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ON MARRIAGE MARKET CONDITIONED INCOME EFFECTS ON LABOR SUPPLY

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ABSTRACT

This paper presents a model that shows how marriage market conditions can possibly affect reservation wages and therefore labor supply. This model assumes one public good and no private goods, in contrast to Grossbard-Shechtman (1984) where individuals consumed private goods only. A graphical presentation is included.

I. Introduction

A MARRIAGE MARKET CONDITIONED INCOME (MMCI) effect on labor supply occurs when the effect of income on labor supply depends on marriage market conditions. This chapter first surveys some of the literature in economics of marriage on this theme, with emphasis on Grossbard (1976), a basic Demand and Supply (D&S) of work in marital household production, and on Grossbard-Shechtman (1984), where MMCI effects on individual labor supply were first formally derived. In Grossbard-Shechtman (1984) it was assumed that household-produced goods were private goods consumed by each spouse separately. Section II below presents a new model in which MMCI effects on labor supply are obtained. The model is similar to Grossbard (1976) and Grossbard-Shechtman (1984) in the sense that it conceives of marriage markets as markets for labor in marital household production and assumes that spouses compensate each other for such labor at compensation levels established in market equilibrium. However, here it is assumed that goods produced by households are household public goods. Before presenting the model that includes MMCI effects on labor supply a simpler model that does not include labor supply is presented.

Review of some of the theoretical literature. The economic analysis of marriage owes its development to pioneering articles by Gary Becker (1973, 1974). Becker's (1973, 1974, 1981) marriage market models assume that what is produced in marriage is a public good denoted by Z_{mf} . They also assume transferable utility between the spouses and that married individuals bring all of their human and physical assets into a joint pool.[1] Therefore, it is in the best interest of Becker's couples to maximize their joint marital production, and two individuals will decide to marry as a function of $Z_{mf} - Z_f - Z_m$, the difference between what they can produce together and the sum of what each can produce alone. Becker's marriage market models don't explicitly model the supply of work entering into household production, the incentives needed to motivate such work, or the possible trade-offs and terms of trade between work in household production and labor supply providing access to consumer goods.

Grossbard's theory of marriage differs from Becker's in the sense that Grossbard (1976), Heer and Grossbard-Shechtman (1981), and Grossbard-Shechtman (1984) offer models of work in marital household production and follow assumptions commonly used in labor economics.[2] The first of these models, Grossbard (1976), written in the context of a Nigerian polygamous society, assumes that women are the spouse/producers and men don't produce in the home but employ women to produce for them. As is commonly assumed in labor market models, it also assumes that female marital household workers have portable marriage-general human capital which they may put to use when co-producing with any potential husband. In analogy with more standard human capital theory (see Becker 1964), this human capital can enhance the productivity of many possible marriages and is not specific to a particular marriage. It is not typically assumed that a worker/employer match—i.e. an employment relationship and the equivalent of a marriage—is characterized by transferable utility, in part because a worker and an

[1] Neither Becker nor Grossbard use the term 'transferable utility'. An economic model of marriage in which the term is used is Willis (1999).

[2] Search models of marriage also go further than Becker in developing analogies between marriage markets and labor markets, see e.g. Michael Keeley (1977) and Dale Mortensen (1988.) However, these search models of marriage have focused solely on explaining marriage formation.

employer never intend to pool their resources together. Likewise, Grossbard's (1976; Grossbard-Shechtman 1984) models assume that married individuals keep some of their own human capital as separate assets and therefore these models are incompatible with the assumption that utility is transferable within marriage.[3] In that respect, Grossbard's theory of marriage differs fundamentally from Becker's.

Grossbard (1976) assumed that wives were workers, that husbands were employers, and that the goods being produced in the home were of benefit to employers/husbands who were compensating workers/wives sufficiently to induce them to work. The material part of that compensation is the transfer of husband's income often taking the form of provision of basic needs and non-pecuniary benefits such as affection, autonomy, and care.[4] In both the cases of labor market models and Grossbard's market model of household production work, competition and a price mechanism facilitate the allocation of general human capital embodied in workers.[5] While in the West the price mechanism functions much better in the case of labor markets than in the case of markets for household production work, the opposite may be the case in Nigeria or India.

The applicability of labor market models to the study of household production work depends on who makes the marriage and divorce decisions. If workers in marriage have no freedom to move in or out of a marriage or to make decisions regarding the allocation of resources in marriage, they are the equivalent of slaves and marriage markets are like slave markets, not like labor markets. The higher the divorce rate, the easier it is to exit and the more a competitive market model applies to the study of marriage. Grossbard-Shechtman (1984) generalized Grossbard's (1976) simple market model of household production work by considering cases where both men and women engage in household production work. It formally derived demands and supplies of household production work in marriage and included a general equilibrium analysis of markets for labor and household production work. It was the first article to derive a number of testable predictions regarding MMCI effects on the labor supply of both wives and husbands. Grossbard-Shechtman (1984) also mentions MMCI effects on consumption.[6] It also follows from the same model that econometric models of labor supply need to separately test for the effects of each spouse's income and other forms of non-wage income, a conclusion that also follows e.g. from Apps and Rees (1988), Chiappori (1988), and McElroy (1990).

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[3] Individuals may also keep some of their financial capital as separate assets. Most countries recognize the rights of individuals to keep separate assets after marriage.

[4] In the context of the African society studied in Grossbard (1976), bridewealth payments paid by men to women's male guardians can also be viewed as part of a compensation for women's household production work (compensations that go to the women's guardians and not to the women themselves), see Grossbard-Shechtman (1993).

[5] Bargaining theories of marriage such as Manser and Brown (1980), McElroy and Horney (1981), and Lundberg and Pollak (1993), as well as Apps and Rees (1988) and Chiappori's (1992) take into account that married individuals are remarriageable. Most of these theories do not consider singles preparing for first marriage.

[6] While he took the first step towards the derivation of a marriage market conditioned household income (MMCI) effect, Becker only derived a MMCI effect on individual access to the gain from marriage expressed in goods. MMCI effects on consumption can also be found in Manser and Brown (1980), McElroy and Horney (1981), and Chiappori's (1992).

Review of some of the empirical literature. The first econometric model of women's labor supply taking account of possible MMCI effects is Grossbard-Shechtman and Shoshana Neuman (1988). That model contains a function $w^* = k(X) \cdot I$, where w^* was defined as a married woman's reservation wage, I was defined as a vector of income from sources other than that individual woman's work, including spouse's income, and k was defined as the proportion of that income that the married woman had access to. It was hypothesized that a number of marriage-market related factors X influence proportion k. This MMCI effect was applied to analyze *compensating differentials in marriage* and their effects on married women's labor supply (see also Grossbard-Shechtman and Fu 2002).

S*ex ratios* can be considered as one of the X factors in vector X that has an impact on reservation wage and therefore labor supply. Age-adjusted sex ratio is a proxy for the ratio of men and women interacting in the same marriage markets. An effect of city-wide sex ratio on individual women's labor supply was found in a cross-section analysis for U.S. cities in 1990 (Grossbard-Shechtman and Matthew Neideffer 1997) and in 1988 (Chiappori, Bernard Fortin and Guy Lacroix 2002), and a comparison of city aggregates for the U.S. in 1930 and 1980 (Grossbard-Shechtman 1993). The effects all went in the direction expected from a household production work market analysis: the more men relative to women, the higher k and the lower married women's labor force participation.

Sex ratios also vary across cohorts, due to the fact that the difference between men and women's average age at marriage varies little over time whereas cohort size often varies dramatically. For instance, for the United State as a whole and using extrapolations based on the 1990 Census, in 2000 there were 112 men ages 27 to 31 (and born in the years 1969-1973) to 100 women ages 25-29 and born in the years 1971-1975. In contrast, using the same definition of sex ratio, the women who were 25-29 in 1975 and were born in the years 1946-1950 had faced sex ratios consisting of 87 men (born in 1944-1948) per 100 women (see Table 1). What drives these large inter-cohort differences in sex ratio is the fact that the number of children born grew rapidly right after World War II, causing a shortage of grooms for the women born at that time, whereas the number of children born fell rapidly after the legalization of abortions in the period 1970-1973.[7] Table 1 presents sex ratios for 13 five-year cohorts of women born in the United States in the years 1916-1980 and men born in the years 1914-1978.[8] It can be seen that, as defined here, sex ratios fluctuated between 87 and 112 during this period.

Grossbard-Shechtman and Granger (1998) have shown that in the United States over the period 1965 to 1990, the cohorts experiencing the fastest growth in women's labor force participation were *growing cohorts*, i.e. generations larger than the generation preceding them. The women in these growing cohorts faced decreasing sex ratios and therefore deteriorating marriage market conditions. A dummy for growing cohort was an important explanatory factor in regressions of changes in women's labor force participation, regressions that controlled for male and female wages and other variables

[7] Links between abortion law changes and changes in fertility in the 1970s have been discussed e.g. by John Donohue and Steven Levitt (2001) and Joshua Angrist and William Evans (1999).

[8] For all generations, sex ratios were calculated according to the Census when women were either 20-24 or 25-29, and men two years older. These are prime ages for dating and marriage, and most likely to influence marriage market conditions. For an updated table that includes information from the 2000 Census, see Table 10.2 in Grossbard-Shechtman and Neuman (2003).

usually included in such regressions (John Pencavel 1998 has also shown that cohort effects are major relative to other explanations of changes in women's labor force participation over time in the U.S.). The cohorts that had grown the fastest, and therefore had experienced the fastest decreases in sex ratio, were precisely the cohorts that had experienced the fastest increases in labor force participation a generation later. A recent study of sex ratio effects on married women's labor supply using comparisons across various U.S. cohorts is Grossbard and Amuedo-Dorantes (2007).

The higher the market value of household production work and the higher the MMCI, the more married women are likely to engage in household production work and to look for ways to combine household production work and commercial employment. Therefore, married women receiving a higher *k* are more likely to be employed in at home commercial work compatible with household production work rather than in on-site commercial work that is less compatible with household production work, even if home-based commercial work pays less than on-site commercial work. This helps explain why there has been a recent increase in the tendency for employed young married women to work in home-based commercial work rather than on-site commercial work (see Field-Hendrey and Edwards 2003). The cohort experiencing this increase in home-based work includes the women born right after the state abortion reforms of the early 1970s and after Roe vs. Wade, the important decision that the Supreme Court passed in 1973. As a result, women born after the legitimization of abortion benefit from high sex ratios and beneficial conditions in markets for household production work in marriage.

Marriage market conditions and MMCI effects on labor supply are also expected to differ across ethnic groups. In the U.S. whether a person is considered Black or White is a factor affecting marriage market conditions. Sex ratios among Blacks are lower and Americans (including Blacks) may have a preference for light skin (see Grossbard-Shechtman 1995). Therefore, even though we do not have data on *k*, it can be expected that relative to White women, Black women may obtain lower compensations for household production work in marriage, and may therefore have a lower *k* (MMCI effect) and lower reservation wage (see Grossbard-Shechtman 1993). This could help explain why Black married women are (1) more likely to be in the labor force than White married women (for instance, in 1999 46.8% of Black married women ages 25-29 were in the labor force full-time year-round whereas 43.9% of their White counterparts were working full-time year-round; and (2) less likely to work in home-based commercial work than White married women (Field-Hendrey and Edwards 2003). Also, studies have documented that husband's income has a stronger effect on wife's labor supply among Whites than among Blacks (see e.g. Evelyn Lehrer 1992). This suggests a multiplicative function of *k* and *I*: the higher *I*, the more a high *k* makes a difference.

One also expects implications for men, even if most paid household production work is performed by women. A switch from a lower MMCI effect (lower *k*) to a higher MMCI effect involves more favorable market conditions in markets for women's household production work, and therefore involves differences in the behavior of both the men and the women born in growing and shrinking generations.

The existence of MMCI effects on labor supply leads to the following implications for econometric models: (1) models of married women's labor supply should test for possible interactions between MMCI factors and husband's income, and MMCI factors and other forms of household income. These MMCI factors include any factor that could

possibly cause a shift in demand for household production work or supply of household production work; and (2) assuming a linear relation, models of labor supply can add MMCI factors linearly to equations of labor supply, as in Grossbard-Shechtman and Neuman (1988), or in a non-linear fashion.

II. A Graphical Analysis of Husband's Income Effects on Wives' Time Use

The following analysis shares common features with Grossbard-Shechtman's (1984) model as well as Gronau's graphical analysis of leisure/goods trade-offs with household production.[9] While the goal is to derive MMCI effects on labor supply, I first discuss a simple case in which women do not have the option of participating in the labor force, a case that applies to many women in the third world. A traditional division of labor is assumed: the only spouse/producer is the wife and the husband and wife consume the goods she produces. However, the analysis is also applicable to the case of a husband who is the household production worker. Two forms of household income effect are examined: a pure income effect and an effect of spousal income transfer interpreted as a compensation for household production work.

A. Simple Case: Leisure and household production work. No LFP

It is assumed that the spouse/producer (let us say the wife) solely chooses between leisure and work in married household production. The only form of income available to women is the share of their income that husbands potentially agree to share with them. In turn, this share is a function of the market quasi-wage established in marriage markets. This quasi-wage is given to any woman considering leisure/goods trade-offs. The assumption of a preset quasi-wage is similar to Chiappori's (1988) assumption that a "sharing rule" has been established.[10] However, Chiappori (1988) and Apps and Rees (1988) assume that the distribution rule is established by the couple itself, whereas here and in Grossbard-Shechtman (1984), the distribution rule is based on a quasi-wage established in the marriage market in which two particular people participated prior to marriage.

It is assumed that the husband enjoys the same goods that the wife produces (i.e. there is joint consumption and the goods that she produces are household public goods) and therefore he is willing to pay her to produce these goods. It is assumed that an hourly compensation *y* for women's household production work has been established in a market for female household production workers. In turn, this assumes that household production workers have marriage-general human capital. Husbands can also transfer income to their wife irrespectively of hours of household production work. From the woman's point of view this is a form of non-work income and will be called *Y*.

The wife is thus maximizing a utility function is $U(x)$, where *x* stands for goods. The total amount of goods *x* that the wife consumes is the sum of the goods x_m that she produces with her time in marital production *m*, plus the commercial goods x_c that she purchases thanks to income that she receives from her husband, i.e. $x = x_c + x_m$. She maximizes her utility subject to

- a time constraint $T = s + m$, where *s* is leisure,
- a production function of x_m, $x_m = f(m)$, with $f' > 0$ and $f'' < 0$,

[9] Robert Cherry (1998) helped me realize that Gronau's (1977) model can be used to integrate intra-marriage transfers.

[10] Apps and Rees (1988) make a similar assumption.

- and a budget constraint $x_c = ym + Y$, where y is the market-set compensation for household production work and Y is an income transfer from the husband that is not tied to household production work. It is assumed that the price of goods is 1.

Figure 1 represents the leisure/goods trade-off of this woman. There are three panels in Figure 1: (a) own consumption of household-produced goods, the equivalent of a corner solution in Gronau (1977); (b) consumption of commercial goods as a result of spouse's consumption of the same household-produced goods and a consequent payment by the spouse; and (c) combined consumption of household-produced goods and commercial goods resulting from a given amount of hours of household production. This combination is obtained by vertical addition of the budget and transformation lines of panels a and b.

A household producer is clearly better off when her household production is also appreciated by her spouse. Whether more appreciation takes the form of a higher *y*, the compensation for household production work, or a higher income transfer *Y*, it will increase individual opportunities for consuming goods and leisure. In both cases, there will be an income effect. However, in case the appreciation takes the form of a compensation for time in household production, there will also be a substitution effect between the two kinds of goods. The difference between the effect of a non-work-related transfer *Y* and that of a household production work-related transfer *ym* is similar to the difference between a pure income effect and a wage effect in standard labor supply analysis. It is expected that if appreciation is conditional on household production work performance, people will have more incentives to engage in in-marriage household production (see Grossbard-Shechtman and Bertrand Lemennicier 1999) than if appreciation takes the form of an income transfer not conditional on work effort.

The analysis implies that allocation of time is a function of marriage market conditions. Both a non-work-related transfer *Y* and a household production work-related transfer *ym* are in-marriage transfers that vary with spouse's income *I*, but they will not necessarily vary in the same proportions, so that $y = k_1 . I$, $Y = k_2 . I$, and $k_1 \neq k_2$. The higher each proportion *k* in a particular market for in-marriage household production work by women of a particular type marrying men of a particular type, the more women can expect to be compensated for producing marital public goods and the better off they are.[11] That proportion will vary as a function of *X* factors, such as the ones discussed above.

Next, the model is expanded to include labor supply.

B. The Case of Labor Supply, Leisure, and Household Production Work

Figure 2 presents an expanded transformation curve and budget constraint that includes leisure/goods tradeoff as well as trade-offs between work in household production and work in the labor force. In this model, an actual or potential household production worker, let us say a woman, is still maximizing a utility function $U(x)$, where x is defined as above, and she has the same production function for x_m, but now she

[11] Cherry's (1998) model includes a function that is the equivalent of $Y = k_2 . I$, but he does not consider the possibility that intra-marriage transfers are based on the hours that a spouse spends in household production.

maximizes her utility subject to a time constraint $T = l + s + m$, where l is labor and a budget constraint, $x_c = ym + wl + Y$, where w is wage. It is assumed that the price of commercial goods is 1 ($p = 1$).

Maximization leads to first order conditions:

$w = MUs / MUx = y + f'$

The equality on the left is the first order condition in Robbins' leisure/goods tradeoff and corresponds to the point where the budget constraint with slope w is tangent to the indifference curve. This is a well-known result obtained by Robbins (1930) and integrated by Gronau (1977). In addition, the equality on the right of this first order condition states that the marginal rate of substitution between leisure and goods also has to equal the sum of y, the hourly compensation for household production work, and the marginal productivity of household production work (m) from the perspective of the household production worker. That sum is the total personal benefit that the woman derives from engaging in an hour of household production work: she enjoys that hour of household production *directly* at a level f' in terms of the home-produced goods that she produces and consumes, and she enjoys that hour *indirectly*: she gets a compensation y from her husband for each hour of work, allowing her to buy commercial goods that she enjoys. (In the extreme case of a person who engages in household production work without enjoying any of the goods that she produces, her only gain from household production work would consist of the compensation y that she earns and of the goods that she can buy with her ensuing earnings).

The person will work in household production if $y + f' > w$.

The person will work in the labor force if $y + f' < w$

This is similar to what is found in Gronau's model, except that in Gronau (1977) and most other models of household allocation of time a married woman does not get paid by her spouse according to what she produces in the household. Accordingly, in Gronau (1977) the transformation curve has a slope f', whereas now it has slope $y + f$' (assuming p is 1).

Two kinds of MMCI effects on labor supply can be derived from this model. Two kinds of compensation that wives may receive for their work in household production are functions of husband's income:

$y = k_1 (X). I$ and $Y = k_2.(X).I$, where $k_1 \neq k_2$.

Any factor X that influences one of those proportions k can cause a MMCI effect on labor supply (see Grossbard-Shechtman and Matthew Neideffer 1997). A positive factor in X that increases a woman's value in marriage markets is likely to cause an outward shift to the transformation curve in Figures 1 and 2. The kind of shift will depend on whether the compensation y or Y is changing. Comparing changes in y and Y that are identical in size, a change that increases y is expected to discourage household production less than a change that increases Y. Both effects discourage household production due to an income effect, but only a change in y induces a substitution effect towards more household production. Therefore, an increase in y is expected to discourage labor force participation more than an equivalent increase in Y. Two major factors included in X that are likely to be associated with MMCI effects are sex ratios and the relative desirability of men and women participating in the same marriage markets (compensating differentials). It follows that if higher sex ratios or better individual qualities cause a

higher k_1 and therefore a higher y, one expects the individual to choose less LFP due to an income effect and a substitution effect.

Furthermore, this model can help us analyze decisions other than the decision to supply labor, including the decision to marry (see Becker 1973) and to have children. According to the analysis presented here the gains from marriage (or cohabitation) include the gains from an exchange of income ym for home-produced goods. This generates a producer surplus to the spouse/producer and a consumer surplus to the spouse/consumer. This helps explain why people want to create couples united in either marriage or cohabitation. The more household production by both wife and husband, the more they jointly consume that household production, the larger the gains from marriage. Obviously, there are also costs of marriage, and gains from marriage or cohabitation may not be sufficiently large to make everyone want to be married or cohabit.

This analysis also leads one to question an insight on fertility and labor supply derived by Willis (1974): the insight that when a wife is employed, the value of her time and her ensuing fertility are not affected by changes in husband's wage and unearned income. According to Willis (1974), only if she is not employed in the labor force will a woman's husband's income affect her value of time in household production. However, according to the market analysis of household production work presented here one does not expect value of time in household production $y + f'$ to vary as a result of a decision to join the labor force or not. Compensation y is determined exogeneously in markets for household production work. Causality is different: as a result of an exogeneously determined y a woman decides to participate in the labor force or not. The same factors, such as household (including husband's) income and the factors influencing MMCI effects, are likely to simultaneously influence married women's value of time, fertility, and the decision to participate in the paid labor force. If markets for household production work exist and establish k and y, the value of time of married women does not vary as a result of whether they are employed or not. It is therefore not surprising that few studies confirmed the predictions that Willis (1974) derived: husband's income effects on fertility do not appear to depend on whether the wife is in the labor force or not (see William Butz and Michael Ward (1979) for the U.S. and John Ermisch (1979) for the U.K).

III. Conclusions

This article presented first a graphical model that showed how marriage market conditions can possibly affect equilibrium quasi-wages for work in marital household production, and therefore the supply of work in marital household production. Marriage market conditions influence equilibrium wages for household production work, and therefore the allocation of time to household production and leisure. A second graphical model showed how marriage market conditions that affect equilibrium quasi-wages for work in marital household production also affect labor supply. One of the advantage of this model is that it ties well with existing analyses of the decision to supply labor, and makes it relatively easy to add the effects of marriage market conditions to current models of labor supply. While simple, the model opens the door to many testable implications, some of which are mentioned in this paper.

The analysis of markets for household production work that was presented here can benefit considerably from further empirical and theoretical work. At the empirical level, it is hoped that there will be more econometric tests of MMCI effects on labor supply,

including tests on the labor supply of men. With more and more men marrying career women, one expects that marriage market conditions increasingly influence men's labor supply and men's productivity at work (a function of hours of work and of the need to compensate women for their household production work work). Men's decisions regarding productivity and hours of work in the labor force are to some extent the mirror image of the decisions of women. For every woman who specializes in household production there tends to be a man who works harder in the labor force, and vice-versa.

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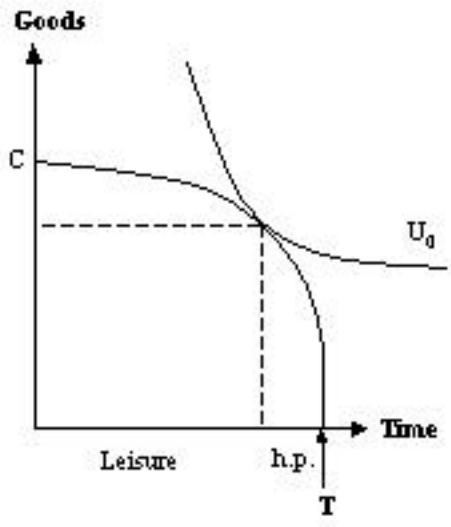
Table 1. Generations of Women, Sex Ratios, and Changes in Labor Supply (United States)

Generation	Year of Birth	Generation Name	Sex Ratio	Change in LFP[1] 25-29	Change married LFP, 25-29[1]	Change married LFP, 30-34[3]
1	1916-1920	World War I	.949	n.a.	n.a.	n.a.
2	1921-1925	Early 20	.927	n.a.	n.a.	n.a
3	1926-1930	Pre-Depression	.98	n.a.	n.a.	n.a
4	1931-1935	Depression	1.00	n.a.	n.a.	n.a.
5	1936-1940	New Deal	.943	3.3	n.a.	9.0
6	1941-1945	World War II	.907	6.3	4.5	5.7
7	1946-1950	Post WW II	.874	12.1	11.9	13.3
8	1951-1955	Korean War	.948	9.4	9.0	6.4
9	1956-1960	Sputnik	.971	4.7	6.3	4.0
10	1961-1965	Kennedy	1.027	2.4	3.9	3.0
11	1966-1970	Moon	1.06	1.1	5.0	-2.6
12	1971-1975	Roe	1.12	2.5	-.25	n.a.
13	1976-1980	First Echo	1.02	n.a.	n.a	n.a.

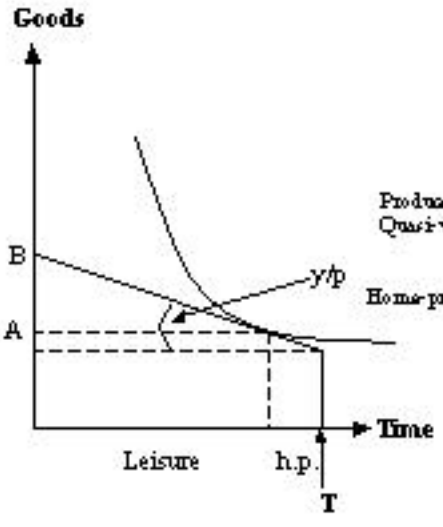
 Source: Census data from 1940 to 1990.

Notes: Ratio of men age 22 to 26 to women age 20 to 24 or men age 27 to 31 to women age 25 to 29 calculated based on Census data. The age group depends on the Census year. Sex ratios for last two generations were calculated based on the 1990 Census using younger age groups.

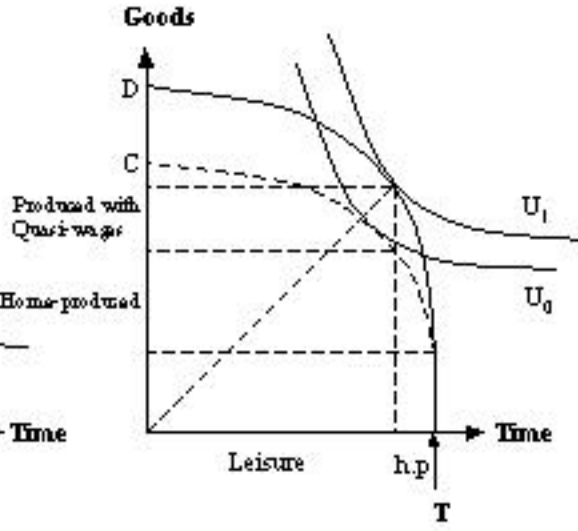
Figure 1. Allocation of time to leisure and household production (h.p.)



a) self-consumed household production (h.p.)



b) h.p. consumed by spouse
spouse pay/y per hour



c) consumed by self and spouse

Figure 2. Allocation of Time by Spouse/Producer when y/p, the Quasi-wage for Household Production (h.p.), is Given