Mothers, Wives and Workers:

The Changing Roles of American Women, 1870 – 1930

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Abstract: This paper investigates the interconnections between marriage, fertility and labor market decisions of American women at the turn of the 19th and 20th centuries. While fertility kept falling throughout the period, the marriage rate first declined, then, in 1890's, picked up again. At the same time, American women were a growing presence on the labor market: first as singles, then, after 1900, increasingly as married women also. Single women's labor force participation is viewed as the prime cause that ultimately transformed women's both professional and private life. It changed women's bargaining position first on the marriage market (encouraging a delay in marriage and consequently a decline in fertility through postponement of child bearing), then inside marriage (leading to an increase in married women's labor force participation and a continued decline in fertility through time reallocation).

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1. The changing role of women

How to make a living, whether (and when) to marry and how many children to have are three crucially important decisions with lifetime consequences. Around the turn of the century, American women increasingly began to arrive at substantially different answers to these questions than their mothers and grandmothers had. An ever growing number of women were making inroads on the labor market.[2] While the average age at marriage of women increased up until the 1890's, it declined thereafter.[3] While married women were rarely taking up wage work outside of home prior to 1900, their presence in the labor force began to increase after this date.[4] While a large fraction of pre-1900 female employment consisted of house service and factory work, after 1900 women ventured into other types of occupations such as teaching and office work.[5] Then, throughout the twentieth century, women have steadily increased their influence in all areas of public life. The seeds of this growing self-assertion were sown between 1870 and 1930.

The shifts on the labor and marriage markets presumably had strong effects on – and were strongly affected by – the ongoing change in the character of the American family. Such aspects as fertility, spending patterns inside a family and labor supply of individual family members have all been subject of numerous empirical studies (Combs, 2006; Moehling, 2005; Angrist, 2002; Goldin, 1990; Mincer, 1961). Theoretical work (Becker, 1981; Greenwood et al., 2003, 2005a, 2005b; Lundberg and Pollak, 1993, 1996; Manser and Brown, 1980; McElroy, 1990; McElroy and Horney, 1981; Pollak, 1985) is either ahistorical or concentrates on post-war developments. This paper focuses on the 1870 – 1930 period and attempts to trace out women's changing answers to the three lifetime questions of work, marriage and fertility as part of a single explanatory framework.

[2] Hill (1929), Table 12 on p. 19
[3] Taeuber and Taeuber (1958), pp. 153. See also Weiner (1985), p. 23, and Handbook of Labor Economics, Vol. 1., Figure 3.2. on p. 207 for the post-1885 birth cohorts.
[4] See Goldin (1990), pp. 46-50, for arguments concerning the U-shaped labor force participation of married women.
[5] See Rotella (1981) and Davies (1982)

What exactly it was that unleashed women's emancipation has long been a matter of some debate. The argument that changes in the legal status of women, such as the married women's property laws of mid-19th century, are responsible has met with skepticism.[6] Goldin (1990) notes that economic progress alone does not always translate into greater equality either.[7] And many of the technological advances in household technology invoked in the work of Greenwood et al. (2003, 2005) do not come into their own until the second quarter of the 20th century. I make a historical and theoretical argument that starts from the market labor of single women. This experience (and the independently earned income that goes with it) of the growing proportion of single women at the end of the 19th century affected their expectations of marriage. To affect a wider societal change in the perception of the role of women, however, the fact of independently earned income alone was not enough; it also had to be used as a bargaining chip on the marriage market. As the ranks of working single women swelled, their bargaining power increased and, after 1900, both the private (household) and public (labor market) sphere of life slowly began to adjust to their views.

2. The mechanism of historical change

With the onset of American industrialization after the Civil War, single women were pushed and pulled into the labor force in ever greater numbers. Among the push factors were the economic necessity of many families where daughters were sent to work to bolster the family budget, as well as the changing nature of domestic work and the decline of agriculture.[8] The pull factors included causes as varied as division of labor due to new technology or the use of women as strikebreakers –

[6] See Basch (1982), pp. 29 – 30, also Zeigler (1996) and Roberts (2006).
[7] Goldin (1990), p. 58.
[8] See Kessler-Harris (1981), p. 57 for the changing domestic work and p.70 – 76 for the necessity argument; also Blackwelder (1997), p. 12.

but also, from the women's point of view, the independence that comes with own, earned income.[9] This independence was enhanced for those working single women who moved to live away from their families. Goldin (1990) cites several turn-of-the century surveys which showed that working single women who lived away from home usually retained most of their earnings and over two thirds of them retained 100%.[10] Among those who lived at home while working, the usual practice was to remit most or all of their earnings but even these women enjoyed the benefit of having a greater say over how family finances were going to be used (Moehling, 2005).[11] So strong, in fact, was the desire for independence that many single women had a clear preference for factory work over domestic service – even though servants usually received free board and could command a higher pay – because domestic service entailed a strong curtailment of their personal freedom.[12] Table 1, which concentrates on white women aged 20-24 and provides some information on the types of jobs they were taking up, illustrates the force of this preference.[13] Notice that, by 1930, the proportion of single white women working as domestic workers collapses to between a quarter and a third of what it had been in 1860. Operative employment (factory work), on the other hand, was consistently strong, constituting a third of their employment. It only went out of favor after 1910 as

[9] On the effects of technology on women's employment in various sectors, see Senate Report (1910) Vol. 9, p. 15 – 17. On women as strikebreakers in the cigar industry, see Abbott (1919), pp. 196 – 208. For women as strikebreakers in the printing industry, see, for example, Senate Report (1910), Vol. 9, p. 57.

[10] Goldin (1990), p. 53

[11] Theoretically speaking, the opportunity of market labor increased the young women's threat point in a bargaining problem inside a family: "the greater a member's threat point, the more strongly that member's relative valuation of goods is reflected in the household demands."(McElroy, 1990: 560). See also McElroy and Horney (1981) and Pollak (1985).

[12] Senate Report (1910), Vol 9. pp. 182 – 183. The report quotes a discussion of this topic in The Revolution, a Boston paper, where, as early as 1870, the problem of esteem and independence is repeatedly stated: "The reason girls don't live in private families is because they lose their independence there. They can't go out and buy a spool of thread until their appointed afternoon or evening comes around for it. When mistresses learn to treat their girls as human beings, they can get enough of them." By 1920's and 1930's, as American and white immigrant women were increasingly reluctant to take up domestic service, the demand was answered by black women. Due to discrimination as well as other reasons, the domestic service then lost even the small income advantage that it may have had in the late 19th century. See Palmer (1987).

[13] Source: IPUMS; the 1890 sample is missing for obvious reasons: the return sheets were burned. The 20-24 age group is selected because many single women started their employment at this age, moreover, between 1860 and 1930, the average age at marriage mostly oscillated between 22 and 25 years of age. White women have been selected for analysis here because other groups, such as blacks and Native Americans are represented in relatively low numbers in IPUMS samples which makes any computations of averages and proportions less reliable.

new occupations, promising not only higher salaries but also higher prestige and shorter hours, were gaining popularity: these were professional, clerical and sales jobs.

For women, the relative independence of working single life contrasted with the considerably stricter routine of married life. In marriage, women lost many of the legal rights they could enjoy while single (Zeigler, 1996). Peiss (1987) notes that husbands had much greater discretion regarding family spending. She also describes the difference in how married and single women spent their free time. Single women could and did attend theatres and dances while married women spent most of their leisure time at home and largely alone, their husbands having gone out.[14]

This sharp and potentially growing disparity between a woman's single and married life may go some way toward explaining the dip in marriage rates at the end of the 19th century. Table 1 shows that, before 1900, the proportion married declines with the growth of single women's labor force participation. This development is particularly strong in the metropolitan areas where the proportion married fell by 8 percentage points, or about a fifth, between 1860 and 1880/1900.[15] Taeuber and Taeuber (1958) also show that among the 1865-1874 birth cohort (i.e. one that would reach 20-24 years of age between 1885 and 1898) the proportion of single women stood at 51.8% and was larger than for any subsequent ten-year birth cohort.[16]

The turn of the century, however, marked the nadir of this decline in marriage. In Table 1, the proportion of young women married rebounded after 1900 and, by 1930, surpassed the 1860 level. Just around that time, the nature of marriage and the public perception of man's and woman's

[14] On women's entertainment, see Peiss (1987), p. 106, and Coontz (2005), pp. 191 – 193. Regarding the spending discretion, Peiss also quotes, on p. 103, an investigator Elsa Herzfield as claiming: "The husband brings his wages to his wife at the end of the week or fortnight. He gives her the whole amount and receives back carfare and 'beer' money; or he gives her as much as 'he feels like' or 'as much as he has left after Saturday night'."
[15] IPUMS uses the 1950 definition of metropolitan area for the 1850 – 1950 samples. Generally speaking, it is a cluster of economically interconnected counties that includes at least one city of 50.000 or more inhabitants. For more details, see www.ipums.umn.edu.
[16] Taeuber and Taeuber (1958), p. 153, Table 47.

sphere in marriage were undergoing a substantial transformation.[17] American courts were increasingly willing to grant women a divorce from cruel and imposing husbands, helping to hold their power in check, and the workings of the household economy were changing also, not least because of the technological and legal innovations of the late 19th century.[18] One aspect of the change concerned married women's labor force participation which, as Table 1 illustrates, was on the increase after 1910, particularly in the metropolitan areas.[19]

For this to happen, certain Victorian pre-conceptions of a wife's employment had to go. In the 19th century, most women, even if they worked while single, would withdraw from employment once they married.[20] They were expected to become full-time mothers, their husbands the sole breadwinners. Some wives worked because their husbands were unable to provide for the family – a signal that a reasonably well-earning husband did not want to send. Because of this social stigma, many wives were discouraged (or prevented by their husbands) from entering the labor market.[21] Thus, even though most US states granted married women property rights over their earnings by late 19th century, married women's labor supply remarkably failed to respond to this change (Roberts, 2006).[22] The prevailing domestic ideology exalted women primarily as mothers. The Brandeis report, the legal brief that documented the negative effects of excessive labor hours on

[17] See Coontz (2005), Ch. 12, pp. 196 – 215

[18] For changes in divorce law, see Griswold (2001). Not only physical but mental cruelty also was increasingly viewed as legitimate grounds for divorce. For a brief overview of the technological changes in the household, see Kessler-Harris (1981), pp. 40 – 42.

[19] The participation rates in Table 1 in fact underestimate the difference between urban and rural environments. Goldin (1990) shows that the 19th century censuses likely underenumerated wives who were supplying unpaid work at a family farm. These women would be included in the labor force under the modern definition but were not counted as labor force then. The omission, according to Goldin, could be as large as 5 percentage points which means that, for the years 1870 – 1900, actual labor force participation of married women in non-metropolitan areas could be as much as triple of what is reported in Table 1. For more detail, see Goldin (1990), Appendix to Ch. 2, pp. 219-227

[20] Baxandall and Gordon (1995), p. 103, cite an 1890 letter of one Knights of Labor leader, concerning the "career future" of one of his female co-workers, Leonora Barry, who was about to marry: "…Sister Barry's days are numbered. You will never, in all probability, rest eyes on her again… She has not yet been called across the dark river but she will soon be buried in the bosom of a Lake that shall wash away all claim that we may have to her…"

[21] Goldin (1990), pp. 133-134

[22] Khan (1996) in fact shows that American women responded to property acts, for example, by increasing their patenting activity. Combs (2005, 2006) shows that analogous property act in Britain (1870) increased British wives' share of ownership inside a family and changed their investment behavior. Thus, married women did respond to the legal changes in their status – but not in terms of labor supply and earning independent income.

women's fitness for child-bearing in the 1908 *Muller v. Oregon* Supreme Court decision, was motivated by this very specific understanding of a woman's role: namely that women's work must be regulated precisely so that it does not compromise, and interfere with, their future motherhood.[23] As late as the Great Depression, 89% of the public believed that married women with husbands present should preferably not work.[24]

But married women were joining the labor force in growing numbers and family life had to adjust to that. An important piece in the puzzle was the changing pattern of marital fertility.[25] Graph 1 traces the changes in marriage behavior and fertility throughout the period in question.[26] The three indexes are related multiplicatively, so the changes in total fertility can be easily decomposed into changes in nuptiality and changes in marital fertility. Prior to 1900, a large portion of the decline in overall fertility is due to falling marriage rate (nuptiality). A simple calculation reveals that of the overall decline in total fertility between 1860 and 1880, 52% was due to decline in nuptiality; between 1860 and 1900, almost a third. Post-1900, fertility was clearly no longer controlled

[23] See Brandeis and Goldmark (1969). The report had a special section on "Specific Evil Effects on Childbirth and Female Functions" (pp. 36 – 42), and another on "The Effect of Women's Overwork on Future Generations" (pp. 51 – 55). Of the benefit of shorter hours, the report said: "Wherever sufficient time has elapsed since the establishment of the shorter work day, the succeeding generation has shown extraordinary improvement in physique and morals." (p. 57)

[24] Kessler-Harris (2001), p. 59

[25] The following analysis omits out of-wedlock fertility. While accurate information of the rate of out-of-wedlock births is hard to find, Taeuber and Taeuber (1958) put it at 4% (p. 266) for the period 1938 – 1950. If, in the previous decades, the rate was similar in value, it is unlikely that it would influence the analysis much.

[26] The graph relies on Princeton indices which have the advantage that total fertility, marital fertility and nuptiality are all measured in a conceptually similar way and so are easily comparable. The "Princeton" label derives from it being introduced and used in the European Fertility Project conducted by the Office of Population Research, Princeton University. Specifically,

$$I_{f,t} = \frac{B_t}{\sum_{a=15-19}^{45-49} N_{a,t} h_a} \qquad I_{n,t} = \frac{\sum_{a=15-19}^{45-49} N_{a,t} h_a m_{a,t}}{\sum_{a=15-19}^{45-49} N_{a,t} h_a} \qquad I_{m,t} = \frac{B_t}{\sum_{a=15-19}^{45-49} N_{a,t} h_a m_{a,t}}$$

where $I_{f,t}$ is the Princeton index of total fertility at a time t; $I_{n,t}$ of nuptiality at time t; $I_{m,t}$ of marital fertility at time t; B_t is the number of births; $N_{a,t}$ is the number of women of age a at time t; h_a is the marital fertility of Hutterites (expressed as number of births per woman of a given age) and $m_{a,t}$ is the proportion of women (of a given age) currently married,. Note that the female population is split into age groups by 5 years, from 15-19 years to 45-49 years. The Hutterite fertility is viewed as an empirically established upper limit on childbearing capacity of a woman. Given this fact, the denominator of the indices represents the overall childbearing capacity of a given female population: it is how many births would result in this population if all the women followed the Hutterite fertility profile. The numerator for $I_{m,t}$ calculates the same for the married fraction of the populations. It is easy to see that $I_{f,t} = I_{m,t}\, I_{n,t}$. The values in Graph 1 are derived by applying these formulae to IPUMS samples except for year 1890 which is interpolated. For more detail, see Sheps (1965).

primarily through the postponement of marriage (as average age at marriage started decreasing (Taeuber and Taeuber, 1958, p. 153)) – greater control was exercised inside marriage.[27] This is why marital fertility falls steeper, after 1900, than total fertility. While other factors were likely at play, it seems that the increase in married women's labor force participation and the steep decline in marital fertility are a sign of reallocation of labor from home to the labor market, a result of the changing opportunities for married women.

To summarize, women's answers to the three questions of work, marriage and childbearing changed significantly between 1870 and 1930. This paper views this transformation as starting in the labor market and leading to changes in marriage and family life. In the final decades of the 19th century, the gap between the employment opportunities of single and married women was widening for a variety of reasons. As wage earners, young single women could enjoy a certain level of independence and freedom which they mostly lost upon marriage. These perks of single life increased the opportunity cost of marriage as well as the young women's threat point in bargaining with men on the marriage market. That was why marriage rate declined. The incentives had to change if women were to return to marriage and that change entailed women's greater say in family finances and later also increased married women's labor force participation. Once the gap between the prospects of single women and married women started closing, the age at marriage declined and the marriage rate rebounded. Fertility was affected first by the postponement of marriage, then by the increase labor supply of women.

In the model below, I put the mechanism, outlined above, on a more formal footing. The empirical facts to be explained include the increase in single women's labor force participation after the Civil War onwards; the decline in marriage rate in late 19th century and a rebound in early 20th; the decline of total fertility and of marital fertility; the eventual rise in married women's labor force

[27] Note that early 20th century was a time when information on methods of contraception proliferated, providing the means, if not the motivation, for the birth control. See Coontz (200), p. 197

participation after 1900 and the improvement in their position inside the family as measured by their share of consumption and their contribution to family budget. The calibration exercise that follows the theory is designed to show that all these aspects can be realistically reconciled with the general trends in labor force participation, marital behavior and fertility in American history.

3. The model

The decisions whether to work, whom to marry, and how many children to have are modeled here as part of a unified framework. It is based on the Nash-bargaining models of Manser and Brown (1980) and McElroy and Horney (1981) but it is not a dynamic general equilibrium model, as seen, for example, in Greenwood et al. (2003). The long-term changes in marital and labor decisions are analyzed in terms of comparative statics of a series of equilibria as the model is solved separately for each generation.

Time is split into periods. Within each period, each individual must make a decision whether to work during the current period (having a time endowment of 1 each period), whether to marry during the period and, if yes, what the newly formed family will look like (see Figure 1).

The utility function takes the following form:

Men	Women
$U = \pi\sqrt{n} + c - \rho(w_M)l$	$U = a\sqrt{n} + c$
subject to $c \le (1-\alpha-\beta n)(w_M - R)$	subject to $c \le \alpha(w_M - R) + w_F l$ or $c \le C$

In this quasi-linear utility function, c stands for consumption; n represents the number of children a person has; α is the fraction of husband's wages consumed by a wife and l represents a wife's labor supply.[28] Before marriage, workers – both men and women – are assumed to live in

[28] Since the model allows the possibility that married women do not supply any labor and thus earn no wages, αw_M is the monetary transfer from their husband that is their sole source of consumption. See Combs (2006), pp. 70 – 71, for a brief description of how such a monetary transfer worked in the late 19th century.

their own household which costs a constant R ("rent") to maintain every period.[29] If a woman does not work while single, she is assumed to live in with her parents, paying no R and receiving a stipend C. The parameter $\rho(w_M)$ in the man's utility function is a measure of his prejudice against his wife's labor supply, l, and it depends positively on the man's wage, w_M: a non-zero labor supply on the wife's part brings the husband a disutility proportional to that labor and this disutility is greater for the higher-earning husbands.[30] The parameters π and a are utility weights which determine how a person values children relative to consumption. Since generally $a \neq \pi$, men and women can differ in their subjective evaluations of the two sources of utility. Finally, consumption good can be purchased at unit price for wages. The quasi-linear functional form has the convenient property that it treats children (n) as a normal good (at least up to a certain level of income) but since each child claims a fraction β of a father's income, it also allows for a negative relationship between income and fertility which is the historically observed relationship.

Dating is assumed to be a result of random matching at the beginning of each period.[31] It is assumed here that in aggregate everybody can find a date (be matched). During dating, men and women fully observe each other's labor force status, wages and utility parameters. Thus, men formulate their proposals in full knowledge of their partner. Adults are indexed by a productivity level (x for men, z for women) which, together with a production function, determines each person's wage.[32] Both men and women have myopic expectations regarding technology, which implies that they expect their next-period wage to be the same as their current-period wage.

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[29] Thus, there are economies of scale in marriage, since two separate households of a man and a woman are reduced to one. Greenwood et al. (2005b) uses a similar setup.

[30] For simplicity, the model takes $\rho(w_M)=\rho w_M$ where ρ is a constant.

[31] Similar dating mechanism is employed by Greenwood et al. (2003) and Greenwood (2005b).

[32] Assume that men's production function is $f = Axl$ and wage $w_M(x) = Ax$ where A is a technological parameter. For women, assume $g = Bzl$ and $w_F(z) = Bz$. Again, parameter B denotes technology.

3.1. Will you marry me?

In view of the sequence of decision-making in Figure 1, the model must be solved backwards. Given that men have the initiative in formulating the marriage proposal, a woman' role is to either accept it or reject it. Denote a woman's lifetime utility V and her one-period utility v_s if she is single and v_m if she is married. While single, a woman enjoys $v_s = (w_F - R$ or $C)$, depending on her labor force status. If a single woman received a man's proposal, (n, α, l), she enjoys $v_m = \alpha(w_M - R) + w_F l + a\sqrt{n}$ of utility every subsequent period of her life. But, of course, not every proposal need be to her liking and if she rejects, she will start a new relationship and face the same decisions next period. Thus, a proposal for marriage will only be accepted as long as $v_s + \delta V \le v_s + \delta \frac{v_m}{1-\delta}$ which simplifies to $V \le \frac{v_m}{1-\delta}$.

What can we say about V? Let us assume that, of all men, only a proportion r is willing and able to present a woman with a proposal that is worth accepting. Then, a woman's lifetime utility depends on her chances of meeting such a man:

$$V = (1-r)(v_s + \delta V) + rv_s + \frac{\delta}{1-\delta}\int_r v_m(w_M)dF(w_M) = (1-r)(v_s + \delta V) + rv_s + \frac{\delta}{1-\delta}E_r v_m$$

where $E_r v_m$ denotes an expectation of marital utility across the acceptable marital proposals. Using this expression in the inequality above, a proposal that a woman finds acceptable will be such that

$$\frac{1-\delta}{1-(1-r)\delta}v_s + \frac{\delta}{1-(1-r)\delta}E_r v_m \le v_m .$$

If, then, some individual man wanted to take this result into account and formulate an acceptable proposal, he would take the left-hand side of the inequality as given: one individual can influence neither r, nor $E_r v_m$, nor v_s. Thus, from the man's perspective, each woman has some given

fixed reservation utility which his proposal must match or better, if it is to be accepted. As will transpire from section 3.2., men will exactly match such reservation utility.

This in return means that, from the woman's point of view, v_m is independent of w_M and $E_r v_m = r v_m$. Using this result and simplifying the inequality yields $v_s \leq v_m$, or more specifically, $(w_F - R, C) \leq \alpha(w_M - R) + w_F l + a\sqrt{n}$. Thus, every woman accepts any proposal that promises her at least as high a per-period utility as she is currently enjoying while single.[33]

3.2. Optimal proposal

Since man has the initiative in proposing, his aim is to come up with a vector (n^*, α^*, l^*) that would be utility-maximizing for him yet still acceptable to his partner. His optimization problem can be summarized thus:

$$\max_{n,\alpha,l} \pi\sqrt{n} + (1 - \alpha - \beta n)(w_M - R) - \rho w_M l$$

subject to:

$(w_F - R, C) \leq \alpha(w_M - R) + w_F l + a\sqrt{n}$ (woman's reservations utility constraint – WRUC)

$l + tn \leq 1$ (wife's time constraint – WTC)[34]

$l \geq 0$ (non-negative labor supply condition – NLSC)

The following Lagrangean yields the necessary first order conditions (FOC):

$$L = \pi\sqrt{n} + (1 - \alpha - \beta n)(w_M - R) - \rho w_M l - \lambda(l + tn - 1) - \mu[(C; w_F - R) - (\alpha w_M + w_F l + a\sqrt{n})] - \nu(-l)$$

FOC:

[33] This result is expected considering that the bargaining rule employed in the model is, according to Manser's and Brown's (1980) typology, a dictatorial one. In a dictatorial setup, one of the bargaining parties gets to make a take-it-or-leave-it offer to the other party. The result is that such offer will exactly match the other party's reservation utility, or threat point. An alternative is symmetric bargaining where the couple solves some Nash objective function in which the prospective utilities of both partners are treated symmetrically. See Manser and Brown (1980), pp. 36 – 41.

[34] Each child claims a fixed fraction *t* of a woman's time.

n: $$\frac{\pi}{2\sqrt{n}} - \beta(w_M - R) - \lambda t - \mu\left[-\frac{a}{2\sqrt{n}}\right] = 0$$

α: $$-(w_M - R) - \mu[-(w_M - R)] = 0$$

l: $$-\rho w_M - \lambda - \mu(-w_F) + \nu = 0$$

Together with the constraints, the FOC form a system of six equations with six unknowns (three optimization variables and three shadow prices-lagrangean multipliers). The solution of this constrained optimization is such that WRUC is always binding. Thus, women's level of utility does not change with marriage. It also means that women never reject such a proposal because waiting for next period would not be advantageous to them in any way. However, this result connects a woman's pre-marriage economic position with the determination of intra-household resource distribution. If the wages earned by single women increase, it will have an important effect on how much they will once consume as wives. Of the other two constraints, corner solutions are possible, depending on wages.

What is of primary interest is precisely how the optimal proposal – vector (n^*, α^*, l^*) – responds to changes is male and female wages, w_M and w_F. This is summarized in Table 2 and Figure 2.

[Table 2 + Figure 2]

To analyze marital behavior, let us consider what happens when such optimal proposal is accepted by a woman and a married couple is formed. Many aspects of the history of American family at the turn of the 19th and 20th centuries are captured in the optimal proposal. Figure 2 is drawn in a w_F–w_M space. When a couple is matched, they fully observe each other's wage (as well as other parameters) and so can determine in which of the three regions they are. The three regions are delineated by which constraint is binding and, together with FOC, these constraints determine what is optimal to propose. Generally speaking, in Region 1, fertility (n^*) is high (demographic

transition has not started yet) and wives are expected to stay at home. In Region 2, the demographic transition is already under way but married women's employment is still zero. Eventually, in Region 3, fertility decline is in full swing and married women gradually appear on the labor market.

For example, when most men and women earn relatively low wages, it is clear that most man-woman matches will at first fall into Region 1. Then, as wages increased, the balance slowly shifted into Region 2. However, if the women's wages also share in the general increase, sooner or later some matches will spill over into Region 3. As these movements occur, what is optimal to propose will also change, as documented in Table 2.

Concentrating on n^* first, a move from Region 1 to Region 2 entails an onset of a decline in (marital) fertility. Optimal n^* declines from $\frac{1}{t}$ to $\left[\frac{\pi + a}{2\beta(w_M - R)}\right]^2$ and keeps declining as male wage increases. If a woman earns a wage that is above $\rho\left[R + \frac{(\pi + a)\sqrt{t}}{2\beta}\right]$, that woman's wage can also enter in the denominator of n^* provided she and her matched partner fall into Region 3, where a married woman's labor supply is positive. Note that, in such case, the wives of the high-earning (and also the very low-earning) husbands do not at first enter the labor market but as the distribution of wages keeps moving up and away from the origin, eventually all wives with lower-tail husbands will end up working.

Married women supply no labor to the market in Regions 1 and Regions 2. This means that even if a woman works while single, she drops out of the labor market once she marries. Here the model realistically captures what was a frequent practice in the turn-of-the-century America. Note that in Region 2, she would have spare time to work, since the WTC is not binding – but it is the disutility that her husband would get from her employment which prevents her from earning an independent income. Once the female wage w_F rises enough to open up Region 3, for some men, the

prejudice becomes "too expensive" and they stop proposing that their (future) wives stay at home. If there is a general increase in wages that shifts the whole distributions of both male and female wages, more and more matches are gong to place in Region 3 – if such matches also lead to marriage, more and more married women will remain in the workforce. As w_F increases further, n^* keeps falling and l^* keeps increasing: thus above the threshold of $\rho\left[R+\frac{(\pi+a)\sqrt{t}}{2\beta}\right]$, married women's labor supply increases with wage.

The fraction α^* of man's income is a reflection of both a woman's premarital consumption and of the family's fertility. When they marry, women's overall utility does not change but it now comes from two sources: consumption and children. This means that her overall consumption declines and children are substituted. However, as wages increase, the optimal number of children declines and so α^* increases.

3.3. To propose or not to propose?

Taking one step backward in the decision-making process, the question arises whether the optimal proposal (as described in Table 2) and the resulting marriage would bring higher utility to the proposer than the alternative which is to wait till next period for a better match.[35] The matched single woman's labor force status and her wage are important, as transpires from the analysis above, because they directly influence how much of the family's monetary resources she will claim in marriage. Thus, if a man is matched with a high-earning working single woman, it may be utility-enhancing for the man to wait for the next period and hope that he will meet a non-working woman (or a low-earning working woman).

[35] Strictly speaking, staying single could be seen as another alternative. Considering that, around 1900, over 90% of all people married at some point in their lives, it is assumed here that the men and women already have made the decision to get married.

Denote a man's utility from marrying a non-working woman $U = U_N(w_M, C)$ and his utility from marrying a working woman $U = U_W(w_M, w_F)$. By plugging the solutions from section 3.2. into the men's utility function, it can be shown that men's utility decreases with w_F. Thus, as long as $w_F - R$ is larger than C, the family stipend, it is clear that men find it preferable to date and propose to a non-working woman ($U_N > U_W$) because she has a lower reservation utility and therefore will accept a lower α.

If the proportion of working single women in the female population, p, is relatively low and if a man's discount factor, $\delta < 1$, is not too low, it may pay to wait till the next period. Here the women's labor market enters into the picture. Note that p, while endogenous in the model (see section 3.4. below), is an aggregate, "macro-economic" statistic – it is not a personal parameter. Everybody can observe it but individuals cannot influence it. Since p represents the proportion of single women working it also captures the chances a man has of meeting a non-working woman (1 – p). It is at this point that the changes in the larger world affect the individual decision-making.

A man matched with a working woman of some wage w_F will wait to be matched with some other woman next period if

$$U_W(w_M, w_F) < \delta EU = \delta\left[(1-p)U_N(w_M, C) + \int_{w_{F\min}}^{\infty} U_W(w_M, w_F)dF(w_F)\right].$$

While a more detailed discussion of what this inequality implies for the marriage market appears in section 3.5., let us state at this point that if a man knows his wage w_M, the distribution of female wages ($F(w_F)$) and the proportion of single women working, p, then he can determine the size of the right-hand side. Then, since U_W is monotonically decreasing in w_F, there exists a unique female wage, w_F *, such that if the woman earns more than this wage, it is preferable for the man to wait for a new match next period, but if she earns less, he will propose to her and they will get married.

Since this is true for every man, there exists a function $w_F^*(w_M)$ which demarcates the dividing line between matches that result in marriages as opposed to matches that do not. Thus, at any given time, only a fraction of men, denoted *r*, will propose to their matched partners – those where the pair's wages (w_F, w_M) are below $w_F^*(w_M)$.

3.4. Why do single women go to work?

In deciding whether to go to work or not, single women consider the costs and benefits of either alternative. In light of the analysis of men's marital decision-making, one can say that by entering the labor force, a woman increases her consumption and utility both during her single life and marriage but jeopardizes her chances of marriage (since men can adopt the waiting strategy). The costs and benefits of not working are the reverse of that: there is the certainty of proposal but low consumption throughout life.

To grasp the woman's conundrum mathematically, denote as V a woman's lifetime utility from a given period onwards. At the beginning of that period, she has to decide whether to work or not. She chooses the alternative that promises the higher lifetime utility. Thus,

$$V = \max\left\{C + \frac{\delta}{1-\delta}C; (1-r)\left(w_F + \delta V\right) + r\left[w_F + \frac{\delta}{1-\delta}w_F\right]\right\}.$$

The term $C + \frac{\delta}{1-\delta}C = \frac{C}{1-\delta}$ denotes her lifetime utility if she does not work (i.e. she marries at the end of the current period and has *n** children, as proposed to her). The term $(1-r)\left(w_F + \delta V\right) + r\left[w_F + \frac{\delta}{1-\delta}w_F\right]$ denotes the lifetime utility if she does work in the current period.

The variable *r* represents the probability that she will marry in the current period if she chooses to work. Recall that men can adopt a waiting strategy: this means that there can be a non-zero proportion of men who refuse to marry a working woman. That proportion is (1– *r*) whereas *r*

represents the fraction of men who will propose to a working woman because they do not find it optimal to wait. Thus, if a woman is matched with someone who prefers to wait (with a probability $1 - r$) she will consume her current wage net of rent, $w_F - R$, and wait for the next period when she will face the same lifetime prospects (δV). If she is matched with a man ready to propose to her (with probability r), she will also consume her current period wage net of rent but then will be married happily ever after.

The decision, whether to work or not, will depend on which of the lifetime utilities is higher. It is not difficult to show that the problem has a simple solution where

$$V = \max\left\{\frac{C}{1-\delta}; \frac{w_F - R}{1-\delta}\right\}.$$

Therefore, any woman will work if her wage is high enough to ensure her higher utility (net of household maintenance) than what her family can provide her on a stipend. The minimum female wage at which any women may be willing to work is therefore determined by these two quantities: $w_{F\min} = R + C$. Here is where individual productivity, z, enters the picture. If technology increases female wages (across the whole distribution) faster than the family stipend and rent increase, more and more single women will go to work and p, the proportion of working single women, will rise:

$$p = \int_{C+R}^{\infty} dF(w_F).$$

3.5. Labor market meets marriage market

Note that p and r are aggregate variables that each individual takes as given. Yet, in aggregate, they are also a result of the individual decision-making. Given the distribution of wages, w_M and w_F, the levels of r and p are determined within the model.

Consider again the man's decision concerning his proposal to a working woman. Using the expression for p from section 3.4., one can rewrite the man's wait-or-propose problem as

$$U_W(w_M, w_F) < \delta\left[(1 - \int_{C+R}^{\infty} dF(w_F))U_N(w_M, C) + \int_{C+R}^{\infty} U_W(w_M, w_F)dF(w_F)\right].$$

$$U_W < \delta\left[U_N - \int_{C+R}^{\infty}(U_N - U_W)dF(w_F)\right]$$

Using the optimization results from section 3.2. (see Table 2), it can be shown that both U_W and U_N grow with male wages, w_M, but decrease in female wages, w_F. In absolute value, the derivatives are smaller than one. Given δ that is sufficiently small, at certain level of male and female wages, the left-hand side will increase at a faster rate than the right-hand side which means that fewer and fewer men will find it worthwhile to wait for the next period for a new match and will propose to his current match even if she is working.

What do the equilibria imply for the marriage rate? Note that, the overall marriage rate (*MR*) equals

$$MR = 1 - p^* + p^* r^*$$

as all non-working women receive a proposal but only a fraction r^* of the working women does. The negative effect of p^* will dominate at first, since low p^* is also accompanied by low r^* and so their product is even low. But as wages of both men and women increase, more single women join the labor force (see section 3.4.) and eventually more men come to propose to working women also. Thus, both p^* and r^* increase, the decline in overall marriage rate will stop and be reversed. The marriage rate will pick up.

4. Calibration

The calibration exercise is designed to show that the underlying reasoning, as expounded in theory in section 3, does provide a plausible explanation for the social and economic changes in women's life at the turn of the century. The calibration is preceded by parameter estimation. Some of the parameters in the model are used in a manner that is standard in economic modeling – for

example, δ, the discount factor – and so the value can be taken from studies of other researchers. However, the model also operates with certain parameters and functional forms which are not as widely used or have not been estimated in the past and so they are estimated in section 4.1. Since they are utility parameters or parameters regarding time and spending allocation, I estimate them using the 1917-1919 Department of Labor cost-of-living survey which provides information, in some detail, about the sources of income and expenditure decisions of early 20th century working class families.

The survey focused on families of wage earners and salaried workers in 99 industrial cities in 42 states. A total of 12,817 families were interviewed but the sample was constructed in such a way that only married couples with at least one child and no more than 3 boarders were included. It represents the earning and consumption patterns of the urban working class. Minimum residency in a given area of 1 year prior to interview was also required.

The budgeting information contained in the survey pertains both to sources of income and to the composition of spending. It contains information on wage rates, labor supply (number of weeks of employment per year) and overall earnings of all working family members, as well as income from boarders, gifts and other, "miscellaneous" sources. The information on spending includes data on the overall costs of running a household (rent, cost of fuel, and cost of lighting), the overall food consumption of the family and detailed information on the family's spending on clothing.[36] The clothing expenditures is the only type of spending specified by recipient, i.e. the survey shows how much was spent on each household member's clothes over the year the survey was conducted. The clothing expenditure therefore forms the basis for inferences about personal consumption within a family.

[36] Since the food consumption is not specified by individual household member, I include it, in further analysis, with rent and fuel costs among the overall costs of running a household.

4.1. Estimating the parameters

The parameters of the model are summarized in Table 3. Three of them are utility parameters (π, ρ, a), the remaining two characterize the financial and time requirements of having a child (β and t). They are assumed to be constant and identical for the whole population. In estimating their values, I rely on the first-order conditions and optimization constraints from section 3.2. Together, they provide one direct parameter estimate and two independent regressable equations which together can shed light on the values of the parameters.

The direct parameter estimate is that of β, the percentage of husband's income (net of household-maintenance cost, R) claimed by each child. I estimate it as the average fraction of the husband's net income spent on the clothing of each child in the family.

The first of the regression equations relies on the WRUC which is always binding:

$$\alpha(w_M - R) + w_F l = (C; w_F - R) - a\sqrt{n} \,.$$

Here, a married woman's consumption is on the left-hand side. The right-hand side includes her consumption while she was single and a term involving the number of children in the family. The regression coefficient on $\sqrt{n}$ will provide an estimate of a.[37]

The second of the regressable equations is based on the three FOC's and the non-negative labor supply condition (NLSC) which can be combined to yield

$$vl = \rho w_M l + \frac{\pi + a}{2t}\frac{l}{\sqrt{n}} - \frac{\beta}{t}(w_M - R)l - w_F l = 0 \,.$$

This can be rearranged into a form that can be used in a regression analysis,

[37] The cost-of-living survey does not provide any information about the past consumption of a married woman, nor any indication whether the wife worked while she was single. Thus, if all wives were pooled in a regression, the constant of the regression would lie between C and $w_F - R$ and it would affect the slope coefficient, a, which is of primary interest. For that reason, the regression is run only on women who work even after marriage – those, according to the theory in section 3, belong to region 3, i.e. they worked before marriage and continue to work after marriage.

$$w_F l = \rho w_M l + \frac{\pi + a}{2t}\frac{l}{\sqrt{n}} - \frac{\beta}{t}(w_M - R)l$$

where the left-hand-side is a wife's earned income and the right-hand-side variables are $w_M l$, $\frac{l}{\sqrt{n}}$ and $(w_M - R)l$ which do not have a ready interpretation but their values can all be calculated from the cost-of-living surveys carried out by the Department of Labor in 1917-1919. The regression coefficients from such analysis would yield values for ρ, $\frac{\pi + a}{2t}$ and $\frac{\beta}{t}$. Using the direct estimate of β and the independent estimate of a, one can express ρ, π and t from these three regression coefficients. The imputed parameter values are in the right-hand column of Table 3.

4.2. Exogenous and endogenous variables

The exogenous variables in the model include male wages, w_M, female wages, w_F, the household maintenance costs, R, and the family stipend to non-working women, C.

Detailed information on wages is somewhat difficult to obtain. Specific information on wage distribution is practically non-existent for the female wages and relatively sparse for the male wages. For the overall trend, I rely on the information provided by Historical Statistics of the USA. Goldin (1990) shows that throughout the period in question (1870 – 1930), the ratio of female-male wages stood at about 0.55 and did not move much.[38] Thus, I used one wage trend or both male and female wages, adjusting the mean of female wages to correspond with the female-male wage ratio of 0.55.

Detailed series of rents and household maintenance costs as well as single women's consumption is also unavailable. Variables R and C are therefore based on the expenditure analysis of the 1917-1919 cost-of-living survey and are assumed to grow at the same rate as the wages.

[38] See Goldin (1990) Table 3.1. on p. 60-61.

The endogenous variables are the variable of interest in the calibration. These are the desired number of children, n, the married women's labor supply, l, the fraction of husbands' income that is transferred to wives, α, the single women's labor force participation, p, and the proportion of women married. The calibration results will be compared with the historically observed values, as inferred from IPUMS and summarized in Table 1 and Graph 1.

4.3. Calibration results and comparison

The calibration is performed using Matlab 7. I generate 2000 men and 2000 women (i.e. who are randomly matched. The results of the calibration are compared to the actual historical series in Table 5. Considering that this research project is still very much under way, the presented calibration outcome should be viewed as the first tentative result which should and can be improved upon.

By far the best match is visible in the series for single women's labor force participation. For married women, the calibrated and historical readings can be considered broadly consistent for 1870 and 1880 but the calibration seems to lead to an excessively swift onset of married women's employment. The fertility series consist of three columns each. The left-most of the three denotes the actual number of children born per married woman (for marital fertility) and per woman (total fertility). In the central column, this number is turned into an index number with 1870 taken as a base year. The right-most of the three columns is an index of the actual historical trend in fertility – the same as is depicted in Graph 1. Both the calibrated marital and total do exhibit the right trends and the calibration results are roughly the same order of magnitude as the historical series. However, the calibration overestimates the decline in both marital and total fertility (more so for total fertility). In terms of the actual number of children born, the calibration of marital fertility seems to provide relatively realistic results, especially towards the end of the period in question.

The proportion married clearly displays the most glaring disparity between calibration and actual historical development. Further analysis will hopefully shed light on why the calibrated series refuses to turn up after 1900.

5. Conclusions

The life of American women changed considerably during the six or seven decades following the Civil War. Both in the private and public sphere, women were gaining influence so that many crucial institutions were either outright transformed or at least substantially reformed. As women increased their presence on the labor market, they were also better positioned to claim greater say in their private and family life.

In this paper, I have argued that the prime cause of the sweeping changes was the young women's ability to earn independent income. Although many families perceived their young daughter's employment as temporary expedient intended only to improve the financial standing of the family, the labor market engagement in fact had deep effects on the young women's expectations regarding their future professional and family life. As the number of women who worked while single increased, their new outlook on marriage and work gained more ground and inevitably led to changes in many areas of life such as marriage, household management and labor market.

Throughout the twentieth century, women have steadily increased their influence in all areas of public life, from labor market to politics. The seeds of this growing self-assertion were sown between 1870 and 1930, a period which marked a crucial turning point in the history of women in America. It was then that they began to present an ever stronger case for single as well as married

women's employment, for their right to vote, for legislative protection in the work place or for an equal access to education – which are all the hallmarks of full citizenship.[39]

[39] See Kessler-Harris (2001), particularly pp. 23-24 for the discussion of the relationship between wage work and the idea of citizenship and political participation.

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Figure 1 - Sequence of decision-making during each period

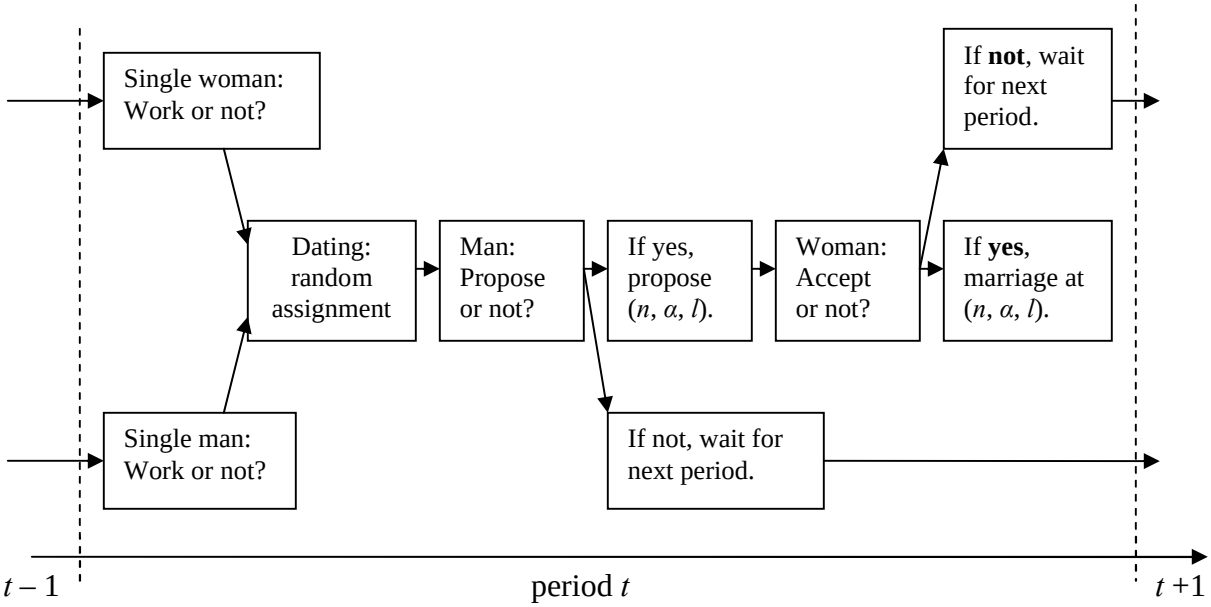
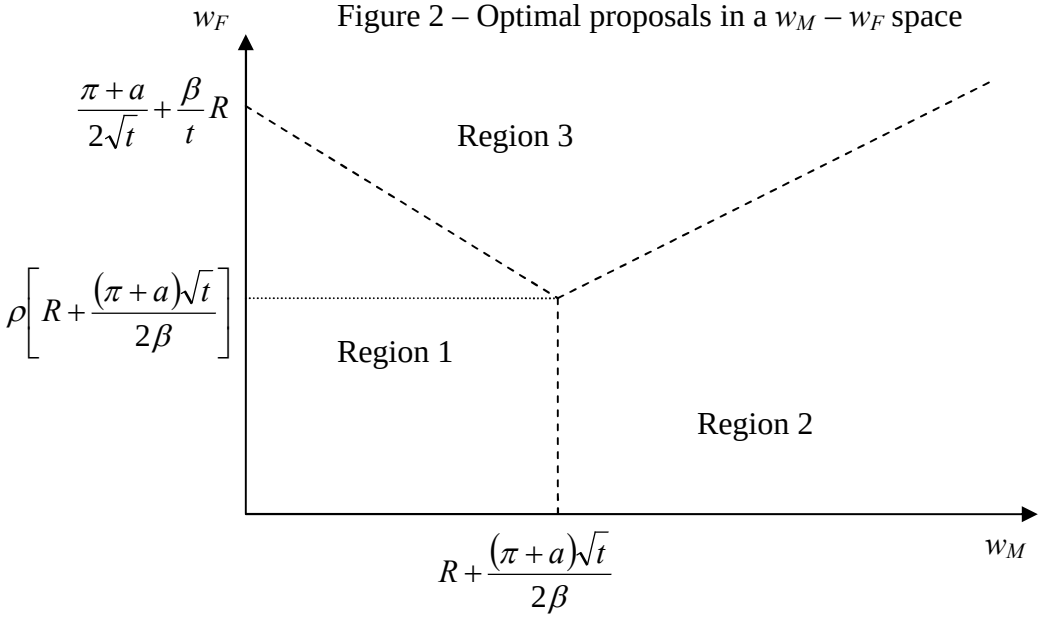


Figure 2 – Optimal proposals in a $w_M - w_F$ space



Graph 1 - Indexes of nuptiality, fertility and marital fertility, 1860=100

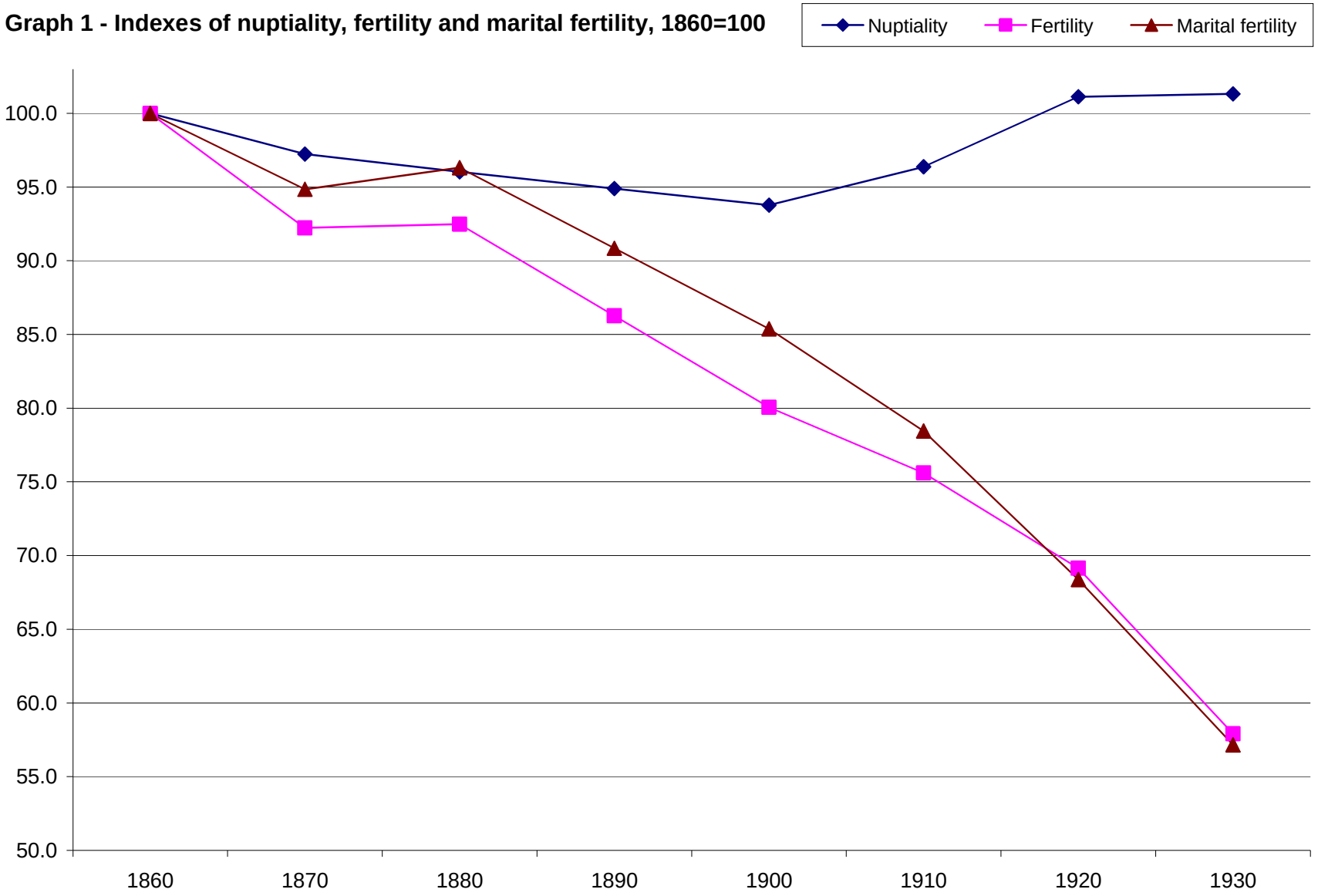


Table 1 - Marriage and labor market characteristics of white women aged 20-24										
			1860	**1870**	**1880**	**1890**	**1900**	**1910**	**1920**	**1930**
Proportion married		Non-metro area	53.35%	51.97%	50.23%		48.87%	50.15%	53.94%	54.21%
		Metro area	42.52%	39.69%	34.35%		34.58%	39.56%	42.99%	42.68%
Labor force participation			**1860**	**1870**	**1880**	**1890**	**1900**	**1910**	**1920**	**1930**
Married women		Non-metro area	5.09%	1.60%	1.73%		1.98%	5.62%	4.69%	8.00%
		Metro area	**3.77%**	**2.55%**	**3.29%**		**2.42%**	**5.41%**	**8.81%**	**15.06%**
Single women		Non-metro area	32.46%	26.94%	31.39%		39.91%	49.76%	51.01%	53.48%
		Metro area	**55.03%**	**56.62%**	**57.09%**		**64.13%**	**73.06%**	**79.98%**	**79.14%**
	Proportions employed as:		**Married women**							
			1860	**1870**	**1880**	**1890**	**1900**	**1910**	**1920**	**1930**
Occupations	Professional, technical	Non-metro area	3.42%	**12.62%**	**11.87%**		8.57%	6.04%	**12.16%**	**14.21%**
	(teachers, actors, engineers)	Metro area	7.17%	2.85%	3.39%		7.10%	6.37%	5.09%	7.28%
	Clerical and kindred	Non-metro area					3.52%	3.62%	**10.32%**	**22.10%**
	(cashiers, telegraph operators, typists)	Metro area					4.06%	3.54%	**23.73%**	**42.50%**
	Sales workers	Non-metro area		0.93%	1.40%		1.51%	2.42%	5.89%	**10.52%**
	(peddlers, demonstrators)	Metro area	4.75%		3.37%		3.03%	4.96%	8.71%	8.15%
	Craftsmen	Non-metro area	3.42%	3.73%	1.39%		2.02%		2.21%	1.05%
	(shoemakers, tailors, bookbinders)	Metro area	**19.04%**	**11.45%**	3.39%		3.04%	1.42%	3.22%	2.62%
	Operatives	Non-metro area	**18.13%**	**32.73%**	**27.22%**		**37.22%**	**16.51%**	**25.05%**	**31.57%**
	(seamstresses, milliners, spinners)	Metro area	**35.73%**	**60.04%**	**72.71%**		**55.79%**	**48.85%**	**43.45%**	**27.07%**
	Service workers	Non-metro area	**59.30%**	**34.14%**	**27.98%**		**22.60%**	**11.28%**	**12.90%**	**11.05%**
	(housemaids, midwives, barbers)	Metro area	**28.54%**	**24.21%**	**13.53%**		**16.20%**	**24.07%**	8.72%	9.03%
	Farm laborers	Non-metro area	4.46%	**10.72%**	**13.99%**		**16.58%**	**53.16%**	**23.02%**	6.84%
	(wage workers, unpaid family)	Metro area						2.13%		
	Other	Non-metro area	11.28%	5.13%	16.14%		7.99%	6.97%	8.45%	2.66%
		Metro area	4.77%	1.45%	3.60%		10.78%	8.66%	7.09%	3.35%
	Proportions employed as:		**Single women**							
			1860	**1870**	**1880**	**1890**	**1900**	**1910**	**1920**	**1930**
Occupations	Professional, technical	Non-metro area	**15.50%**	**17.39%**	**20.10%**		**23.32%**	**28.17%**	**30.67%**	**29.82%**
	(teachers, actors, engineers)	Metro area	5.79%	5.71%	8.62%		8.25%	**10.29%**	**11.22%**	**14.15%**
	Clerical and kindred	Non-metro area					6.30%	**14.04%**	**24.05%**	**22.09%**
	(cashiers, telegraph operators, typists)	Metro area					**11.53%**	**21.72%**	**44.05%**	**44.23%**

	Sales workers	Non-metro area		0.87%	1.67%	5.78%	6.68%	8.86%	8.11%
	(peddlers, demonstrators)	Metro area	1.27%		3.57%	8.71%	7.99%	6.94%	7.55%
	Craftsmen	Non-metro area	2.85%	1.38%	1.59%	1.36%		0.81%	0.65%
	(shoemakers, tailors, bookbinders)	Metro area	5.67%	3.47%	4.84%	4.30%	2.85%	2.46%	1.82%
	Operatives	Non-metro area	**21.59%**	**22.38%**	**23.81%**	**21.60%**	**16.65%**	**12.62%**	**14.45%**
	(seamstresses, milliners, spinners)	Metro area	**31.95%**	**34.45%**	**39.30%**	**32.87%**	**34.07%**	**23.08%**	**17.37%**
	Service workers	Non-metro area	**54.41%**	**52.26%**	**45.08%**	**34.68%**	**23.55%**	**14.68%**	**16.41%**
	(housemaids, midwives, barbers)	Metro area	**54.12%**	**51.59%**	**40.52%**	**32.16%**	**20.52%**	**9.65%**	**12.30%**
	Farm laborers	Non-metro area	1.41%	3.39%	5.12%	3.89%	7.82%	4.68%	5.59%
	(wage workers, unpaid family)	Metro area					0.45%		
	Other	Non-metro area	4.24%	2.33%	2.63%	3.06%	3.10%	3.63%	2.88%
		Metro area	1.21%	4.78%	3.16%	2.17%	2.12%	2.60%	2.58%
Source: IPUMS									

Table 2 – Solution to the constrained optimization – optimal proposal

	Binding constraints	n^*	α^*	l^*
Region 1 $w_M < R + \frac{(\pi+a)\sqrt{t}}{2\beta}; w_F < \frac{\pi+a}{2\sqrt{t}} + \frac{\beta}{t}(w_M - R) - \rho w_M$	WTC, NLSC	$\frac{1}{t}$	$\frac{(C; w_F - R)}{w_M - R} - \frac{a}{(w_M - R)\sqrt{t}}$	0
Region 2: $w_F \le \rho w_M; w_M \ge R + \frac{(\pi+a)\sqrt{t}}{2\beta}$	NLSC	$\left[\frac{\pi+a}{2\beta(w_M - R)}\right]^2$	$\frac{(C; w_F - R)}{w_M - R} - \frac{a(\pi+a)}{2\beta(w_M - R)^2}$	0
Region 3 $w_F \ge \frac{\pi+a}{2\sqrt{t}} + \frac{\beta}{t}(w_M - R) - \rho w_M; w_F > \rho w_M$	WTC	$\left[\frac{\pi+a}{2\beta(w_M - R) + 2t(w_F - \rho w_M)}\right]^2$	$\frac{(R + w_F tn^*)}{w_M - R} - \frac{a\sqrt{n^*}}{w_M - R}$	$1 - tn^*$

Table 3 – Parameters and their values		
Parameter	*Description*	*Value*
π, a	relative weight of children in the utility functions of men and women	π = 5.91; a = 15.98
ρ	strength of husband's prejudice against his wife's work	0.273
β	fraction of income spent on children	0.085
t	time spent by a mother per child	0.129

Table 4 – Parameters – Dependent variable: Wife's earned income	
Parameter expression:	Coefficient values and standard errors
ρ	0.273
	[0.034]**
$\frac{\pi + a}{2t}$	85.057
	[48.216]
$\frac{\beta}{t}$	-0.659
	[0.079]**
Observations	3297
R^2	0.7425
Note: Since, in the model, *n* is employed as a measure of total fertility, only families with wives 35 years old and older were included. Robust standard errors in brackets; * significant at 5%; ** significant at 1%	

Table 5 - Historical developments versus results of calibration												
	Single women's LFP		Married women's LFP		Proportion married		Marital fertility - children born			Total fertility - children born		
	Historical	Calibrated	Historical	Calibrated	Historical	Calibrated	calibrated	index	historical	calibrated	index	historical
1870	34.42%	35.50%	1.76%	3.93%	49.37%	90.15%	5.44	100.0	100.0	3.93	100.0	100.0
1880	38.96%	33.67%	2.00%	4.49%	46.41%	90.41%	5.40	99.3	101.5	3.86	98.3	100.3
1890		45.58%		7.39%		83.25%	4.64	85.3	95.8	2.94	74.7	93.5
1900	50.20%	51.75%	2.11%	9.67%	43.64%	80.55%	4.08	74.9	90.0	2.54	64.7	86.8
1910	60.85%	56.75%	5.54%	12.55%	45.62%	76.92%	3.34	61.4	82.7	1.98	50.4	82.0
1920	66.42%	61.17%	6.43%	14.97%	48.70%	74.77%	3.01	55.4	72.1	1.77	45.0	75.0
1930	69.01%	69.75%	11.47%	19.02%	47.86%	68.73%	2.27	41.7	60.3	1.25	31.9	62.8