Changes in the Determinants of Female Labour Supply in the US between 1981 and 1992

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Introduction

Interest in the subject of female labour supply has grown since the early 1960s as women's participation in the labour force has increased steadily. Following the seminal work of Jacob Mincer (1962), the classic labour supply model has been developed in two fundamental ways to better accommodate the behaviour of women. First, the model takes into greater account the family as a decision-making unit. Second, the definition of leisure has evolved, such that an individual's time allocation is no longer just a choice between supplying labour or enjoying leisure. To incorporate more realistically women's choices, leisure activities have expanded to include such non-market activities as child rearing and household production. Thus, the classic dichotomy of labour and leisure becomes more complex, implying different substitution elasticities for men and women. A proliferation of studies on the determinants of female labour supply have continued through the 1980s refining certain points of discussion such as measurement error in the form of endogeneity problems (wage measures, children and nonwife income), sample selection bias and the importance of taxes (Mroz, 1987).

The 1980s have proven to be of particular interest regarding women and female labour supply because of the changes that have taken place in the US in wages and wage structure. For both men and women wage dispersion increased during the 1980s. Returns to higher education increased while real earnings for the less educated and lower paid workers declined relative to the same worker a decade earlier (Freeman and Katz, 1995). The most important change for women over this period was the 10 percent

decline in the earnings differential between men and women (the male/female pay gap had until this time remained constant for the past thirty years). Thus wages and returns to education levels, both important determinants in female labour supply, have altered significantly.

This paper attempts to capture the effect of these changes over the 1980s by examining the determinants of female labour supply in the US at two different points in time, 1981 and 1992. We begin with a review of a number of stylized facts about women in the labour force over this century. We then turn to the basic theoretical model of female labour supply, and discuss the econometric specification and estimation procedures of the model. Finally we present the results of the regression analysis and a conclusion.

1. Stylized Facts About Female Labour Supply

1.1 Trends over the Century

The trends in female labour participation rates have been remarkable in their consistent movement upward, particularly in the case of married women. For most western economies, this trend has been most consistent since the 1960's. Table 1 presents the participation rates by age of women in the US. Rates have increased over the century for all age groups, except for women 65 years of age or older. The increases since 1950 have been dramatic - a 127 percent increase in the percentage of working women between the ages of 25 and 44, and a 116 percent increase for women between the ages

Table 1. US Female Civilian Labour Force Participation Rates (in Percent) by Age Over Time

Age(in years)	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	% Change 1950-1990	% Change 1970-1990
14/ 16-19 yrs (a	26.8	28.1	28.4	22.8	18.8	22.5	23.9	35.3	45.7	51.8	130.22%	46.74%
20-24 yrs	32.1	35.5	38.1	42.5	45.1	42.5	44.9	56.3	67.8	71.6	68.47%	27.18%
25-44 yrs	18	21	22.5	25.4	30.2	33	39.1	47.8	64.9	75	127.27%	56.90%
45-64 yrs	14.1	17.1	17.1	18.7	19.8	28.6	41.6	48.2	50.5	62	116.78%	28.63%
>=65	9.1	8.6	8	8	5.9	7.6	10.4	10	8.7	8.7	14.47%	-13.00%
All (b)	20.4	22.8	23.3	24.3	25.4	28.6	34.5	41.6	50.5	57.5	101.05%	38.22%

Source: Killingsworth and Heckman, pg,104; 1990, US Statistical Abstract, US Bureau of the Census, 1995,Table 627.
(a) 14-19 years old (1890-1960) or 16-19 years old (1970 -1990)
(b) Age 14 or older (1890-1960) or age 16 or older (1970-1990)

of 45 and 64. More recently, between 1970 and 1990, the most significant increases have been made by those women between 25 and 44, the time during which most women have finished their education and they embark on careers, as well as marriage and establishing a family. In 1990, 75 percent of women in this age group were working. As Table 2 shows, much of this increase can be attributed to the increase in participation of married women. In 1960, 32 (59) percent of married (single) women worked, whereas that number had increased to 59 (66) percent in 1990. Efforts to explain the postwar increase have pointed to real-wage growth as the primary explanation (Smith and Ward, 1985, p.S89-90), but of course there are many factors that have played a role in this fundamental socio-economic change. Changes in fertility and marital stability certainly have played large roles, as well as changes in contraception technology, education, social security and attitudes toward women's work. It is often difficult to separate cause and effect, for example a woman's decision to have a child is often affected by her decision to participate in the labour force.

This upward trend in participation rates is in marked contrast to the decline in participation rates among men (see Pencavel, 1986). Male labour force participation rates have been declining throughout the century. Since the post-war years, this decline has been particularly evident among men over 45. The decline has been attributed to, in particular, the creation and expansion of social security systems, and an increase in the amount of time spent in school (Ibid., p.9).This difference in trends between men and women could be due to numerous factors, including the fact that women are

Table 2. US Female Participation Rates by Marital Status in the Civilian Labour Force

Year	Single	Married(a)	Other(b)	Total Women	Total Men
1960	58.6	31.9	41.6	31.9	89.2
1970	56.8	40.5	40.3	40.5	86.1
1980	64.4	49.9	43.6	49.8	80.9
1990	66.9	58.4	47.2	58.4	78.2
1992	66.4	59.2	47	59.2	77.6
% Change 1960-1992	13.31%	85.58%	12.98%	85.58%	-13.00%

Source: US Statistical Abstract 1995, Tables 636 and 637; US Bureau of Labor Statistics, Bulletin 2307.
(a) Husband present
(b) Widowed, divorced or separated.
Note: For civilian noninstitutional population 16 years of age and older.

entering the labour force at a later stage and thus the sectors they work in are in less relative decline than those men work in (manufacturing for example). Women may also be more willing to work part-time or have flexible hours.

Weekly hours worked by both men and women have been declining. This has not offset the overall increase in female participation rates, and total weekly labour input growth is still positive (as defined by Owen, 1985). The decline may be explained by the addition within each cohort of women working part-time or "low hours" (Killingsworth and Heckman, 1989, p. 109).

Cumulative years of work experience have increased for all women in the post-war years. Historically, because of commitments to child rearing and home production, women would be more likely to interrupt their work experience, and have less incentives to invest in training and schooling. Recent generations of women however have increased their work experience. "Each cohort [of women] has accumulated more work experience at each stage of the life cycle than the cohort preceding it" (O'Neil and Polachek, 1993 p.211). For working women, the average years of work experience hardly increased or remained the same between 1950 and 1980, which may be explained by their increase in years of education. Working women are on average better educated than the whole population, with one quarter to one half years more schooling than the average for all women (Hill and O'Neil, 1992,p.231).

With regard to the kind of work women are engaged in, that too has shown a dramatic shift. In 1900, 20.2 percent of all women worked in white-collar jobs. In 1980 that number had increased to 66 percent. While this certainly reflects in part the growth of this sector in the economy, the increase experienced by women (224 percent) was still faster than that experienced by men (141 percent). As well, the proportion of women in blue-collar and service jobs declined during this period, whereas the proportion of men in these sectors increased. In 1900, 27.9 (37.6) of all female (male) workers held blue collar jobs, versus 13.8 percent (44.8) in 1980. In the service industry, 35.5 (3.1) percent of all women (male) workers worked in this area, compared to 19.5 percent (8.8) in 1980 (Killingsworth and Heckman, p.114).

Personal characteristics, such as level of education, marital status and fertility rates all have played important roles in women's attachment to the labour force.

Education There has been a dramatic change in the educational attainment levels of women in the last two decades as Table 3 shows. The percentage of women with more than a high school education has increased by over 100 percent, while the number with less than a high school education or just high school education has been in continuous decline.

Marital Status Marital status has varied considerably over time as Table 4 shows. The percentage of women married between the ages of 25 and 29 in 1910 is about the same as the percentage married in 1980. A clear trend has been the delaying of marriage. Women between the ages of 25 and 29 have progressively delayed

Table 3. Educational Attainment Level of the Female Civilian Labor Force (percent distribution)

Year	Less than high school	High school graduate	1 to 3 years post-secondary	4 years or more
1970	33.5	44.3	10.9	11.2
1980	18.4	45.4	17.4	18.7
1990	11.3	42.4	21.9	24.5
1991	10.9	41.6	22.2	25.2
%Change 1970-1991	-67.46%	-6.09%	103.67%	125.00%

Source: US Statistical Abstract, 1995, Table 629; US Bureau of Labor Statistics, Bulletin, 2307.
Note: For civilian noninstitutional population 25 to 64 years of age.

Table 4. Marital Status of women ages 25 to 29 by year, in percent

Year	Never married	Currently Married	Other
1910	24.9	71.8	2.8
1930	21.7	75.3	3.8
1940	22.8	74.1	3.1
1950	13.3	83.3	3.4
1960	10.5	86.2	3.3
1970	12.2	82.5	5.4
1980	20.8	70.3	9.9
% Change, 1950-1980	56.39%	-15.61%	191.18%

Source: Killingsworth and Heckman, p,121.

marriage such that 13 percent of this age group was not married in 1950, compared to 21 percent in 1980. The change is most pronounced in the more recent decades. In 1973 only 12 percent of women between 25 and 29 had never married. That number increased to 28 percent in 1987 (Hill and O'Neil, 1992,p.232). There has also been a clear upward trend in the "other" category, containing mostly divorced women.

Fertility Finally, with regard to fertility, overall fertility rates have declined. By the ages of 35 to 39, white women in 1967 had on average three children. That number dropped to two by 1983. Likewise, the percentage of women choosing not to have children has increased. Ten percent of white women between the ages of 35-39 were childless in 1967, whereas in 1983 that number increased to 16 percent (Ibid., p.235).

1.2 Trends During the 1980s

The 1980s have proven to be a significant decade in terms of changes in the US wage structure. Wage structure refers to the span of prices set for different labour market skills (measured or unmeasured), and the rents received for employment in certain sectors of the economy (Blau and Kahn, 1994, p.106). A number of important trends have been identified, which have implications for female labour supply. The following points, outlined by Freeman and Katz (1995), highlight the major findings:

1) Overall wage dispersion in the US increased during the 1980s. The hourly earnings of a full-time worker in the ninetieth percentile of the US earnings distribution

relative to someone in the tenth percentile increased by 20 percent for men and 25 percent for women between 1979 and 1989. Because this trend has held for both men and women, it suggests that the same set of factors affect the wages of men and women in a similar way (Blau and Kahn, 1994).

2) Pay differentials by education and age increased, such that the college to high school wage premium doubled for young workers, and, among workers without a college degree, older workers' wages rose relative to younger workers.

3) The earnings differential between men and women decreased by 10 percent in all education and age categories, leading to a decline in the male/female pay gap, the first significant change in the past thirty years.

4) Wage dispersion increased within demographic and skill groups. Greater wage differentials for "similar" workers across establishments emerged. Educational qualifications were more important in 1990 than in the past.

5) Real earnings for less educated and lower paid workers declined relative to the same worker a decade before.

These trends have been particulalry important for working women. The increase in inequality as well as the rewarding of skills that have occurred in the US labour market

place a large penalty on those with lower levels of market skills (both measured and unmeasured). Given that women tend to be in the lower half of the skills distribution, they have been "swimming upstream" in order for the male to female earnings differential to decline. Women`s relative skills and treatment (i.e. labour market discrimination) must improve just for the pay gap to stay constant. Blau and Kahn (1994) show that over the period 1971-1988, rising US wage inequality *reduced* the potential convergence in the gender pay gap by approximately one-fourth. Despite this, there was significant convergence in the gender pay gap in the 1980s, with women's earnings rising from 59.7 percent of men's to 71.6 percent in 1990 (based on annual earnings of full-time year-round workers aged 16 and older, Hill and O'Neil, 1992,p. 215). The ratio had been virtually constant between 1950 and 1980.

This decline in the wage gap has been explained by numerous factors, as outlined in Blau and Kahn, 1994, and O'Neil and Polachek, 1993. In the first study, examining the 1975 to 1987 period, the authors find that measured characteristics account for over 90 percent of the decrease in the male to female pay gap. An increase in work experience accounts for about half of the decrease, while an increase in the level of occupations held relative to men's accounts for another 30 percent. The authors also point to deunionization as a positive factor in the convergence, given that unions benefit men more than women. All of these factors have countered the positive effects on men's earnings of the return to experience, changes in industry wage effects and increases in the union premium. The second study, which looks at approximately the same period,

finds that increases in women's work experience and schooling are important factors, as well as the returns to these factors. The decline in the relative earnings of blue-collar workers has also had an effect on the convergence of male/ female earnings since men make up a larger proportion of these workers.

Other explanations for the decrease in the gender pay gap have turned to changes in supply and demand and industrial and occupational make-up. Katz and Murphy (1992) find that women with less than a college education benefited more than men of the same educational level from shifts in demand for output across industry-occupation cells between 1979 and 1987. In contrast, men with college educations were favoured over women. Overall, demand shifts are thought to have benefited women more than men. In another study (Blau and Kahn, 1993), the authors find that shifts in occupational and industrial composition, as in the decline in manufacturing and blue-collar jobs, have benefited women, as has the decline in unionization. These favourable changes in demand are contrasted by the increase in supply of female workers, leaving the net effect of supply and demand shifts undetermined.

2. The Evolution of the Female Labour Supply Model

2.1 The Theory of Labour Supply

The model of female labour supply has evolved out of the modern theory of labour supply which began with the work of Robbins (1930). In that classic model, individuals

maximize their utility with the following utility function:

$$U = U(L, C)$$

where L represents leisure and C represents a composite consumption good. The amount of labour individuals are willing to supply is dependent upon the intersection of their reservation wage, or the price of their "leisure", and the offered wage, with which they can consume more goods. There are two opposing forces at play: an increase in the real wage makes leisure more expensive leading to an increase in the number of hours worked (the substitution effect). But for a given number of hours of work, an increase in the real wage may lead the individual to decrease the number of hours worked because they can now consume more goods including leisure (income effect). Whether the substitution effect or the income effect dominates cannot be predetermined.

Empirical studies of labour supply between 1935 and 1960 determined an inverse relationship between hours worked and wage rates for male workers, creating a "backward-bending" labour supply curve (Pencavel, 1986). Thus as wages increase, hours of work decrease, inferring a dominant negative income effect over a positive substitution effect. This evidence was consistent with a number of trends such as the decline in the length of the work week and the decline in male labour force participation rates (Mincer, 1993, p.ix).

However, this pattern of declining participation rates in male labour supply has not repeated itself in the case of female labour supply. Women's participation rates have increased over time, particularly for those who are married. Even as real family income increased, women continued to enter the labour force, rejecting the prevailing assumption of a dominating negative income effect.

The seminal work which attempted to better explain this trend in female labour supply was Jacob Mincer's article, "Labor-force participation of married women: a study of labor supply"(1962). Mincer replaced the model of the individual decision unit by a more realistic representation of decision making in the case of families by using the household as the decision unit, where income is pooled. In addition, the classic leisure-work dichotomy was replaced and the representation of time allocation adjusted. While traditionally time is divided between work and leisure, the model for women created a richer distinction between market-work and leisure, including leisure as one of many non-market work activities, such as household work, child rearing, and education.

In Mincer's model, the household maximizes its utility based on the two factors, L, leisure and C, a consumption good, where the leisure of each member of the household depends on their allocation of time between market and non-market activities, and consumption represents family consumption:

$U=U(L_1...L_m, C)$

where $L_1 \ldots L_m$ represents the leisure of each members of the household, and C is family consumption. This is subject to the family's budget constraint which is the sum of all non-earned income, R and earned income W*H, market wages times hours worked :

$$PC <= R + \sum W_i H_i$$

where P is the price of one unit of the composite good, times C, the family's consumption of a composite consumer good. While the total family income variable is common to every member of the household, each member has a separate labour supply function based on the individual's market wages W_i and the "price"of their non-market activities, L_i. Thus the labour supply function for each family member is a function of the individual wage rate and total family income, allowing for the estimation of individual income and substitution effects.

Studies of female labour supply since the late 1950s (Long, 1958, Mincer, 1962, Cain, 1966, O'Neil, 1981, Hill, 1983) have concentrated on attempting to separate the measurement of income from substitution effects (Pencavel, 1986,p.11). These studies have found a dominating substitution effect for women, exceeding the negative income effect found for men (Mincer, 1993, pg.xi). This has been explained in part by the differences in and substitutability of non-market activities for women compared to

men. Whereas men's choices outside of market-work are traditionally strictly leisure, women's alternatives include household production, which is a much more substitutable good than leisure. Rather than take care of the children at home, a mother can choose to send her children to day care. Also the improvement in household appliances can replace the time spent on domestic work. As discussed above, other changes in social trends such as fertility and marital status certainly have also played a role in the women's decisions between market-work and non-market activities.

Family labour supply models have evolved since Mincer's seminal work into three general classes of labour supply models: individual, sequential and simultaneous. In individual models, the wage information of the husband is incorporated in the nonlabour income of the wife. In sequential models, the labour supply decision of the husband precedes the labour supply decision of the wife, and finally in simultaneous labour supply models, the labour supply decision of both husband and wife are determined at the same time. The following presents a simple model of female labour supply within a family context, in which the woman's decision to work is made simultaneously with her husband's decision to work. Each member of the family has a distinct utility function but shares the same budget constraint. If the leisure of the wife and husband are considered complements, then the cross-substitution effects on their leisure is positive, leading to a decline in labour supply. If their leisure is substitutable, then the effect on their labour supply in unclear (Attalah, 1996,p.7).

2.2 A Theoretical Model of Female Labour Supply

The woman's utility function is:

$$U = U(L, C), \quad U' > 0, U'' < 0 \qquad (1)$$

where L is the woman's leisure and C is the family composite consumption good. While the woman maximizes her own utility function, changes in the wages of other family members affect her behaviour since it is assumed that all income is pooled. Thus an increase in the husband's income could have an indirect income effect on the woman's labour supply (Killingsworth and Heckman, 1986).

This maximization is subject to budget and time constraints. The budget constraint is:

$$PC <= WH + Y \qquad (2)$$

where P is the price of the composite good, Y is family income other than the woman's earnings (husband's earnings, income from wealth such as rents, dividends etc.), and WH represents the woman's earnings (wage times hours worked). The price of the composite good is normalized to one. The time constraint, in which time is allocated between working hours, H, and non-market activities, L, is ;

$$T=H + L, \qquad (3)$$

where T equals total available time. To maximize the individual's utility, subject to budget and time constraints, we write the Lagrangian equation for utility maximization:

$$\Psi = U(L, C) - \lambda \{PC - WH - Y\} - \mu \{T - H - L\} \quad (4)$$

where λ and μ are the Lagrange multipliers which may be interpreted as the marginal utility of income and time respectively. The Kuhn -Tucker conditions for maximization are :

$$\delta\Psi / \delta C = U_C - \lambda P <= 0 \quad (5)$$

$$\delta\Psi / \delta L = U_L - \mu <= 0 \quad (6)$$

$$\delta\Psi / \delta H = \lambda W - \mu <= 0 \quad (7)$$

$$\delta\Psi / \delta\lambda = PC - WH - Y = 0 \quad (8)$$

$$\delta\Psi / \delta \mu = T-H-L = 0 \quad (9)$$

U_C and U_L are the marginal utilities of goods and leisure respectively. Solving for equations (6) and (7) , we find that if the woman finds it optimal to work , then these

equations will hold as equalities.

from (6) , $U_L = \mu$

from (7) , $\lambda W = \mu$

thus $U_L = \lambda W$, or $U_L/\lambda = W$. (10)

The woman's marginal rate of substitution between leisure and goods equals the wage she receives in the market place. If the wife does not work , then (7) holds as an inequality and

from (7) , $W < \mu / \lambda$

thus $W < \mu / \lambda = W_R$ (11)

where W_R is the wife's reservation wage, or the shadow price of time at zero hours of work. In this case, the marginal rate of substitution between leisure and goods exceeds the market wage and the woman will choose not to enter the labour force.

3. An Empirical Model of Female Labour Supply: Econometric Specifications

From the utility maximization problem outlined above, we use an empirical model with which to estimate the labour supply function. As outlined in Mroz (1987) , there are many variations to the standard model, all of which can be obtained by maximizing an explicit utility function. Presented here is the standard two-step procedure, which involves estimating both the participation and hours of work decision. The former is categorical in nature and the dependent variable P is either one for participating, or zero for non-participating. The latter is continuous in nature where the dependent variable H represents hours of work supplied. The first step estimates the participation equation using a maximum likelihood probit for the whole sample. The probit essentially tests the effect of each variable on the probability that the woman participates in the labour force. The second step estimates the hours of work supplied using the Ordinary Least Squares (OLS) estimator for the sub-sample of working women in the population.

3.1 The Labour Force Participation Equation and the Labour Supply Equation

As stated above, the labour force participation equation is tested using a maximum likelihood probit. The dependent variable, P, is a discrete variable that falls within the interval [0,1] such that :

P = 1 if participation in the labour force;
0 otherwise;

The labour force participation equation is :

$$P = \theta_1 Z + \theta_2 \ln (W) + \theta_3 V + \mu \qquad (12)$$

where the vector Z contains the following variables :

Z_1 = age

Z_2 = level of education (where < 12 = less than high school, 12 = high school, 13-15 = post-secondary, 16+ = university)

Z_3 = 1 if married, 0 otherwise ;

Z_4 = number of children under 6 ; if no children = 0 ;

Z_5 = number of children between the ages of 6 and 17 ; if no children =0 ;

Z_6 = 1 if Black, 0 if other ;

Z_7 =1 if Hispanic,0 if other ;

Z_8 = 1 if living in a city; 0 if other ;

ln W is the woman's market wage;

V is a vector of income variables ;

V_1 = husband's employment income ;

V_2 = non-earned private income (dividends, interest, rent, child support,

alimony)

and μ is the error term, representing unobserved determinants.

The hours of work equation for working women is the following:

$$H = \theta_1 Q + \theta_2 \ln (W) + \theta_3 V + \eta \qquad (13)$$

in which the variables included in the vector Q are three age categories, the number of children under six and the number of children ages 6 to 17. The ln W is the market wage. Finally the variables in the vector V are the husband's income and other non-earned income. The error term is represented by η.

A critical independent variable in the labour force participation equation is W, women's wages. Before estimations of this equation can proceed, W*, the predicted wage for the entire sample must be computed to avoid problems of selection bias. The following explains the procedure for the calculation.

3.2 Selection Bias

Before the coefficients in the participation equation can be estimated, there is one supporting equation that must be estimated beforehand, which is the wage equation. The wage equation is:

$$\ln W = \beta X + \lambda + \varepsilon \qquad (14)$$

where lnW is the logarithm of the market wage. The log wage is used in order to express absolute differences in percentage differences. X is a vector of observable characteristics which includes the level of education of the woman, her work experience, whether she lives in a city, and whether she is Black or Hispanic. Lambda is the correction term or the inverse Mill's ratio (explained below), and ε is the error term.

The estimation of women's wages presents certain methodological issues which arise whenever a high percentage of one group does not participate relative to another group (for example, women relative to men). Wages for women are only observed for those who are participating in the labour force. The wage for those not participating, while not observed, would not necessarily equal zero if they did participate. The women who are not participating have a reservation wage, W_R, which must be higher than the W observed on the market. Because W, the observed market wage, is below W_R , the reservation wage, the reservation wage should be taken into account in the estimations. If not, the wage W* computed from working women will not represent a random selection from the whole population, thus the parameter estimates will be biased because the distribution of the error term is truncated. This problem, in which data are

missing on the dependent variable (rather than the problem of omitted explanatory variables) is called sample selection bias. To perform regressions on such a sample leads to regression coefficients that confuse the structural parameters of the regression with the parameters of the function that determine the probability that an observation is part of the biased sample. To correct for this, it is assumed that the missing data and the available data come from a common probability distribution, that is, normal (Heckman, 1980, p.206). A wage is imputed for the non-working female population. A wage equation for the working population is estimated (Mincer, 1974) and a predicted wage for non-working women is calculated by including a Heckman correction term, λ, (inverse Mills ratio) (Heckman, 1974) as a regressor in the wage equation.

The lambda is the ratio of the ordinate of a standard normal density to the tail area of the distribution. While the value λ is not known, it can be estimated. This requires estimating a reduced form labour participation function in which the actual wage is replaced by its determinants (instrumental variables). Using the estimated parameters, lambda is computed for each woman. This value is then included as a regressor in the wage equation for working women, thus correcting for selection bias.

3.3 The Reduced Form Labour Participation Equation

The reduced form labour participation equation contains all of the variables listed above in equation (12) in section 3.1. Once again, that equation is :

$$P = \theta_1 Z + \theta_2 \ln (W) + \theta_3 V + \mu \qquad (12)$$

However, the actual wage rate is replaced by its determinants. Once a value for lambda (λ) has been computed from this regression, we then include lambda in the estimation of the wage equation which will yield W*.

Once W*, the predicted wage, has been computed, it can then be incorporated as a regressor in the structural labour force participation equation, which is :

$$P = \theta_1 Z + \theta_2 \ln (W^*) + \theta_3 V + \mu \qquad (15)$$

where the vector Z includes the variables age, the number of children under six and the number between six and 17. The vector V includes as variables husband's income and other non-earned income.

The labour supply or hours worked equation is :

$$H = \theta_1 Q + \theta_2 \ln (W) + \theta_3 V + \eta \qquad (16)$$

the variables of which have been stated above. This equation is only estimated for women who work.

4. Description of the Data

The data is based on US Current Population Surveys of March, 1981 and March, 1992. The data contains observations on individuals of all ages, but only women between the ages of 16 to 64 are used for the analysis. The 1981 sample size is 59,518, while the sample size for 1992 is 50,600 (the number of cases in the surveys have been declining from 114,000 in 1980 to 100,000 in 1990). A few points should be made about some of the variables used in the analysis. Wages and salaries earned, as well as weeks worked and hours worked per week, are based on the previous year (i.e., 1980 and 1991). Other income includes dividends, interest, rent, other income, and child support and alimony. Experience is used as a proxy for the woman's potential labour force experience. The calculation used here is the age of the woman minus the number of years of education minus 6, the age at which most start school. This is obviously imprecise since it assumes that there are no periods of unemployment or breaks for child rearing. Urban living environment refers to those living in a standard metropolitan statistical area (SMSA) that is either a central city or a non-central city. The participation rate includes anyone who earned an amount greater than zero in the past year.

5. Descriptive Statistics and Estimations

5.1 Descriptive Statistics

Before discussing the results of the regressions, some points regarding the means of the two data sets should be highlighted. Once again, the means presented in Table 5 are based on data sets comprising women in the US between the ages of 16 and 64, for the two years, 1981 and 1992. Over the decade in question the average age of the female population has become older by one year, from 36 to 37 and there are less young women (ages 16 to 24) as a percentage of the population (from 25% to 19%). In contrast, the number of women between the ages of 35-44 has increased by seven percentage points. Fewer women are married in 1992 than in 1981 - a decline from 61 percent to 58 percent of the female population, and family size has remained relatively stable at three members to a family, though the number has decreased slightly. This may be accounted for in the slight decrease in the number of children between the ages of six and 18. There has been a slight increase in the number of women living in an urban environment, from 53 to 58 percent. Blacks and Hispanics represent more of the population from 19% in 1981 to 24% in 1992, mostly representing an increase in the Hispanic population from nine to 13 percent. The percentage of black women has remained relatively constant at 10 to 11 percent.

Some of the more interesting changes to take place over the decade concern education,

Table 5. Demographic and Economic Variables

Variable	1981	1981 $ in 1991$	1992	%Change
Mean age of female population	36.5		37.5	2.74%
Percentage of population that is:				
16-24 years of age	25%		19%	
25-34 years of age	26%		26%	
35-44 years of age	18%		25%	
45-64 years of age	31%		30%	
Percentage married	61%		58%	
Nunber of members in family	3.35		3.1	
Number of children under 18	1.06		0.94	
Number of children under 6	0.29		0.29	
Mean years of education	11.96		12.42	3.85%
Percentage of population that has:				
Less than high school	28%		18%	
High School	43%		38%	
Post-secondary (1to3yrs)	17%		26%	
University	13%		18%	
Percentage living in urban environme	53%		58%	
Percentage of pop. that are black	10%		11%	
Percentage of pop. that is Hispanic	9%		13%	
Work				
Mean years of potential experience	18.5		18.95	2.43%
Women's average weeks				
worked in the last year	40.42		43.68	8.07%
Hours worked per week	34.36		35.59	3.58%
Annual Earnings	7668.18	12674.73	15958.06	25.90%
Hourly wage	5.52 $	9.12 $	10.27 $	12.56%
Men's average weeks				
worked in the last year	43.83		45.55	3.92%
Hours worked per week	40.2		41.51	3.26%
Annual Earnings	15474.40	25577.64	25946.66	1.44%
Hourly Wage	8.78 $	14.52 $	13.72 $	-5.47%
Total household income	22996.88	38011.54	40343.77	6.14%
Income other than earnings	1455.47	2405.75	3040.89	26.40%
Alimony or child support	1937.80	3202.99	3407.71	6.39%
Participating in labour force	63.60%		69.00%	

Note: Means calculated for women's and men's average weeks worked, hours worked per week and annual earnings use only non-zero observations. The same holds for income other than earnings and alimony and child support.

work, and income. Women have become more educated over the eleven-year period in question (the following numbers will differ slightly from those presented in Table 3 because they contain women between the ages of 16 and 64, not 25 and 64). The percentage of women with less than a high school education has dropped by 10 percentage points (from 28% to 18%, a decrease of 36 percent), while the number of women with more than a high school education has increased by 14 percentage points. The number of women with post-secondary training of one to three years increased a dramatic 53 percent (17 to 26 percent), while the number of women with a university degree or more increased by 39 percent (from 13 to 18 percent). As of 1992, 44 percent of the female population had more than a high school education.

Years of potential work experience for the sample have increased slightly (by 2.4%) to 18.95 years. As discussed before, years of work experience have not increased dramatically in recent decades because women have spent more time in school. For those women working, the decade saw an increase in both the average number of weeks worked and the hours worked per week. Compared to working men in 1992, women worked two weeks less per annum, and six hours less per week. However, when one looks at earnings patterns, there is an interesting change in trends. While for women, real annual earnings over the decade increased by 26 percent and hourly wages by 13 percent, for men, there was very little increase in annual earnings (1.4 percent) and a *decrease* in hourly wages (by 5.5 percent). Even with an increase in average weeks

worked and hours worked per week, men experienced an overall decrease in per hour earnings while annual earnings were flat. As discussed in Part 1, there are numerous explanations for this trend, including the decline in blue-collar jobs and the trend toward deunionization.

Total household income for women increased in real terms by six percent to $40,343, which included on average, income other than earnings of $3,040 (up by 15 percent since 1981), and alimony or child support (or both) of on average $3,407 (up by six percent).

Finally, the total labour participation rate for women increased five percentage points from 64% to 69% (an increase of 8.5 percent).

We now turn to the empirical results of the regressions. The results of 1981 are presented first in full to show the complete two-step procedure. The 1992 results are then presented in comparison with those of 1981, to allow for easier comparison of the two years.

5.2 Empirical Results, 1981

5.2.1 Reduced Form Labour Force Participation Function and the Market Wage Equation

The 1981 reduced form labour force participation function and the market wage function are presented in Table 6. The reduced form probit contains all of the market wage determining variables as laid out by Mroz (1987) as well as the variables important to the woman's reservation wage such as the husband's income, the presence of children and other outside income. The coefficients for the reduced form probit exhibit on the whole the expected signs. Regarding age groups, the 25 to 34 years of age variable is positive and significant at a ten percent confidence interval. The coefficients for the two other age categories are negative and significant, suggesting that as women age, they are less likely to work, most probably due to the combined effects of family responsibility and increased household incomes. All the education variables show positive signs, and the coefficient increases in magnitude with the higher level of education (0.5303 for high school, 0.6533 for post-secondary, and 0.85 for university). As mentioned earlier, higher educated women are more likely to work. The urban environment variable is negative but statistically insignificant. Being married has the expected negative sign as does husband's income and other household income, though the effect of the latter two variables is slight. With respect to children, their presence decreases the probability of a woman working, but there is a greater

Table 6. Reduced Labour Force Participation Probit and Log Wage Equation, 1981

Variable	Probit Coefficient	p-value	Log Wage Coefficient	p-value
Intercept	0.5378	0.0001	1.4467	0.0001
Age 25-34	0.0703	0.0001		
Age 35-44	-0.0893	0.00001		
Age 45+	-0.5830	0.0001		
Experience			0.0264	0.0001
Experience Squared			-0.0005	0.0001
High School Education	0.5303	0.0001	0.1885	0.0001
Post-Secondary (1to3 yrs)	0.6533	0.0001	0.3114	0.0001
University	0.8456	0.0001	0.5315	0.0001
Married	-0.2240	0.0001		
Urban	-0.0124	0.272	0.1203	0.0001
Husband's Income	-3.03E-06	0.0001		
Other Income	-0.00001	0.0001		
Children under 6	-0.4035	0.0001		
Children between 6 and 18	-0.1184	0.0001		
Black	-0.1003	0.0001	-0.0438	0.0001
Hispanic	-0.0621	0.0001	-0.0363	0.0001
Lambda			0.0045	0.0001
R2			0.1750	
Number of Observations	59518		36854	

negative effect in the case of pre-schoolers than in the presence of 6 to 18 year olds. Finally, being Black or Hispanic has a negative impact on the probability of working, (a greater effect in the case of being Black). This may reflect the fact that Blacks and Hispanics are relatively concentrated in the lower end of the skill distribution in the US and thus are in the lower half of the wage distribution (see Juhn, Murphy and Pierce, 1993, pg 413.).

5.2.2 The Wage Equation

The log wage equation includes the classic variables used in Mincer (1974) to determine the effects of human capital on earnings : experience, experience squared and education. Also added to the regression are the dichotomous variables of Black, Hispanic and urban living environment. Experience ideally measures the amount of market experience the woman has and is an imprecise measurement, given that it assumes no periods where one is either studying or working. As is shown on the right side of Table 6, the education variables all have a positive effect on wages, and are statistically significant. In addition, the coefficient for the education levels increases with each level from 0.189 for high school, .311 for post-secondary education, and 0.531 for university level. Experience is also positive and significant, while experience squared has a negative effect on wages, which implies that earnings rise at a decreasing rate with experience.

Living in an urban area has a positive effect on wages, which may reflect the higher level of economic activity in urban areas. The two variables Black and Hispanic are negative and significant reflecting, as stated before, the lower economic status held by these minority groups. Finally, the coefficient of lambda is found to be significant which points to the importance of selection bias in the sample. The fact that it is positive means that the women who are more productive in the market are those found in the working sample (Malathy, 1991, p54). All of the variables together explain about 18 percent of the variation in the dependent variable, with an R^2 at .175. This is just slightly lower than the average of nine studies on married women's labour supply in the US (0.19) summarised in Mroz (1987).

5.2.3 Structural Form Labour Force Participation Probit and Hours of Work Equation

In Table 7 we turn to the structural form labour force participation probit and the hours of work per week equation for 1981. The predicted hourly wage computed from the wage equation has been incorporated into the econometric specifications of the structural labour force participation equation. Wages have a positive and significant effect on participation. Thus women are more likely to participate in market work if their wage offer increases, other things remaining the same. Other than wages, all other variables are negative and significant. All of the age groups have a negative effect on labour force participation, and the effect increases with each age variable, which could again be related to the increase in women's child-care responsibilities and household income. Being married has a negative impact on participation as does the presence of

Table 7. Structural Labour Force Participation Probit and Log Hours of Work Equation, 1981

Variable	Probit Coefficient	p-value	Log Hours Coefficient	p-value
Intercept	-1.8327	0.0001	3.2505	0.0001
Predicted Wage	1.5221	0.0001		
Wage			-0.0218	0.0001
Age 25-34	-0.1740	0.0001	0.1987	0.0001
Age 35-44	-0.5030	0.0001	0.2523	0.0001
Age 45+	-0.9788	0.0001	0.2280	0.0001
Married	-0.1673	0.0001	0.0620	0.0001
Children under 6	-0.3865	0.0001	-0.0195	0.0011
Children between 6 and 18	-0.1221	0.0001	-0.0577	0.0001
Husband's Income	-3.95E-06	0.0001	-0.000003	0.0001
Other Income	-0.000013	0.0001	-0.000003	0.0001
Lambda			0.0108	0.0001
R2			0.0731	
Number of Observations	59518		36854	

children, particularly younger children. Husband's income, as well as other income, has as expected a negative but very small impact on labour force participation.

Turning to the hours of work per week supplied, we find that wages have a negative and significant effect on the marginal hour of work supplied by working women, suggesting that women are not motivated to work solely by financial compensation. The age categories, all positive and significant, suggest that being between the ages of 35 and 44 has a greater effect on working more hours, than being a member of either the younger or older age categories (which may be more involved with schooling, family, or have higher incomes). The presence of children has a negative effect, more so in the case of adolescents, which may be explained by the need for greater adult presence as children enter the primary school years. Interestingly, being married has a positive effect on the marginal hour of work supplied, which could reflect the possible division of household labour that comes with being two in a household. However, the married coefficient is less than the combined effect of the presence of children, which suggests that the division of labour in a household without children may change when children come onto the scene. Women reduce their hours worked as husband`s income and other household income increase, though the effect is very small. Finally, lambda is positive and significant meaning that the women who are more productive in the market are those in the working sample. The R^2 is .07 which underlines the limited explanatory power of this model with regard to why working women supply more labour.

5.3 A Comparison of the 1981 Empirical Results with 1992

5.3.1 The Log Wage Equation

To compute lambda, the correction term, for the 1992 wage equation, a reduced form participation probit is once again used (see the Appendix). The results produce the same signs as those generated with the 1981 data and all of the variables are significant (including the variable urban). Table 8 presents a comparison of the log wage coefficient estimates for 1981 and 1992. All of the coefficients are significant. The most interesting results of the comparison between the two years involve the coefficients for the various levels of education. All of the coefficients increased in 1992, and increased relative to the level of education. The coefficient for high school education increased from 0.189 to 0.225 (19 percent), while that for post-secondary education increased from 0.311 to 0.389 (25 percent). For a university degree or higher, the effect was even greater, with an increase from 0.531 to 0.731(a 38 percent change).

The effect of experience on wages has also increased over the period from 0.026 to 0.036 (39 percent). As discussed earlier, women's work experience is increasing relative to men's. The positive effect on wages of living in an urban environment has increased, while the negative effect of being Black or of Hispanic origin has increased as well, much more so for Hispanics than for Blacks. These statistics capture the decline in real earnings for the least skilled in the face of rising skill prices. The dramatic

Table 8. Log Wage Coefficient Estimates 1981 and 1992

	1981		1992	
Variable	**Coefficient**	**p-value**	**Coefficient**	**p-value**
Intercept	1.4467	0.0001	1.2383	0.0001
High School Education	0.1885	0.0001	0.2254	0.0001
Post-Secondary (1to3 yr)	0.3114	0.0001	0.3897	0.0001
University	0.5315	0.0001	0.7309	0.0001
Experience	0.0264	0.0001	0.0360	0.0001
Experience Squared	-0.0005	0.0001	-0.0006	0.0001
Urban	0.1203	0.0001	0.1686	0.0001
Black	-0.0438	0.0001	-0.0621	0.0001
Hispanic	-0.0363	0.0001	-0.0887	0.0001
Lambda	0.0045	0.0001	0.0026	0.0001
R2	0.1750		0.2370	
Number of Observations	36854		34480	

negative effect on earnings for Hispanics may reflect this rise rather than a decline in skills among entering cohorts of immigrants (Juhn et al., 1993, pg. 413). The R^2 increased from 0.18 in the 1980 sample to 0.24 in the 1992 sample.

5.3.2 Oaxaca Decomposition

A logical question to ask regarding the changes in the mean wages between 1980 and 1991 to what extent the differences are due to changes in the personal characteristics of women, or due to a variation in the returns to these characteristics. Understanding the reasons behind the changes in wages can shed light on why women decide to participate in the labour force.

A Oaxaca decomposition (Oaxaca, 1973), usually used in measuring labour market discrimination, examines the differences between the two years in the mean values of the independent variables (Xs) at 1992 "prices" ($\beta 92$), and the price differences (βs) at the mean value of 1981 characteristics (X81). The equation is the following:

$$\ln W92 - \ln W81 = \beta 92(X92-X81) + X81(\beta 92-\beta 81)$$

The first term on the right hand side assigns to the differences in individual characteristics between 1992 and 1981, the returns, or prices, for those variables in 1992. The second term looks at the differences in returns between 1992 and 1981 and

assigns them the individual characteristics present in 1981. Thus the sum of each of the terms expresses the difference in log points between the wage equations due to Xs and the βs, respectively. Table 9a presents a decomposition of the wage functions for 1981 and 1992 (Table 9b contains the back-up calculations). The decomposition, found in the summation line, shows that .117 log points of the difference in wages is explained by changes in individual characteristics, while -.028 log points is explained by the returns to those individual characteristics. Looking more closely at the breakdown in these differences, we find that the changes in individual characteristics, (the Xs), are related to increases in human capital investments in the form of higher education levels (the percentage change in means of post-secondary education is 50 percent, while for that of university education is 39 percent). The overall negative effect of the changes in the coefficients (βs) reflect the decline in the rate of returns to experienced squared and being Hispanic, which overshadow the relative increase in returns for higher levels of education. In addition, the overall effect of lambda is negative, suggesting that changing sample selection has a negative effect on wage growth. This fits with the fact that women's participation rates have increased over the two years in question, meaning the sample of working women is, in effect, less select than it used to be. Thus, wage growth can largely be attributed to the increase in women's post-secondary education levels, and secondarily, to the returns to that education. Hispanics have been particularly negatively affected by the rise in the returns to skills. As mentioned earlier, the decline in relative earnings is not necessarily related to a decline in the skills among

Table 9a. Oaxaca Decomposition

Lwage92-Lwage81= 0.0529
W92-W81 = B92(X92-X81) + X81(B92-B81)

Variable	**B92(X92-X81)**	**X81(B92-B81)**	**Sum**
Intercept	0	-0.2083	-0.2083
Experience	0.0422	0.1584	0.2006
Exp. Squared	-0.0042	-0.0766	-0.0808
Completed high school	-0.0161	0.0165	0.0004
Some post-secondary	0.0380	0.0152	0.0532
University or more	0.0441	0.0309	0.0750
Urban	0.0077	0.0258	0.0336
Black	-0.0004	0.0352	0.0347
Hispanic	-0.0023	-0.0042	-0.0065
Lambda	0.0082	-0.0212	-0.0130
Sum	0.1172	-0.0284	0.0888

Table 9b. Oaxaca Decomposition

Variable	Mean 92	Coeff. 92	X92*B92	Mean 81	Coeff.81	X81*B81
Lwage	2.0660			2.0131		
Intercept	1	1.2383	1.2383	1.0000	1.4467	1.4467
Experience	17.5660	0.0360	0.6330	16.3937	0.0264	0.4324
Exp. Squared	454.6771	-0.0006	-0.2824	447.8486	-0.0005	-0.2015
Completed high school	0.3761	0.2254	0.0848	0.4475	0.1885	0.0844
Some post-secondary	0.2917	0.3897	0.1137	0.1943	0.3114	0.0605
University or more	0.2155	0.7309	0.1575	0.1551	0.5315	0.0824
Urban	0.5810	0.1686	0.0980	0.5351	0.1203	0.0644
Black	0.1002	-0.0621	-0.0062	0.0936	-0.4377	-0.0410
Hispanic	0.1065	-0.0887	-0.0095	0.0810	-0.0363	-0.0029
Lambda	14.5080	0.0026	0.0379	11.3749	0.0045	0.0509
Sum	474.9141	2.6402	2.0650	478.1237	2.1547	1.9762

Note: Differences between the mean log wage (19 92 : 2.0660; 1981: 2.0131) and the mean estimated wage (1992: 2.0650; 1981: 1.9762) are due to rounding errors.

entering cohorts of Hispanic immigrants.

5.3.3 Structural Labour Force Participation Probit and the Hours Worked Equation

The estimations from the structural labour force participation probit are presented in Table 10 for 1981 and 1992. The 1992 estimations differ from 1981 only in their smaller effect. All of the variables are significant. The effect of the predicted wage has weakened from 1.522 to 1.272. The three age categories as well as the variables considered important to the woman's reservation wage (married, children, husband's income and other income) all have a lesser negative effect on the probability of a woman working. In the case of the husband's income and other income, the coefficients are extremely small and have a very slight effect. No one reason could explain this overall decline in effect, but one could posit that the increase in real wages for women, greater substitution of leisure in the form of household production for work, and general changes in attitudes and expectations could all play a role.

Finally, in Table 11, the results of the regression on the log hours of work supplied are presented for the two years. All of the coefficients are significant and differ in sign for only one variable, wages. While the wage variable had a negative effect on the hours worked in 1981, in 1992 is has a positive effect. Clearly, women are substituting work for leisure, which is perhaps a reflection of the changing economic environment over

Table 10. Structural Labour Force Participation Probit, 1981 and 1992

	1981		1992	
Variable	**Coefficient**	**p-value**	**Coefficient**	**p-value**
Intercept	-1.833	0.0001	-1.3610	0.0001
Predicted Wage	1.52208	0.0001	1.2722	0.0001
Age 25-34	-0.17403	0.0595	-0.0881	0.0001
Age 35-44	-0.503	0.0001	-0.3883	0.0001
Age 45+	-0.9788	0.0001	-0.9015	0.0001
Married	-0.1673	0.0001	-0.0684	0.0001
Children under 6	-0.3865	0.0001	-0.3807	0.0001
Children between 6 and 18	-0.1221	0.0001	-0.1097	0.0001
Husbands Income	-3.95E-06	0.0001	-1.63E-06	0.0001
Other Income	-0.000013	0.0001	-8.74E-06	0.0001
Number of Observations	59518		50600	

Table 11. Log Hours of Work Coefficient Estimates 1981 and 1992

	1981		1992	
Variable	**Coefficient**	**p-value**	**Coefficient**	**p-value**
Intercept	3.2505	0.0001	3.2167	0.0001
Wage	-0.0218	0.0001	0.0312	0.0001
Age 25-34	0.1987	0.0001	0.2531	0.0001
Age 35-44	0.2523	0.0001	0.2959	0.0001
Age 45-64	0.2280	0.0001	0.2428	0.0001
Married	0.0620	0.0001	0.0149	0.0231
Children Under 6	-0.0195	0.0001	-0.0348	0.0001
Children betw. 6 and 18	-0.0577	0.0001	-0.0682	0.0001
Husband's Income	-0.000003	0.0001	-0.000002	0.0001
Other Income	-0.000003	0.0001	-0.000002	0.0001
Lambda	0.0108		0.0004	
R2	0.0731		0.0956	
Number of Observations	36854		34480	

the decade. Real wages have increased for women which may lead them to work more hours. In addition, given the decline in real wages for men, women, particularly those who are married, may be encouraged to work more hours to provide the needed level of financial security.

All of the three age categories have a larger positive effect on working more hours in 1992. Being married still has a positive effect on hours supplied in 1992, though less than the combined effect of the presence of children. The presence of children, particularly those of six years or older, have a larger negative effect in 1992. Given that women are delaying marriage and childbirth, they may be planning more carefully when to have children such that, with relatively higher incomes and greater job flexibility that might come with experience, they can choose to work fewer hours rather than more, to accommodate the needs of their children.

Husband's income and other household income have a negative effect on the marginal hour of labour supplied, but the effect is still negligible. The coefficient of lambda, while positive and significant, has declined from 1981, suggesting that the sample of working women is less select in 1992 than in 1981. As stated before, this makes sense given the increase in the participation rate.

6. Conclusion

This paper has presented a theoretical model of female labour supply, and the empirical results of a test of this model at two points in time, 1981 and 1992. The empirical results identify the variables that are significant determinants of female labour supply as well as women's wages. In addition, the results confirm the remarkable changes that have taken place in the wage structure of the US during the 1980s.

The principal variables used in the regression analyses were, but for one exception, all significant and on the whole exhibited the expected signs. First, in the wage equation, rising levels of education have an increasing positive effect on wages. Experience as well has a positive effect. As Jacob Mincer outlined in his work on human capital in 1974, these variables are critical determinants of wage compensation. In addition, it is found that living in an urban environment has a positive effect on wages, while being Black or Hispanic has a negative effect. Second, the probit regressions show that the predicted wage increases the probability that a woman will work, while being married, husband's income, the presence of children and other non-earned income all decrease the probability of working. Finally, regarding the marginal hour of labour supplied by working women, the effect of wages changed over the decade, from negative to positive, possibly due to the response to increases in real earnings for women. Husband's income, the presence of children and other non-earned income have a

negative effect. Interestingly, being married has a positive effect, though not larger that the combined effect of the presence of children.

A comparison of the estimations for the two years supports many of the trends that have been discussed previously. As shown in Table 5, over the decade in question, the percentage of women with post-secondary education has increased (44 percent), real wages have increased by 13 percent, and in 1992, 69 percent of women were participating in the labour force, an increase of 8.5 percent from 1981. Regarding overall wage structure in the US, wage dispersion increased during the 1980s, largely due to rising returns to skills and higher education, while real earnings for less educated and less skilled workers declined relative to the same worker a decade earlier. Most important for women, the earnings differential between men and women declined by 10 percent.

Many of these trends are reflected in the estimations of the wage equations for the two years. Higher levels of education have a greater effect on wages, as does work experience. For Blacks and Hispanics, largely concentrated at the lower end of the skills distribution, there is an increasing negative effect on wage levels for being a member of one of these minority groups, confirming the decline in real earnings for the lower skilled. A decomposition of the changes in wages between the two years points to the primary importance of the increase in actual education levels. The decline in the rate of

return to being Hispanic (a minority group located at the lower end of the wage distribution) overshadows the increase in the rate of returns to higher education levels that would be evident otherwise.

The results of the structural probit suggest that what traditionally has determined a woman's reservation wage, below which she would not work, has a lesser effect on a woman's decision to work in 1992. All of the coefficients in 1992 were smaller suggesting that the effect of these variables on the probability of a woman deciding to work has weakened over the decade. In the labour supply equation, the decision for working women to work more hours, while negatively affected by an increase in the wage offer in 1981, is positively affected by wages in 1992. Working women who are married supply more hours, though not when there are children present. Husband's income and other income have a negative effect on the marginal hour of labour supplied though it is minimal. Given the combined results of the participation equation, and the labour supply equation, it is fair to say that women became increasingly autonomous during the 1980s regarding their decisions to work, or work more hours. Husband's income, for those who are married, as well as other income have a declining very slight negative effect on these decisions. Quite to the contrary, being married encourages working women to supply more hours of labour. Working women substituted leisure for labour, given the positive effect an increase in the wage offer has on the hours of work supplied in 1992. This change in the effect of wages on labour supply may indeed

reflect the changing economic environment in the US and the relative progress made in closing the wage gap between men and women. A desire and need to be financially independent and secure, whether single, married or divorced, may have altered women's attitudes toward work such that the decision to participate is less affected by the traditional variables which determine the reservation wage. These variables may play more of a role when deciding how much to work. Children, particularly those of primary school years and older, have an increasingly negative effect on the hours of work supplied by women in 1992.

Given these results, it seems that participating in the labour force is becoming more a fact of life for women rather than a choice in lifestyle. It will be interesting to see whether over the next decade the trends identified during the 1980s continue. Of particular interest will be whether women continue to increase their levels of educational training, whether their labour participation rates, particularly among married women, increase or plateau, and finally, whether there is further closure to the female/male wage gap.

Appendix. Reduced Labour Force Participation Probit and Log Wage Equation, 1992

Variable	Probit Coefficient	p-value	Log Wage Coefficient	p-value
Intercept	0.3037	0.0001	1.2383	0.0001
Age 25-34	0.1966	0.0001		
Age 35-44	-0.0798	0.0001		
Age 45+	-0.4312	0.0001		
Experience			0.0360	0.0001
Experience Squared			-0.0006	0.0001
High School Education	0.6128	0.0001	0.2254	0.0001
Post-Secondary (1to3 yrs)	0.8369	0.0001	0.3897	0.0001
University	1.0410	0.0001	0.7309	0.0001
Married	-0.1228	0.0001		
Urban	-0.0421	0.0014	0.1686	0.0001
Husband's Income	-9.09E-07	0.0096		
Other Income	-9.07E-06	0.0001		
Children under 6	-0.3767	0.0001		
Children between 6 and 18	-0.0954	0.0001		
Black	-0.0962	0.0001	-0.0621	0.0001
Hispanic	-0.1422	0.0001	-0.0887	0.0001
Lambda			0.0026	0.0001
R2			0.2370	
Number of Observations	50600		34480	

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