor force relative to men’s 2.22 years. Using the National Longitudinal Survey, Spivey (2005: 124) found that in 1994 only 57% of women worked more than 70% of the time after the start of their careers, whereas the figure for men was 79%. An analysis of foreign countries produces similar results. Using Canadian data, Simpson (2000) found that in 1993 married women with children averaged 7.6 years (36.4% of work years) out of the labor force, whereas single women spent only 1.5 years out of the labor force. For men, this figure is .9 years (8.1%). Catalyst (2003) supports these trends by examining individual professions. The study finds that only 29% of women MBA graduates worked full time continuously since graduation compared to 69% for men. Similarly, only 35% of women law graduates worked continuously since graduation compared to 61% for men. These studies show there is a definite relationship between gender, marital status, and lifetime labor force participation. As a result, we must also focus on the division of labor in the household.

In addition to lifetime labor participation in relation to family, division of labor in the home is another possible explanation to why men work throughout their lives, while

women may drop out to bear and raise children. Several variables can influence bargaining within a marriage and the division of labor. Variables such as high marginal tax rates on wives' earnings can discourage women to allocate child-rearing years towards the workforce (Kumar, 2005).¹³ The unavailability of day care centers can also influence the division of labor (Kreyenfeld and Hank, 2000). Simply cultural norms can cause married women to allocate more time towards the home (Coltrane, 2000). Whatever the reason may be, the significant focus is that less time in the workforce over one's lifetime decreases incentives to invest in marketable human capital.

3.1 Households as Efficient Economic Units

One method of explaining these patterns is to model households as efficient economic units that maximize the discounted value of production throughout the course of a marriage; subject to human capital accumulation and asset constraints (Polachek, 1975a JHR). Proceeding this way implies households

$$\text{Max} \int_0^T e^{-pt} Z_t dt = \int_0^T e^{-pt} f(X_t, T_{M_t}, T_{F_t}) dt$$

where p = within-family perceived rate of commodity discount rate; Z_t = household production in year t produced by a household production function $f(X_t, T_{M_t}, T_{F_t})$; f = within-family production function of commodities Z_t (assumed invariant to change over the family life cycle); X_t = market goods consumed in period t in the production of Z_t ; and T_{M_t} and T_{F_t} are respectively husband's and wife's time in period t spent at home

¹³ High marginal tax rates can be heavily assessed on secondary incomes, thus discouraging women. Top marginal tax rates will be examined as a variable in this study.

in the production of Z_t . Human and physical capital asset equations, serving as budgetary constraints on the production and consumption of Z_t are as follows:

$$K_{M_t} = g(S_{M_t}, K_{M_t})$$

$$K_{F_t} = g(S_{F_t}, K_{F_t})$$

$$A = w_M(1 - T_{M_t} - S_{M_t})K_{M_t} + w_F(1 - T_{F_t} - S_{F_t})K_{F_t} - P_X X_t + rA_t$$

Where $K_{M_t} = (\partial K_{M_t} / \partial t)$, $K_{F_t} = (\partial K_{F_t} / \partial t)$, $A = \partial A / \partial t$, K_{M_t} = husband's stock of human capital at time t, K_{F_t} = wife's stock of human capital at time t, S_{M_t} = time spent by the husband investing in time period t, S_{F_t} = time spent by wife investing in earnings in time t, w_M = husband's rental value per unit of human capital, w_F = wife's rental value per unit of human capital; A_t = family assets at time t; $(1 - T_{M_t} - S_{M_t})$ = husband's time spent at work in time period t; and $(1 - T_{F_t} - S_{F_t})$ = wife's time spent at work in time period t.

Such a model visualizes a complex decision process within the household. As examined by Polachek and Xiang (2009), marriage length is not known with certainty in the model above. The model is more applicable the longer one expects the marriage to last. In this model, the household must determine for each period of the life cycle, both the husband's and the wife's allocation of time to work in the household and in the labor market. In order to solve such a problem, the Hamiltonian must be maximized.

3.2 Maximizing the Hamiltonian

In each time period, the household must determine the husband's and wife's allocation of time to the household and to labor market work; as well as allocation of time to human capital investment. To solve this, the household maximizes the Hamiltonian

$$H = e^{-\rho t} f(X_t, T_{M_t}, T_{F_t}) + \lambda_{M_t} g(S_{M_t}, K_{M_t}) \\ + \lambda_{F_t} g(S_{F_t}, K_{F_t}) + \mu_t [(1 - T_{M_t} - S_{M_t}) w_M K_{M_t} + (1 - T_{F_t} - S_{F_t}) w_F K_{F_t} - P_X X_t + rA_t]$$

with respect to decision variables $X_t, T_{M_t}, T_{F_t}, S_{M_t}$, and S_{F_t} yielding a set of optimal conditions implying the following within-period allocation:

$$\mu_t = \frac{e^{-\rho t} (\partial f / \partial X_t)}{P_{X_t}} = \frac{e^{-\rho t} (\partial f / \partial T_{M_t})}{w_M K_{M_t}} = \frac{e^{-\rho t} (\partial f / \partial T_{F_t})}{w_F K_{F_t}} = \frac{\lambda_{M_t} (\partial g / \partial S_{M_t})}{w_M K_{M_t}} \\ \frac{\lambda_{F_t} (\partial g / \partial S_{F_t})}{w_F K_{F_t}}$$

where the shadow prices are governed by the following differential equations

$$\dot{\lambda}_{M_t} = \mu_t w_M (1 - T_{M_t} - S_{M_t}) - \lambda_{M_t} (\partial g / \partial K_{M_t})$$

$$\dot{\lambda}_{F_t} = \mu_t w_F (1 - T_{F_t} - S_{F_t}) - \lambda_{F_t} (\partial g / \partial K_{F_t})$$

$$\dot{\mu} = \mu r$$

The closed form solution of these equilibrium conditions depends on both the system's initial conditions and the precise functional forms of the human capital and commodity production functions. The model applies equally well for a single person household. In such a case, it is highly likely that equilibrium results differ for men and women because $\partial f / \partial T_M \neq \partial f / \partial T_F$

The model's symmetry implies identical husband and wife labor force participation, investment and wages throughout the marriage assuming they are equally efficient in producing household goods and human capital ($\partial f / \partial T_M = \partial f / \partial T_F$), have the same human capital going into their marriages ($K_{M0} = K_{F0}$), and have the same rental (wage) rates per unit of human capital ($^W M = ^W F$). Bargaining models of the household achieved by embedding household production into a Nash bargaining model yield the same symmetric solution as long as husbands and wives have the same individual production functions and are equally adept at bargaining (Polachek and Xiang 2009). Assuming equality at the start of marriage is, of course, highly unrealistic.

Husbands and wives differ in many ways. Men and women can differ in household productivity. Discrimination could also cause men to have higher rental rates (wages) per unit of human capital. Yet even without discrimination or differing husband-wife productivity, equality at the outset of marriage is unlikely because they both bring different quantities of human capital. For example, in the United States, 32.7% of husbands graduate from college compared to 29% of their wives. Husbands are also 2.1 years older than their spouses.¹⁴ As a result, being older and more educated indicates an opportunity for husbands to have acquired greater human capital at the start of marriage. In correlation, the age at first marriage variable can be used to examine these same patterns emerging internationally. According to OECD data on thirty four countries, over a forty year time span, based on the average age of first marriage of both male and

¹⁴ Data from Table 2, Nock (2001) and based on the 1999 March Current Population Survey (CPS) Demographic Supplement.

females, husbands are older than their wives in every year.¹⁵ Men on average engaged in their first marriage at 27.91 years of age and women married at 25.06 years of age. These demographic differences at the outset of marriage are able to cause the symmetry of the above model to break down.

Given that age and education are positively related to human capital and earnings, these differences between husband-wife age and education imply greater husband human capital. Differences in the market value of human capital ($w_M K_{M0} > w_F K_{F0}$) lead to specialization where the spouse with the greater market earnings potential (husband) concentrates more on market activities ($T_{M_t} < T_{F_t}$). This spouse works a greater proportion of time over the marriage, and as a result gains more rewards from human capital investment ($\lambda_{M0} > \lambda_{F0}$). This spouse thus invests more in human capital. Despite the initial differences at the outset of marriage, efficient behavior based on maximization dictates specialization so that the spouse (husband) with greater lifetime work invests more in the market than compared to the spouse with lower lifetime work. Although these models aren't impregnable, they offer insight into the way we examine household division of labor and investments in human capital.

Polachek's model and the Hamiltonian model are significant because they powerfully argue the prevalence of the division of labor within a household. Although these models cannot apply in every situation, they show that families reasonably bargain within a marriage to maximize economic output through the obtainment of human capital, time in the work place, and household productivity.

¹⁵ Based on OECD data collected and analyzed through my personal dataset.

CHAPTER 4 MEASURES OF THE GENDER WAGE GAP

Measuring the gender wage gap is in itself a complex study that requires significant research and analysis. There are a total of 263 empirical papers and articles based on measurements of the gender wage gap (Weichselbaumer and Winter-Ebmer, 2003 and EconLit, 2000). Of these numerous studies, nine different methods of computing and analyzing are incorporated. This chapter will examine the various measures of the gender wage gap, show the progression of these measures throughout history, and compare them to determine the most appropriate measure to use for this study.

The most common way to analyze discrimination based on gender is to compare male and female earnings while holding productivity constant. One method is to include a sex dummy in the wage regression model:

$$W_i = \beta X_i + \gamma sex_i + \varepsilon_i,$$

where W_i represents the log wage and X_i the control characteristics (education, job experience, marital status) of an individual. i , β , and γ are parameters. This equation however is too simple and outdated to use in our study.

The Mincer earnings equation is another measure that is widely adopted and used to estimate the age-earnings profile because of its estimation convenience and explanatory ability.¹⁶ The popularity of the Mincer equation is related to how it is based on a formal model of investment in human capital. Another explanation is how the Mincer equation provides a “parsimonious specification that fits the data remarkably

¹⁶ Analysis by Polachek, 2009. See Mincer (1974) for details on the derivation of this equation, and Heckman and Polachek (1974) for an empirical test of the functional form of the earnings-schooling relationship.

well” in a variety of sets (Limieux, 2006: 128). Though critical surveys of this approach have been conducted, the equation is still widely used and is stated as:

$$(7) \quad \ln y = \ln y_0 + rS + \beta_1 X + \beta_2 X^2$$

where the y is earnings, S is years of schooling, and X is years of potential labor market experience. The dependent variable in this equation is the natural logarithm of earnings, and the most common independent variables include number of school years, labor market experience, and a quadratic term of experience. This equation can even include demographic variables such as gender to measure the female wage deficiency unexplained by human capital variables.¹⁷

This measure, however, is debated for several reasons. Although the equation is a good approximation in many cases, it may “overstate or understate the effect of experience and schooling on earnings for some groups; particularly the effect of experience on earnings of young workers” (Lemiux, 2006: 142). The Mincer function also appeared to fit data well in the 1960s and 1970s, but not so much in the 1980s and 1990s. This is because wages are a convex function of years of schooling and experience—wage profiles are no longer parallel for different education groups. In particular, the college-high school age is now much larger for less experienced than more experienced workers. Thirty years after the Mincer’s publication of *Schooling, Experience, and Earnings*, there has been a “dramatic expansion in micro data and estimation techniques available to labor economists” (Lemiux, 2006:127). Although still viewed as important for its innovation and relatively accurate way of modeling earnings, schooling and experience, the Mincer earnings equation is seen to be outdated.

¹⁷ Examined by Polachek, 2009.

The Mincer equation is also subject to debate because it assumes that men and women have the same returns to skills. Many argue that employers value similar skills differently for men and women. As a result, Blinder (1973) and Oaxaca (1973) propose a technique to decompose the observed gender wage gap into two parts: the differential due to “discrimination” and the differential due to difference in skills. In the Blinder-Oaxaca decomposition, the unadjusted wage differential is

$$\Delta\bar{w} = \bar{w}_M - \bar{w}_F = \bar{x}_M\beta_M - \bar{x}_F\beta_F,$$

where \bar{x}_M and \bar{x}_F represent mean values of vectors of characteristics of men and women respectively, β_M and β_F are coefficients from male and female separated earnings regressions. Adding and subtracting $\bar{x}_F\beta_M$ yields,

$$\Delta\bar{w} = \bar{x}_F(\beta_M - \beta_F) + (\bar{x}_M - \bar{x}_F)\beta_M,$$

where the first term on the right hand side is often interpreted to represent “discrimination” and the second term to be the wage differential due to skill differences.

This decomposed gender wage gap is subject to its own criticism. Based on the analysis of Polachek (1975a), Jones (1983), and Borjas (2000: 365), there are a number of statistical biases with this computation that include how the validity of the “discrimination” estimate is dependent upon whether one controls for differences of all relevant characteristics. As examined by Polachek and Xiang (2009), if any human capital qualities that affect earnings are omitted, the measured “discrimination” part would be contaminated with unmeasured human capital, thus failing to capture the real meaning of discrimination.¹⁸ One bias of this decomposition would be the failure to account for the amount of job skills women would have sought had they expected to

¹⁸ Polachek also finds how this same criticism hold when using a dummy variable in a Mincer earnings equation. It also applies when using newer versions of the Blinder-

work continuously. As Polachek and Xiang (2009) examine, typical implementation of the decomposition adjusts for training received given observed work experience, but not the training one would have received had one intended to work continuously. By excluding this extra training, the decompositions underestimate a discontinuous worker's potential wage. Discrimination would then be overestimated, given that discrimination is the difference between what the continuous worker actually earns and what one projects a discontinuous worker earns if she participated continuously. This scenario can also apply to adjusting for marital status because of variances in division of labor as examined in chapter 3.

To address these concerns, a different approach must be examined. Blau and Kahn (2003: 117) examine how wage compression may affect women's and men's relative values of explanatory variables, and that there may also be exogenous reasons for men and women to have different relative levels of qualifications in different countries. For this reason, they focus on results based on GAPUSCHARS, which estimates the predicted "gender pay gap on the assumption that the men and women in each country-year microdata file have the same average levels of measured characteristic as U.S. men and women for that year" (Blau and Kahn 2003: 117).

$$GAPUSCHAR_{jt} = (40b_{3mjt} + X_{mut}B_{mjt}) - (40b_{3fjt} + X_{fut}B_{fjt}),$$

This measure is designed to normalize each country's gender wage gap by eliminating cross-country differences in human capital. Blau and Kahn's measure computes a predicted gender wage gap in each country assuming comparable human capital cross-nationally. However, this measure might be biased if true earnings function coefficients in part depend on expected human capital (Polachek 2009). In this case,

biases would result by assuming marital status has the same effects for men and women or by not including expected lifetime labor force participations. In order to avoid these potential biases, unadjusted gender pay gap will be examined as an appropriate measure. Data on wages used in this study will examine the gross annual earnings and will be examined in the following chapter.

CHAPTER 5

DATA COLLECTION AND EXAMINATION

In a comparative study, data is a critical issue. Data limitations are a common problem when utilizing international comparisons of labor markets. This is especially true for gender difference analyses because many variables are only computed for the aggregate population, rather than specifically by gender. Comprehensive information is mostly collected in developed countries, as such, inferences are usually drawn from these nations (Blau and Kahn, 1996b). In order to obtain data on variables, this study will utilize OECD wage data, WISTAT Women's Indicators and Statistics Database, Inter-Parliamentary Union data, UNESCO educational data, Economic Freedom Index data, and data from the Economic Freedom of the World Annual Reports. When examining data on wages, we will examine annual and weekly wage data compiled by the OECD, with credits to various national data publishers. Descriptions and information on collected wage data can be examined in the tables section.

The data set to conduct this study covers 22 countries, over 40 years, by 12 variables. Due to various methods of quantifying the gender wage gap, I will confine the gender wage gap according to OECD data. Choosing a single method of analyzing the gender wage gap is extremely important. The quote in chapter one happens to be using a metric that uses annual wages. When calculating weekly or hourly wages, the wage gap happens to be much smaller.¹⁹ According to the OECD, the gender wage gap is unadjusted and defined as the difference between male and female median wages, divided by the male median wages. However, I will also include the difference between

¹⁹ Fact checks on the State of the Union Address were poised to point out discrepancies and possible exaggeration.

male and female mean wages to increase accuracy.²⁰ I restrict our sample to full-time workers who work at least 30 hours a week. Available wage data in most countries is calculated weekly, monthly, and annually. Wages that were calculated on an hourly basis will not be included because hours worked can be higher than 30 hours per week and much of the wages are calculated annually. The inclusion of hourly calculations would create inconsistencies. In addition, the OECD collects pretax (gross) wage data on full-time workers from surveys conducted by governments for each country. Although other measures are used to compute the gender wage gap, we will select this particular method for consistency. When compared to the International Social Survey Programme (ISSP) and Luxembourg Income Study (LIP) datasets, the OECD dataset is much more consistent over time.

Combining the various variables, measures of the gender wage gap, and examining available data requires a pooled time-series, cross-section estimation model. This general estimation model is

$$y_{it} = x_{it}\beta + C_i y_i + v_i + \varepsilon_{it}$$

where y_{it} represents the gender earnings difference for country i in year t , x_{it} represents the independent variable for country i in year t , C_i represents the country specific fixed-effect, and v_i is a country error term.²¹

²⁰ Differences will be calculated as the median \log_e and mean \log_e pay difference.

²¹ Estimation model formulated by Polachek and Xiang (2009). Although I would like to use this model, my inexperience with analytical software and statistical regression confine me to using only OLS regressions.

CHAPTER 6

INDEPENDENT VARIABLES AND RESEARCH MODELS

The division of labor in the family was considered as the underlying reason for low work incentives, especially for married women with children. Although these incentives are generally unobservable, one way to apply them to this study is to gather observable variables that have a direct influence on women's expected lifetime work. In addition to these observable variables, this study will examine the influence of labor market and political institutions. These variables include fertility, the age gap between husband and wife, female educational attainment, top marginal tax rates, economic competition, public/private employment ratio, overall earnings dispersion (9th-1st), centralized bargaining, and proportions of female representation in parliaments.

The variable of fertility is expected to play a significant role and influence women's (and men's) lifetime work behavior. The greater the number of children, the more pronounced the division of labor. One observable consequence of high fertility is that women are expected to drop out of the labor force more frequently, which suggests less market experience and human capital investment. A second observable consequence is that women are likely to exert less effort in market work than in household investment when children are present and there is a lack of childcare substitutions. As examined by the literature in section 2.1 and chapter 3, both observable consequences eventually lead to a larger gender wage gap.

A second variable that influences women's incentives to participate in the labor market is the mean age gap between husband and wife. As examined by OECD data, on national averages, husbands are older than their wives at first marriage ever year, across

34 countries. Given that age and education are positively related to human capital and earnings, these differences between husband-wife age and education imply greater human capital. The larger this age gap, the more pronounced the division of labor within the family because relatively higher husband human capital leads them to specialize in market activities, as previously discussed. As a result, women in countries with larger husband-wife age gaps are likely to have lower incentives to invest in the labor market. The age gap between husband and wife cannot explain variations in human capital and the gender wage gap alone. Despite husbands being universally older than their wives on average, there is no empirical evidence relating this age differential to the gender wage gap. There are obvious outliers and individual cases where women marry younger than men and have higher human capital and greater educational attainment. Yet in a cross-national time series analysis, the age gap between husband and wife at first marriage seems to play an influential role on incentives for women in the labor market. From applying the above argument to the Hamiltonian model, it is expected that the gender wage gap is likely to be smaller in countries where the difference in a husband's and wife's ages are smallest.

The variable of female educational attainment has been found to have a significantly negative effect on the gender wage gap. This variable indicates women's work incentives and affects the gender wage gap in two ways. First, the wage gap is expected to decrease as a direct result of a larger female human capital stock. Second, more schooling instigates higher labor force participation. These expectations are supported by the research of Chaykowski and Powell (1999) in their examination of Canadian women in the labor market from 1978 to 1998. They found women's

educational attainment to be one of the major factors contributing to the increase of women's labor force participation. Eckstein and Wolpin (1989) also found that the increase in the level of schooling has the largest (positive) impact on labor force participation. Higher labor force participation is expected to increase job-training and wages so that the higher women's education relative to men, the higher their wage and the lower the wage gap.

Educational attainment is originally defined as third level students per 100,000 population by sex. Education at the third level refers to education provided at a university, teacher's college or higher professional school and requires as a minimum condition of admission to the successful completion of education at second level. Female educational attainment will be examined as the ratio of female educational attainment over male educational attainment at the third level. There are several, obvious discrepancies from only focusing on third level students. Many men and women may only have a primary or secondary education, at best, and can be contributing to the labor market. In addition, men and women may have tertiary educations that qualify for levels 4, 5, and 6 of the ISCED. An absolutely complete study on the effects of educational attainment at all levels, and all age groups, on the gender wage gap should include individuals with various levels of education.

The reason this study focuses only on third level educational attainment is because of the unavailability of data. According to UNESCO, European Centre for the Development of Vocational Training, and Eurostat, data cover only the enrollment of primary and secondary levels of education. After searching for completion ratings of 1st and 2nd levels across multiple sources, the completion percentages only accounted for a

select few countries and select years. Data was widely unaccounted for. Regarding tertiary education (levels 4, 5, and 6), available data only cover totals of educational attainment and not by gender. Available data that examine tertiary educational attainment by sex only cover age groups 30-34. The inclusion of lower level educational attainment data, and tertiary educational attainment may skew the data or contribute to error. This study requires analyzing the effects of educational attainment on the wage gap, and thus reliable data regarding the gender gap in educational attainment is necessary. As a result, this study will only examine data on female educational attainment of students at the third level based on available UNESCO data.

The variable of country-specific income tax rates can also influence one's incentives to work in the labor market throughout a lifetime. This is especially true for women because women's labor supply is more elastic, and therefore more sensitive to tax rates (Polachek 2009). Depending on country specific tax rates, some designs may place emphasis on taxing secondary incomes, which are likely to be female earnings. Married women may find it advantageous to specialize in the household when a large proportion of secondary earner income is attributed to taxes. In relation, a low income tax regime is likely to have a positive effect on women's incentives to consistently participate in the labor market. The effect of tax rates on women's labor force participation has been examined in several studies. Based on an international study of Britain, Ireland, Denmark, and Germany, Smith, Dex, and Callan (2003) found that women's labor force participation rates are highly influenced by the design of tax schemes (e.g. joint taxation versus separate). Baffoe-Bonnie (1995) supports these investigations by finding that women are likely to reduce their labor supply at all levels of tax rates, whereas men can

increase the labor supply at certain program parameter levels. These findings are supported by a study, in the Antwerp district in Belgium, in which women's labor supply decreased over 20% if they receive an individual transfer of 15,000 Belgian Francs a month, while simultaneously facing an increase in the income tax rate (Kesenne, 1990). By examining the economic variable of income taxes, this study can analyze how they may affect the incentives of female labor market participation.

This variable will be examined as the top marginal tax rate in percentage according to the Economic Freedom of the World Annual Report and OECD data. There is overt room for error and discrepancies when trying to analyze the numerous variations in tax policy. Large populations of each country will not necessarily fall under the highest income brackets. Tax rates and application of these rates vary by country and income bracket, tax breaks, special circumstances, etc. Although there may be room for error, examining top marginal tax rates in this study will allow us to analyze the maximum effects of income taxes. I expect top marginal income taxes to negatively affect incentives of female labor market participation and lead to an increase in the GWG.

Institutional variables such as centralized bargaining have been found to significantly, negatively relate to the gender wage gap. Blau and Kahn (2003) provide strong evidence that wage setting institutions provide for relatively high wage floors and "raise the relative pay of women, who tend to be at the bottom of the wage distribution (2003:40)." Iversen (1999) and Wallerstein (1999) argue that bargaining centralization reduces wage differentials among different firms and sectors because bargaining includes more sectors into a common wage settlement. This is significant to this study because female workers are observed to work in less remunerative sectors. Centralized bargaining

may equalize these sectoral wage differentials and so we expect the gender wage gap to be negatively associated with this labor market institution. I hypothesize that the political variable of centralized bargaining will decrease the gender wage gap.

Centralized bargaining will be examined by using Torben Iversen's Index of Centralization. This index combines a measure of union concentration with a measure of the prevalent level of bargaining. The operational definition of centralization –C—is

$$\sum(w_j \cdot p_{ij}^z)^{1/2}$$

Where w_j is the weight accorded to each bargaining level j ($\sum(w_j = 1)$), and p_{ij} is the share of workers covered by union (or federation) i at level j . Information about the concentration of union membership at each level of bargaining (p_{ij}) was obtained from Visser (1989). The weights (w_j) depend on (i) the predominant level(s) at which bargaining take place, and (ii) the enforceability of bargaining agreements. The weights were assigned to every bargaining round in each country over the 23-year period from 1973 to 1995. Only three levels of bargaining were used in the classification, reflecting the empirical prevalence of peak-level bargaining, sector-/industry-level bargaining, and firm-/plant- level bargaining.

According to Iversen, the degree of enforceability depends on the capacity of bargaining agents to implement their agreements. Enforceable agreements presuppose that bargaining agents control most strike and lockout funds, and can impose fines for non-compliance. Non-enforceable agreements mean that the bargaining agents lack credible threats of sanctions. In some borderline cases, bargaining agents exercised partial control over enforcement. The use of Iversen's bargaining centralization may prove to be implemental in this study but contains several areas of questioning. The

application of weights depending on the three predominant levels of which bargaining take place and enforceability of bargaining agreements may not examine the entire influence of labor unions. The presence of a labor union may have other intangibles on specific firms or industries. In addition, examining the absolute capacity of bargaining centralization has on reducing wage differentials may be caused by random effects and may require further support from future studies. However, the variable of centralized bargaining will indeed be essential to this study because of how bargaining has been shown to affect wage differentials.

An additional institutional characteristic that will be included is economic competition. As examined by Becker (1957), economic competition is supposed to negatively affect the gender wage gap because firms would eliminate discrimination against women to minimize costs in a highly competitive market. In support, Weichselbaumer and Winter-Ebmer's (2002) show that both increased competition and the enactment of equal treatment laws reduce the gender wage gap. Economic competition will be examined by using the Economic Freedom Index. Although quantifying levels of economic competition are difficult, the EFI examines countries by the (1) size of government, (2) legal system and property rights, (3) sound money, (4) freedom to trade internationally, and (5) regulation. Within each category contains several sub-components that are individually quantified. The Index combines these categories together to create a chain-linked summary index.

Changes in a country's chain-linked index through time are based only on changes in components that were present in adjoining years. This methodology means that a country's rating will change across time periods only when there is a change in

ratings for components present during adjacent years. According to Gwartney, Lawson, and Hall (2003), “This is precisely what one would want when making comparisons across time periods” (15). This form of analysis has been published since 1970 and throughout time has become more comprehensive and the available data more complete (Gwartney, Lawson, Hall 2013). As a result, this variable is seemingly reliable and will be incorporated in this study.

Public employment is another indicator of wage compression and should be examined in this study. Public employment is an indicator of wage compression because public sectors are more inclined than private sectors to equalize wages for their employees (Kolberg 1991).

Hourly Earnings	Private	Public	Total
Total (ISCO 0-9)	76.7	86	82.7
PAT (ISCO 0-1)	61.2	81.6	74.8
Manufacturing (ISCO 7-8)	82.3		82.6
Low Skilled Services	85.1	86.2	85.9

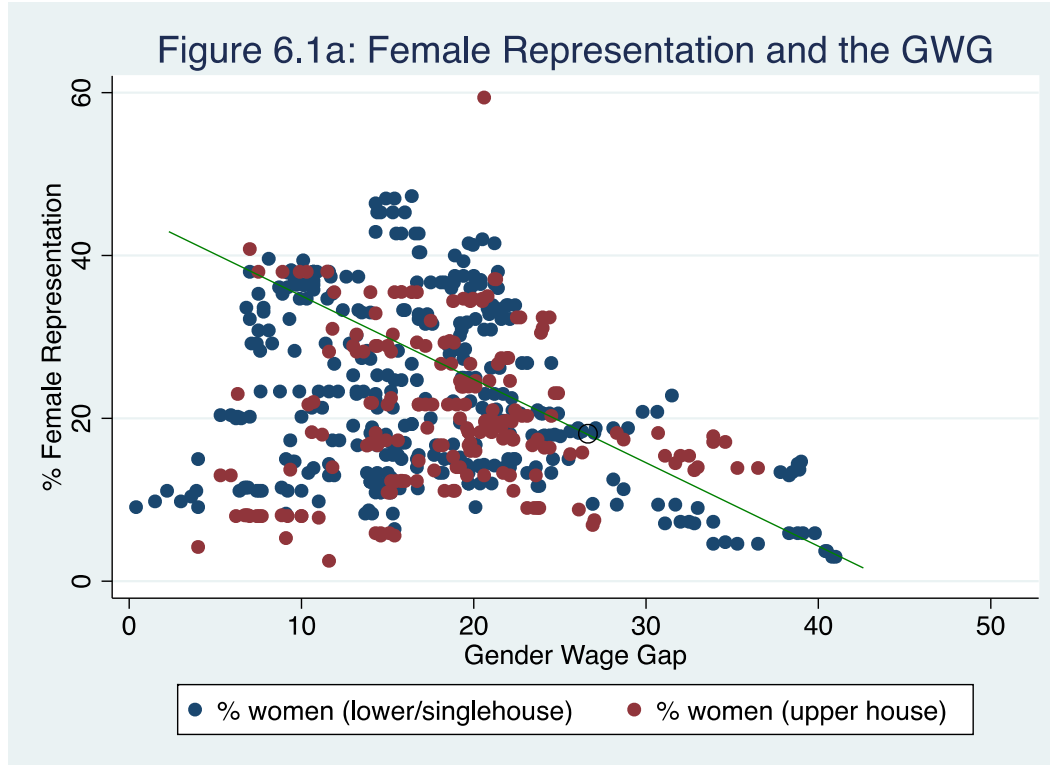
This study examines the argument against the woman-hostile state and shows female-male wage differentials to be smaller in the public sector than in the private sector of the economy.²² In support of these findings, Chatterji, Mumford, and Smith (2007) find there are higher relative earnings in the public sector for women. By using evidence from matched employee-workplace data, they conclude there is a considerable public-private pay differential. The public employment ratio is based on civilian government

²² Source: Calculations of a data set from the Norwegian Level of Living Survey (1983). Note: Figures are for employees twenty through sixty-four years of age. ISCO= International Standard Classification of Occupations (here specified at a modified one-digit level).

employment as a percentage of working age population (15-64). This data is based on information collected by national databases and is seemingly reliable. As a result, the variable of public employment will be included in this study.

I include the institutional characteristic of overall earnings dispersion and use direct measures of the 90th percentile minus 10th percentile wage gap for males and for females. Blau and Kahn (2003) use the 50-10 wage gap as an independent variable in a regression to show that a more compressed male wage structure decreases the gender wage gap. The rationale behind examining the 50-10 gap is that, “It is a measure that may be especially relevant to those at the bottom of the distribution, such as women” (2003: 118). By including 90-10 wage gaps, we can better examine the range in which wage compressions decrease the gender wage gap.

A final political institution that will be examined is the decision making body of parliaments and the effects they have on incentives for female labor market participation, and the gender wage gap. Female representation in parliaments can vary dramatically across the world. The differences in representation can range from merely 2.4% in Turkey (1997), to 47.3% in Sweden (2007) for lower house/single house parliaments, while differences in the upper house can range from 2.5% in Slovenia (2008), to 59.4% in Germany (2000). When these variations in female representation are compared with percentages of the gender wage gap, we observe interesting findings.



The main question here is, “Does an increase in female representation lead to the narrowing of the gender wage gap?” Although changing the proportion of representation alone cannot be accredited to directly changing the gender wage gap, increasing female representation may lead to an increase in gender sensitive policies. This increase in gender sensitive policies can in turn lead to decreases in the gender wage gap. I hypothesize that an increase in female representation leads to the narrowing of the gender wage gap.

The literature examining this assumption is nonexistent. This can be due to the lack of interest in this subject, inability to isolate the effect of this variable, or assumptions that this correlation should be “obvious.” Perhaps an increase in female representation is a natural tendency of an evolving society. Or perhaps, a decrease in the

gender wage gap is a combined result of the other variables and models that are being examined in this study. Examining the effects of this political variable would require one to study a time series, focusing on increases in gender sensitive policies proposed, policies passed, policies enforced, and the subsequent isolated effects they have on the gender wage gap over time. Multiplying this complexity to examine a cross-national study would be even more difficult and would require a new study in itself. As a result, this study will not examine this variable in such depth, but will simply include the variation in levels of female employment in relation to the other variables of this study. This a new theoretical approach I have included to show the effects political institutions may have on the incentives of female labor market and the gender wage gap. The effect of this experimental variable will be examined in separate models.

Five models will be used to examine differences between countries. Looking within groups may be too narrow since there is far less variation within than between countries. Although other studies may want to examine unobserved country heterogeneity, it is not obvious that the within-group differences, over a short period of time, are large enough to reflect sufficient change. As a result, we first analyze differences between countries. Since I am using the OECD measures of the median gender wage gap, as well as the mean, we examine the median \log_e pay difference. In addition, to show further accuracy, this study will also incorporate the mean \log_e pay difference.

The first model examines how a country's fertility rate, the husband-wife age difference at first marriage, and the top marginal income tax rate are related to the gender wage gap. Female educational attainment is not included in this model because its effect

on the wage gap is significant in two ways. The first reason is because a higher educational level is found to increase women's wage directly. The second reason is because higher education works to raise women's incentives for more lifetime labor force participation, which increases women's wages indirectly through more human capital investment. By excluding the effect of educational attainment, the first model shows how female labor force participation affects the gender wage gap. Model 2 will incorporate the educational attainment variable and its direct role on the gender wage gap.

Model 3 incorporates institutional variables such as centralized bargaining, economic competition, and an economy's proportion of public employment. Model 4 will incorporate the 90-10 female and 90-10 male earnings dispersion measures. The institutional variable of female political representation will be examined separately in Model 5. Data for female representation according to IPU archives only cover years 1997-2010. As a result, the variables selected will be chosen to increase r^2 and examine the strength of this variable with available data. The variables that will be correlated with this variable are fertility, age at first marriage, top marginal tax rates, and economic competition. This model will aim to examine the effect of female political representation and broadly determine its effect. Although the results are largely prone to error and require further examination, examining the effects of this variable in this study may contribute to future research.

CHAPTER 7

RESULTS AND CONCLUSIONS

Model 1's results show us that all three independent variables (fertility, age at first marriage, top marginal taxes) have positive coefficients. This suggests that variables connected to low lifetime labor force participation may be associated with a larger gender wage gap. Through this cross-national time series study of heterogeneous countries, these results also show us the negative impact of fertility on female-relative-to male earnings. The results of husband-wife age gap at first marriage suggest that a determinant of the gender wage gap may be traced to specialization between family members. These results can be compared to our discussion regarding families as efficient economic models. Higher top marginal income taxes are also shown to raise the gender wage gap, possibly reducing women's labor force participation relative to men's. Although the coefficient is minor, this study shows that marginal income taxes do have some effect on the gender wage gap and should be examined in future studies. My original hypothesis that these variables possibility increase the gender wage gap seems to be relatively true.

Model 2's results show us the powerful effect female educational attainment has on the gender wage gap. The female education coefficients appear to support the argument that relatively more schooling for women reduces the gender wage gap. Collectively, these variables lend empirical evidence to support the argument that women's incentives for labor force participation increase and decrease the gender wage gap.

Model 3 adds three institutional variables: centralized collective bargaining, economic competition, and the public-private employment ratio. As can be seen,

centralized bargaining is associated with a reduction in the gender wage gap. This is a significant finding because it shows that political institutions such as mediating institutions and labor unions can help reduce the gender wage gap. Our hypothesis that political institutions of bargaining centralization and mediating institutions have a negative effect on the gender wage gap is found to be relatively true.

In addition, economic competition is associated with an increased wage gap. This finding is also significant because it opposes theoretical claims that an increase in economic competition will cause employers to avoid discrimination in order to maximize costs. One may come to the conclusion that more policies and regulations need to be enacted in order to help women compete in competitive labor markets. Finally, the public employment ratio seems to be statistical insignificant. As examined in the literature, public sectors are more inclined than private sectors to equalize wages for their employees. Our findings cannot determine whether public employment in fact does equalize wages.

Model 4 examines the variables of fertility, age at first marriage, top marginal taxes, female educational attainment, and 90-10 wage differentials. Incorporating the 90-10 overall male and female earnings spread does not qualitatively alter the results. As with Blau and Kahn (2003), we find that greater male wage dispersion is associated with a wider gender wage gap.

Model 5 incorporates fertility, age at first marriage, top marginal taxes, economic competition, and women's representation in parliaments. These results show us that female representation is largely insignificant and further research must be assessed. As

examined in the previous sections, literature on this relationship is nonexistent and thus expectations were not high.

In conclusion, my results underscore the role of demographic variables, particularly those affecting lifetime work which in turn influence human capital investment. I show evidence that the gender wage gap, at least in part, results from factors affecting women's lifetime labor force participation. These factors include labor market and political institutions, which seem to affect the gender wage gap over time. Political institutions such as bargaining centralization do have some effect on the wage gap while female representation in parliaments seemingly has no effect. These findings also shed light on the currently paradoxical finding that the gender wage gap is narrowing despite a wider dispersion in the overall wage structure. In order to fully understand the gender wage gap and the effect of variables, a mere OLS regression will not suffice. I conclude with the knowledge that future studies will require the use of advanced techniques such as Random Effects, Fixed Effects, and subsequent Two Stage Least Square analytics for further analysis and to incorporate the estimation model in chapter 5. I fully intend to learn these advanced techniques and expand upon my research in the near future.

TABLES

Table 1: Variable Summaries

Variable	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
Gender Wage Gap 50 th	546	.3546442	.3363621	.0038509	1.696031
Gender Wage Gap Mean	543	.3224264	.133302	.0995436	.8754687
Fertility Rate	902	1.802	.4435784	1.08	4.54
Age Gap at First Marriage	807	2.71867	.7835062	.1666679	5.414286
Top Marginal Income Tax Rate	749	53.80204	12.72527	15	89
Female Educational Attainment	532	.7865971	.2386072	.3006182	1.243149
Bargaining Centralization	315	.2988857	.1675957	.071	.654
Economic Competition	852	7.080869	.9450935	3.46	8.84
Public Employment Ratio	483	10.62435	4.395086	5.14	24.97
90/10 Male Wage Gap	598	3.076204	.7165803	2.03	5.28
90/10 Female Wage Gap	600	2.779225	.6420363	1.7	4.58
Female Representation	308	22.69574	10.5437	3	47.3

Note: a) Variable definitions:

Gender Wage Gap 50th: The difference between the log of males' median wage and log of females' median wages based on the full-time sample.

Gender Wage Gap Mean: The difference between log of males' mean wage and log of females' wage based on the full-time sample.

Fertility Rate: Births per woman.

Age Gap at First Marriage: Mean age gap between husband and wife at the first marriage.

Top Marginal Income Tax Rate: Top marginal income tax rate as a percentage.

Female Educational Attainment: The ratio of females-to males at the "third level" post-secondary education level.

Bargaining Centralization: An Index of the degree to which bargaining is centralized.

Economic Competition: The Economic Freedom Index.

Public Employment Ratio: Civilian government employment as a percentage.

Female Representation: The mean percentage of women in parliaments.

Table 2: Examination of Model 1

`. regress gwg_mean fertility afm_d top_marginal_tax`

Source	SS	df	MS			
Model	1.82410164	3	.608033881	Number of obs =	473	
Residual	6.55683423	469	.013980457	F(3, 469) =	43.49	
Total	8.38093587	472	.01775622	Prob > F =	0.0000	
				R-squared =	0.2176	
				Adj R-squared =	0.2126	
				Root MSE =	.11824	

gwg_mean	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
fertility	.1252218	.018772	6.67	0.000	.088334	.1621095
afm_d	.0245772	.0080705	3.05	0.002	.0087184	.040436
top_marginal_tax	.0025022	.0004773	5.24	0.000	.0015643	.0034401
_cons	-.0956805	.0377826	-2.53	0.012	-.1699246	-.0214363

`. regress gwg_50 fertility afm_d top_marginal_tax`

Source	SS	df	MS			
Model	2.60481957	3	.86827319	Number of obs =	476	
Residual	49.1521153	472	.104135837	F(3, 472) =	8.34	
Total	51.7569349	475	.108961968	Prob > F =	0.0000	
				R-squared =	0.0503	
				Adj R-squared =	0.0443	
				Root MSE =	.3227	

gwg_50	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
fertility	.1627511	.0604211	2.69	0.007	.0440235	.2814787
afm_d	-.0652127	.0222144	-2.94	0.003	-.1088641	-.0215613
top_marginal_tax	.0043069	.0013265	3.25	0.001	.0017003	.0069135
_cons	.0219253	.121389	0.18	0.857	-.2166044	.2604549

Table 3: Examination of Model 2

. regress gwg_mean fertility afm_d top_marg female_edu

Source	SS	df	MS	Number of obs = 238		
Model	3.34086329	4	.835215823	F(4, 233) = 101.73		
Residual	1.91296111	233	.008210134	Prob > F = 0.0000		
				R-squared = 0.6359		
				Adj R-squared = 0.6296		
Total	5.2538244	237	.022168035	Root MSE = .09061		

gwg_mean	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
fertility	.1686937	.0200884	8.40	0.000	.1291157	.2082718
afm_d	-.0134538	.0085631	-1.57	0.118	-.0303248	.0034172
top_marg	-.0020363	.0005257	-3.87	0.000	-.003072	-.0010006
female_edu	-.4963934	.0305028	-16.27	0.000	-.5564901	-.4362968
_cons	.6644443	.0664007	10.01	0.000	.5336218	.7952667

. regress gwg_50 fertility afm_d top_marg female_edu

Source	SS	df	MS	Number of obs = 226		
Model	10.6600935	4	2.66502338	F(4, 221) = 32.11		
Residual	18.3424079	221	.082997321	Prob > F = 0.0000		
				R-squared = 0.3676		
				Adj R-squared = 0.3561		
Total	29.0025015	225	.128900006	Root MSE = .28809		

gwg_50	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
fertility	.3140315	.0999974	3.14	0.002	.116961	.5111019
afm_d	-.1596224	.0272684	-5.85	0.000	-.2133618	-.105883
top_marg	-.001206	.0016966	-0.71	0.478	-.0045495	.0021375
female_edu	-1.062434	.105902	-10.03	0.000	-1.271141	-.8537267
_cons	1.345529	.2378378	5.66	0.000	.8768085	1.814249

Table 4: Examination of Model 3

. regress gwg_mean fertility afm_d top_marg female_edu bargain_cent econ_comp public_emp

Source	SS	df	MS	Number of obs =	174
Model	1.07754976	7	.15393568	F(7, 166) =	36.66
Residual	.697075144	166	.004199248	Prob > F =	0.0000
				R-squared =	0.6072
				Adj R-squared =	0.5906
Total	1.77462491	173	.010257947	Root MSE =	.0648

gwg_mean	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
fertility	.0430894	.029992	1.44	0.153	-.0161255	.1023044
afm_d	-.0051017	.0072476	-0.70	0.482	-.019411	.0092076
top_marg	-.0006752	.000547	-1.23	0.219	-.0017551	.0004048
female_edu	-.4602395	.0397632	-11.57	0.000	-.5387462	-.3817327
bargain_cent	-.227475	.0363039	-6.27	0.000	-.2991519	-.1557981
econ_comp	.0631118	.013475	4.68	0.000	.0365073	.0897164
public_emp	.0062351	.0015538	4.01	0.000	.0031673	.009303
_cons	.2793101	.1104132	2.53	0.012	.0613149	.4973053

. regress gwg_50 fertility afm_d top_marg female_edu bargain_cent econ_comp public_emp

Source	SS	df	MS	Number of obs =	167
Model	17.7502698	7	2.53575283	F(7, 159) =	57.67
Residual	6.99164105	159	.043972585	Prob > F =	0.0000
				R-squared =	0.7174
				Adj R-squared =	0.7050
Total	24.7419109	166	.149047656	Root MSE =	.2097

gwg_50	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
fertility	.1098383	.0988178	1.11	0.268	-.0853264	.3050031
afm_d	-.1599903	.0234829	-6.81	0.000	-.2063689	-.1136117
top_marg	.0013446	.0017999	0.75	0.456	-.0022103	.0048994
female_edu	-2.166086	.1287736	-16.82	0.000	-2.420413	-1.911758
bargain_cent	-.5748134	.1215403	-4.73	0.000	-.8148551	-.3347717
econ_comp	.3200737	.0447145	7.16	0.000	.2317628	.4083847
public_emp	.0565284	.0050009	11.30	0.000	.0466515	.0664052
_cons	-.2739943	.360984	-0.76	0.449	-.9869363	.4389478

Table 5: Examination of Model 4

```
. regress gwg_mean fertility afm_d top_marg female_edu male_earn female_earn
```

Source	SS	df	MS	Number of obs = 220		
Model	2.00300164	6	.333833607	F(6, 213) = 62.63		
Residual	1.1353134	213	.00533011	Prob > F = 0.0000		
Total	3.13831505	219	.014330206	R-squared = 0.6382		
				Adj R-squared = 0.6281		
				Root MSE = .07301		

gwg_mean	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
fertility	.0585564	.0279765	2.09	0.038	.0034103	.1137026
afm_d	-.0035258	.007575	-0.47	0.642	-.0184573	.0114057
top_marg	-.0002573	.0005065	-0.51	0.612	-.0012556	.000741
female_edu	-.4386511	.0271349	-16.17	0.000	-.4921384	-.3851638
male_earn	.0987399	.0138987	7.10	0.000	.0713433	.1261366
female_earn	-.0079487	.0152372	-0.52	0.602	-.0379836	.0220863
_cons	.4018754	.088814	4.52	0.000	.2268084	.5769424

```
. regress gwg_50 fertility afm_d top_marg female_edu male_earn female_earn
```

Source	SS	df	MS	Number of obs = 226		
Model	11.1309036	6	1.8551506	F(6, 219) = 22.73		
Residual	17.8715979	219	.08160547	Prob > F = 0.0000		
Total	29.0025015	225	.128900006	R-squared = 0.3838		
				Adj R-squared = 0.3669		
				Root MSE = .28567		

gwg_50	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
fertility	.2966628	.1091957	2.72	0.007	.0814539	.5118716
afm_d	-.1466768	.0292344	-5.02	0.000	-.2042935	-.0890601
top_marg	.0004843	.001965	0.25	0.806	-.0033884	.0043569
female_edu	-1.056704	.1055168	-10.01	0.000	-1.264663	-.8487461
male_earn	.0932534	.0538765	1.73	0.085	-.0129293	.1994362
female_earn	-.0101556	.0590335	-0.17	0.864	-.126502	.1061908
_cons	.9888168	.346871	2.85	0.005	.3051843	1.672449

Table 6: Examination of Model 5

. regress gwg_mean fertility afm_d top_marg econ_comp wpr

Source	SS	df	MS	Number of obs =	203
Model	.162130565	5	.032426113	F(5, 197) =	7.24
Residual	.881771517	197	.004475998	Prob > F =	0.0000
				R-squared =	0.1553
				Adj R-squared =	0.1339
Total	1.04390208	202	.005167832	Root MSE =	.0669

gwg_mean	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
fertility	-.0840935	.0211775	-3.97	0.000	-.1258572	-.0423298
afm_d	.0176062	.0078023	2.26	0.025	.0022195	.0329929
top_marg	-.00061	.0006789	-0.90	0.370	-.0019489	.0007289
econ_comp	.0467702	.010033	4.66	0.000	.0269843	.066556
wpr	-.0002662	.0004829	-0.55	0.582	-.0012185	.000686
_cons	.0161333	.0677773	0.24	0.812	-.1175289	.1497955

. regress gwg_50 fertility afm_d top_marg econ_comp wpr

Source	SS	df	MS	Number of obs =	216
Model	3.72070132	5	.744140264	F(5, 210) =	10.83
Residual	14.4229885	210	.068680898	Prob > F =	0.0000
				R-squared =	0.2051
				Adj R-squared =	0.1861
Total	18.1436898	215	.084389255	Root MSE =	.26207

gwg_50	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
fertility	-.0203421	.0775413	-0.26	0.793	-.1732011	.132517
afm_d	-.0007931	.0304158	-0.03	0.979	-.0607526	.0591664
top_marg	-.0052498	.0026337	-1.99	0.048	-.0104416	-.0000581
econ_comp	.2151766	.0352619	6.10	0.000	.1456639	.2846894
wpr	-.0031567	.0018844	-1.68	0.095	-.0068715	.0005581
_cons	-1.023579	.2572236	-3.98	0.000	-1.53065	-.5165078

Table 7: Inclusion of Public Employment Ratios in Model 5

. regress gwg_mean fertility afm_d top_marg econ_comp public_emp wpr

Source	SS	df	MS	Number of obs =	31
Model	.118531358	6	.019755226	F(6, 24) =	7.33
Residual	.064673825	24	.002694743	Prob > F =	0.0002
				R-squared =	0.6470
				Adj R-squared =	0.5587
Total	.183205184	30	.006106839	Root MSE =	.05191

gwg_mean	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
fertility	-.2496952	.0706755	-3.53	0.002	-.3955622	-.1038282
afm_d	.0543959	.0162329	3.35	0.003	.0208928	.0878989
top_marg	.0031292	.001889	1.66	0.111	-.0007695	.0070279
econ_comp	.2231357	.0535501	4.17	0.000	.1126137	.3336577
public_emp	.0118602	.0057636	2.06	0.051	-.0000352	.0237556
wpr	-.0057753	.0022013	-2.62	0.015	-.0103186	-.0012319
_cons	-1.401069	.4560126	-3.07	0.005	-2.342233	-.4599055

. regress gwg_50 fertility afm_d top_marg econ_comp public_emp wpr

Source	SS	df	MS	Number of obs =	31
Model	1.44908044	6	.241513407	F(6, 24) =	2.45
Residual	2.36408552	24	.098503563	Prob > F =	0.0543
				R-squared =	0.3800
				Adj R-squared =	0.2250
Total	3.81316596	30	.127105532	Root MSE =	.31385

gwg_50	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
fertility	-.699292	.4273031	-1.64	0.115	-1.581202	.1826182
afm_d	.0982735	.0981439	1.00	0.327	-.1042856	.3008326
top_marg	.0009878	.0114209	0.09	0.932	-.0225837	.0245594
econ_comp	.6790042	.3237634	2.10	0.047	.0107893	1.347219
public_emp	.0407682	.0348464	1.17	0.254	-.0311513	.1126877
wpr	-.0201776	.0133092	-1.52	0.143	-.0476465	.0072913
_cons	-4.254722	2.757047	-1.54	0.136	-9.944987	1.435543

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Appendix 1: Definitions and Sources of Independent Variables

Fertility Rate: The total fertility rate, defined as births per woman. Source: World Development Indicators, World Bank CD-ROM, 2004. Data are available for most years. Linear interpolation is used to create a time series.

Age Gap at the First Marriage: Mean age gap between husband and wife at the first marriage. Source: United Nations Women's Indicators and Statistics Database, version 4, United Nations 1999. Data on mean age at the first marriage by sex are available in 1970, 1980, 1990, and the latest year (around 1995). Linear interpolation is used to create a time series.

Top Marginal Income Tax Rate: Top marginal income tax rate in percentage. Source: Economic Freedom of the World 2004 Annual Report, James Gwartney and Robert Lawson (eds). Data are available at 5-year intervals. Linear interpolation is used to create a time series. OECD personal income tax rates databases were also consulted.

Female Educational Attainment: The ratio of female educational attainment over male educational attainment at the third level (educational attainment is originally defined as third level students per 100,000 population by sex). Source: United Nations Women's Indicators and Statistics Database, version 4, United Nations 1999. Data on third level students per 1000,000 population by sex are available in 1970, 1980, 1990, and the latest year (around 1995). Linear interpolation is used to create a time series.

Bargaining Centralization: The Index of Centralization. Source: Torben Iversen, "Wage Bargaining, Central Bank Independence and the Real Effects of Money," *International Organization*, 52, summer 1998.

Economic Competition: The Economic Freedom Index. Source: Economic Freedom of the World 2014 Annual Report, James Gwartney and Robert Lawson (eds). Data are available at 5-year intervals. Linear interpolation is used to create a time series.

Public Employment Ratio: Civilian government employment as a percentage of the working age population (15-64). Source: Comparative Welfare States Dataset, 2004 (downloaded from Luxembourg Income Study). Find the Original Sources in the Comparative Welfare States Dataset.

Female Political Representation: The mean percentage of women in parliaments. Parliaments include both single and upper house systems. Source: The Inter-Parliamentary Union archive of statistical data on women in parliaments.

Appendix 2 Earnings Data Definitions and sources, OECD Statistics

Country	Years	Earnings definition	Original Source	Data Provider
Australia	1975-1995, 1997-2010	Gross Weekly earnings in main job (all jobs prior to 1988) of full-time employees	Enterprise Survey (Survey of Earnings)	Australian Bureau of Statistics, <i>Weekly Earnings of Employees (Distribution)</i> .
Austria	1980, 1987-1999, 2000-2009	Yearly gross income for full-year employees working full time	Household survey (Household Economic Survey) and social security data	Statistics Austria.
Belgium	1985-1995, 1999-2008	Gross monthly earnings of full-time employed wage earners in NACE sectors C-K.	Social security data and structure of earnings survey	Belgium Institut national d'assurance maladie-invalidité (INAMI).
Canada	1967, 1973, 1981, 1986, 1988, 1990, 1997-2010	Gross weekly earnings distribution for full-time workers.	Labour Force Survey, Statistics Canada.	Analytical Studies Branch, Statistics Canada.
Czech Republic	1996-2009	Gross monthly earnings of full-time, full-year employees.	Enterprise Survey (Periodic Census of Employers).	Czech Statistical Office.
Finland	1978-1980, 1982-1984, 1986-2009	Gross annual earnings of full-time, full-year workers.	Household survey (Income Distribution Survey).	Statistics Finland.
France	1970-2008	Net annual earnings of full-time, full-year workers.	Salary records of enterprises. (<i>Déclarations Annuelles des Données Sociales</i>).	Institut national de la statistique et des études économiques (INSEE), <i>Séries longues sur les salaires</i> .
Germany	1984-2009	Gross monthly earnings of full-time workers.	Household survey (German Socio-Economic Panel).	Secretariat alculations.
Hungary	1989, 1992, 1994, 1996, 1998-2000	Gross monthly earnings of full-time employees in May of each year.	Enterprise survey (<i>Survey of Individual Wages and Earnings</i>).	National Labour Centre, Ministry of Labour.
Ireland	1994, 1997, 2000, 2003-2008	Gross weekly earnings of full-time employees.	Household survey (<i>Living in Ireland Survey 2000</i>), ESRI, for 2000 data. European Union Survey on Income and Living Conditions (<i>EU SILC</i>) 2003, Central Statistics Office Ireland, for 2003 and 2004 data.	The data and decile calculations were provided by Brian Nolan, Economic and Social Research Institute, Dublin.
Italy	1986-1996, 1998-2008	Net monthly earnings of full-time employees.	Household survey (<i>Survey of Household Income and Wealth</i>). SHIW-HA	Bank of Italy.
Japan	1975-2010	Scheduled gross monthly earnings of regular, full-time employees.	Enterprise Survey (<i>Basic Survey on Wage Structure</i>).	Planning Division, Statistics and Information Department, <i>Yearbook of Labour Statistics</i> .
Korea (South)	1975-2009	Gross monthly cash earnings, including overtime and one twelfth of annual bonuses, of full-time regular workers	Enterprise Survey (<i>Wage Structure Survey</i>).	Korean Ministry of Labour, <i>Yearbook of Labour Statistics</i> and data provided directly by the Korean authorities.
Netherlands	1977-2005	Gross annual earnings of full-time, full-year equivalent workers.	Enterprise survey (<i>Survey of Earnings</i>).	Sociaal-Economische Maandstatistiek, Dutch Central Bureau of Statistics.
New Zealand	1984, 1986, 1988, 1990, 1992, 1994-1997	Gross weekly earnings of full-time employees	Household survey (<i>Household Economic Survey</i>).	Estimates provided by the New Zealand Department of Labour.
Norway	1997-2010	Average monthly earnings for full-time equivalents	Enterprise surveys	Statistiks bank of Norway.
Poland	1995, 1996, 1998, 1999, 2001, 2002, 2004	Gross monthly earnings of full-time employees	European Union Survey on Income and Living Conditions (EU SILC).	Polish Central Statistical Office, Statistical Yearbook of Poland Earnings Distribution.

Spain	1995, 2002, 2006	Gross annual earnings of full-time employees	European Union Survey on Income and Living Conditions (EU SILC).	Instituto Nacional de Estadística.
Sweden	1975, 1978, 1980-2004	Gross monthly earnings for full-time employees	Statistics Sweden.	Statistics Sweden.
Switzerland	1996, 1998, 2000, 2002, 2004, 2006, 2008	Net monthly earnings of full-time workers	Office fédéral de la statistique, <i>Enquête suisse sur la structure des salaires</i> .	Swiss Office federal de la statistique.
United Kingdom (Great Britain)	1970-2010	Gross weekly earnings of all full-time workers	<i>Annual Survey of Hours and Earnings (ASHE)</i> for year 2006 to 2008 (2006 consistent with 2007)	Office for National Statistics
United States	1974-2010	Gross weekly earnings of full-time workers.	Household survey (<i>Current Population Survey</i>).	U.S. Department of Labor, Bureau of Labor Statistics

Note: a): Gross earnings and net earnings refer to earnings before and after income taxes respectively.

b): All earnings were calculated to equal annual totals.

c): The log of means and median wages were calculated to generate a gender wage gap.