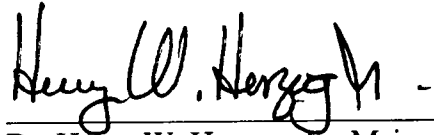


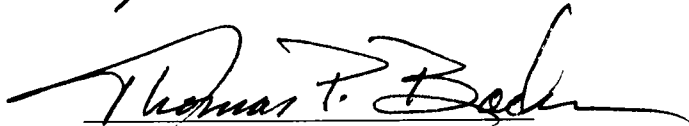
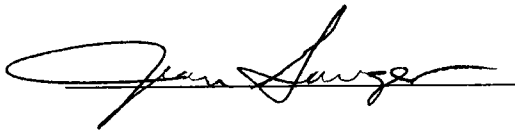
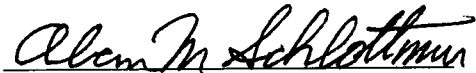
To the Graduate Council:

I am submitting herewith a dissertation written by Mary Kirchner Lanier entitled "Minding the Gap: A Cross-Country Analysis of Wage Differentials Using the Luxembourg Income Study Database." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Economics.



Dr. Henry W. Herzog, Jr., Major Professor

We have read this dissertation
and recommend its acceptance:



Accepted for the Council:



Associate Vice Chancellor
and Dean of the Graduate School

**MINDING THE GAP:
A CROSS-COUNTRY ANALYSIS OF WAGE DIFFERENTIALS USING THE
LUXEMBOURG INCOME STUDY DATABASE**

**A Dissertation
Presented for the
Doctor of Philosophy Degree
The University of Tennessee, Knoxville**

**Mary Kirchner Lanier
December 1998**

DEDICATION

This dissertation is lovingly dedicated to my grandparents, H. Ronald and Mary Eleanor Knotek Kirchner without whose encouragement and support I would have relinquished this dream long ago. There exist few on this earth who give so unstintingly of themselves. I hope to make them proud and fulfill their expectations of me as a teacher, mother, wife, and Christian.



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ABSTRACT

This research estimated the marriage penalty/premium and parenthood penalty/premium to wages in four countries, the United States, Canada, the United Kingdom, and Norway, using the Luxembourg Income Study Database. Individuals were separated into subgroups to isolate the effect of marriage and parenthood on wages. A two-stage regression procedure was used which employed Heckman's correction for self-selection bias. In addition, a decomposition procedure was used to highlight the characteristic, parameter, and self-selection effects.

This investigation found that the marriage penalty to women's wages varies substantially across countries. The largest marriage penalties to women's wages were found in the United Kingdom and Norway, with a significantly smaller marriage penalty in the United States, and a small marriage premium to women's wages in Canada. These penalties/premium are unexplained by personal characteristics of the women in question. Men in all four nations experienced a substantial marriage premium.

This analysis points out one particular difference in institutions across the nations in the study: the legislative framework supporting equal pay for women in the workplace. It is evident within the limited confines of this study that the pattern of equal pay legislation follows the pattern of marriage penalties uncovered in this study.

This investigation found significant parenthood penalties to women's wages in all four countries. Women in the United States incurred the largest parenthood penalty to their wages. Men typically incurred either a small parenthood penalty or none at all.

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CHAPTER 1

INTRODUCTION AND STATEMENT OF THE PROBLEM

Since World War II women have been an increasingly important part of the American work force. Labor force participation among women has increased dramatically in this century. From 20 percent in 1900, 26 percent in 1940, 34 percent in 1960 (Oppenheimer, 1970, 8), 51.6 percent in 1980, and 58.8 percent in 1990 (Ehrenberg and Smith, 1997, 29), the percentage of women employed outside the home continues to grow. In the early part of this century, the female work force was typically composed of young, unmarried women who left employment permanently upon marriage. By the 1960s, a double peak pattern emerged with women returning to the work force when their children were older (Oppenheimer, 1970, 9). In the 1980s and 1990s, a higher percentage of women have remained in the work force during the childbearing years, avoiding some of the pitfalls that accompany an intermittent work history. The modal female worker today is married and, as such, carries the dual role of worker and caretaker of home and hearth (Roos, 1985, 14).

The entrance of married women en masse into the American work force over the past two decades has generated considerable interest concerning the economic well being of these working women. In particular, numerous studies have been undertaken to explain the persistent wage gap which exists between male and female workers in the industrialized countries. Previous studies have predicted that, as women increase their

investment in human capital, the gender wage gap would close. Recent evidence shows that the gender wage gap is closing more slowly than predicted. Women still earn substantially less than men in the American labor market.

The wages of married women exhibit the most substantial differences from men's wages. The presence of children in the home intensifies the gender wage differential. While many previous economic studies have used marital status and the presence of children as independent variables in the wage equation, this study will isolate the predictors of wages within these subgroups: all men, all women, married men, married women, single men, single women, men with children, and women with children. This strategy will provide more detail on the wage structure of these subgroups, allowing direct comparison between comparable subgroups, e.g. the wages of married men vs. the wages of married women. Moreover, further insight will be gleaned regarding the differing effects on wages of work-related personal characteristics by subgroup.

The use of subgroups is particularly useful in the consideration of the existence and magnitude of the marriage penalty and the parenthood penalty to the wages of female workers. The marriage penalty to wages is the difference between the wages commanded by single women and those wages earned by married women, given identical work-related personal characteristics excluding marital status. If this difference is positive, a marriage penalty to wages exists. In other words, when a female worker is paid less than otherwise identical workers due to marital status alone,

this wage differential can be thought of as a penalty based only upon her marital status. The parenthood penalty to the wages of female workers is the difference between the wages paid to childless women versus those paid to working mothers. If this difference is positive, a parenthood penalty to wages exists.

While past studies have considered the effect on wages of marriage or parenthood in isolation or as explanatory variables in a wage equation, the subgroups utilized in this study will allow direct examination of the magnitude of both of these penalties. If one takes into consideration the traditional order of the events in question, that is, marriage then children, the marriage penalty and parenthood penalty can be seen as a two-step penalty process, depressing the wages of affected women at different points in their working lives. The use of subgroups in this study allows consideration of both the existence and the magnitude of each of the penalty steps.

In a study of wage differentials, the decision of an individual worker whether or not to participate in the paid labor force determines the inclusion or exclusion of that individual in the wage sample. Labor participation is influenced by factors unobserved in the wage function, i.e. some individuals will chose not to work and, thereby, remove themselves from the wage sample. This introduces self-selection bias. For example, individuals with low levels of education may decide not to work. This will positively skew the education coefficient in the standard ordinary least squares (OLS) regression model since individuals with lower levels of education remove themselves from the

wage sample. Work-related personal characteristics that result in lower wage offers will be underrepresented in the wage equation.

To correct for possible self-selection bias, the procedure introduced by Heckman in 1979 and improved upon by Greene in 1981 will be implemented. This two-stage regression procedure yields consistent estimates of the parameters of the wage equation. In the first stage, a probit model integrates all individuals regardless of work status to yield a wage-offer function facing each subgroup. This wage-offer function estimates the effect of work-related personal characteristics on mean wage offers, regardless of whether the offer is accepted by the individual or not. In the second stage, consistent estimates of the observed wage function are calculated by adjusting for the self-selection bias revealed in the first stage (Reimers, 1985, p.28).

Work-related personal characteristics explain only a portion of the observed gender wage differential. There are additional possible explanations for the observed differences between the wages of men and women. Discrimination against women in the labor market, particularly against married women and women with children, may account for a proportion of the observed difference in wages. To distinguish between wage differentials due to work-related personal characteristics and that portion ascribed to possible gender discrimination, a variant of the decomposition procedure introduced in the economic literature by Oaxaca will be utilized for each subgroup. The results of the decomposition will allow comparisons to be made as to the relative importance of

various work-related personal characteristics and possible discrimination for each subgroup.

The Luxembourg Income Study provides a unique opportunity to examine the gender wage gap in an international context. Recent data on labor market outcomes from various national labor surveys have been compiled to yield comparable information from participating countries. Cross-country comparisons highlight the extent to which findings are idiosyncratic to the American labor market and to what degree findings are generally true in other industrialized countries. If a negative result is unique to the United States, either in significance or severity, programs or institutions in place in other countries may indicate possible strategies for enhancing American labor market outcomes. On the other hand, if a finding suggests that the American labor market is superior at addressing a particular area of concern, the study may provide insight regarding policies or institutions extant in the United States that are particularly effective.

CHAPTER 2

PREVIOUS FINDINGS

The primary purpose of this analysis is the examination of wages by gender to determine the extent to which personal characteristics, discrimination, and cultural differences explain observed wage differentials in four industrialized nations. The marriage penalty to wages and the parenthood penalty to wages are of particular interest in this study. Cross-country differences in these estimates are considered to glean insight regarding the proportion of observed differences that are attributable to cultural influences or policies unique to each individual country.

To set the stage, a thumbnail sketch of human capital theory and its role in explaining the gender gap is presented. In addition, an overview of other theories relevant to the gender gap is furnished. A profile of selected empirical gender wage differential models is provided to support the use of given work-related personal characteristics in this study. In particular, past studies of the marriage penalty to wages and the parenthood penalty to wages are considered.

I. Human capital theory and the gender gap in wages

Human capital theory traces its roots to Adam Smith and The Wealth of Nations (1776). In one of his more famous pronouncements, Smith states:

A man educated at the expense of much labor and time to any of those employments which require extraordinary dexterity and skill, may be compared to one of those expensive machines. The work which he learns to perform, it must be expected, over and above the usual wages of common labor will replace

to him the whole expense of his education, with at least the ordinary profits of an equally valuable capital.

Smith's argument that the development of human capabilities is rewarded with higher earnings is a tenet of current human capital theory. Countless studies have shown this relationship between investments in human capital and lifetime earnings profiles to hold. Specifically, a worker's value in the labor market increases as the individual attains higher levels of education, training, and experience.

Human capital theory posits that an individual makes the decision whether to invest in human capital based upon the present value of the difference between the costs associated with increasing human capital and the projected benefits of that investment in human capital. To maximize utility, the individual will invest in human capital only when the present value of anticipated future benefits of the investment exceed the present value of the costs associated with attaining the human capital. Benefits to higher levels of human capital encompass both economic and psychic gains. The major economic gain of human capital investment is a higher lifetime earnings stream. Possible psychic gains to higher levels of human capital include increased job satisfaction, greater prestige in the workplace and the community as a whole, and enhanced enjoyment of nonwork interests.

A worker's decision to invest in attaining higher levels of human capital depends upon several factors which influence the cost/benefit mix including age, earnings differentials by educational level or training attained, and costs related to the investment. For instance, a younger individual will have a longer expected remaining

work life than an older individual. Given equal annual benefits to human capital investment, the younger worker will reap a higher lifetime benefit than the older worker.

Human capital theory also supports the argument that increases in the earnings differential by educational level or training attained will heighten investment in human capital. The benefit of investments in human capital is increased when workers are rewarded with higher economic gain, all else equal. If the gap between the lifetime earnings streams of college-educated workers and high school graduates widens, workers have more incentive to invest in human capital. For instance, as the ratio of mean earnings of male college graduates to male high school graduates in the United States increased from 1.19 in 1980 to 1.54 in 1993, college enrollment rates by male high-school graduates increased from 46.7% in 1980 to 59.7% in 1993 (Ehrenberg and Smith, 1996, 297). In addition to the pure statistics, numerous empirical studies have verified this prediction of human capital theory.

Costs of attaining higher levels of human capital will also influence the decision of workers whether or not to undertake additional human capital investments. The costs to a worker of human capital improvement involve more than monetary costs alone. While increases in net monetary costs such as higher college tuition, lower levels of financial aid, and higher foregone wages during education predictably lower investments in human capital, other nonmonetary costs will also discourage workers from pursuing human capital investment. For example, a nonmonetary cost of education is less time to fulfill family obligations such as the maintenance of a

household and child rearing. Hence, factors that increase the demands of the home such as the presence of children will increase the cost of investments in human capital.

Human capital theory postulates that investment in human capital may vary significantly by gender. This hypothesis hinges, in part, upon the theory of household production. Household production includes such activities as cooking meals, maintaining a clean household, running household errands, child rearing, and any other work necessary within the home. Traditionally, the burden of household production has fallen largely upon women. The household production model of labor supply argues that a household will maximize utility by allocating time between household work, market work, and leisure. Men traditionally have opted for higher levels of market work and leisure, leaving the household work to women. The theory argues that, for a household to benefit from a woman's market work, the household must be able to substitute market goods purchased with her earnings for her sacrificed household production. It follows that a woman's work-related decisions will depend upon whether she is a household unto herself, i.e. single with no minor children, or whether she is married and/or a mother of minor children.

The decision of a female to invest in human capital will depend, in part, upon her marital and family status. Specifically, the benefits and costs of any increase in human capital are affected by gender and gender roles. For instance, traditionally women have had shorter work lives due to the demands of child rearing and maintaining a household. Any investment in human capital by a woman subject to these household

constraints would result in a lower expected future benefit relative to that of a man without similar household demands. To compound this effect, employers may form an expectation that married female workers and working mothers will have a shorter work life due to their household duties. Theoretically, this expectation predictably leads to less emphasis on training for female employees and contributes to occupational segregation by gender.

Mincer and Polachek (1974) argue that the dual demands on women's time raised by work and family obligations lowers women's competitiveness in the labor market by influencing such factors as education, training, hours worked, perceived commitment to firm and career, and ability to pursue advancement opportunities. For instance, the intermittent nature of labor market participation by child-bearing women may lead these women to pursue employment where this behavior is not penalized, e.g. in lower-paying service jobs which require little or no on-the-job training (Kuhn, 1989). It is further argued that discontinuous labor force participation by women leads to lower investments in human capital by these women. In addition, the value of any investment in education by women erodes with time spend out of the labor market. This erosion of skills and education further discourages women from seeking higher levels of education and training.

Investments by women in human capital are also limited by sex differences in socialization. Children learn at a very early age the appropriate behavior for males and females. While women are not discouraged from working as stridently as in past eras,

women are typically seen as second incomes within the family and, therefore, are expected to place the career aspirations of the male partner first. Young girls perceive this emphasis and place less importance on increasing their worth in the labor marketplace (Marini and Brinton, 1984). Women holding traditional views on their economic role may also expect less from the labor market in terms of financial reward for their efforts. If a woman expects a lower return from work, she will have less incentive to invest in her human capital (Vella, 1994)

Finally, human capital theorists have hypothesized other effects of household responsibility on women's productivity. Women are traditionally the primary caretakers of the home and children. Household obligations may limit a woman's perceived or actual commitment to her job and career, in part by restricting the number of hours she can work outside of the home. A woman's mobility may be curbed by her family role, excluding her from assignments that typically result in promotions. Women may tend to gravitate toward jobs with more flexible hours, accepting a lower wage in exchange for this benefit (Roos, 1985). Restrictions on hours and geographic mobility will tend to depress wages.

II. Additional theories on the gender gap

Occupational segregation by race and sex is a characteristic of labor markets in developed countries. Low-paying segments of the labor market tend to employ women and ethnic minorities in larger numbers, while high-paying segments tend to employ larger percentages of white men (Bianchi, 1995). An extensive body of literature,

encompassing the neoclassical, institutional, and Marxian viewpoints, has emerged to explain this market segmentation. Each theory posits that discrimination by employers is not the sole source of labor market segmentation, although the accompanying explanations are starkly different. Suggested sources of market segmentation include, but are not limited to, life cycle theories of labor participation, differences in socialization and education patterns, varying levels of household responsibility, internal vs. external labor markets, and pre-market exploitation of minorities.

While lower levels of human capital investment by women may explain a portion of observed occupational segregation, discrimination in hiring and promotion practices potentially expands the gap between “women’s jobs” and “men’s jobs”. Employers may be more likely to hire a woman as a secretary or a kindergarten teacher rather than as an executive or a principal, regardless of her qualifications relative to male applicants. This discrimination steers women away from “men’s jobs”, both before women enter the job market through a strengthening of the aforementioned socialization effect and after women enter the labor force through lack of job offers in male dominated fields.

Neoclassical economic theory posits that, in the absence of discrimination, the market system eliminates observed differences in wages among workers of equal productivity. If discrimination in wages existed in the short run, resulting in lower wages for one equally productive group vis a vis another, employers could increase profits by hiring workers from the underpaid group. The demand for the underpaid,

equally productive workers would rise, thereby placing upward pressure on the wages of these workers. The employers practicing discriminatory policies would be forced out of the market and discrimination would disappear. Theoretically, discrimination is not profit-maximizing behavior and market forces preclude its continued existence (Hamermesh and Rees, 1993, 474).

The theory of discrimination evolved to explain persistent differences in income variables along racial, gender, and ethnic lines. In his seminal work on the issue, Becker (1971) asserts that some employers have a taste for discrimination, which drives the market as a whole away from the profit-maximizing equilibrium. His theory of competitive discrimination implies that discriminatory employers maximize their utility based upon their own prejudices against or for certain sectors of the population, subject to some profit constraint. This view differs materially from the pure profit-maximizing behavior assumed to prevail in most neoclassical wage models. Continuing in this vein, even if laborers are assumed to be perfect substitutes in productivity, discrimination on the part of employers may result in markedly different wage profiles for individuals by gender and by race.

The theory of statistical discrimination advanced by Edmund Phelps (1972), Kenneth Arrow (1977), and others provides an alternative explanation for the persistence of employer discrimination along racial and gender lines in competitive labor markets. The theory of statistical discrimination acknowledges that employers hire in a world of uncertainty and incomplete information. Even if particular attention

is given by employers to screening the qualifications of potential employees, it can not be known with certainty how well those hired will perform on the job nor how long their tenure will be with the firm. In jobs involving high screening and training costs, errors in the selection process are costly to the employer.

To increase the probability of hiring the most well-suited employees, employers will use all information at their disposal. This may include beliefs regarding race or gender. For example, if an employer believes from past experience that women, on average, are less productive workers than their male counterparts, the employer may discriminate against an individual woman by applying this belief to that female applicant. Extension of group averages to an individual results in statistical discrimination against that individual.

Disciplines other than economics also consider the question of discrimination in the labor market and its persistence to the present day. Jacobs and Steinberg (1995) found that discriminatory practices persist in organizations within the United States. Many sociologists argue that the rules of work, gender relations in the workplace, and power differentials between advantaged and disadvantaged groups contribute to the persistence of discrimination against women in the labor market. Devaluation of "women's work", such as child care and caring for the elderly, leads to the definition of these jobs as unskilled (Reskin, 1988). Wages in these areas tend to be low, regardless of the level of education or experience required.

Consideration of occupational segregation in other nations supports this finding. While the specific jobs which are considered "women's work" vary across nations, professions dominated by women tend to be low paying. Job "A" may be high-paying in countries where it is dominated by men and low paying in countries where the same job is filled more commonly by women. The weakness of past research in this area is that it is largely anecdotal in nature. Further quantitative research is required to support this theory, although it is appealing in theory.

Theoretically, gender differences in human capital and other work-related personal characteristics, occupational segregation, and discrimination in the workplace combine to depress women's wages relative to those of men. Theory predicts that, as women assume more nontraditional roles in the workplace, the boundaries of occupational segregation will blur. In addition, higher levels of investment in human capital by women should contribute to an increase in wage levels for those women. If women enter and stay in the workforce in larger numbers, attain higher levels of education and training, and move into jobs and professions traditionally held by men, economic theory holds that the gender wage differential will decrease.

III. Empirical Gender Wage Differential Models

Empirical studies of the gender wage differential center upon the extent to which personal work-related characteristics of the individual explain the observed differences in wages by gender. The self-selection of workers, through the decision whether or not to participate in the formal labor market, demands consideration of additional variables

that may influence their labor decision. In addition, this study utilizes sub-grouping to isolate differences in the effects of personal work-related characteristics by gender, marital status, and the presence of minor children in the home. To justify inclusion of particular factors in this examination, each of the major sub-groupings and variables will be discussed in this section.

A. Grouping

To isolate the marriage penalty and parenthood penalty to wages, individuals in the study are separated into subgroups by marital status and the presence of minor children. Individuals are also separated according to gender to allow consideration of differences in the effect of each of the penalties by gender, as well as consideration of differences in the effect of personal work-related characteristics on wage.

1. Gender Economic literature is rife with studies of differences in wages by gender. Results of these studies vary by methodology, as well as by data selection. Empirical studies have consistently found that women earn a portion of the wages earned by men in all industrialized countries. This ratio of the wages of men to the wages of women has increased in the United States in the last century (Oppenheimer, 1970, 8).

Studies of gender wage differentials in specific market segments abound. For example, a study by Harris in 1996 found that professional women in advertising, engineering, and other professional areas that self-reported wages earn 85 percent to 95 percent of the wages of men in comparable jobs. More general wage differential

studies, such as those using CPS data, find lower ratios than Harris for the United States. Using 1992 U.S. data on average earnings of full-time, year-round workers yielded a 71 percent wage ratio of men to women (Spain and Bianchi, 1996, 109).

Comparable studies on the wage ratio of men to women in the other countries under consideration also show women earning less than men across the board. Among the countries under consideration in this study, Norwegian women earn the highest percentage of men's wages, followed by Canada, the U.S. and the U.K. (Blau and Kahn, 1995).

2. Marital Status Past studies using U. S. labor data have shown that marital status affects men and women differently. Studies have found that marital status is significant in the labor participation decision. A smaller percentage of married women work than single women, whereas a higher percentage of married men work than single men (Roos, 1985).

The effect of marriage on wages also varies by gender. Studies in the U. S. have found evidence of a marriage premium for men, that is, married men earn higher wages than single men. The marriage wage differential for men has been estimated at between 10 and 35 percent (Daniel, 1995). Possible explanations for this premium include, but are not limited to, the perception of married men as more stable than single men, married men making tradeoffs between pleasant work and higher wages (Reed and Harford, 1989), and discrimination by employers against single men. Women assuming

the role as provider of household services may theoretically increase a married man's productivity at work (Daniel, 1995).

Past studies in the U.S. have found an opposite effect of marriage on the wages of women. Evidence indicates that married women earn lower wages on average than unmarried women. This marriage penalty to wages was substantial in the early part of this century, when marriage often precluded continued employment for women in fields such as teaching and nursing. By 1980, Census sample data indicated that married women in the U.S. between the ages of 35 and 44 earned \$9.84 per hour on average, compared with earnings of \$10.78 for unmarried women of the same age group. By 1990, this wage gap had narrowed with married women earning \$11.60 on average, compared to \$11.99 for unmarried women (Spain and Bianchi, 1996, p. 156).

3. Presence of Minor Children The effect of parenthood on labor participation is well documented, as well as logically consistent. Due to the persistence of the mother's role as primary childcare provider in most cultures, women tend to participate less in the labor market with the advent of minor children in the home. It follows that women with children will more commonly have intermittent work experience due to interruptions caused by childbirth and childrearing. Predictably, this intermittent work history depresses the wages of working mothers. Recent studies have concentrated primarily on the welfare of single mothers (Harris, 1993).

The effect of parenthood on fathers has not been well studied in either the economic or the sociological literature. The presence of minor children does appear as

an explanatory variable for both sexes in several U.S. wage differential studies including Oppenheimer (1982), Reimers (1985), and Blau and Kahn (1995). Men may be influenced by their fatherhood to seek jobs with family friendly benefits, time schedules, and less travel. If current trends toward men assuming a more active role in parenting continue, the presence of minor children may become an increasingly important predictor of father's wages.

B. Personal Work-Related Characteristics

Wages are dependent upon the personal work-related characteristics of the worker. Factors such as age, experience, education, age of the youngest minor child in the household, other income of the household, and family-based wage supplements may affect the worker's hourly wage rate.

1. Age The convexity of age/earnings profiles have been well documented in the literature, indicating that earnings increase with age at a decreasing rate (Hammermesh and Rees, 1993). Human capital theory argues that, as a worker ages, the worker's stock of human capital depreciates and the worker's incentive to attain additional human capital declines, thereby decreasing the growth rate of wages over the life of the worker (Hammermesh and Rees, 1993). While much of the effect of age on earnings is explained by increased experience, studies which include age and experience have found both to be significant predictors of wage rates (Roos, 1985). Older workers may be perceived to be more stable and tend to exhibit lower quit-rates (Ehrenberg and Smith, 1997).

2. Experience In his early work on income distribution, Jacob Mincer (1974) pioneered the use of experience as a predictor of earnings. Mincer and subsequent researchers have found that increases in experience in the labor force increase wage levels, all else equal. As experience on the job increases, workers increase their skill levels and productivity, resulting in higher wages. In a comprehensive study of wage differentials using extremely detailed measures of work history, Corcoran and Duncan (1979) found that 39 percent of the earnings gap between males and females was explained by differences in work histories. In a later study of the gender wage gap, O'Neill and Polachek (1992) found that increased work experience by younger cohorts of women was the most significant reason for the narrowing of the wage gap in the 1980s. Inclusion of experience as an explanatory variable is standard in wage estimation models.

3. Education An individual's education strongly influences the wage earned by the worker. As the level of formal education rises, the average earnings of full-time workers increases (Ehrenberg and Smith, 1997). Education potentially increases worker productivity on the job, as well as providing a signal to employers regarding the trainability of applicants. The level of formal education is a standard explanatory variable in wage estimation models.

Many early studies on gender differences in the payoffs to education found that men had higher levels of education and correspondingly higher wages than their female counterparts. This supported the premise that, in part, women were paid less than men

due to lower levels of education. As women of the baby boom generation sought higher education in larger numbers than previous generations, the wages earned by these women predictably increased (Spain and Bianchi, 1996). However, some recent studies of the gender wage differential in the U. S. have indicated that, while education has a payoff to women in increased wages, men receive a higher wage payoff per unit of education.

4. Age of the Youngest Minor Child in the Household Some economic theorists hold that a mother's childrearing responsibilities may decrease her attachment to the labor market, either through complete exit of the mother from the paid work force or lower commitment to the job through part-time scheduling or increased absenteeism. If indeed this is the case, mothers of very young children would be most strongly affected due to the higher demands of rearing the very young. As the youngest child ages, the mother would theoretically have more time and effort to devote to paid labor. Gender wage differential studies by Roos (1985), Reimers (1988), and others have used the age of the youngest minor child in the household as a proxy for the increased responsibility of childrearing for the mother.

5. Family-Based Wage Supplements Family-based wage supplements include child allowance payments, as well as parental leave benefits. Studies of the effect of extended maternity leave on the hourly wages of mothers have generally shown that there is a maternity leave premium to wages. For example, using longitudinal data from the UK, Waldfogel (1995) found a large wage premium for using maternity leave and

returning to work. Studies of the effect of maternity leave on women's wages in the United States are scant, due to the voluntary nature of parental leave programs in this country until 1993.

Economic theory supports the granting of some type of maternity leave. The firm benefits through the retention of trained workers, thereby lowering training costs. The taking of maternity leave increases tenure at the same job, lowering the effect of intermittent work experience. The mother returns to her former job at approximately the same level of wages as when she left. On the other hand, mothers who do not take maternity leave or do not return to identical employment after childbirth lose tenure, theoretically resulting in lower wages over their lifetime.

IV. Recent Studies of the Effect of Marriage and Parenthood on Wages

Prior to the 1980s, contemporary research supported the hypothesis that the demands on women's time of household duties and childrearing were the basis, at least in part, of the gender wage differential. It was argued that the labor productivity of women must be lower than that of men, justifying in a lower wage structure for women. In a sweeping survey of male-female wage differentials, Gunderson (1989) found that past studies had concluded that marriage had a different effect on the wages of males and females: males experiencing a marriage premium, whereas females incurred a wage penalty. The conclusion of this and other studies was that household responsibilities and the accompanying decrease in the productivity of married women explained the a portion of the gender wage gap.

In a groundbreaking longitudinal study, Korenman and Neumark (1989) tested the hypothesis that household responsibilities reduced the labor market productivity of married women relative to that of married men and single women, given similar human capital attributes. Korenman and Neumark found no consistent evidence that marriage or children lower women's labor market productivity. And yet, later research by Korenman and Neumark (1992) among others has found persistent gender wage differentials which vary by marital status and parenthood status. For example, Korenman and Neumark found that first difference estimation of the gender wage gap understates the negative effect of children on the wages of female workers.

In general, current research suggests that married men do experience a marriage premium to wages while women experience a wage penalty from both marriage and parenthood. In his comprehensive analysis of the wages of males, Daniel (1992) found that, even when adjustments for worker and job traits were made, the marriage premium to men's wages was as large as the wage differential associated with race. Daniel argued that the main source of this substantial marriage premium for men was the augmentation of their labor productivity by their wives. This sacrifice of time and effort spent completing household chores by wives was explained as income-maximizing behavior by the household. Daniel argued that, since the husband generally had a higher wage rate, the household maximized income by increasing the husband's labor productivity at the expense of the labor productivity of the wife.

Early studies of the effect of motherhood on women's wages typically found a significant difference between the wages of mothers and childless women. Dalto (1989) found that maternity leave benefits and the availability of adequate child care influenced the earnings attainment of mothers over time. In her sweeping study of the "family gap", Waldfogel (1993) found a substantial difference in the wages of mothers and childless women. Using data on British women, Waldfogel found a family gap of 20 to 22%. Most studies which attempt to isolate the parenthood penalty to wages have been undertaken using data from Western European countries.

CHAPTER 3

DATA AND WAGE EQUATION ESTIMATION

The analyses of this study use wage and personal characteristic data from the Luxembourg Income Study to investigate the marriage penalty to wages and the parenthood penalty to wages. As a preliminary step, this section provides an overview of the Luxembourg Income Study (LIS) data used in this inquiry. In addition, preliminary investigation of the LIS data being used highlights wage differentials among the chosen subgroups under consideration.

I. The Luxembourg Income Study

The Luxembourg Income Study (LIS) project is a cooperative research project sponsored jointly by the government of Luxembourg and the Center for Population, Poverty and Policy Studies (CEPS). Funding for the LIS project is provided by contributions from the national science and social science research foundations of its member countries. United States sponsors include the U.S. National Institute on Aging, the Ford Foundation, the U.S. Agency for International Development, the Russell Sage Foundation, and many others. The LIS project, begun in 1983, promotes comparative research on the economic status of populations in different countries (LIS, 1995, 1).

LIS is an extensive international database comprised of microdata from household surveys of each of the member countries. The LIS database, housed in Walferdange, Luxembourg, is accessed by researchers remotely using the Internet

system. The database currently consists of over sixty data sets covering the period 1968 to 1995. Data in the LIS database are not directly accessible and cannot be copied, downloaded, or removed in any way. Access is limited to researchers registered with LIS and programs are scrutinized to meet restrictions imposed by the member countries. The data for each country is maintained as an independent data set. LIS does not reweight datasets, but utilizes the sample weights provided with the original datasets.

The goal of this study is to perform cross-country comparisons of the marriage penalty and the parenthood penalty to women's wages, as well as to consider success factors of individuals in particular labor market subgroups. To undertake comparative analysis, consistent data is necessary for each of the groups under consideration. The major strength of the LIS database in comparative studies is that LIS contains numerous labor market variables which are almost identically defined across disparate nations. This comparability of data allows consideration of the effect of domestic policies and cultural influences on labor market outcomes.¹

The data for this study will consist of 1991 household microdata from the LIS for the United States, the United Kingdom, Canada, and Norway. These nations were selected for comparison for several reasons. All four nations are highly industrialized which eliminates the difficulties inherent in comparison of countries at different stages of development. None of the countries in the study were members of the Eastern bloc

¹ While comparability of LIS data is a desirable and indeed necessary component of this investigation, the need for consistent data across countries precludes the use of variables with significantly divergent definitions. The scope of this study is, therefore, limited by the need for reasonable comparable data.

and were, therefore, essentially immune from the data comparison problems intrinsic to post-1989 data for countries such as Germany or Russia. The four countries in the study exhibit relatively high proportions of labor force participation by women, both single and married, thus providing a substantial comparative sample to represent each population subgroup. Most importantly, selection of these four nations provides a cross section of national social programs and thereby allows comparison of the overall effect of national social policies on gender wage differences.

The United States data set to be used in this study is a 20 percent random sample of the Current Population Survey (CPS). The United States LIS file for 1991 consists of 14,708 households. Weighting procedures are implemented to eliminate noninterview selection bias, as well as bias introduced by undercoverage of certain groups within the population. Specifically, a basic weight for each person is assigned to adjust for failure to obtain interviews from eligible households. Subsequently, a two-stage ratio estimation procedure adjusts for undercoverage of certain groups, especially young adults, in the CPS. This procedure adjusts the sample population to the known distribution of the entire population gleaned from independent estimates. Without the weighting procedure, undercoverage in the CPS could potentially introduce serious sampling bias (LIS, 1997, 21).²

The 1991 United Kingdom data set to be used in this study is culled from the

² Undercoverage of minority populations within the US is also a weakness of the CPS. However, this investigation is limited to white individuals and, as such, will not be affected by this undercoverage.

Family Expenditure Survey (FES) and consists of 23,370 households. Survey weights are not assigned within the FES. Theoretically, the sample design is intended to be self-weighting. This self-weighting may be partially thwarted by deficiencies in the available data (LIS, 1997, 25). Several restrictions are placed upon use of the UK's LIS data including provision by the researcher of a confidentiality contract and agreement that all data will be used for comparative purposes only.

Canadian data to be used in this study consists of 1991 microdata from the Survey of Consumer Finances (SCF). This survey is carried out as a supplement to the Canadian Labour Force Survey. The SCF employs a stratified cluster probability sample design. 41,670 households were surveyed from a total of 9,244,000 households in the population. The data made available to LIS encompasses 11,518 cases. The Yukon and Northwest Territories, geographically large areas with scant population, were excluded from the SCF study. Weights are assigned by the SCF to adjust for undercoverage of certain population groups using independent population estimates by Province, age, and sex categories (LIS, 1997, 6).

The Norwegian Income and Property Distribution Study provides microdata to LIS for comparative purposes only. The Norway LIS file for 1991 is composed of 8,073 households. Persons in institutions such as nursing homes and prisons were excluded from the survey. Due to the extremely small ethnic minority population in Norway, race is not a question on the Norwegian survey. The Norwegian Income Study is weighted to adjust for undercoverage of sectors of the population as a whole. No

weighting for noninterview bias is provided, nor is any effort undertaken to adjust for other nonsampling errors related to income (LIS, 1997, 13).

Data in LIS is provided within the framework of the household file and individual person files. The individual person files in LIS do not include information on marital status or on the presence of children. As a result, individual person files from LIS will not be used in this study.³ Household files within LIS contain variables on both the head of household and the spouse, if a spouse is present within the household. For the purposes of this study, a procedure is employed to extract relevant information on each individual within the household. Hence, it is possible that more than one data point can be gleaned from a household within the LIS household file.

LIS household files include a wide variety of information on each individual within the household. The household surveys of individual member nations do not typically include all variables from the LIS variable list. Consideration of variables available for a given nation limits other countries that can be included in any comparative study with that nation. Variables contained in the LIS database that are appropriate to the analyses in this study include personal characteristics such as marital status, sex, age, education, and experience, among others. Household characteristics of interest to this investigation include, but are not limited to, the presence of minor

³ Given the nations chosen for comparison, no information relevant to this study is sacrificed by using the household file versus the person file. This condition would not necessarily hold true for other nations' LIS databases.

children and ages of children in the household. The LIS database also contains income variables of interest in this study such as hourly wage rates for both head of household and spouse, maternity leave benefits, and child allowances.⁴

Data under consideration in this study is limited to white individuals. In the nations included in this study, whites are in the majority. The inclusion of minority individuals in the analysis may introduce racial discrimination effects outside the scope of this inquiry. In addition, to isolate the effects of gender, marriage, and parenthood on wages, individuals must have answered questions regarding these issues, i.e. an individual who refused to indicate gender, marital status, or parenthood status will not be included in the study. The data used in this study is also limited by age. Only individuals between the ages of 18 and 58 are included in the study. This exclusion is specifically intended to cull out partially retired or retired individuals who, theoretically, would respond differently than individuals in the working stage of their lives.

To isolate of the effects of marriage and parenthood on wages, the data is separated into subgroups. For each gender, individuals are placed in subgroups by marital status and parenthood status. Single parent families are not included as a subgroup in this study due to low representation in the sample data, as well as institutional differences in the definition of singleness. Married status in this study

⁴ In the case of Norway, a proxy for hourly wage rate is created using gross annual wage divided by number of hours worked annually.

indicates that the spouse is present in the household. All other individuals are considered single for the purposes of this study.

II. Wage Ratios

A preliminary step in analyzing marriage and parenthood penalties to wages is to establish wage ratios of single people to married people and childless people to those with children. Mean wage ratios are calculated for each subgroup and displayed in Table 3.1. Consideration of the wage ratios reveals differences in wage by gender and parenthood status. Further examination of these differences in wage ratio pinpoints areas of possible interest. An underlying supposition of this study is that women in some economies may experience a two-step wage penalty process, specifically, a marriage wage penalty followed by a parenthood wage penalty. While wage ratios cannot fully explore this query, the absence of differences in wage levels consistent with this conjecture would preclude further study. However, the wage ratios in this case support further investigation. With the exception of Canada, married women without children earn less per hour than single women. British married women without children fare the worst, earning 86% of the single female wage. Norwegian and American married women earn similar portions of the single female wage, garnering 95.2% and 95.8%, respectively. Canadian married women without children are the sole exception, earning 101.7% of the single female wage on average. Hence,

Table 3.1.
Mean Wage Ratios

	United States	Canada	United Kingdom	Norway
Females				
Married No Children/ Single	.958	1.017	.860	.952
Married With Children/ Married No Children	.921	.983	.955	.983
Males				
Married No Children/ Single	1.239	1.073	1.051	1.029
Married With Children/ Married No Children	.990	1.011	1.001	1.011

Canadian women may not experience a marriage penalty to wages.

Without exception, married mothers earn less than childless married women in this study.⁵ Significant variance in the magnitude of this difference exists among the countries considered. Canadian and Norwegian married mothers earn almost as much on average as childless married women, reaping 98.3% of the hourly wage of their childless counterparts. British and American married mothers secure a lower proportion of the wage of their childless counterparts, earning 95.5% and 92.1%, respectively. This finding across all four countries supports the possible existence of a parenthood penalty to wages for women.

In contrast to the experience of women in this study, the wage ratios for males indicate that a marriage premium to wages may exist in all four of the nations in this study. In addition, Norwegian and Canadian men may also experience higher wages upon parenthood.

III. Two-Stage Regression Methodology

The purpose of these regression analyses is to develop a model for predicting wages for each subgroup separately, and thereby, create a basis for comparing how personal work-related factors influence the wages of different subgroups. The regression procedure estimates the wage equation separately for each subgroup. The natural

⁵ The term ,“childless”, refers to the absence of children under age 18 in the household. In this study, “childless” does not imply that a given women has never borne children.

logarithm of wage is used as the dependent variable. Work-related personal characteristics of the respondents are the explanatory variables. Factors that significantly affect wages for the six subgroups are identified. The magnitude of the effect of each factor on wages is indicated by consideration of the regression coefficients.

As stated earlier in this study, wage data is necessarily subject to self-selection, based upon each respondent's decision whether or not to enter the labor force. James Heckman advanced a technique in 1979 to adjust for possible bias introduced by this self-selection. This procedure integrates the self-selection adjustment with the ordinary least squares (OLS) regression model (Heckman, 1979). The Heckman self-selection correction procedure requires the use of a bivariate normal model for the selection equation and ordinary least squares regression for the behavioral equation. Heckman's two-stage regression procedure yields consistent estimates of the parameters of the wage equation.

In the first step of the two-stage regression procedure, a probit model is applied to the data incorporating all individuals in each subgroup, regardless of wage status. In other words, individuals who decided not to participate in the labor market for whatever reason and, therefore, exhibited wages equal to zero, are included in the probit model with all wage-earners. Along with the variables used to estimate wage, additional variables that may affect the labor participation decision are included in the probit estimation procedure. These additional variables include, but are not limited to, wages

of the spouse, education level attained by the spouse, employment status of other household members, disability status of the individual and the spouse, as well as other factors which would potentially influence the labor participation decision.

The general probit model is in the form:

$$F(X_i'\beta) = \int_{-\infty}^{X_i'\beta} \frac{1}{\sqrt{2\pi}} e^{-t^2/2} dt$$

where X_i is the vector of independent variables used to estimate labor force participation and β is a vector of unknown parameters. The use of the probit form is standard in labor participation models. In this instance, the probit model predicts the probability that a given individual will be included in the sample. This procedure yields $\hat{\lambda}_j$, which adjusts for nonrandomness in the observed wage sample.⁶ $\hat{\lambda}_j$ is used as an explanatory variable to adjust for self-selection in the second step of the wage estimation process. Examination of differences in $\hat{\lambda}_j$ by subgroups will be undertaken to consider the role of self-selection in the data.

In the second step of the two-stage regression procedure, the following log wage function is estimated:

$$\ln W_{ij} = X_{ij}\beta_j + \sigma_j\hat{\lambda}_j + \nu_{ij}$$

where $\ln W_{ij}$ is the natural logarithm of the hourly wage rate for individual i of subgroup

⁶ $\hat{\lambda}_j$ will be referred to in this investigation as "lambda" for simplicity.

j , X_{ij} is the vector of known personal characteristics used to estimate wage, $\hat{\lambda}_j$ is the explanatory variable used to adjust for self-selection in the model, σ_j is the coefficient on $\hat{\lambda}_j$, and β_j is a vectors of unknown coefficients that are common to members of the subgroup j , and $v_{ij} \sim N(0, \Sigma_j)$. If σ_j is not equal to zero, labor participation is not random for group j and the self-selection adjustment is necessary. The two-stage regression results in consistent estimates of the parameters and their standard errors (Jaeger, 1993). Differences in the regression coefficients for personal work-related characteristics by subgroup can then be analyzed.

The variables employed in this study are listed in Table 3.2. Different sets of variables are used in each stage of the regression procedure. In the first step of the wage estimation procedure, relevant variables are used to predict the probability that an individual participates in the work force.⁷ Education, age, age squared, number of earners in the family, and disability status are used to predict the probability that single men and single women are workforce participants. To predict the probability of labor force participation by married persons without children, relevant spouse variables, i.e. spouse education, spouse wage, and spouse disability status, are added to the basic

⁷ In addition to the variables listed, a location variable is also incorporated in the study. For the United States, nine population density levels serve as proxies for location, requiring the use of eight binary variables. For the United Kingdom, five population density levels are used, requiring the use of four binary variables for location. For Canada and Norway, six population density levels are used, requiring the use of five binary variables for location. Generally, the location proxies were not statistically significant in any of the four countries. For theoretical purposes, however, their inclusion in the model was appropriate. The location variable is utilized in both steps of the wage estimation procedure.

Table 3.2.
Definitions of Selected Variables Used in the Analyses

Variable	Definition
LNWAGE	Natural logarithm of the hourly wage rate
EDUC	Number of years of formal education
SP EDUC	Number of years of formal education of spouse
AGE	Age in years
AGE ²	Square of AGE
HRS WK	Hours worked per week
SP HRS WK	Hours worked per week by spouse
#CH<18	Number of children under age 18 in the home
AGE YC	Age of the youngest child in the home
SP WAGE	Hourly wage of the spouse
# EARN	Number of wage earners in the family
DSBLTY	=1 if disabled, 0 otherwise
SP DSBLTY	=1 if spouse disabled, 0 otherwise
ALIMONY	Amount of alimony received annually by family
Lambda	Explanatory variable predicted by the first-stage probit equation for being in the wage sample

variable set listed for singles. Lastly, the number of children under age 18, age of the youngest child, and alimony are included with the basic variable set and the spouse variables to predict the labor force participation of married parents. The first step of the wage estimation procedure generates the variable lambda. Lambda is used to adjust for self-selection in the second step of the wage estimation procedure.

In the second stage of the regression procedure, the variable list is reduced to include only variables expected to influence the wage of a given individual. For single individuals, the explanatory variables used to estimate wage include education, age, age squared, hours worked, and lambda. For married persons without children, the variables used for single individuals to estimate wage are supplemented by spouse wage and spouse education. To predict the wage of married parents, the explanatory variables include education, age, age squared, hours worked, lambda, spouse wage, spouse education, number of children under age 18, and age of the youngest child.

As stated earlier in this study, occupation can strongly influence the wage of an individual. In particular, previous studies have found that occupational segregation by gender is a probable source of wage differences. Due to significant differences in the definition of occupational categories across countries, a consistent occupational variable could not be derived from the LIS database for this study. Hence, no occupation variable is employed in this investigation.

IV. Analysis of Estimation of Wage Equations by Subgroups

A. United States

The coefficients from the first step of the wage estimation procedure for the United States appear in the Appendix, Table 1. This table shows the coefficients from the reduced-form probit equations for the probability that a given subgroup member participates in the work force. A significant positive coefficient from the reduced-form probit equation indicates that an increase in the level of the variable in question increases the likelihood that a person will participate in the work force. A significant negative coefficient indicates that an increase in the level of the variable will decrease the likelihood that a person will participate in the work force.

The only variables which were consistently significant across virtually all subgroups were the number of earners in the family and the disability variable. Following expectations, the more earners in the family, the lower the labor participation rate of others within that family. In other words, if one or more individuals within the family is employed, other individuals in that family would reasonably have a lower incentive to work and exhibit a significantly lower labor participation rate. Also, as expected, if a person is disabled and married, labor participation is significantly lower than that among non-disabled married individuals. Presumably, the spouse of the disabled individual works to support the family in many cases. This presumption is supported by the significantly positive effect of a spouse's disability on labor force participation, as shown in this study. The only exception is among married females

with children, who presumably stay home to provide child care when their spouse is disabled. In contrast, if a disabled person is single and has no spouse to provide support, labor force participation is positively influenced by the disability. Overall, the results of the first step of the wage estimation procedure for the United States appear reasonable. All but 6 of 52 coefficients on labor participation follow expectations.

Consideration of the mean values of variables used in the second step of the wage estimation procedure, displayed in Table 3.3, pinpoints several relevant differences among the subgroups in the United States. As mentioned previously, single women exhibit a higher average wage than their married counterparts. The means of personal characteristics reveal that single women on average are younger, have higher levels of education, and work longer hours outside of the home per week than married women. Among married women, those without children in the household earn a higher average wage. The means show that, on average, married women without children in the household are older, more educated, and work more hours outside the household than married women with children at home. These findings clearly imply that some portion of the difference in wages among women is due to differences in personal characteristics.

Deliberation of the means exhibited by men in this study also highlight relevant differences among the subgroups. Single men earn the lowest average wage among the male subgroups. Single men on average are younger, have more education, and work

Table 3.3.**Means of Selected Variables in the Wage Regression: United States**

Variable	Single Females No Children	Married Females No Children	Married Females With Children	Single Men No Children	Married Men No Children	Married Men With Children
LNWAGE	2.095	2.007	1.848	2.026	2.511	2.485
EDUC	14.27	12.22	12.03	12.95	12.53	12.27
AGE	31.70	44.75	36.05	30.72	41.28	37.96
AGE ² /100	10.94	21.51	13.52	10.19	18.26	15.01
HRS WK	39.40	37.54	34.61	41.27	43.64	44.24
SP HRS WK		40.26	42.63		30.96	25.43
SP WAGE		12.29	12.47		7.76	6.14
#CH<18			1.84			1.93
AGE YC			7.07			6.55
Lambda	4.82E+24	385.61	1.17E+8	45.84	12.38	11.38

fewer hours per week than married men. Married men without children at home earn the highest average wage. These men are on average older, more educated, and more likely to have a spouse who also works outside of the home. These results also support the conclusion that a portion of the difference in wage among men is due to differences in personal characteristics.

The coefficients of the wage equations corrected for self-selection for the United States are reported in Table 3.4. A statistically significant positive coefficient indicates that increases in the level of the factor under consideration increases wage for that subgroup, all else equal. Conversely, a statistically significant negative coefficient indicates that increases in the level of the factor under consideration decreases wage for that subgroup, all else equal.

As expected, age positively and significantly influences wage for all of the subgroups. In addition, for all subgroups, age increases wage at a decreasing rate, as indicated by the significantly negative coefficient of age squared. This finding implies that the positive wage effects of age decrease as one becomes older. That is, on average, a one year increase in age exerts a stronger positive influence on wages when an individual is twenty than when an individual is fifty. Single men and women experience high returns from increases in age, as do married women with children.

Why do increases in age increase wage so significantly in this study? The lack of an independent experience component in the wage estimation procedure is the key.

Table 3.4.

Coefficients of Wage Equations Corrected for Self-Selection^a: United States
(Dependent Variable is the Natural Logarithm of the Hourly Wage)

Variable	Single Females No Children	Married Females No Children	Married Females With Children	Single Men No Children	Married Men No Children	Married Men With Children
INTERCEPT	-1.52** (.349)	-.571** (.246)	-2.23** (.357)	-2.41** (.309)	.046 (.232)	-.049 (.264)
EDUC	.056** (.006)	.045** (.004)	.056** (.004)	.048** (.005)	.041** (.003)	.049** (.002)
AGE	.145** (.021)	.071** (.011)	.151** (.020)	.216** (.018)	.077** (.011)	.090** (.013)
AGE ²	-.142** (.030)	-.076** (.013)	-.170** (.027)	-.283** (.026)	-.076** (.014)	-.095** (.017)
HRS WK	.002 (.003)	.016** (.002)	.016** (.002)	.001 (.002)	.005* (.002)	-.0001 (.001)
SP HRS WK		-.001 (.0014)	-.002 (.0015)		-.003* (.0011)	-.005** (.0007)
SP WAGE		.007** (.0021)	.007** (.0020)		.008** (.0026)	.010** (.0019)
#CH<18			-.077** (.021)			-.006 (.013)
AGE YC			-.015** (.004)			.002 (.003)
Lambda ^b	-2.05E-28 (1.88E-13)	3.61E-7 (1.75E-6)	-2.05E-13 (1.45E-14)	-2.94E-6 (5.42E-5)	.001 (.001)	.002 (.001)
# of Obs	717	1755	2617	1195	1729	3324
Corrected R ²	.2499	.1521	.1864	.2251	.1808	.2297

* significant at .05 level

** significant at .01 level

Standard errors of the coefficients are presented parenthetically beneath the respective coefficient.

^a A binary variable was utilized to adjust for population density. This location variable is described more fully in footnote 7 of page 37 in Chapter 3.

^b Lambda is the self-selection adjustment resulting from the first step of the regression procedure. The first step probit results for the United States appear in Appendix Table A-1.

Unfortunately, the LIS database provides no comparable experience variable. Hence, the effects of increases in age also embody the positive influences of increased levels of work experience. Not only do employers pay more for mature workers on average, but they reward increasing levels of experience. Due to the limitations of this dataset, the positive effects of age and experience on wage cannot be distinguished from each other and are commingled in the age component. However, since the ultimate goal of this study is to determine and compare the effect and magnitude of marriage and parenthood on wages, this drawback is not insurmountable. Care must be taken to emphasize that the age component in this study encompasses both age and experience.

Education positively affects wage for all subgroups. All of the subgroups have positive returns to education. Both single females and married women with children have returns of 5.6% to education, whereas married women without children experience a lower return of 4.5%. This finding is mirrored among men, with single men and married men with children experiencing higher returns to education than married men without children. Regardless of the relative magnitude of the effect, increases in education enhance the earning capability of all subgroups.

Hours worked per week significantly affect the wages of married women, regardless of parental status, and the wages of married men without children. Married women accrue a 1.6% increase in hourly wage by increasing average hours worked per week by one. Married men without children experience a smaller 0.5% increase in hourly wage from a one hour increase in average hours worked per week. A possible

explanation for the substantial effect of increased average weekly work hours on the wages of married women is the difference in full-time or part-time status among these women. Married women in this study work fewer hours than any other group and, in fact, work less than full-time on average. Numerous studies have found that part-time jobs pay significantly lower hourly wages than full-time jobs in the United States. It follows that, if married women increase their work effort to full-time, their average hourly wage will increase.

The number of hours which an individual's spouse works per week exerts statistically significant negative pressure on the hourly wages of married men in the U.S.. While this effect is small, a 0.3% decrease for married men without children and a 0.5% decrease for married men with children, it is not entirely unexpected. As stated previously, Daniel (1992) theorized that part of the marriage premium in wages for men is derived from the augmentation of men's labor productivity by their wives. Theoretically, a wife undertakes household chores which increase her husband's labor productivity. The flip side of that finding is shown in this study. As wives increase their labor hours outside of the home, husband's wages are negatively affected, albeit by a small amount.

Parenthood significantly affects the wages of married mothers in this study. A marginal increase in the number of children in the household under the age of 18 decreases a mother's hourly wage by 7.7% on average. Further research would have to be undertaken to determine the proportion of this effect that is reversed upon the exodus

of the children from the home. Married mothers also incur a decrease in hourly wages due to the age of the youngest child. A one year difference in the age of the youngest child decreases a mother's wage by 1.5% on average. That is, if a mother has a youngest child of age one, she could expect to earn 1.5% less per hour than a mother with a youngest child of age two. The coefficient of these factors for married men indicates that married men experience neither of the parenthood wage effects levied on mothers.

The coefficient on λ , which is the inverse of the Mill's ratio, is not significantly different from zero for any of the subgroups in the United States. Following the analysis in Reimers (1982), the covariance between the errors in the market and reservation wages are not significantly different than the variance of the error in the market wage offer. This indicates that there is no significant self-selection bias in the sample data under consideration in this study. In other words, self-selection does not adversely impact the randomness of the sample of workers used in the wage estimation procedure. This conclusion is further supported by the finding that no significant differences in the wage coefficients emerged between a one-step OLS procedure performed on the data and the two-stage procedure presented in this study.

B. Canada

The coefficients from the first step of the wage estimation procedure for Canada are presented in the Appendix, Table 2. Several variables under consideration consistently impact labor participation. As in the case of the United States, the presence

of additional earners in the family lowers the incentive of any given individual in that family to join the workforce, as indicated by the significantly negative coefficient on the variable across all subgroups. Other significant influences on labor participation across all subgroups include age and education, both of which increase the probability that a given individual will participate in the workforce. Overall, the results of the first step of the wage estimation procedure for Canada are within reasonable parameters.

As shown in Table 3.5, the means of the variables used in the wage regression equation for Canada highlight several differences in personal characteristics for the subgroups, vis a vis , those of the United States. Most glaringly, single women do not earn the highest average wage among women in the Canadian sample. Married females without children hold the distinction of earning the highest average wages for women, with single women and married mothers lagging behind slightly. Single women have the highest average educational attainment, as well as the highest mean number of hours worked weekly for women in Canada. Single women are also younger than their married counterparts.

Among the means for the male subgroups, the findings for Canada also indicate differences from those of the United States. Married fathers exhibit the highest average wages and work the longest hours on average among all subgroups. In the United States, this distinction was held by married men without children. Single men in Canada have several similarities with their U.S. counterparts, being the youngest male

Table 3.5.**Means of Selected Variables in the Wage Regression: Canada**

Variable	Single Females No Children	Married Females No Children	Married Females With Children	Single Men No Children	Married Men No Children	Married Men With Children
LNWAGE	2.31	2.35	2.31	2.48	2.66	2.69
EDUC	14.52	12.98	13.53	13.51	12.22	13.06
AGE	30.19	41.25	35.96	29.73	42.71	37.70
AGE ² /100	10.10	18.26	13.39	9.51	19.49	14.73
HRS WK	35.96	34.11	31.91	39.89	42.17	42.82
SP HRS WK		33.15	36.75		24.44	21.02
SP WAGE		12.43	13.59		8.97	8.25
#CH<18			1.84			1.91
AGE YC			7.58			6.88
Lambda	6.13	4.64	4.85	3.62	4.03	4.56

subgroup with the lowest wages, highest average education, and lowest hours worked per week, on average.

The coefficients of the wage equations corrected for self selection for the Canadian subgroups appear in Table 3.6. The coefficients on education and age are consistent with those found for the U.S. subgroups, with all Canadian subgroups exhibiting positive and statistically significant coefficients on the two variables. The positive returns to education are larger for women than for men in Canada. The female subgroups have returns to education of 3.8%, 2.7%, and 3.3%, while male subgroups experience returns of 1.7%, 1.6%, and 1.2%. All of the Canadian subgroups have lower returns to education than their American neighbors.

The coefficients on age and age squared for virtually all subgroups are positively significant and negatively significant, respectively. As in the case of the U.S. subgroups, this finding indicates that there are positive returns to age, but at a decreasing rate as age increases. Once again, the lack of an experience coefficient leads to the conclusion that the strong effects of age on wage are commingled with those of increasing levels of experience. This mingling of effects limits the degree to which the age component can be independently analyzed.

Hours worked per week significantly and positively influence the wage of the individual for all subgroups. The subgroups experience returns to an increase in average hours worked per week of between 1.8% and 2.5%. In the United States, the

Table 3.6.

Coefficients of Wage Equations Corrected for Self-Selection^a: Canada
 (Dependent Variable is the Natural Logarithm of the Hourly Wage)

Variable	Single Females No Children	Married Females No Children	Married Females With Children	Single Men No Children	Married Men No Children	Married Men With Children
INTERCEPT	1.58** (.314)	1.35** (.205)	1.02** (.321)	1.66** (.295)	1.96** (.231)	2.26** (.237)
EDUC	.038** (.007)	.027** (.003)	.033** (.003)	.017** (.005)	.016** (.003)	.012** (.003)
AGE	.048* (.019)	.073** (.011)	.088** (.018)	.075** (.018)	.079** (.013)	.068** (.013)
AGE ²	-.046 (.026)	-.090** (.014)	-.108** (.024)	-.092** (.026)	-.085** (.016)	-.080** (.016)
HRS WK	.022** (.003)	.018** (.001)	.019** (.001)	.018** (.013)	.024** (.001)	.025** (.001)
SP HRS WK		.001 (.001)	-.001 (.001)		-.001 (.001)	-.003** (.001)
SP WAGE		.001 (.001)	.001 (.001)		.0001 (.001)	.001 (.001)
#CH<18			-.050** (.018)			-.008 (.007)
AGE YC			-.001 (.004)			.004 (.003)
Lambda ^b	.002 (.004)	-.004 (.003)	4.75E-6 (.001)	.001 (.006)	.005 (.013)	.024** (.007)
# of Obs	630	2206	2617	819	2098	3731
Corrected R ²	.1660	.1277	.1864	.1105	.1844	.1857

* significant at .05 level

** significant at .01 level

Standard errors of the coefficients are presented parenthetically beneath the respective coefficient.

a A binary variable was utilized to adjust for population density. This location variable is described more fully in footnote 7 of page 37 in Chapter 3.

b Lambda is the self-selection adjustment resulting from the first step of the regression procedure. The first step probit results for Canada appear in Appendix Table A-2.

returns to an increase in average hours worked was substantially lower.

Parenthood is a significant factor only in the wages of married mothers. A marginal increase in the number of children under the age of 18 decreases a mother's hourly wage by 5% on average. This is a smaller negative effect than that experienced by married mothers in the United States. The age of the youngest child does not significantly influence the wage of either parent in Canada. In the United States, the age of the youngest child was a significant influence on wage for working mothers. Possible explanations for this difference in the effects of parenthood will be discussed later in this chapter.

The coefficient on λ is significantly different from zero for only one Canadian subgroup: married men with children. There is not significant self-selection bias in the sample for the other Canadian subgroups. The positive coefficient on λ for married men with children indicates that there is significant self-selection in the labor market for this group. A positive and significant coefficient on λ implies that men in this subgroup receive relatively high wage offers, given their measured characteristics, and so are more likely to be found in the wage sample than their characteristics would predict.

C. United Kingdom

The results from the first step of the wage estimation procedure for the United Kingdom appear in the Appendix, Table 3. The equation estimated in this table shows the effect of given factors on the probability that a given subgroup member will

participate in the workforce. The only consistently significant factor in labor participation for all subgroups in the United Kingdom is the number of earners in the family. As in the case of the U.S. and Canada, the number of earners in the family is negatively related to the probability that a person will be in the workforce. As the number of earners in the family increases, the probability that another family member will work is lessened.

Disability is a significant factor in the labor participation decision for married individuals without children. Both men and women in the group are less likely to work in the labor force if they are disabled, as indicated by the negative disability coefficient. In addition, married women without children are more likely to be in the work force if they have a disabled spouse, as indicated by the positive spouse disability coefficient. No other findings are consistently significant. Overall, the first-stage probit equation for the United Kingdom is reasonable.

Consideration of the mean values of the variables used in the second step of the wage estimation procedure for the United Kingdom, exhibited in Table 3.7, emphasize several salient differences between the subgroups. Of primary interest is the difference in the mean geometric hourly wage of British women. Single females earn the highest average wage among the female subgroups by far, followed by married women without children, and with married mothers bringing up the rear. Married men, regardless of parenthood status, earn the same mean geometric wage, which is higher than that earned

Table 3.7.**Means of Selected Variables in the Wage Regression: United Kingdom**

Variable	Single Females No Children	Married Females No Children	Married Females With Children	Single Men No Children	Married Men No Children	Married Men With Children
LNWAGE	1.79	1.54	1.47	1.87	1.97	1.97
EDUC	14.09	12.55	12.79	14.34	12.68	13.13
AGE	31.93	42.40	36.93	33.76	43.29	38.00
AGE ² /100	11.06	19.24	14.14	12.39	19.94	14.98
HRS WK	39.35	31.37	24.17	41.39	42.93	45.06
SP HRS WK		32.16	35.76		25.34	15.05
SP WAGE		5.86	6.30		4.19	3.25
#CH<18			1.78			1.84
AGE YC			7.75			6.52
Lambda	1.46E+9	68727	163263	1.481E+13	15.38	6.59

by single men. This pattern of wages shares more similarities with that of the United States than Canada.

Consideration of the personal characteristics of the subgroups in the U.K. reveals that these personal characteristics may well influence the wage distribution of the subgroups. For instance, the highest paid female subgroups, single women, are more highly educated and work substantially longer hours per week than the other female subgroups. Married women without children are the oldest and least educated female subgroup. Married women with children in Britain work significantly fewer hours than other subgroups previously encountered in this study. Working an average 24.17 hours per week outside of the home, British working mothers are predominantly part-time workers. For women in the United Kingdom, personal characteristics appear to strongly influence wages.

The means of the male British subgroups are less explicatory than those of British women. Single men earn less than the other male subgroups. In an apparent contradiction, single men in Britain have significantly higher levels of educational attainment than married men. However, evidently more than offsetting the effect of education, British married men work considerably longer hours on average and are older than their single male counterparts. This implies that a portion of the differential in the wages of British males can be explained by differences in personal characteristics.

The coefficients of the wage equations derived from the two-stage estimation

procedure for the United Kingdom appear in Table 3.8. The education and age coefficients for the U.K. are consistent with those of the United States and Canada, with all British subgroups exhibiting positive and statistically significant coefficients on these two variables. The positive returns to education are largest for married women with children, who experience a 9% return to education on average. Married women without children also have a copious yield from additional education, reaping a 7.9% return. Single women in the U.K. have a 6.1% return to education, which conforms more closely to the return experienced by British men. Married men without children have the highest return to education, 6.7%, among the male subgroups. Married men with children garnish the lowest return to education, 5.7%, while single men obtain a 6.2% return from education.

Age positively influences wage for all of the subgroups in the United Kingdom. As age encompasses both experience and age, this result is not unanticipated. Furthermore, this return to age increases wage at a decreasing rate, as shown by the negative coefficient on age squared. The largest returns to age are experienced by married men with children, who are the youngest married subgroup in the U.K., with returns to age of 10.3%⁸. Single men and women are the youngest subgroups overall and predictably have relatively high returns to age with 8% and 8.6%, respectively.

⁸ For exposition purposes, I approximate the return to age throughout this investigation with the coefficient on age. The true return to age encompasses both the coefficient on age and the coefficient on age squared. To compute this true return to age, one would calculate $\hat{\alpha} + 2\hat{\beta}\bar{A}$ where $\hat{\alpha}$ is the coefficient on age, $\hat{\beta}$ is the coefficient on age squared, and $\bar{A}$ is a chosen mean age level.

Table 3.8.

Coefficients of Wage Equations Corrected for Self-Selection^a: United Kingdom
 (Dependent Variable is the Natural Logarithm of Hourly Wage)

Variable	Single Females No Children	Married Females No Children	Married Females With Children	Single Men No Children	Married Men No Children	Married Men With Children
INTERCEPT	-.058 (.465)	.017 (.233)	-.767* (.384)	.111 (.452)	.057** (.276)	-.474 (.322)
EDUC	.061** (.014)	.079** (.007)	.090** (.007)	.062** (.010)	.067** (.006)	.057** (.005)
AGE	.086** (.025)	.026* (.011)	.062** (.021)	.080** (.024)	.045** (.013)	.103** (.017)
AGE ²	-.093** (.035)	-.034* (.014)	-.069* (.027)	-.104** (.031)	-.048** (.016)	-.117** (.021)
HRS WK	.003 (.004)	.004** (.001)	.002 (.001)	.010** (.003)	.009** (.002)	.008** (.001)
SP HRS WK		-.003** (.001)	-.003** (.001)		-.005** (.001)	-.003** (.001)
SP WAGE		.025** (.004)	.020** (.004)		.030** (.006)	.009** (.003)
#CH<18			-.057* (.022)			-.020 (.018)
AGE YC			-.017** (.005)			.001 (.004)
Lambda ^b	3.28E-13 (1.00E-9)	1.04E-8 (1.00E-8)	7.83E-9 (1.00E-8)	5.25E-17 (1.05E-13)	-7.49E-5 (1.14E-4)	-.0025 (.001)
# of Obs	158	881	965	233	801	1247
Corrected R ²	.2512	.2766	.2300	.2496	.2484	.1915

* significant at .05 level

** significant at .01 level

Standard errors of the coefficients are presented parenthetically beneath the respective coefficient.

a A binary variable was utilized to adjust for population density. This location variable is described more fully in footnote 7 of page 37 in Chapter 3.

b Lambda is the self-selection adjustment resulting from the first step of the regression procedure. The first step probit results for the United Kingdom appear in Appendix Table A-3.

Married females with children garner a 6.2% return to age, while their childless counterparts gain a scant 2.6% return to age. Married men without children also have a relatively low return to age at 4.5%.

The coefficients on hours worked per week for the United Kingdom present an interesting contrast to those of the other countries in the study. Following the pattern manifested by the United States and Canada, married women without children experience a positive, albeit small, return to increases in hours worked of 0.4%. However, in a conspicuous divergence from the other countries in this study, all British male subgroups exhibit a statistically significant negative return to increases in hours worked on average, ranging between 0.8% and 1%. Further investigation reveals that the source of this disparity may be a fundamental difference in the underlying pay structure to part-time work for men in the United Kingdom. Gornick and Jacobs (1994), in their study on the wage gap between part-time and full-time workers, found that men working part-time in the U.K. earned higher hourly wage rates than full-time workers. Gornick and Jacobs hypothesize that this finding is explained, to a large extent, by the vocational choice of most male part-time workers in Britain: teaching. The effect of this part-time wage premium peculiar to the United Kingdom may very well be driving the negative return to hours worked for men in this study.

As seen in the U.S. and Canada, parenthood is a significant factor in the wages of married mothers. An increase in the number of children under the age of 18 in the household lowers the hourly wage of married mothers in Britain by an average 5.7% per

child. The age of the youngest child also exerts a negative and significant influence on the wages of working mothers. Neither of these variables are significant for British fathers.

The coefficient on λ is not significantly different from zero for any of the British subgroups. This finding indicates that self-selection bias is not a significant factor in wage determination.

D. Norway

The results from the first step of the wage estimation procedure for Norway appear in the Appendix, Table 4. The reduced-form probit equations estimate the probability that a given subgroup member participates in the workforce. As in the case of the other countries under consideration in this study, the number of earners in the family is significant and negatively related to the probability that a person will be in the workforce in Norway. This is true for all Norwegian subgroups except married men with children, who exhibit a negative but insignificant coefficient on the number of earners.

Disability is also a significant factor in Norwegian labor supply decisions. For four of the subgroups, disability of the worker lowers the probability that that individual will participate in the workforce, as theory would suggest. For two Norwegian subgroups, however, the coefficient on disability is significant and positive, i.e., the disability exerts positive pressure on the individual to participate in the workforce. This positive effect is small for married females without children, but is quite strongly

positive for married men with children. An argument can be posited that it is not unreasonable to believe that disabled married men with children and a non-working spouse at home providing child care may very well have an increased incentive to join the workforce. No other coefficients are consistently significant for the subgroups. Overall, the first-stage probit equation for Norway seem reasonable.

The means of variables used in the second step of the wage estimation for Norway appear in Table 3.9. Notable in their absence are the variables for hours worked per week and spouse's hours worked per week. These variables are not available in the Norwegian dataset used in this study. Hence, any conclusions regarding the influence on wage of other personal work-related characteristics must be tempered by the fact that there is no proxy for part-time vs. full-time employment for Norway. However, this lack of the hours worked variables is not as grave as it may at first seem due to the fact that part-time employment in Norway is predominantly limited to the very young and the semi-retired. Efforts have been made in this study to cull these individuals from the dataset by restricting age and dropping individuals who are semi-retired or retired.

The mean values for log wage reveal a pattern similar to that of the United States and the United Kingdom for females. Single females in Norway earn the highest average wage, followed by married women without children, and lastly, married women

Table 3.9.
Means of Selected Variables in the Wage Regression: Norway

Variable	Single Females No Children	Married Females No Children	Married Females With Children	Single Men No Children	Married Men No Children	Married Men With Children
LNWAGE	4.42	4.21	4.14	4.56	4.69	4.74
EDUC	11.12	10.44	11.17	11.40	11.04	11.49
AGE	37.44	47.19	38.43	35.26	48.07	40.42
AGE ² /100	15.37	22.89	15.24	13.34	23.76	16.86
SP WAGE		70.89	75.99		53.22	45.28
#CH<18			1.76			1.83
AGE YC			8.66			8.18
Lambda	16.82	10.66	6.78	4.61	4.96	4.75

with children. For men, singleness is a decided disadvantage, with single men garnering the lowest average wage. Married men with children in Norway have the highest average wage among the subgroups followed closely by married men without children. All female subgroups in Norway earn lower average hourly wages than any of the male Norwegian subgroups.

Examination of the means of personal characteristics for the Norwegian subgroups intimates that differences in these personal characteristics may very well explain at least a portion of the difference in wage. Single females, the highest paid female subgroup, have relatively high average levels of education. Married females without children are the oldest female subgroup and have the least education among all subgroups.

Married females with children, exhibiting the lowest average wages among the subgroups, have the highest average educational levels among Norwegian women. The wage of Norwegian married mothers may also be influenced by the child variables in the model. With the lowest number of children at home aged less than 18 among the women in this study, the comparably low level of Norwegian fertility considered in and of itself would seem to suggest less work interruption for Norwegian mothers vis a vis other mothers in this study. In direct opposition to this factor, however, is the age of the youngest child. The average age of the youngest child for Norwegian working mothers is substantially older than for the other three countries in this study. This would suggest, that while Norwegian working mothers have fewer children, they may

tend to stay home longer for each child on average than other women in this study.

Among the male subgroups, married men with children earn the highest average hourly wage. Personal characteristics of these men may explain a portion of this wage difference. Married Norwegian men with children are the highest educated subgroup on average. Married men without children are the oldest of all of the subgroups on average. Single Norwegian men, who exhibit the lowest average hourly wage among males, have relatively high levels of education. However, single men are also the youngest of the Norwegian subgroups.

The coefficients of the estimated wage equations for Norway are reported in Table 3.10. Once again, as with the other three countries, the coefficients on age and education are significant and positive for virtually all subgroups. Education yields comparable returns of between 5.1% and 5.7% to all subgroups with the singular exception of married women with children. Married women with children experience a relatively high return to education of 6.9%, substantially higher than the other subgroups.

Age positively and significantly influences wage in Norway for all but one of the subgroups. In addition, age increases wage at a decreasing rate for all subgroups as indicated by the negative and significant coefficient on age squared. For the five subgroups experiencing significant and positive returns to age, the returns range from 5.7% to 6.9%. The exception to this significant return to age is married women without

Table 3.10.

Coefficients of Wage Equations Corrected for Self-Selection^a: Norway
 (Dependent Variable is the Natural Logarithm of Hourly Wage)

Variable	Single Females No Children	Married Females No Children	Married Females With Children	Single Men No Children	Married Men No Children	Married Men With Children
INTERCEPT	2.48** (.310)	3.15** (.270)	2.19** (.253)	2.65** (.346)	2.29** (.353)	2.67** (.258)
EDUC	.054** (.011)	.057** (.006)	.069** (.005)	.051** (.011)	.054** (.007)	.053** (.006)
AGE	.057** (.017)	.023 (.012)	.057** (.014)	.060** (.019)	.069** (.016)	.064** (.013)
AGE ²	-.065** (.022)	-.030* (.014)	-.068** (.017)	-.070** (.025)	-.071** (.018)	-.076** (.016)
SP WAGE		.0002 (.0002)	.0003* (.0001)		-.0002 (.0004)	-.0008* (.0003)
#CH<18			-.067** (.014)			-.006 (.013)
AGE YC			.004 (.003)			.004 (.003)
Lambda ^b	-0.0004 (.001)	-.0002* (.0001)	-.0002 (.001)	.021 (.011)	.007 (.006)	.005 (.005)
# of Obs	231	876	1423	333	646	1373
Corrected R ²	.2246	.1383	.2162	.1843	.1973	.2198

* significant at .05 level

** significant at .01 level

Standard errors of the coefficients are presented parenthetically beneath the respective coefficient.

a A binary variable was utilized to adjust for population density. This location variable is described more fully in footnote 7 of page 37 in Chapter 3.

b Lambda is the self-selection adjustment resulting from the first step of the regression procedure. The first step probit results for Norway appear in Appendix Table A-4.

children who display an insignificant return to age. In partial explanation of this finding may be the average age of this subgroup. Married women without children is the oldest of the Norwegian female subgroups with an average age of over 47 years, much older than any other female subgroup in this study. Norwegian working mothers have a significant and negative return to the number of children under 18. An increase in the number of children under the age of 18 by one decreases a woman's wage by 6.7% on average. This is consistent with the findings in the other three countries. The wages of Norwegian fathers are not significantly affected by the presence of children in the home.

Five of the Norwegian subgroups exhibit insignificant coefficients on the self-selection measure, λ . The lone deviant is married females without children. This subgroup exhibits a small but significant negative coefficient on λ . Following the argument of Reimers (1982), a negative and significant coefficient on the self-selection variable implies that the individuals in question have higher productivity in other sectors of the economy and are, therefore, less likely to be included in the wage sample. In addition, the subgroup married women without children is exceptional in that the coefficient of determination for this group is materially lower than those of the other Norwegian subgroups. This finding indicates that a smaller portion of the variance in wage is explained by the chosen model for married women without children than for the other subgroups.

To more fully examine the implications of the findings discussed in this chapter, a decomposition procedure was performed to determine the relative sign and magnitude

of wage differences between subgroups, as well as to uncover possible sources of these differences. The results of this decomposition procedure appear in the following chapter.

CHAPTER 4

DECOMPOSITION OF WAGE EQUATIONS

As discussed in the previous section, the LIS records for households in each country are parsed into six subgroups: single men, single women, married men without children, married women without children, married men with children, and married women with children. Given that gender, marital status, and presence of children have been established as factors that strongly influence wage, dividing the data into six separate groups based upon these three factors permits each factor to be studied in isolation. Comparisons of results among the subgroups are also possible. The decomposition procedures described are conducted using data from each of the four countries under consideration. The decomposition facilitates in-depth examination of the marriage and parenthood penalties to wages.

I. Decomposition Procedure

Work-related personal characteristics explain a portion of the observed wage differential between subgroups. To determine the portion of the wage differential explained by this characteristic effect, a decomposition procedure is used similar to that developed by Oaxaca (1973). The residual differences in wages unexplained by the personal work-related characteristics in the model or by selectivity bias is referred to as the parameter effect.

To separate the characteristic effect, the selectivity effect, and the parameter effect in the wage regression equation, the estimated wage equation can be rewritten as:

$$\overline{\ln W_a} - \overline{\ln W_b} = (\overline{X_a}\beta_a - \overline{X_b}\beta_b) + (\sigma_a\overline{\lambda_a} - \sigma_b\overline{\lambda_b})$$

where $\overline{\ln W_a}$ and $\overline{\ln W_b}$ are the natural logarithms of the geometric mean of the observed wage rate for subgroup a and subgroup b, respectively. The difference between $\overline{\ln W_a}$ and $\overline{\ln W_b}$ is the observed geometric wage differential between subgroups a and b. This observed geometric wage differential equals the difference in mean wage offers of subgroups a and b, $(\overline{X_a}\beta_a - \overline{X_b}\beta_b)$, plus the difference in average selectivity bias of subgroups a and b, $(\sigma_a\overline{\lambda_a} - \sigma_b\overline{\lambda_b})$. The following decomposition can be implemented:

$$\overline{\ln W_a} - \overline{\ln W_b} = (\overline{X_a} - \overline{X_b})[D\beta_a + (I - D)\beta_b] \quad (1)$$

$$+ [\overline{X_a}(I - D) + \overline{X_b}D](\beta_a - \beta_b) \quad (2)$$

$$+ (\sigma_a\overline{\lambda_a} - \sigma_b\overline{\lambda_b}) \quad (3)$$

where D is a diagonal matrix of weights with zero off-diagonal elements and I is the identity matrix. The right-hand side components of the equation are the characteristic effect, the parameter effect, and the selectivity bias effect, respectively. This decomposition technique follows the methodology utilized by Reimers (1988), Roos (1985), and others.

Considerable debate has erupted surrounding the correct weights to use in the above decomposition. Neumark (1988) asserts that the estimate of wage discrimination depends on the weights selected in the decomposition procedure. If $D = I$, then pure

discrimination against subgroup “b” exists. This implies that, in the absence of discrimination, the wage structure of subgroup “a” would prevail. Conversely, if $D = 0$, i.e., D is a zero matrix, then pure nepotism towards subgroup “a” exists which implies that, in the absence of discrimination, the wage structure of subgroup “b” would prevail. Neither of these assumptions is theoretically appealing. Neumark argues for a different assumption regarding the no-discrimination wage structure which implies neither pure discrimination nor pure nepotism, but some combination of both.

Estimation of this no-discrimination wage structure is under debate. Cotton (1988) also supports a more realistic no-discrimination wage structure, asserting that real world labor markets both undervalue the labor of the discriminated group and overvalue the labor of the preferred group, resulting in subsidization of the wages of the preferred group by underpayment of the discriminated group. Cotton states that, in the case of racial discrimination, since there are more white workers than black workers, the true non-discrimination wage structure lies closer to that of the majority group. In the case of gender wage differences, the true no-discrimination wage structure may have been closer to that of males in the past. However, with the entrance of women en masse into the work force in the past two decades, an argument can be made that the true no-discrimination wage structure for gender may lie approximately equidistant from the male wage structure and the female wage structure. In this case, use of a weight equal to .5 is reasonable and is used in this study. This weighting yields a D matrix with diagonal elements equal to .5 and off-diagonal elements equal to zero.

This decomposition procedure allows the consideration of differences in the relative effect of personal work-related characteristics on the wages of various subgroups. For example, the impact of education on the wages of married men can be compared to that of married women. Insight can be gained into the relative importance of the different characteristics on wage by subgroup.

Early studies of the gender wage gap considered the parameter effect to be a clear measurement of the degree of discrimination present in a given labor market. However, this conclusion must be tempered by the realization that the parameter effect may overestimate or underestimate the true effect of discrimination, and therefore, must be used with caution. If the model is underspecified, that is, the model excludes a relevant variable, the parameter effect will overestimate the extent of discrimination in the labor market. On the other hand, if discrimination in the labor market also distorts the impact of personal work-related characteristics on wages, the parameter effect will underestimate the extent of discrimination.

II. Analysis of Decomposition Results

The decomposition procedure is performed in this investigation using four different subgroup comparisons. The difference in the observed wage differential between single women and married women without children is decomposed to isolate any possible marriage penalty or premium to women's wages. A corresponding decomposition is presented for the difference in the observed wage differential between single men and married men without children, both to isolate any possible marriage

penalty or premium to men's wages and to highlight differences in the influence of personal characteristics on women and men in the labor market. Comparisons between nations in the study are possible at this point to determine if there is evidence to support a conclusion that marriage penalties/premiums differ across national boundaries.

To isolate the parenthood penalty or premium to women's wages, the observed wage differential between married women without children and married women with children is decomposed. Correspondingly, the same decomposition is performed on married men without children and married men with children to uncover possible parenthood penalties to men's wages. Both comparisons within countries across gender and international comparisons are facilitated by this approach.

All explanatory variables used in the second stage of the regression procedure are included in the decomposition procedure, regardless of significance¹. The inclusion of all explanatory variables is reasonable in that there is an a priori expectation that certain variables will influence wage. Hence, leaving any of these explanatory variables out of the decomposition would present an incomplete picture of any wage penalties or premiums.

To facilitate the decomposition of wage differences between subgroups, the two-step regression procedure for each subgroup must be performed using a common set of explanatory variables. For instance, in order to decompose the wage difference between single women and married women without children, the subgroups must be analyzed

¹ Lambda, the self-selection variable, is necessarily part of the decomposition procedure.

using the same set of explanatory variables. Therefore, the coefficients of the wage equation for married women without children were reestimated using only variables appropriate to both subgroups, i.e., spouse variables were excluded from the reestimation. An identical reestimation procedure was performed for married men without children which excluded all spouse variables to allow direct comparison with single men.

To facilitate the decomposition of the wage difference between married women without children and married mothers, a reestimation was performed for married women with children which excluded all child variables. The reestimated results for married women with children and the original results for married women without children were then used in the subsequent decomposition of wage differences. An identical reestimation procedure was performed for married men with children to allow direct comparison with married men without children.

To familiarize the reader with the basic decomposition procedure and to provide a basis for comparison, the decomposition results of the United States are presented first. Subsequently, each possible penalty is isolated to facilitate international comparison. For instance, the decomposition of the observed wage differentials of single women and married women without children is displayed on one table for all four countries, allowing exploration of cross-national differences.

A. United States

Table 4.1 shows the reestimated coefficients of the wage equations corrected for self-selection for the United States. The first column of reestimated coefficients is that of married females without children and includes only those variables common to both single women and married women without children. These reestimated coefficients are then used in the decomposition of the wage differences between single women and married women without children.

The reestimated coefficients for married women without children are similar, but not identical, to those coefficients that resulted from using the complete set of regressors for this subgroup². All coefficients for this subgroup carry the same sign in both the reestimation and the original estimation. All coefficients that were statistically significant in the first estimation of this subgroup remain significant in the reestimation. The return to education is slightly higher in the reestimation at 4.8% versus 4.5% in the original estimation. Similarly, the return to age is larger in the reestimation at 7.9% compared to 7.1% in the original estimation. The return to hours worked is identical in both estimations at 1.6%. Lambda, the self-selection indicator, remains insignificant in both estimations.

The second column shows the reestimated coefficients for married women with children. This reestimation includes only variables common to both married women without children, as originally estimated, and married women with children.

² The original results for this subgroup and all other U.S. subgroups appear on Table 3.4 on page 44.

Table 4.1.

Reestimated Coefficients of Wage Equations Corrected for Self-Selection^a: United States
 (Dependent Variable is the Natural Logarithm of the Hourly Wage)

Variable	Married Females No Children ^b	Married Females With Children ^c	Married Men No Children ^b	Married Men With Children ^c
INTERCEPT	-.715**	-1.87**	-.177	-.034
EDUC	.048**	.060**	.042**	.049**
AGE	.079**	.119**	.083**	.089**
AGE ²	-.085**	-.135**	-.081**	-.093**
HRS WK	.016**	.016**	.004**	-.0002
SP HRS WK		-.002		-.005**
SP WAGE		.007**		.010**
Lambda ^d	1.34E-7	6.95E-13	.005	.001

* significant at .05 level

** significant at .01 level

^a A binary variable was utilized to adjust for population density. This location variable is described more fully in footnote 7 of page 37 in Chapter 3.

^b The two-step regression procedure was reestimated for married persons without children using only those variables appropriate for single persons. In other words, variables unique to married persons such as spouse education and spouse wage were not used in the reestimated regressions. The reestimation was undertaken to facilitate the decomposition procedure.

^c The two-step regression procedure was reestimated for married persons with children using only those variables appropriate for married persons without children. In other words, variables unique to married parents such as age of the youngest child were not used to derive the reestimated coefficients. The reestimation was undertaken to facilitate the decomposition procedure.

^d Lambda is the self-selection adjustment resulting from the first step of the regression procedure.

Essentially, all reestimated coefficients for this subgroup preserve the sign and significance level of the original estimates. The return to education is higher at 6% versus 5.6% in the original estimation. The return to age is lower at 11.9% in the reestimation versus 15.1% in the original estimation. The returns to hours worked, spouse hours worked, and spouse wage are essentially the same in both estimations at 1.6%, -0.2%, and 0.7%, respectively. Lambda remains insignificant in both estimations.

The third column of Table 4.1 shows the reestimated coefficients for married men without children. As with married women without children, the results of the reestimation for married men without children are similar, but not identical, to those coefficients that resulted from using the complete set of regressors for this subgroup. All significant coefficients carry the same sign and level of significance in both estimations for married men without children. The return to education is slightly higher in the reestimation at 4.2% versus 4.1% in the original estimation. Likewise, the return to age is larger in the reestimation at 8.3% compared to 7.7% in the original estimation. The return to hours worked is slightly lower when reestimated at 0.4% versus 0.5% in the original estimation. Lambda and the intercept remain insignificant in both estimations.

The fourth column of Table 4.1 displays the reestimated coefficients for married fathers. This reestimation includes only variables common to both married men without children, as originally estimated, and married men with children. Essentially, all reestimated coefficients for this subgroup preserve the sign and significance level of the

original estimates. The results of the reestimation are the same as the original estimation for the return to education, the return to spouse hours worked, and the return to spouse wage. Lambda remains insignificant in both estimations. The return to age changes slightly in the reestimation to 8.9% from 9.0% in the original estimation. All other coefficients are insignificant in both estimations.

Table 4.2 shows the decomposition of wage differences between subgroups for the United States. The first column decomposes the wage difference between single women and married women without children. Single women earn an 8.9% higher average wage than married women without children, after correcting for selection bias, as shown on the third line of the table. This figure is derived by subtracting the selectivity bias from the observed geometric wage difference. In other words, an 8.9% difference between the average wage of single women and that of married women without children is not explained by selection bias.

The aggregate characteristic effect is displayed on line 5 of the table. This characteristic effect is the sum of the effects of all of the personal characteristics on the wage difference. Differences in personal characteristics account for a 3.2% differential in average wages between single women and married women without children. As shown, education accounts for a 10.6% differential in wages between the groups. If married women without children increased their average educational level to that of

Table 4.2.

Decomposition of Wage Differences Between Subgroups^a: United States

	Females		Males	
	Single/ Married No Children	Married No Children/ Married with Children	Single/ Married No Children	Married No Children/ Married with Children
Observed wage difference	.088	.158	-.486	.026
Difference in selection bias	-.001	.000	-.054	.000
Wage difference, corrected for selection bias	.089	.158	-.431	.026
Parameter effect	.057	.114	-.334	.019
Total effect of personal characteristics listed below:	.032	.044	-.097	0.006
EDUC	.106	.010	.019	.012
TOTAL AGE ^b	-.106	-.017	-.111	.001
HRS WK	.016	.047	-.007	-.001
SP WAGE		-.001		.015
SP HRS WK		.004		-.021

^a A binary variable was utilized to adjust for population density. This location variable is described more fully in footnote 7 of page 37 in Chapter 3.

^b Total Age encompasses both age and age squared. Total Age is derived by adding the decomposition result for age to that of age squared.

single women, this difference would be eradicated. This education differential in wages is balanced by that of age, which favors married women without children by 10.6%³. The fact that married women without children are older narrows the wage differential that they experience. The average age and level of education taken together, cancel each other and explain none of the remaining 8.9% difference in wages between the subgroups.

The 3.2% characteristic effect between single women and married women without children in the United States is explained in part by the average number of hours worked per week. Single women work longer hours than married women without children, resulting in a 1.6% wage differential in their favor.

The remaining wage difference not explained by either characteristic effect or selectivity effect is shown on line 4 and is referred to as the parameter effect. If single women and married women without children had identical personal characteristics, married women without children would still incur a 5.7% wage differential. This 5.7% wage differential can be interpreted as the marriage penalty to women's wages. Reiterating, after adjusting for the effect on wages of education, age, and hours worked per week, married women without children still earn 5.7% less on average than single women in the United States⁴.

³ Total Age, as shown on Table 4.2 and all subsequent decomposition tables, encompasses both age and age squared. Total Age is derived by adding the decomposition result for age to that of age squared.

⁴ A binary variable was utilized in the study to adjust for population density for each of the four countries.

The second column of Table 4.2 decomposes the wage difference between married women without children and married women with children. Married women without children have an average hourly wage 15.8% higher than that of married women with children, after adjusting for selection bias. Differences in personal characteristics between these subgroups explain a 4.4% wage differential. Differences in average education accounts for a 1% difference in wage. That is, if married women with children raised their average education to that of married women without children, their average wage would increase by only 1%. Age doesn't hurt married women with children, favoring them with a 1.7% wage differential. By far the most significant difference in personal characteristics among these subgroups is average hours worked per week. Differences in the average number of hours worked weekly accounts for a 4.7% wage differential between married women with children and their childless counterparts.

The parameter effect for married women with children as compared to married women without children is 11.4%. If married women had the same personal characteristics, differing only in parental status, the women with children would receive averages wages of 11.4% less. This 11.4% wage differential can be attributed to the parenthood penalty to women's wages in the United States. This parenthood penalty is twice the magnitude of the marriage penalty experienced by married women without children.

The third column in Table 4.2 decomposes the wage difference between single men and married men without children. After correcting for self selection bias, married men without children earn 43.1% more than single men on average. This difference is by far the largest among the U.S. subgroups, but is not outside of the range predicted by prior studies (Korenman and Neumark, 1991; Loh, 1996). A 9.7% differential in average wages of married men without children and single men is explained by personal characteristics.

Single men in the U.S. have higher educational attainment than that of married men without children. This difference in education, taken alone, would yield single men a 1.9% higher wage than that of married men without children. However, the foremost personal characteristic influencing the wage differential experienced by single men, vis a vis married men without children, is not education. Married men without children would have a wage 11.1% higher than that of single men due to age alone. In this study, due to the lack of an experience variable, the age variable encompasses experience and age. These two personal characteristics, age and education, explain the lion's share of the characteristic effect.

The parameter effect, which is the portion of the wage differential unexplained by personal characteristics or selectivity bias, is substantial in this instance. After adjusting for self selection, married men without children earn 33.4% more than single men, given identical personal characteristics. This substantial differential can be interpreted as the marriage premium to men's wages.

The fourth column of Table 4.2 decomposes the difference in average wages between married men without children and married men with children. After adjusting for self selection, this difference is a scant 2.6%. In other words, married men without children earn 2.6% more on average than married men with children. Differences in personal characteristics between the groups explains a 0.6% wage differential in favor of married men without children. This leaves a 1.9% parameter effect, which may be interpreted as the parenthood penalty to men's wages.

B. The Marriage Penalty to Women's Wages

Table 4.3 shows the coefficients of the wage equations corrected for self-selection used in the decomposition of wage differences between single women and married women without children for all four countries. The coefficients for single women are those which appear in Chapter 3 and are not reestimated. The coefficients which appear on Table 4.3 for married women without children are the result of the reestimation of that subgroup and include only those variables common to both single women and married women without children⁵.

The reestimated coefficients are similar to the original coefficients for married women without children for both Canada and Norway. For these two countries, all significant coefficients carry the same sign and level of significance in the original estimation and the reestimation. Likewise, the magnitude of the coefficients in the

⁵ All original coefficients are reported in Chapter 3. Original coefficients for the United States appear in Table 3.4 on page 44, for Canada in Table 3.6 on page 50, for the United Kingdom in Table 3.8 on page 56, and for Norway in Table 3.10 on page 63.

Table 4.3.**Coefficients of Wage Equations Corrected for Self-Selection Used in the Decomposition Procedure^a:****Single Women and Married Women Without Children^b**

(Dependent Variable is the Natural Logarithm of the Hourly Wage)

Variable	<u>United States</u>		<u>Canada</u>		<u>United Kingdom</u>		<u>Norway</u>	
	Single	Married No Children ^c	Single	Married No Children ^c	Single	Married No Children ^c	Single	Married No Children ^c
INTERCEPT	-1.52**	-.715**	1.58**	1.39**	-.058	-.170	2.48**	3.13**
EDUC	.056**	.048**	.038**	.027**	.061**	.091**	.054**	.059**
AGE	.145**	.079**	.048**	.074**	.086**	.032*	.057**	.024
AGE ²	-.142**	-.085**	-.046	-.092**	-.093**	-.041*	-.065**	-.031*
HRS WK	.002	.016**	.022**	.018**	.003	.003**	c	c
Lambda ^d	-2.05E-28	1.34E-7	.002	6.57E-4	3.28E-13	7.97E-08	-.0004	-.0001*

^a Reestimated

* significant at .05 level

** significant at .01 level

^a A binary variable was utilized to adjust for population density. This location variable is described more fully in footnote 7 of page 37 in Chapter 3.

^b The two-step regression procedure was reestimated for married persons without children using only those variables appropriate for single persons. In other words, variables unique to married persons such as spouse education and spouse wage were not used in the reestimated regressions. The reestimation was undertaken to facilitate the decomposition procedure. The above figures are rounded for presentation purposes and may not yield the exact decomposition results.

^c Limitations of the Norwegian data did not allow the inclusion of hours worked or spouse hours worked as explanatory variables.

^d Lambda is the self-selection adjustment resulting from the first step of the regression procedure.

reestimations differs little from that of the original estimations.

In contrast, the results of the reestimation differ substantially from those of the original estimation in magnitude of the coefficients for the United Kingdom. All reestimated coefficients for this subgroup preserve the sign and significance level of the original estimates. The reestimated return to education is higher at 9.1% versus 7.9% in the original estimation. The return to age is also higher at 3.2% in the reestimation versus 2.6% in the original estimation. The returns to hours worked in the reestimation is lower at 0.3% compared to 0.4% in the original estimation. Lambda remains insignificant in both estimations⁶.

In the case of the United States, married women without children in the study exhibit a 5.7% marriage penalty to wages. To facilitate the comparison of this marriage penalty with that experienced by women in other nations, Table 4.4 presents the decomposition of wage differences between single women and married women without children for the four nations in the study. Excluding Canada, married childless women earn lower wages than single women on average in this investigation.

Married women without children in the United Kingdom and Norway exhibit large corrected wage differences, earning wages 25.5% and 20.3% lower than their single counterparts, respectively⁷. American married childless women incur a less severe corrected wage differential of 8.9%. Only Canadian women do not experience a

⁶ Discussion of the difference in reestimated and original coefficients for this subgroup for the United States appears on page 72.

⁷ This differential appears on line 3 of Table 4.4 and is corrected for self selection.

Table 4.4.
Decomposition of Wage Differences Between Single Women and
Married Women without Children^{a b}

	<u>United States</u>	<u>Canada</u>	<u>United Kingdom</u>	<u>Norway</u>
Observed wage difference	.088	-.045	.250	.211
Difference in selection bias	-.001	.015	-.005	.008
Wage difference, corrected for selection bias	.089	-.060	.255	.203
Parameter Effect	.057	-.063	.164	.167
Characteristic Effect	.032	.002	.091	.037
Effect of selected personal characteristics:				
EDUC	.106	.049	.118	.038
TOTAL AGE ^c	-.106	-.111	-.069	-.030
HRS WK	.016	.037	.027	d

^a A binary variable was utilized to adjust for population density. This location variable is described more fully in footnote 7 of page 37 in Chapter 3.

^b The two-step regression procedure was reestimated for married persons without children using only those variables appropriate for single persons. In other words, variables unique to married persons such as spouse education and spouse wage were not used in the reestimated regressions. The reestimation was undertaken to facilitate the decomposition procedure.

^c Total Age encompasses both age and age squared. Total Age is derived by adding the decomposition result for age to that of age squared.

^d Limitations of the Norwegian data did not allow the inclusion of hours worked or spouse hours worked as explanatory variables.

marriage penalty to wages. Canadian married women without children receive wages 6% higher on average than their single counterparts, after correcting for self selection.

Further examination of the relative roles of the characteristic effect and the parameter effect in these wage differentials is necessary. The characteristic effect explains a portion of the wage differential between married women without children and single women in all four countries. In the United Kingdom, married women without children earn wages 9.1% lower than their single counterparts due entirely to differences in personal characteristics between the two subgroups. Norwegian and American married women without children incur a 3.7% and 3.2% lower wage attributable to differences in personal characteristics, respectively. Canadian married women without children display a relatively weak characteristic effect of only 0.2%. Although differences in personal characteristics do not explain a large portion of the total differential in these women's wages, consideration of the origins of these characteristic effects is potentially enlightening and may suggest possible means of narrowing the gap in these women's wages.

The role of education in the wage structure of these women is apparent. In all four countries, education explains a portion of the wage differential experienced by married women without children. In all four countries, married women without children have lower average educational attainment than single women. *Ceteris paribus*, differences in education alone account for an 11.8% lower wage for British married women without children than that of single women. This is comparable to the 10.6%

lower wage attributable to educational differences experienced by married women without children in the United States. Canadian and Norwegian women incur less draconian wage effects due to lower levels of education, exhibiting 4.9% and 3.8% lower wages than their single counterparts.

The characteristic effect attributable to hours worked is significant in the United States, Canada, and the United Kingdom. In the United States, Canada, and the United Kingdom, married women without children would experience wages 1.6%, 3.7%, and 2.7% lower due to the number of hours worked alone, respectively. Limitations of the Norwegian data do not allow the inclusion of hours worked as an explanatory variable.

The final personal characteristic to be considered in this study is age. As previously mentioned, the age variable commingles both age and experience components in this investigation. Childless married women are older in all four countries. The wage differential explained by age would render married women without children in the United States, Canada, the United Kingdom, and Norway wages 10.6%, 11.1%, 6.9%, and 3% higher than that earned by singles, respectively. This positive age effect serves to blunt the negative effects of education and hours worked on the wages of married women without children.

The total characteristic effect of all four countries is relatively small for these subgroups. Differences in personal characteristics only explain approximately 36% of the total wage difference corrected for self selection in the United States and the United

Kingdom⁸. The amount of total wage difference corrected for self selection explained in Norway by personal characteristics is an even smaller 18%. Essentially, none of the total wage difference corrected for self selection in Canada is explained by differences in personal characteristics, since the characteristic effect and the total difference exhibit different signs. The remaining wage difference unexplained by personal characteristics in the study is the parameter effect.

A positive parameter effect between these subgroups can be interpreted as the marriage penalty to women's wages. American, British, and Norwegian women all incur marriage penalties to wages. As mentioned previously, the marriage penalty to women's wages for American women is 5.7%. The marriage penalties to women's wages for British and Norwegian women are substantially higher than that of American women at 16.4% and 16.7%, respectively⁹. The parameter effect is explained by differences in the returns that married women without children experience relative to their single counterparts.

Table 4.3 on page 81 is designed to highlight sources of the marriage penalty to women's wages. Returns to education differ between the subgroups in all four countries. In the United Kingdom, married women without children experience higher

⁸ This percentage is found by dividing the characteristic effect by the wage difference corrected by self selection.

⁹ Canadian women experience a marriage premium to wages of 6.3%, which is entirely unexplained by differences in personal characteristics.

returns to education than single women, 9.1% and 6.1% respectively. A similar instance is found in Norway where married women without children experience a 5.9% return to education compared to their single counterparts' 5.4% return. In these countries, if women were encouraged to pursue further education, the gap between the subgroups might close relatively quickly due to larger wage returns for married women without children. Married women without children would receive relatively large wage increases compared to those of single women for an equal increase in education. The difference in returns would render even small increases in average educational attainment effective in narrowing the wage gap between the two subgroups.

The cases of the United States and Canada are quite different than the European countries in this instance. In both the United States and Canada, single women not only have higher levels of education, but also garner a higher return to education than married women without children. Even if married women without children were to attain the same educational levels as single women in these countries, the lower return to education experienced by these married women would keep their wages lower than that of singles.

The effect of the return to hours worked on the parameter effect varies across the countries. In the United States, married women without children garner higher returns to hours worked than single women. This may help to offset the negative effects of the returns to education and age on American married women's wages. In Canada, single women experience a slightly higher return to hours worked than married women. In the

United Kingdom, there is no appreciable difference between the return to hours worked for the two subgroups. Therefore, return to hours worked does not explain any of the marriage penalty to women's wages in the United Kingdom. Limitations of the Norwegian data did not allow the inclusion of hours worked as an explanatory variable.

Returns to age also differ between the subgroups in all four countries. Married women without children have a lower return to age than single women in every country, except Canada. This indicates that the labor market rewards maturity and experience more highly for a single women than for a married women in these countries. Canada stands out as the sole exception to this finding. The return to age is higher for married women without children than for single women in Canada. The return to age is strong enough to result in a marriage premium to Canadian women, more than counteracting the negative effects married Canadian women experience due to lower returns to education and hours worked.

A portion of the parameter effect may be due to discrimination in the work force against married women. However, several other explanations for the parameter effect exist. In the case of Norway, a partial explanation for the large parameter effect may be the less complete model used for Norway. The Norwegian data employed in this study did not allow the use of hours worked as an explanatory variable. Hence, part of the Norwegian parameter effect may be due to an under-specified model.

The model may be under-specified in general due to the lack of an occupation variable. As discussed in Chapter 2, low-paying occupations tend to employ women

and minorities in large numbers in developed economies. For occupational segregation to be explanatory in this case, singleness, i.e. marital status, would have to be the segregating factor. Married women without children would have to be more prevalent in low paying occupations than single women. It is doubtful, or at least not proven in the literature, that this is the case. While marriage restrictions may once have been quite common in such "women's" professions as teaching and nursing, these restrictions no longer exist. Occupational segregation by marital status within a gender has not been widely studied.

Income distribution is another area of possible interest. It may seem plausible that economies with divergent income distributions, i.e. high levels of income inequality, would display larger wage differences in general. An argument could be made that such an economy would exhibit parameter effects completely or partially produced by income inequality in the general economy and, indeed, not attributable to a penalty to wages. The evidence in this study does not appear to fit this contention. If wage differentials in the study were products of income inequality in general, the United States would exhibit the largest wage differences followed by the United Kingdom, Canada, and Norway, as that is the order of income inequality. This national ordering would be evident across all the subgroups. The results of this study do not follow this hypothesized pattern. Further investigation of a possible connection between the parameter effect and general levels of income inequality is left for later study.

Another possible explanation for a portion of the parameter effect is institutional differences among the countries in the study. For instance, a strong legislative framework supporting the equal treatment of women in the work force is perceived as conducive to women's increased and continued participation in the labor market, as well as producing a positive effect on the wages of women overall within an economy. Canada was the first nation among the four to enact strong legislation regarding comparable pay and equal treatment in the workplace for women. Similar legislation was enacted in the United States in 1963, the United Kingdom in 1970¹⁰, with Europe lagging behind (Sloane, 1986).

Married childless women are older on average and may have suffered retardation in both their initial wage levels and subsequent increases in their wages due to a lack of supportive legislation within their economy. Theoretically, over time, wage differences among the subgroups would narrow as older cohorts of women harmed by the lack of legislative support early in their work lives leave the work force. Canada, having enacted the earliest supportive legislation, may be reaping the benefits of that legislation in the eradication of the marriage penalty to women's wages in that country. This finding, while anecdotal, is compelling, as the marriage penalty to women's wages found in this study follows the pattern of legislation in the four countries. Further examination of this connection is left for later study.

¹⁰ The 1970 Equal Pay Act in the United Kingdom was not fully phased in until the end of 1975, thereby delaying the effects of the act.

C. The Marriage Premium to Men's Wages

Several previous studies have found evidence to support the existence of relatively large marriage premiums for men's wages. However, if men experience parenthood penalties to their wages, previous marriage premium estimates may understate the true magnitude of men's marriage premiums. The methodology of this study is devised to assure that marriage effects and parenthood effects on wages are not merged together.

Table 4.5 shows the coefficients of the wage equations corrected for self-selection used in the decomposition of wage differences between single men and married men without children for all four countries. The coefficients for single men in Table 4.5 are identical to those in Chapter 3 and have not been reestimated. The coefficients which appear on Table 4.5 for married men without children are the result of the reestimation of that subgroup and include only those variables common to both single men and married men without children.

Overall, the reestimated coefficients are similar to the original coefficients for married men without children for Canada and Norway. For these countries, all significant coefficients carry the same sign in the original estimation and the reestimation. In addition, the magnitude of the coefficients in the reestimations differs little from that of the original estimations, with one exception. The return to age in Canada is lower at 7.1% in the reestimation versus 7.9% in the original estimation.

Table 4.5.

Coefficients of Wage Equations Corrected for Self-Selection Used in the Decomposition Procedure^a:

Single Men and Married Men Without Children^b

(Dependent Variable is the Natural Logarithm of the Hourly Wage)

Variable	<u>United States</u>		<u>Canada</u>		<u>United Kingdom</u>		<u>Norway</u>	
	Single	Married No Children ^c	Single	Married No Children ^c	Single	Married No Children ^c	Single	Married No Children ^c
INTERCEPT	-2.41**	-.177	1.66**	2.01**	.111	.257**	2.65**	2.20**
EDUC	.048**	.042**	.017**	.018**	.062**	.075**	.051**	.052**
AGE	.216**	.083**	.075**	.071**	.080**	.057**	.060**	.072**
AGE ²	-.283**	-.081	-.092**	-.075**	-.104**	-.061**	-.070**	-.073**
HRS WK	.001	.004*	.018**	.024**	.010**	.010**	c	c
Lambda ^d	-2.94E-05	4.78E-03	.001	2.92E-03	5.25E-17	6.23E-5	.021	.047*

Reestimated

* significant at .05 level

** significant at .01 level

^a A binary variable was utilized to adjust for population density. This location variable is described more fully in footnote 7 of page 37 in Chapter 3.

^b The two-step regression procedure was reestimated for married persons without children using only those variables appropriate for single persons. In other words, variables unique to married persons such as spouse education and spouse wage were not used in the reestimated regressions. The reestimation was undertaken to facilitate the decomposition procedure. The above figures are rounded for presentation purposes and may not yield the exact decomposition results.

^c Limitations of the Norwegian data did not allow the inclusion of hours worked or spouse hours worked as explanatory variables.

^d Lambda is the self-selection adjustment resulting from the first step of the regression procedure.

In contrast, the results of the reestimation differ substantially from those of the original estimation in magnitude of the coefficients for the United Kingdom. All reestimated coefficients for this subgroup preserve the sign and significance level of the original estimates. The reestimated return to education is higher at 7.5% versus 6.7% in the original estimation. The return to age is also higher at 5.7% in the reestimation versus 4.5% in the original estimation. The returns to hours worked in the reestimation is slightly lower at 0.9% compared to 1% in the original estimation. Lambda remains insignificant in both estimations¹¹.

Table 4.6 shows the results of the decomposition of wage differences between single men and married men without children. All four countries exhibit a positive observed wage differential in favor of married men, as compared to their single brethren. The most striking instance is that of the United States where married men without children garner a wage 43.1% higher than that of single men, after correcting for self selection. Corrected wage differences in favor of married men are smaller in Canada, the United Kingdom, and Norway at 16.4%, 9.7%, and 17.4%, respectively.

A portion of the corrected wage difference in favor of married men without children is explained by the characteristic effect. Given personal characteristics alone, married men without children reap wages 9.7% higher than single men in the United States, 12.4% higher than single men in Canada, and 6.5% higher than single men in

¹¹ Discussion of the difference in reestimated and original coefficients for this subgroup for the United States appears on page 72 and page 74.

Table 4.6.
Decomposition of Wage Differences Between Single Men and
Married Men without Children^{a b}

	<u>United States</u>	<u>Canada</u>	<u>United Kingdom</u>	<u>Norway</u>
Observed wage difference	-.486	-.173	-.095	-.130
Difference in selection bias	-.054	-.009	.002	.045
Wage difference, corrected for selection bias	-.431	-.164	-.097	-.174
Parameter Effect	-.334	-.040	-.176	-.110
Characteristic Effect	-.097	-.124	.079	-.065
Effect of selected personal characteristics:				
EDUC	.019	.023	.114	.019
TOTAL AGE ^c	-.111	-.114	-.030	-.093
HRS WK	-.007	-.047	-.015	d

^a A binary variable was utilized to adjust for population density. This location variable is described more fully in footnote 7 of page 37 in Chapter 3.

^b The two-step regression procedure was reestimated for married persons without children using only those variables appropriate for single persons. In other words, variables unique to married persons such as spouse education and spouse wage were not used in the reestimated regressions. The reestimation was undertaken to facilitate the decomposition procedure.

^c Total Age encompasses both age and age squared. Total Age is derived by adding the decomposition result for age to that of age squared.

^d Limitations of the Norwegian data did not allow the inclusion of hours worked or spouse hours worked as explanatory variables.

Norway. Only the United Kingdom displays a characteristic effect which would result in higher wages for single men than married men without children: 7.9% in favor of singles. Consideration of specific personal characteristics sheds light on these characteristic effects.

Education is especially helpful in understanding the outlying case of British married men. British married men without children would experience wages 11.4% lower than single men due only to differences in educational attainment. The source of this wage differential lies in vastly different levels of education for the subgroups. Single men in the United Kingdom average 14.34 years of formal education, whereas married men without children average only 12.68 years of formal education. The characteristic effect due to education is large enough to overpower the negative characteristic effects due to lower age levels and fewer hours worked by British single men as compared to their married counterparts.

Education accounts for a smaller characteristic effect in the United States, Canada, and Norway, where the educational attainment of single men and married men without children is much more similar than in the United Kingdom. American and Norwegian married men without children would experience wages 1.9% lower than single men in their respective countries due to differences in education, *ceteris paribus*. Canadian married men without children would obtain wages 2.3% lower than single men due to their lower average level of education.

The hours worked variable explains a relatively small portion of the corrected wage difference between single men and married men without children in the United States and the United Kingdom, specifically 0.7% and 1.5% differentials in favor of married men without children. In Canada, however, a 4.7% wage differential favoring married men without children over single men is explained by differences in hours worked. Canadian married men without children work over two hours more per week on average than their single brethren¹².

The age variable accounts for an appreciable wage differential in favor of married men without children over single men. The United States and Canada have the largest wage differential attributable to the age variable at 11.1% and 11.4%. Norwegian married men without children garner a 9.3% wage benefit from age, while British married men without children reap a comparatively paltry 3% wage differential attributable to differences in average age level.

After accounting for differences in personal characteristics between married men without children and single men, substantial portions of the corrected wage difference between the two subgroups remain unexplained for all four countries. This marriage premium to men's wages is a whopping 33.4% in the United States, 4% in Canada, 17.6% in the United Kingdom, and 11% in Norway. Only in Canada are similar marriage premiums to wages experienced by both men and women. In the other three

¹² Limitations of the Norwegian data did not allow the inclusion of hours worked as an explanatory variable.

nations included in the study, women are at a distinct disadvantage in the effect of marriage on their wages, vis a vis, men.

Table 4.5 on page 92 is designed to highlight sources of the marriage premium to men's wages. Returns to education differ between the subgroups in all four countries. In Canada, the United Kingdom, and Norway, married men without children experience higher returns to education than single men. This difference is large only in the United Kingdom where married men without children have a return to education of 7.5% compared to 6.2% for single men. As mentioned previously, British married men without children attain much lower educational levels than their single brethren. The difference in the return to education dampens the overall effect of education on these men's wages. Only in the United States do single men have a higher return to education than married men without children.

The effect of the return to hours worked on the parameter effect is strongest in Canada where married men without children experience a return of 2.4% compared to 1.8% for single men. Combined with a substantial characteristic effect due to more hours worked by married men than singles in Canada, hours worked may explain a large portion of the overall wage difference of Canadian married men without children. In the United States, married men without children reap slightly higher returns to hours worked than single men. As in the case of the female subgroups, there is no appreciable difference between the return to hours worked for marrieds without children

and singles in the United Kingdom. Limitations of the Norwegian data did not allow the inclusion of hours worked as an explanatory variable.

Returns to age are higher for single men than for married men in all of the countries in the study, with the exception of Norway. This indicates that the labor market rewards maturity and experience more highly for a single man than for a married man without children in these three countries. The effect is strongest in the United States, where single men experience a whopping 21.6% return to age compared to an 8.3% return to age for married men without children. Single Norwegian men, on the other hand, experience a return to age of 6%, lower than the 7.2% return of married men without children.

D. The Parenthood Penalty to Women's Wages

Table 4.7 shows the coefficients of the wage equations corrected for self-selection used in the decomposition of wage differences between married women without children and married mothers for all four countries. The coefficients for married women without children are those which appear in Chapter 3 and are not reestimated. As such, these coefficients differ from those used to examine the marriage penalty to women's wages, which required the use of reestimated coefficients for married women without children. The coefficients which appear on Table 4.7 for married women with children are the result of the reestimation of that subgroup and

Table 4.7.

Coefficients of Wage Equations Corrected for Self-Selection Used in the Decomposition Procedure^a:
Married Women Without Children and Married Women With Children^b
 (Dependent Variable is the Natural Logarithm of the Hourly Wage)

Variable	<u>United States</u>		<u>Canada</u>		<u>United Kingdom</u>		<u>Norway</u>	
	No Children	Mothers ^c	No Children	Mothers ^c	No Children	Mothers ^c	No Children	Mothers ^c
INTERCEPT	-.571**	-1.87**	1.35**	1.20**	.017	-.365*	3.15**	2.37**
EDUC	.045**	.060**	.027**	.033**	.079**	.097**	.057**	.064**
AGE	.071**	.119**	.073**	.072**	.026*	.031**	.023	.041**
AGE ²	-.076**	-.135**	-.090**	-.086**	-.034*	-.039**	-.030*	-.042**
HRS WK	.016**	.016**	.018**	.018**	.004**	.001	c	c
SP HRS WK	-.001	-.002	.001	-.001	-.003**	-.002**	c	c
SP WAGE	.007**	.007**	.001	.001	.025**	.019**	.0002	.0003*
Lambda ^d	3.61E-7	6.95E-13	-.004	-.0003	1.04E-8	-7.09E-9	-.0002*	-1.05E-04

^a Reestimated

* significant at .05 level

** significant at .01 level

^a A binary variable was utilized to adjust for population density. This location variable is described more fully in footnote 7 of page 37 in Chapter 3.

^b The two-step regression procedure was reestimated for married mothers using only those variables appropriate for married women without children. In other words, variables unique to parents such as age of the youngest child were not used in the reestimated regressions. The reestimation was undertaken to facilitate the decomposition procedure. The above figures are rounded for presentation purposes and may not yield the exact decomposition results.

^c Limitations of the Norwegian data did not allow the inclusion of hours worked or spouse hours worked as explanatory variables.

^d Lambda is the self-selection adjustment resulting from the first step of the regression procedure.

include only those variables common to both married women without children and married women with children.

The reestimated coefficients for Canadian mothers are different for age and hours worked. The reestimated return to age is lower at 7.2% as compared to 8.8% in the original estimation. The reestimated return to hours worked is slightly lower at 1.8% compared to 1.9% in the original estimation. All other coefficients are essentially the same in both estimations.

The largest difference due to reestimation for British mothers is in return to age. The reestimated return to age is half at 3.1% of the 6.2% from the original estimation. The reestimated return to education is higher at 9.7% compared to 9% in the original estimation. All other coefficients are essentially identical in both estimations.

The reestimated coefficients for Norwegian mothers are different for education and age. The reestimated return to education for Norwegian mothers is 6.4% compared to 6.9% in the original estimation. The reestimated return to age is 4.1% compared to 5.7% in the original estimation. All other coefficients are essentially identical in both estimations¹³.

Table 4.8 displays the decomposition of wage differences between married women without children and married women with children. This decomposition is undertaken both to isolate possible parenthood penalties to women's wages and to

¹³ Discussion of the difference in reestimated and original coefficients for this subgroup for the United States appears on pages 74.

Table 4.8.
Decomposition of Wage Differences Between Married Women without Children
and Married Women With Children^{a b}

	<u>United States</u>	<u>Canada</u>	<u>United Kingdom</u>	<u>Norway</u>
Observed wage difference	.158	.045	.065	.066
Difference in selection bias	.000	-.016	.002	-.002
Wage difference, corrected for selection bias	.158	.061	.063	.068
Parameter Effect	.114	.078	.091	.106
Characteristic Effect	.044	-.018	-.029	-.038
Effect of selected personal characteristics:				
EDUC	.010	-.016	-.021	-.044
TOTAL AGE ^c	-.017	-.046	-.027	.003
HRS WK	.047	.040	.020	d
SP WAGE	-.001	-.002	-.010	-.001
SP HRS WK	.004	.001	.010	d

^a A binary variable was utilized to adjust for population density. This location variable is described more fully in footnote 7 of page 37 in Chapter 3.

^b The two-step regression procedure was reestimated for mothers using only those variables appropriate for married women without children. In other words, variables unique to parents such as age of the youngest child were not used in the reestimated regressions. The reestimation was undertaken to facilitate the decomposition procedure.

^c Total Age encompasses both age and age squared. Total Age is derived by adding the decomposition result for age to that of age squared.

^d Limitations of the Norwegian data did not allow the inclusion of hours worked or spouse hours worked as explanatory variables.

highlight the effect of personal characteristics on these women's wages. By far, the largest observed wage difference due to parenthood status among the four countries is that of the United States.

American women exhibit a 15.8% corrected wage difference due to parenthood status compared to 6.1%, 6.3%, and 6.8% parenthood wage differences for Canadian, British, and Norwegian women, respectively. Essentially, the American case is an anomaly within this group of nations. Further examination of both the characteristic effect and the parameter effect may shed some light on this difference.

The characteristic effect explains a 4.4% difference in wages between American married women due to parenthood status. In other words, the personal characteristics of American mothers result in a 4.4% lower wage than childless married women. This finding is in stark contrast to the other nations in the study. In the case of the other three nations, mothers would have *higher* wages due to the characteristic effect, *ceteris paribus*, not *lower* wages as in the case of the United States. Particularly, Canadian, British, and Norwegian mothers experience wages 1.8%, 2.9%, and 3.8% *higher* than their childless counterparts due to the characteristic effect. Why is the characteristic effect of American mothers different in sign than the characteristic effects of mothers in other countries in the study?

Firstly, the effect of education on the wages of American mothers is opposite to that of the other mothers in the study. Education alone explains a 1% lower wage to American mothers compared to their childless counterparts. Mothers in Canada, the

United Kingdom, and Norway would experience wages 1.6%, 2.1%, and 4.4% higher respectively as compared to their childless counterparts due to education, *ceteris paribus*. The source of the lower wage to married mothers in the United States due to education lies in the mean level of education of these women. Married mothers have lower mean levels of education than married childless women in the United States. This finding is unique among the nations in this investigation.

Secondly, the number of hours worked by American mothers has a stronger effect on the wage difference than that exhibited by women in the other nations included in the study. Hours worked per week alone explains a 4.7% lower wage to American mothers compared to their childless counterparts. Canadian mothers experience a similar effect, exhibiting a 4% lower wage due to differences in hours worked. British women have the smallest effect, a 2% lower wage due to hours worked¹⁴. In all three nations, married mothers exhibit lower mean hours worked per week than their childless counterparts, resulting in lower wage levels due to fewer hours worked per week. Not surprisingly, programs intended to support working mothers in their work effort, such as childcare centers at the work site and availability of high quality child care, have been shown to increase the hours worked per week of working mothers, as well as increasing their productivity.

Another policy consideration is that of sick leave. Sick leave programs in

¹⁴ Limitations of the Norwegian data did not allow the inclusion of hours worked as an explanatory variable.

Canada, the United Kingdom, and Norway are more generous than in the United States. There is not a strong federal mandate which requires firms to provide sufficient sick leave in the United States. Generally, if firms do elect to provide sick leave, accounting rules in force in the United States discourage many firms from allowing the worker to use sick leave as family leave. Indeed, some employers require verification of illness, which is not always reasonable for childhood illnesses. Typically, the dynamics of the nuclear household lead to the female worker taking time off to care for sick children. This cultural influence, combined with insufficient and restrictive sick leave, may lead to a decreased number of hours worked per week by American mothers. The net effect of time off spent with sick children in the United States is lower wages, if not unemployment.

The age variable incorporates both age and experience in this study. American mothers would have wages 1.7% higher than their childless counterparts due to age, *ceteris paribus*. The age effect is not strong enough in the United States to mute the negative effect on mother's wages of lower levels of education and fewer hours worked per week. In contrast, the effect of age on mother's wages is more strongly positive in both Canada and the United Kingdom, than in the United States. Canadian mothers reap 4.6% higher wages due to age than their married but childless counterparts. British mothers receive 2.7% higher wages than childless married women due to age. In the case of both Canada and the United Kingdom, the age effect overwhelms the effect of all other personal characteristics.

Are there institutional differences within the countries under consideration which may account for the differences in age effects seen among these countries? One possible source may be differences in the continuity of work experience among working mothers. While this study is unable to isolate the effects of experience, theory and the findings of prior studies support a hypothesis that continuity of work experience increases wage levels, as discussed in Chapter 2. Substantial institutional differences exist in the countries included in this study regarding programs which support continuity of work experience for women.

National maternity leave policies in the countries under consideration are very different. In the nation with the smallest observed wage difference, Canada, women have right to at least 17 weeks unpaid leave surrounding the birth of each child. Reinstatement to the same or comparable employment is protected by law. Unemployment insurance can be tapped for 10 weeks of parental benefit, 15 weeks surrounding the birth itself, and 15 weeks for sickness. A maximum total of 30 weeks unemployment can be taken by the mother with full to partial income replacement (Baker, 1995).

In the United Kingdom, women have a statutory right to stop work 11 weeks prior to the birth of a child. Provisions are in place to secure the return of the mother to her existing employment after a maximum leave of 29 weeks duration after the birth of the child. The total leave possible with return to prior employment is 40 weeks.

Income replacement is limited: 90% pay for 6 weeks, a low flat rate for 12 additional weeks (Cochran, 1993).

In Norway, job-protected parental leave for 150 working days is provided with full pay. As an alternative, a parent may take a leave of 190 working days with 80% pay. A maximum of 60 working days can be taken as leave prior to the birth of the child. A minimum of 30 days maternity is mandated and must be taken by law (Cochran, 1993).

Until 1993, the United States lagged far behind in the provision of maternity leave for working mothers. With the adoption of the Family Leave Act of 1993, American mothers who worked at least twenty hours a week in a firm employing a minimum number of employees were granted a 12 week unpaid leave by federal law. No paid maternity leave provision is in place. Some disability insurance policies provide income replacement, but this is not the norm. For the majority of working mothers in the United States, maternity benefits are unpaid and limited, if available at all¹⁵.

Theoretically, more generous maternity policies would support women in an effort to maintain tenure with the same firm throughout the child-bearing process and lead to more continuous work experience. The nations with more generous maternity leave policies in this investigation display a stronger effect of age on the wages of

¹⁵ As this investigation uses data collected prior to the enactment of the 1993 Family Leave Act, any benefits to American mothers of that legislation will not be reflected in this study.

working mothers, which partially offsets the negative wage effect of other personal characteristics such as hours worked. Is this stronger age effect due to a more continuous work experience during child-bearing years? While the evidence from this study on the efficacy of maternity leave is purely anecdotal, further investigation of this question is warranted.

The characteristic effect explains approximately 28% of the wage difference of American mothers. After adjusting for education, age, hours worked per week, population density, spouse's wage, and spouse's hours worked per week, an 11.4% wage differential persists. This parameter effect may be considered a parenthood penalty to women's wages.

Similar parenthood penalties to women's wages are exhibited in the other nations of the study. Canadian, British, and Norwegian mothers experience a 7.8%, 9.1%, and 10.6% wage differential after adjusting for self selection bias and the characteristic effect. Observed wage differentials are much higher in the United States as compared to these other countries due primarily to the sign of the characteristic effect. In all but the United States, working mothers' wages are increased due to their personal characteristics, thereby blunting the overall wage differential experienced by these women. In the United States alone, the characteristic effect intensifies the wage difference experienced by mothers.

E. The Parenthood Penalty/Premium to Men's Wages

Table 4.9 shows the coefficients of the wage equations corrected for self-selection used in the decomposition of wage differences between married men without children and married fathers for all four countries. The coefficients for married men without children are those which appear in Chapter 3 and are not reestimated. As such, these coefficients differ from those used to examine the marriage premium to men's wages, which required the use of reestimated coefficients for married men without children. The coefficients which appear on Table 4.9 for married men with children are the result of the reestimation of that subgroup and include only those variables common to both married men without children and married fathers. The reestimation yields similar results to the original estimation for Canada, the United Kingdom, and Norway¹⁶.

Isolating any parenthood penalty or premium to men's wages serves two major purposes in this study. Firstly, estimating a separate parenthood effect on men's wages avoids the understatement or overstatement of the marriage premium to men's wages due to parenthood status. Secondly, comparison between the effects of parenthood on the wages of men and women is possible. Due to the relatively small effect of parenthood on men's wages, no effort will be undertaken in this study to explore the relative importance of individual characteristics on men's wages.

¹⁶ Discussion of the difference in reestimated and original coefficients for this subgroup for the United States appears on pages 74 and 75.

Table 4.9.

Coefficients of Wage Equations Corrected for Self-Selection Used in the Decomposition Procedure^a:**Married Men Without Children and Married Men With Children^b**

(Dependent Variable is the Natural Logarithm of the Hourly Wage)

Variable	<u>United States</u>		<u>Canada</u>		<u>United Kingdom</u>		<u>Norway</u>	
	No Children	Fathers ^c	No Children	Fathers ^c	No Children	Fathers ^c	No Children	Fathers ^c
INTERCEPT	.046	-.034	1.96**	2.24**	.057*	-.435	2.29**	2.60**
EDUC	.041**	.049**	.016**	.011**	.067**	.056**	.054**	.051**
AGE	.077**	.089**	.079**	.067**	.045**	.099**	.069**	.067**
AGE ²	-.076**	-.093**	-.085**	-.077**	-.048**	-.111**	-.071**	-.076**
HRS WK	.005*	-.0001	.024**	.025**	.009**	.008**	c	c
SP HRS WK	-.003*	-.005**	-.001	-.003**	-.005**	-.003**		
SP WAGE	.008**	.010**	.0001	.001	.030**	.008**	-.0002	-.0007*
Lambda ^d	.001	1.18E-03	.005	.028**	-7.49E-5	-.0021	.007	.007

^a Reestimated

* significant at .05 level

** significant at .01 level

^a A binary variable was utilized to adjust for population density. This location variable is described more fully in footnote 7 of page 37 in Chapter 3.^b The two-step regression procedure was reestimated for married fathers using only those variables appropriate for married men without children. In other words, variables unique to parents such as age of the youngest child were not used in the reestimated regressions. The reestimation was undertaken to facilitate the decomposition procedure. The above figures are rounded for presentation purposes and may not yield the exact decomposition results.^c Limitations of the Norwegian data did not allow the inclusion of hours worked or spouse hours worked as explanatory variables.^d Lambda is the self-selection adjustment resulting from the first step of the regression procedure.

Table 4.10 displays the decomposition of wage differences between married men without children and married men with children. A positive parameter effect can be interpreted as the parenthood penalty to men's wages, whereas a negative parameter effect indicates a parenthood premium to men's wages. Only Norwegian fathers experience a parenthood premium to their wages, amounting to wages 3.8% higher than their childless counterparts. The experience of Norwegian fathers contrasts sharply with that of Norwegian mothers, who incur a 10.6% wage penalty due to parenthood.

Canadian fathers incur the largest parenthood penalty to wages among men of 8.6%. Among the four countries in the study, only Canadian fathers experience a wage penalty due to parenthood in excess of that incurred by women in their country. Canadian women experience a slightly smaller 7.8% parenthood penalty to their wages. Canada is also unique in that both sexes experience similar marriage premiums as well as parenthood penalties to their wages.

British fathers garner a 6.3% parenthood penalty compared with the 9.1% parenthood penalty of British mothers. American fathers incur a slight parenthood penalty to their wages of 1.9%. On the other hand, American mothers experience a substantially larger 11.4% parenthood penalty to their wages.

Table 4.10.
Decomposition of Wage Differences Between Married Men without Children
and Married Men With Children^{a b}

	<u>United States</u>	<u>Canada</u>	<u>United Kingdom</u>	<u>Norway</u>
Observed wage difference	.026	-.036	-.003	-.050
Difference in selection bias	.000	-.108	.013	.003
Wage difference, corrected for selection bias	.026	.072	-.015	-.053
Parameter Effect	.019	.086	.063	-.038
Characteristic Effect	.006	-.014	-.078	-.015
Effect of selected personal characteristics:				
EDUC	.012	-.011	-.021	-.024
TOTAL AGE ^c	.001	-.020	-.015	.010
HRS WK	-.001	.016	-.018	d
SP WAGE	.015	.000	.018	-.004
SP HRS WK	-.021	-.007	-.042	d

^a A binary variable was utilized to adjust for population density. This location variable is described more fully in footnote 7 of page 37 in Chapter 3.

^b The two-step regression procedure was reestimated for fathers using only those variables appropriate for married men without children. In other words, variables unique to parents such as age of the youngest child were not used in the reestimated regressions. The reestimation was undertaken to facilitate the decomposition procedure.

^c Total Age encompasses both age and age squared. Total Age is derived by adding the decomposition result for age to that of age squared.

^d Limitations of the Norwegian data did not allow the inclusion of hours worked or spouse hours worked as explanatory variables.

CHAPTER 5

CONCLUSION

Each of the countries in this study has a history of unequal wage structures across the genders. The analysis of the gender wage differential using comparable data from a cross-section of countries sheds light on both the nature of the gender wage gap in each country and possible underlying reasons for differences between countries. The decomposition procedure indicates differences in the personal work-related characteristics of workers in these countries, which explain a portion of the difference in wages between groups. In addition, the residual in the gender wage gap unexplained by either self-selection or personal work-related characteristics also differs among countries.

The subgroup methodology used in this investigation is a powerful analytical tool. In contrast to prior studies in which the marriage penalty to wages and the parenthood penalty were commingled, the use of within-gender subgroups combined with the decomposition procedure reveals subtleties about gender wage differences which otherwise may have gone unnoticed. For instance, the method used in this study clearly delineates the effects of a relatively small marriage penalty to women's wages and a relatively large parenthood penalty to women's wages within the United States. Were these two effects commingled through insufficient separation of the subgroups,

the result would be a single large penalty to women's wages, thereby clouding subsequent examinations of the sources of the penalty. The use of subgroups by marital status, gender, and parenthood status avoids the obscuring of the penalties and their sources.

Cross-country comparison allows the isolation of differences in the gender wage structure which may be idiosyncratic to an individual nation as compared to those which may be universal to industrialized countries. In addition, the inclusion of other nations in this investigation assists in the uncovering of possible institutional sources of the gender wage gap, by isolating effects unique to individual countries.

This investigation found that the marriage penalty to women's wages varies substantially across countries. The largest marriage penalties to women's wages exist in the United Kingdom and Norway, with a significantly smaller marriage penalty in the United States, and a small marriage premium to women's wages in Canada. These penalties/premium are unexplained by personal characteristics of the women in question. Institutional differences among countries may account for the variation in the effect of marriage on women's wages.

This investigation points out one particular difference in institutions across the nations in the study: the legislative framework supporting equal pay for women in the workplace. The importance of legislative differences can be explained in two divergent ways. Some see legislative initiatives as a precursor to future institutional changes.

Others consider legislation a reflection of institutional changes already extant in the wider realms of society. Subsequent studies utilizing the analysis of longitudinal data may reveal which case holds in this instance. It is evident within the limited confines of this investigation that the pattern of equal pay legislation follows the pattern of marriage penalties uncovered in this study.

This investigation found significant parenthood penalties to women's wages in all four countries. Women in the United States incurred the largest parenthood penalty to their wages. Reasons for the variations in this parameter effect across countries may include differences in labor markets, government programs, and other institutional arrangements.

The United States has typically emphasized the expansion of access to education and equal opportunity in the labor market in dealing with the gender wage gap. Canada, Norway, and the United Kingdom have taken a different route, emphasizing family support mechanisms and subsidy programs, resulting in more generous maternity and parental leave policies. Differences in the parameter effect may be partially related to differences in these underlying institutional arrangements. With the enactment of weak but groundbreaking family leave legislation in the United States in 1993, the parenthood penalty within that country may decrease. Consideration of data subsequent to 1993 could reveal the strength of the effect of this legislation on the parenthood penalty within the United States.

The relative strength of both parenthood penalties to women's wages and maternity policy within a nation may provide a reflection of domestic attitudes toward motherhood and work. Few would disagree that attitudes toward women in general in the workplace have improved dramatically over the past five decades. However, attitudes toward working mothers have not changed as precipitously in the United States. There exists a dichotomy concerning working mothers: women are welcome in the workplace but mothers should stay home with their children.

Few concessions to working motherhood have been made in nations with scant maternity policies. This may reflect a more general leaning toward mothers staying at home in those countries. The wage penalty to mother's wages may be due not only to weak maternity policies, occupational segregation, and intermittent work histories, but also to discrimination in the workplace stemming from a cultural disinclination to have mothers work. In other words, cultural support for mothers staying at home may coincide with discrimination in the workplace against working mothers.

A weakness of this investigation is that possible sources of the penalties/premiums found in the study cannot be disentangled. While a portion of these parameter effects may be due to discrimination by employers in the labor market, several other possible explanations exist. A portion of the penalties/premiums may be explained by national variables such as maternity leave policy, enactment and enforcement of equal pay legislation, and occupational segregation. In addition, couples

may consciously make choices to alter their work effort to maximize family utility, not family income. The couple's utility maximizing decision may result in decreased work effort by either one spouse or both spouses, resulting in lower wage levels.

The scope of this investigation is naturally limited by the data. As data becomes available which follows women through their working lives, investigation of the wage effects of institutional differences such as legislation and maternity leave policy will become more feasible.

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APPENDIX

Table A-1.
Estimated Coefficients of Reduced-Form Probit Equations for the Probability
that a Given Subgroup Member Participates in the Workforce^a: United States

Variable	Single Females No Children	Married Females No Children	Married Females With Children	Single Men No Children	Married Men No Children	Married Men With Children
INTERCEPT	.954 (.952)	-1.34** (.507)	3.75** (.484)	-.775 (.543)	-1.46** (.536)	-2.90** (.641)
EDUC	-.039 (.071)	-.055 (.029)	-.049 (.070)	-.015 (.009)	-.024 (.081)	-.021 (.064)
AGE	.070 (.058)	.089** (.020)	-.172** (.026)	.009 (.032)	.073** (.025)	.104** (.032)
AGE ²	-.090 (.081)	-.064** (.021)	.292** (.034)	.015 (.044)	-.061* (.030)	-.094* (.039)
# EARN	-2.90** (.234)	-1.014** (.049)	-1.32** (.042)	-.709** (.072)	-.406** (.052)	-.292** (.041)
DSBLTY	.435 (.333)	-.792** (.144)	-.507** (.127)	.974** (.160)	-1.070** (.124)	-.887** (.100)
SP HRS WK		.014** (.002)	.023** (.002)		.008** (.003)	.006** (.002)
SP WAGE		.004 (.003)	.005 (.003)		-.012 (.006)	-.004 (.004)
SP DSBLTY		.341** (.126)	-.097 (.119)		.110 (.161)	.019 (.141)
SPEDUC		.010 (.008)	.015* (.006)		.020* (.010)	.016* (.007)
#CH<18			.209** (.027)			.028 (.029)
AGE YC			.009 (.006)			.003 (.006)
ALIMONY			-.00002 (.000023)			-.00003 (.00031)
# of Obs	853	2494	4049	1446	2146	3976
Log-likelihood	-141.29	-1001.39	-1733.11	-489.32	-825.03	-1479.48

* significant at .05 level

** significant at .01 level

Standard errors of the coefficients are presented parenthetically beneath the respective coefficient.

^a A binary variable was utilized to adjust for population density. This location variable is described more fully in footnote 7 of page 37 in Chapter 3.

Table A-2.

**Estimated Coefficients of Reduced-Form Probit Equations for the Probability
that a Given Subgroup Member Participates in the Workforce^a: Canada**

Variable	Single Females No Children	Married Females No Children	Married Females With Children	Single Men No Children	Married Men No Children	Married Men With Children
INTERCEPT	3.17** (.560)	8.56 (3099)	11.39 (2298)	8.38 (3630)	8.75 (2793)	9.25 (1948)
EDUC	.064** (.009)	.051** (.005)	.056** (.004)	.056** (.006)	.023** (.004)	.037** (.004)
AGE	.130** (.028)	.053** (.016)	.182** (.021)	.072** (.024)	.093** (.019)	.095** (.021)
AGE ²	-.171** (.039)	-.092** (.020)	-.272** (.028)	-.103** (.034)	-.117** (.023)	-.012** (.026)
# EARN	-.555** (.084)	-.505** (.029)	-.611** (.024)	-.500** (.062)	-.183** (.030)	-.156** (.024)
DSBLTY	7.03 (6689)	-7.31 (3099)	-7.40 (2298)	-6.57 (3630)	-7.15 (2794)	-7.04 (1948)
SP HRS WK		-.001 (.001)	-.001 (.001)		-.002 (.001)	.001 (.001)
SP WAGE		-.0003 (.001)	-.0003 (.001)		-.0004 (.001)	.001 (.001)
SP DSBLTY		.457** (.138)	.403* (.171)		.266 (.207)	-.294 (.210)
SPEDUC		.001 (.004)	.002 (.004)		-.010 (.005)	-.014 (.004)
#CH<18			.084** (.029)			.040 (.028)
AGE YC			-.006 (.005)			.011* (.005)
ALIMONY			.000097** (.000038)			3.95E-6 (.00004)
# of Obs	1161	4154	6354	1756	3615	6278
Log-likelihood	-571.35	-2252.24	-3590.77	-1015.74	-2002.95	-3360.05

* significant at .05 level

** significant at .01 level

Standard errors of the coefficients are presented parenthetically beneath the respective coefficient

^a A binary variable was utilized to adjust for population density. This location variable is described more fully in footnote 7 on page 37 in Chapter 3.

Table A-3.
Estimated Coefficients of Reduced-Form Probit Equations for the Probability
that a Given Subgroup Member Participates in the Workforce^a: United Kingdom

Variable	Single Females No Children	Married Females No Children	Married Females With Children	Single Men No Children	Married Men No Children	Married Men With Children
INTERCEPT	8.90 (.14603)	1.83** (.675)	2.58** (.847)	1.74 (1.05)	1.95** (.597)	2.41** (.722)
EDUC	.072** (.025)	-.015 (.021)	-.030 (.017)	.046* (.019)	-.018 (.016)	.041** (.014)
AGE	-.070 (.048)	-.016 (.020)	-.043 (.037)	.018 (.035)	-.056** (.019)	-.098** (.031)
AGE ²	.091 (.053)	.053* (.021)	.093* (.046)	-.006 (.039)	.096** (.019)	.139** (.037)
# EARN	-2.56** (.320)	-1.15** (.057)	-1.59** (.070)	-2.44** (.246)	-.696** (.050)	-.659** (.055)
DSBLTY	-5.49 (14603)	-1.46** (.401)	-.375 (.356)	-.160 (.798)	-.889** (.207)	-.418 (.292)
SP HRS WK		.001 (.003)	-.001 (.002)		-.0001 (.003)	.002 (.003)
SP WAGE		.026* (.010)	.015 (.009)		.016 (.016)	.007 (.006)
SP DSBLTY		.554** (.164)	.658 (.362)		.409 (.212)	.063 (.261)
SPEDUC		.007 (.018)	.014 (.015)		.011 (.018)	.012 (.015)
#CH<18			.259* (.112)			.191* (.093)
AGE YC			-.019 (.011)			.031** (.009)
ALIMONY			-.0005 (.0003)			-.0002 (.0002)
# of Obs	338	2229	1761	469	2229	1761
Log-likelihood	-59.92	-691.62	-710.42	-157.66	-838.42	-895.54

* significant at .05 level

** significant at .01 level

Standard errors of the coefficients are presented parenthetically beneath the respective coefficient

a A binary variable was utilized to adjust for population density. This location variable is described more fully in footnote 7 on page 37 in Chapter 3.

Table A-4.
Estimated Coefficients of Reduced-Form Probit Equations for the Probability
that a Given Subgroup Member Participates in the Workforce^a: Norway

Variable	Single Females No Children	Married Females No Children	Married Females With Children	Single Men No Children	Married Men No Children	Married Men With Children
INTERCEPT	-.029 (1.18)	-1.12 (.938)	2.32** (.747)	1.25 (.850)	-1.90 (1.19)	-.239 (.766)
EDUC	.099** (.042)	.111** (.022)	.115** (.016)	.081** (.023)	.107** (.019)	.124** (.014)
AGE	.014 (.060)	.044 (.041)	-.058 (.037)	.030 (.043)	.125* (.051)	.028 (.037)
AGE ²	.026 (.075)	-.030 (.045)	.107* (.047)	-.011 (.055)	-.123* (.055)	-.024 (.045)
# EARN	-.450** (.114)	-.199** (.036)	-.355** (.034)	-.289** (.083)	-.105** (.039)	-.021 (.032)
DSBLTY	-.621* (.242)	.078** (.111)	-.679** (.178)	-1.37** (.306)	-.701** (.163)	.744** (.215)
SP WAGE		-.004** (.001)	-.001* (.0004)		-.006** (.001)	-.004** (.001)
SP DSBLTY		.259* (.126)	.073 (.225)		-.206 (.138)	.236 (.182)
SPEDUC		.061** (.018)	.005 (.014)		.049* (.023)	.035* (.015)
#CH<18			.096 (.067)			
AGE YC			.009 (.009)			
ALIMONY			4.87E-6 (6.09E-6)			
# of Obs	370	1624	2635	639	1297	2602
Log-likelihood	-144.68	-875.24	-1345.96	-354.19	-751.00	-1483.22

* significant at .05 level

** significant at .01 level

Standard errors of the coefficients are presented parenthetically beneath the respective coefficient

a A binary variable was utilized to adjust for population density. This location variable is described more fully in footnote 7 on page 37 in Chapter 3.

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