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**Annotated Version of “A Theory of Allocation of Time in Markets for Labour and Marriage,” *The Economic Journal*, Vol. 94, No. 376 (Dec., 1984), pp. 863-882.]**

**Henceforth: GS84**

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**2009 PREFACE**

*This article was published 25 years ago and written mostly while I was a fellow at the Center for Advanced Study in the Behavioral Sciences at Stanford, in 1980-81. I used my middle name Amyra, my last name was hyphenated, I had just completed my dissertation under the supervision of Gary Becker and was not yet naturalized as a citizen of the USA. My English writing skills were lacking. I was impatient, packed too many ideas into one article, and was not careful enough in stating all my model’s assumptions. Had this article been more readable, the differences between my marriage model and Becker’s would have been more obvious, and so would be parallels with more recent models of marriage. These notes are aimed at filling the gaps that I left open in the early 1980s. This article was reproduced in my 1993 book with very few changes (GS93).*

*INSTRUCTIONS TO READERS: These notes need to be used in juxtaposition to the original article, for most equations and all graphs are omitted here. In the text below the original GS84 article is reproduced in Times Roman, while explanations, qualifications and notes are in Courier. They address the shadowed statements in the previous paragraph reproduced from GS84. Text in squared brackets has been added to original article. The original article [henceforth, the article] follows British spelling, whereas the additions use US spelling. Most footnotes found in the original article are ignored here.*

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Economists have long recognised that the nature of the household plays a role in determining the supply of factors of production and the demand for goods and services. However, it was not until the 'new home economics' developed by Mincer (1962)) Becker (1965) and Lancaster (1966) that household structure was given a significant role in economic theory. Today labour economists regularly write about the value of married women's time, and marital status enters economic analyses of consumption. However, no allowance has been made for potential changes in the character of the household: single persons don’t marry and married couples do not divorce. In each case the contact of the couple or the individual with the outside world is limited to exchange in goods, factor or asset markets. We have no theory analysing the interdependence between labour and marriage markets. This universally accepted assumption of a predetermined marital status is puzzling in the light of more than a decade of contributions to the economics of marriage, e.g. Becker (1973; 1981), Freiden (1974), Grossbard (1978a;1980; 1982a), Keeley (1979), Papps (1980) and an even older sociological literature on marriage markets (e.g. Rosenthal (1970), Heer (1962), Henry (1975)).

NOTE: The bargaining theories of marriage of Manser and Brown (1980) and McElroy and Horney (1981) appeared after this article was mostly written. Since then many more bargaining models of marriage have

been published. Collective models of marriage first appeared in Chiappori (1992). Bargaining and collective models don't include the general equilibrium analysis of markets for labor and marriage found in this article.

It is argued here that market conditions regarding marriage influence the value of time in the home. For instance, the value of the time of a married woman varies according to the number of single men and women surrounding the household. Ceteris paribus, she is better off in a town with numerous single men than in a city disproportionately inhabited by single women. Generally, marriage-related market mechanisms create a mutual dependence between men and women who want to work, buy or reproduce. The prevalent assumption of households independent of marriage market conditions has led labour economists to overlook important factors of relevance to the study of labour supply.

Accordingly, in this paper marriage and labour markets are viewed as mutually related. To simplify the discussion and emphasise interdependence, marriage is assumed to be an exchange of household labour between spouses. Analysis of markets for female and male labour and household labour leads to interesting insights regarding labour supply, consumption, fertility and marriage.

EXPLANATION: "household labor" as defined here is NOT what is generally understood by a well-known term such as 'household labour'. What I mean are activities performed for the benefit of the spouse and entailing an opportunity cost. To clarify this idea, over the years I have tried a number of different terms. In GS93 I used the term "spousal labor". Since 2003 I use *Work-In-Marriage* or WIM. QUALIFICATION: 'exchange': I did not mean that spouses exchange all their WIM. This would imply that the only exchanges are exchanges of time-for-time. Marriages also often involve exchanges of time-for-money, as discussed below.

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The theory predicts, for instance, that income changes influence wives' labour supply more than they do husbands'.

NOTE: The model distinguishes between wives' income and husbands' income and has individuals derive their own supplies of labor based on their individual resources. Since then, such models have been labeled as 'non-unitary'. Most of the conclusions derived here also follow from other non-unitary models, including models by Apps and Rees and by Chiappori.

that the labour force participation of married women varies with the sex ratio of eligible partners,

NOTE: the same theoretical prediction was derived by others many years later, without reference to this article.

and that women's labour supply is more backwardbending than men's.

The results which are demonstrated imply a critique of Willis's (1974) influential conclusions regarding the effect of male income on the fertility of families with working and non-working wives. More generally, significant reinterpretations are provided for previous empirical observations.

EXPLANATION: It follows from this theory that Willis was wrong in expecting male income effects on marital fertility to depend on wife's LFP status. Empirical evidence confirms the analysis presented here.

NOTE: There are many further predictions from the theory that are mentioned in the article but not highlighted in the introduction.

## I. THEORY

The economic view of marriage to be adopted in this paper should not be regarded as necessarily descriptive of actual behaviour or attitudes in any particular society. The general caveat applicable to more traditional price theory holds here too. The intent is not to make a philosophical statement about Economic Man, but to present a theory with testable applications. The theory is developed along the following lines.

To stress the mutual dependence between labour and marriage, marital decisions are translated into labour terms. Marriages are viewed as exchanges of 'household labour' i.e. labour which benefits one's (actual or potential) spouse such as cooking, child care, counselling or gardening, and is performed for a longer time than one would spend on such activities if living alone. [footnote 2: A similar distinction between work at home and leisure is made in Gronau (1977).]"

EXPLANATION: Household labor or WIM has two components: household production activities that (1) benefit spouses, and (2) entail an opportunity cost to the individuals.

QUALIFICATION: What the two categorizations have in common is that there are 3 categories and that one of them is called leisure. However, this separation between WIM and leisure is very different from Gronau's separation between leisure and household production: whereas Gronau aggregates all household production, regardless of who benefits from it, GS84 separates between household production that only benefits the self (leisure) and household production of goods that the spouse benefits from, and therefore possibly has a demand for. Whether an activity such as childcare and housework is WIM or leisure according to GS84 has important implications for many results, including time use studies. For instance, it leads to opposite predictions regarding the sign of wage and income elasticities for certain home production activities.

Women demand male household labour, and supply female household labour as well as labour in the ordinary sense of the word (henceforth simply labour), and similarly for men. In all, transactions take place in four interrelated labour markets, those for male and female household labour, and male and female labour. The gender distinction is based on the assumption that from the employers' perspective workers of different sex often serve as poor substitutes for one another. As a prerequisite to investigating the various interconnections among these four different labour markets, individual supply and derived demand schedules are needed. It is initially assumed that equilibrium prices have been established in product and factor markets.

NOTE: In the language of the collective model, this amounts to assuming that the sharing rule has been established, for prices determine intra-marriage distribution of the surplus produced in the marriage.

Subsequently, market equilibria are established via aggregation over individual agents.

(i) *Individual Supplies and Demands*

It is assumed that each individual makes a separate decision according to the same general principles of optimisation. Decisions are made *ex ante* for different equilibrium market prices. The planning horizon consists of one period. Individuals devote their time to three kinds of activity: labour, household labour [now called WIM], and self-oriented time. Both categories of labour benefit others (employers or spouses) and can provide direct utility or disutility to the worker.

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Individuals accordingly have utility functions (1) ..

where  $i, j = f, m$  ( $m = \text{male}$ ,  $f = \text{female}$ ,  $i \neq j$ ),  $l_i$  denotes time allocated to labour,  $h_i$  is household labour (now called WIM),  $s_i$  is self-oriented time, and  $x$  denotes commercial goods.

QUALIFICATION: the goods in this model are private goods consumed by individual  $i$ , as also assumed in Chiappori (1992). The model could be expanded to include public goods. A partial extension in that direction is found at [http://www-rohan.sdsu.edu/faculty/sgs/documents/model\\_for\\_Duncan.pdf](http://www-rohan.sdsu.edu/faculty/sgs/documents/model_for_Duncan.pdf).

Assuming monogamy is legally imposed, labour can be obtained only from one spouse and hence only a single  $h_i$  appears in the utility function.

The marginal utility of the two kinds of labour can be positive or negative. Although labour is often unpleasant, people may derive satisfaction from contributing to others' wellbeing. Both forms of labour create non-pecuniary rewards, and these rewards may vary across forms of labour, amount of time devoted to an activity, and individual preferences.

To the extent that the marginal utility of labour is negative, one can term the function relating compensation level and amount of labour a supply function. It is assumed that both labour and household labour generally have a negative marginal utility, especially after a person is already engaged in a certain amount of labour. For instance, if labour is measured in hours per day, a person's marginal utility of labour could become negative after one hour of labour per day. If that person enjoys working for a spouse more than for an employer, the marginal utility of household labour could become negative after 2 hours.

NOTE: The article derives two upward-sloping supply curves for each individual: a regular supply of labor and a supply of WIM.

QUALIFICATION: For there to be a supply of WIM there needs to be not only negative marginal utility, but also a price. More on that price below and in Grossbard (2005).

The individual maximises the utility given by (1) subject to the time constraint

(2) ...and a monetary budget constraint (3)...where  $T$  is maximum of time available (e.g. 24 hours per day);  $w$  is market wage for labour;  $w^*$  is market wage for household labour;  $V$  is non-wage income, and  $p$  is the price vector for commercial goods normalized such that for each good the price is unity.

EXPLANATION: income includes WIM-workers' income from supplying this type of household production benefiting a spouse at a "wage"  $w^*$ .

QUALIFICATION: in the article it is assumed that the price for WIM-work is established in a market equilibrium. Later I relax this

assumption and recognize that the actual wage faced by a particular individual may diverge from the market equilibrium if there are costs of entry and exit and other frictional factors.

PS: I now call the wage for WIM the 'quasi-wage for WIM', to emphasize that it is not a formal, monetary wage. I now use the symbol  $y$  for it.

The left-hand side of the budget constraint indicates that sources of individual income consist of labour, household labour, and income sources unrelated to work. If all income is spent, the left-hand side equals the right-hand side, the individual's expenditures on commercial goods and labour supplied by a spouse. It is seen that all individuals depend on the equilibrium conditions in the markets for household labour by both men and women to the extent that their income from such labour depends on the market-determined compensation for own household labour, and their expenditures are a function of the  $w^*j$ , the equilibrium compensation for their spouse's work.

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All individuals interested in either supplying or demanding household labour affect these market wages for such labour (as shown in the next subsection). This includes married people who, by assumption, can costlessly recontract through divorce and remarriage.

CLARIFICATION: The analysis also leads to a demand (willingness to pay) for the spouse's WIM.

The compensation for household labour is not as readily observable as that for labour. In the case of a housewife married to a husband who works outside only, part of her compensation [FOR WIM] is that portion of his income from which she benefits via such purchases as food, lodging, or clothing.

CLARIFICATION: a wife may get paid for her WIM even if she is not a full-time housewife and her husband also engages in some WIM; it is also possible that women pay men for WIM.

If both husband and wife supply labour to each other, barter will occur, the net income transfer possibly canceling out.

EXPLANATION: If both spouses perform WIM and earn income outside the marriage it is possible that potential quasi-wage transfers cancel each other out, and no quasi-wages are actually paid.

Maximising the utility function (1) subject to constraints (2) and (3) yields supplies of labour and own household labour, as well as derived demands for self-oriented time, other's household labour, and commercial goods. From the first-order conditions we have:

...[equations 4 and 5]

hence indicating that the real wage per hour of work is equal in equilibrium to the sum of the monetary equivalent of the value of that hour in self-oriented activities and of the absolute monetary value of the disutility of work."

This applies to both kinds of work: labor and WIM.

Combining (4) and (5) yields the trade-off between the two kinds of work (6) ...

Expression (6) indicates that time is allocated between two occupations so that the wage in one occupation equals the wage in the other occupation, plus the monetary equivalent of the difference in marginal utility produced by these occupations. In contrast, since Robbins (1930) labour supply schedules are derived from leisure demands. Except in studies of occupational choice, economists assume that work generates (i) disutility and (ii) income to obtain useful goods.

EXPLANATION: in equilibrium, the rational individual spends time in the labor force (LF) and working for a spouse such that the marginal total benefit from work in the LF (total = pecuniary + nonpecuniary benefits) equals the marginal total benefit from work for a spouse (WIM) .

Given that there are 2 forms of labor, the demand for leisure does not simply lead to the supply of labor. This analysis is formally equivalent to an analysis of occupational choice, where it is also assumed that work generates some utility and occupations differ in the amount of disutility they generate.

Consequently, in equilibrium the value of workers' time equals their wage, and equation (6) takes the simplified form

$$(6') \quad w^* = w,$$

assuming participation in the labour force.

QUALIFICATION: It is the total marginal benefit from WIM (quasi wage  $y + MU_h/MU_x$ ) that equals the total marginal benefit from work (wage +  $MU_l/MU_x$ )

For a person who does not work outside the home, the value of time in the home  $w^*$  exceeds the wage rate.

QUALIFICATION: the minimum asking wage that will be set by a housewife or househusband who does not participate in the LF but obtains a quasi-wage payment for their WIM is  $y + MU_h/MU_x - MU_l/MU_x$ . The more they enjoy WIM work relative to work in the labor force, the higher their asking wage.

Using (2) and (6) the income constraint can be rewritten as a full income constraint (7) ... where  $S$  = full income.

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The left-hand side consists of the sources of  $i$ 's full income, time being valued at the market wage for labour. The right-hand side indicates all the uses of that full income, expenditures on goods, household time, self-oriented activities and the excess in marginal utility obtained from spending time in household labour instead of other labour.

From this one can derive the supply of labour and household labour [own WIM], as well as the demand for [the spouse's WIM] other's household labour. In reduced form, these variables are solely dependent on exogeneously determined parameters, as in [ equations (8) to (10) here]

EXPLANATION: the decisions of individual  $i$  are made independently by the individual. He or she takes account of the partner via a price mechanism operating in the form of quasi-wages for her type of WIM and his type of WIM. They both have to accept these quasi-wages  $y_i$

and  $y_j$  as given, just as they accept that wages in the LF,  $w_i$  and  $w_j$ , are given. This is an individualistic model, in which spouses employ each other and accept prices, wages, and quasi-wages established exogeneously to their marriage. Before households are formed, there is no household decision-making. Eventually, once couples are formed, fixed costs of exit appear, investments in human capital are made, and quasi-wages are likely to diverge from their market equilibrium levels. Bargaining between partners is likely to occur.

Panels a and b in Fig. 1 describe individual supplies of both kinds of labour. It is assumed that initial hours of work produce positive utility, thereby causing the supply curves to start at negative wage levels. The individual whose labour supplies are depicted in Fig. 1 enjoys the first hours of household labour more than the first hours of labour.

[Figure 1 here]

Both supply functions are assumed to have the characteristics giving rise to the standard backward bending form, i.e. the substitution effects of increases in the real wage ( $w^*i$  in panel a and  $w_i$  in panel b) initially dominate the income effects, but eventually the income effects come to dominate. The equivalent of non-leisure in conventional models is here the sum of labour and household labour. Although this latter sum is predicted to decrease when income rises, this does not necessarily mean that both  $l_i$  and  $h_i$  decrease with higher income.

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The demand for  $h_j$  could possibly be a downward sloping function of real wage [quasi-wage]  $w^*j$  for the usual reasons determining the slope of derived demands.

Each productive individual in a society can be viewed as having such supplies of  $l_i$  and  $h_i$ , and such demand for  $h_j$ . **Individual women demand male labour whereas individual men demand female labour.**

QUALIFICATION: it is implicitly assumed that all men and women are heterosexual.

### *(ii) Market Equilibria*

All men and women acting as if wages had been established in competition will actually determine those equilibrium wages. This occurs in the respective markets once all individual demands and supplies are aggregated. Our previous analysis leads to derivation of individual demands and supplies in the markets for male and female household labour [markets for WIM]. It is assumed initially that there are no costs of divorce and remarriage and that there is **one kind of woman and one kind of man.**

PS: this assumption needs to be replaced with the assumption that there are many hedonic markets for men and women. Becker (1973) implicitly assumes that in his demand and supply analysis of marriage, and Choo and Siow (2006) explicitly present a hedonic market analysis of marriage.

Aggregate demand and supply functions for women are presented in equations (11)-(13), and for men in equations (14)-(16). Superscripts  $d$  and  $s$  denote whether a function is a supply or a demand. Capital letters are used to denote aggregate hours of work.

[Equations 11 to 16 here]

Markets for [WIM] household labour are reminiscent of traditional labour markets. **Market forces are relatively difficult to identify because of the absence of physically visible institutions,**

rigidities in compensation levels and hours of work, limitations on the relative proportion of pecuniary to non-pecuniary compensation, etc.

CLARIFICATION: all these limitations of labor markets also apply to markets for WIM

Participants in markets for household labour face an additional restriction that prohibits polygamy, thereby forcing one-to-one matches. Even in societies allowing polygamy, specific rules limit the kinds and numbers of marriages.

MORE GENERALLY: marriages tend to be smaller firms. Even where there is polygamy, the number of wives is low whereas some large firms employ hundreds of workers in labor markets.

In the real world, populations are heterogeneous, and laws and norms determining marriage substitutability also set limits to the operation of markets for [WIM] household labour. People of certain classes, races, or religions may be forbidden to intermarry, or divorce and remarriage may be illegal or expensive. In such cases, separate markets could be considered, one for each group of substitutable potential spouses. In the rest of this discussion, we will assume only two markets

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for household labour, one for women, and one for men, and the assumption of identical men and women will be dropped.

QUALIFICATION: see above

The equilibrium conditions in all these labour markets [for labor and for WIM] are interdependent. Wages in labour markets affect marital behaviour and conditions in the markets for household labour influence labour supply. Given the traditional focus of economics and the measurement problems involved in empirical studies of  $w^*$ , [the quasi-wage for WIM], the remainder of this paper deals primarily with this theory's implications for labour supply. The way in which the existing state of the art in labour economics can be enriched by taking account of conditions in household labour markets [markets for WIM] even though  $w^*f$  or  $w^*m$  [quasi-wages for men and women] cannot directly be measured, is shown in the next section. But first it is necessary to summarise the results obtained so far and to question the assumption of competition.

### (iii) *Competition and Monopoly*

It was assumed that each person participates in three separate labour markets, as supplier of own labour and household labour, and as employer of household labour. In a sex-differentiated society this implies the existence of four interrelated markets for male and female labour and household labour [WIM]. As in the theory of the competitive firm, this analysis has taken two steps: individual maximisation assuming competitive equilibrium prices were established, and aggregation of individual schedules that leads to the derivation of these equilibrium prices.

INTERPRETATION: Similarly, two steps are found in a number of recent models. In this article, in the first step individuals assume that prices are established. In the second step in this article prices (acting also as sharing rules) are established in a general equilibrium process.



One of the steps in Chiappori (1992) assumes that a sharing rule is established. Apps and Rees (1988) call it 'share of household full income'. Quasi-wages for WIM, sharing rules, and full-income shares all imply a particular internal distribution of the gains. Lundberg and Pollak (2008) have a similar step too.

The second step in Chiappori, Apps and Rees and Lundberg and Pollak is also found here. In this article it is a third step linked to the first step: once equilibrium quasi-wages for WIM are established then individuals make decisions regarding labor supply, marriage, consumption, fertility, etc.

THE MODEL IN GS84 AND THE OTHER MODELS DIFFER IN THE CENTRALITY OF THE ROLE PLAYED BY THE MARKET MECHANISM AND PRICES. The interrelationships between markets for labor and WIM is also unique here.

Similarly to a firm an individual has to decide on (i) whether to marry (equivalent to being in business), and (ii) level of inputs, including household labour [WIM].

NOTE: It follows from this article that not all participants in markets for WIM will marry (form couples, as there is no distinction between marriage and cohabitation). The decision to enter marriage is modeled the way that economists model the decision to enter the labor force, since both are derived from similar labor supply decisions. As pointed out by Lundberg and Pollak (2008) Becker's theory of marriage assumed that all men or women marry if there are equal numbers of men and women. If their numbers are not equal, all those in short supply marry in Becker's theory.

Despite regulations imposed on participants in marriage markets, the competitive model seems to be as relevant in (household labour) markets [for WIM] as it is in traditional labour markets, especially in densely populated areas where actual and potential spouses are substitutable. People have some freedom in deciding whether to become, or remain, married, and in establishing-often implicit reciprocal spousal employment contracts.

NOTE: the theory is now applied to analyze the decision to marry or divorce.

Single persons looking for marriage partners respond to market forces and decide accordingly whether to marry and how much work to invest and employ. in the framework of marriage. Married people are also often responsive to markets for household labour.

In a monogamous society marriage tends to occur when at the equilibrium quasi-wages for [male and female WIM] a man demands the amount of household labour a woman wants to supply and that woman demands the amount of labour supplied by the man. A married couple in equilibrium experiences no excess demand for, or supply of, household labour at the competitive  $w$ 's. Exchanges of such labour are egalitarian if the market value of her [WIM] services is identical to the market value of his [WIM] services. To the extent that the value of her WIM exceeds the value of his WIM, a male  $m$  transfers goods (or means to purchase goods) to a female  $f$  (or vice versa).

This view of marriage may sound strange. As a description of attitudes it is probably not much more controversial than what economists write about decision-making by firms. But then our goal is not to describe but to derive testable hypotheses. Feelings are not necessarily absent from this theory. Personal liking can formally be incorporated in the form of a higher demand curve for

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the household labour of a particular person (or a shift to the right in the supply of such labour to that person).

This view of marital relations differs from previous economic analyses in its emphasis on the time spouses devote to each other's service. Changing outside factors can lead not only to changes in income redistribution between the spouses or to marital break-up (as in Becker 1973, 1981), but also to **new marital labour relations**.

NOTE: the theory is also applicable to time use studies.

Thus a married woman's sudden realisation that attractive labour market opportunities are open to her could possibly lead to a new spousal employment contract, the wife reducing her burden of household labour and using some of her additional wage income to obtain substitutes for her household labour, including perhaps her husband's household labour.

At the same time, however, monopolistic elements enter into an existing marital relationship to the extent that divorce and marriage are costly (e.g. due to search costs).

NOTE: this is about bargaining, even though the word is not specifically mentioned.

In that case one could find divergence between the market  $w^*$  and the terms of trade prevailing in a particular couple. Bilateral monopoly could often operate. Partners experiencing higher divorce and remarriage costs are likely to absorb more consequences of monopolistic exploitation. The following section studies implications for labour supply derived from the interdependence between competitive labour and household labour markets. The obstacles to competition mentioned above will be ignored for most of the discussion.

## II. IMPLICATIONS FOR LABOUR SUPPLY

The major divergence between the traditional theory of labour supply and the one presented here lies in **the way  $w^*$ , the value of time in the home, is determined**.

CLARIFICATION: it is really about the factors influencing the asking wage of potential workers. It is a function of  $y$ , the quasi-wage for WIM.

Traditionally,  $w^*$  is derived assuming a predetermined marital status. Households are either single persons or husband-wife teams with no options to marry or divorce. The value of a person's time depends only on household characteristics, and households are interdependent only to the extent that work is supplied to the same markets and goods are bought from the same sellers. In the case of a married woman, the assumptions common to the previous literature translate into an individual supply of time for home production in the form of a transposed L, horizontal at the wage level she would receive if working in the market sector and vertical as soon as the time constraint is reached. There exists no market for household labour.

By using households as their decision-making units and by assuming that men and women are permanently bound into families, economists have lost sight of some important determinants of labour supply. The realisation that the supply of labour can shift following changes in a market determined wage for household labour,  $w^*$ , opens new directions for research in labour economics and in particular, for studies of female labour supply. The sexual differentiation assumed in the rest of this discussion follows observed patterns of division of labour, wives being generally responsible for most

household production. It is also assumed that both men and women differ in productivity, tastes, and income. Theoretical implications are now derived regarding sex ratio effects, group differences in

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marriage opportunities, income and wage effects, and the backwardbending supply of labour.

CLARIFICATION: the discussion of group differences includes an analysis of compensating differentials in marriage.

(i) *Sex Ratio Effects*

NOTE: this section not reproduced here; a more recent and abbreviated version of this part of the theory can be found in Grossbard-Shechtman and Neideffer (1997). Note that if the sex ratio changes but the population size is constant, there needs to simultaneously be shifts in the curves reflecting men's decisions and those reflecting women's decisions.

EMPIRICAL EVIDENCE: sex ratio effects on women's labor supply have been documented using (1) cross-sectional evidence by Grossbard-Shechtman and Neideffer (1997) mentioned above and by Chiappori, P.-A., Fortin, B. & Lacroix, G. (2002). "Marriage market, divorce legislation, and household labor supply". *Journal of Political Economy*, 110, 37-71 and (2) time series by Grossbard and Amuedo-Dorantes (2007).

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in female labour supply, namely an increase in the demand for female workers, implies increasing wages.

Additional evidence for the theory is provided by comparisons between blacks and whites in the United States. Black women have generally been found to have higher rates of participation in the labour force than white women (for instance, in a study of labour force attachment soon after pregnancy - Mott and Shapiro (1978)), even after statistical control for income, education, marital status and other important variables. This can be explained by the sex ratio hypothesis stated here, for among U.S. blacks the sex ratio of those eligible for marriage is significantly lower than among whites, due to lower sex ratio at birth, higher mortality, and higher rates of imprisonment. Moreover, black males show a much higher tendency to intermarry with whites than do black females, which adds to the shortage of men experienced by black women (see Spanier and Glick (1980)).

(ii) *Effects of Individual or Group Differences in Marriage Opportunities*

As can be seen from equation (6) variation in labour force participation can be a consequence of variation either in wages or in the value of time in the home. In their empirical studies economists have looked solely at household characteristics (such as number and age of children or number of adults) as determinants of the value of women's time and thus of labour supply. (See, for instance, Gronau (1973), Heckman (1974).) It follows from this theory that individual or group differences in marriage opportunities are also related to the value of time in the home, and therefore labour supply.

First, comparison of the individual characteristics of husband and wife can provide some of the missing information regarding a person's productivity as a spouse. For instance, a woman's ability to marry into a wealthier family (judging from a comparison of wealth or income in the bride's and the groom's family), or her relative number of previous marriages, might be an indicator of her  $w^*$  (holding other characteristics constant).

Second, the present theory can shed new light on ethnic and racial differences in the elasticity of labour supply. Racial or ethnic origin can shift not only the constant term in labour supply regressions - it can also influence slopes. A case in point is the finding by Gronau (1981) that in Israel the labour force participation of women of Asian-African origin is more sensitive to changes in wage

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(actual or potential) than that of European-American women. Gronau's explanation is that the former women react more to pecuniary rewards. The present theory leads to an alternative explanation based on ethnic differences in the division of household labour. Stricter adherence to traditional spouse roles among Asian-African Jews (documented for instance by Yogev and Ayalon (1982)), implies a lower correlation between  $w$  and  $w^*$  and therefore a more elastic supply of labour. This is explained with reference to Fig. 3, wherein  $S$  represents the supply of two women, one from each group, with identical opportunities  $w_0$  and  $w^*_0$  in the two relevant labour markets. We can compare these two women with women who are offered a higher wage,  $w_1$ . The *observed* elasticity of labour supply could differ across ethnic groups due to varying shifts in the supply schedule which could result from varying correlations between  $w$  and  $w^*$ . If there is no link between  $w$  and  $w^*$ , the *observed* elasticity is also the true elasticity. However, if  $w$  and  $w^*$  are positively correlated, for instance because the same unmeasured characteristics - such as ability - raise opportunities in both labour markets, an increase in wages from  $w_0$  to  $w_1$  leads to both a movement along the supply curve and a leftward shift of the supply curve (due to a substitution effect and an income effect away from work).

Stricter rules of division of household labour among Asian-African Jews imply a greater conflict between the two kinds of labour in this group. This leads to a more bimodal distribution of the population according to  $w$  and  $w^*$  and a lower observed correlation between  $w$  and  $w^*$  than among European-American women. For instance, if the correlation is zero among Asian-African Jews and positive among European-American Jews, the observed elasticity and the true elasticity coincide in the case of Asian-African women, whereas in the case of European-American women the supply schedule shifts leftwards to  $S_e$ , implying a lower observed elasticity of labour supply.

Available evidence suggests that whereas all Israeli women succeeding more

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in marriage are less likely to work, this is more so among women of Asian-African origin. For instance, Matras and Selby (1981) found that all women who married men whose father had a higher occupation than their own father (an indicator of higher  $wf^*$ ) were less likely to participate in the labour force, but that a high  $wf^*$  had a much more discouraging effect on the labour-force participation of Asian-African women. This could indicate that  $wf$  and  $wf^*$  are correlated less positively in that group than among European-American Jews. This alternative explanation of group differences in the elasticity of labour supply thus seems to be applicable to Israel. It could also explain Hall's (1973) finding that whereas working wives usually show a positive elasticity of substitution, a sample of U.S. black wives showed a negative elasticity of substitution. Hall's finding is consistent with taste for less familism among blacks than among whites, implying more of a positive correlation between the  $w$  and  $w^*$  of various women among blacks than among whites. In turn this difference in conceptions of marriage could be related to the unbalanced sex ratio black women have to deal with (see above).

### (iii) *Income and Wage Effects*

The present theory leads to new insights regarding income and wage effects on labour supply. First, these effects depend on the extent to which a person is engaged in household labour and therefore they will be different for husbands and wives. Second, simultaneous changes in the income of husbands and wives can lead to marital conflicts, and the couple's method of resolving such

conflicts will in turn affect labour supply. For instance, assume independent increases in the non-wage income of a

couple initially in equilibrium at the market wages for household labour  $w^*f(\bar{a})$  and  $w^*m(\bar{a})$  (see Fig. 4). Assuming that the other spouse's labour is a 'normal input' in the utility function (1), higher incomes lead to rightward shifts in each spouse's demand for the other's labour. If the shifts are proportional to the existing amount of household labour supplied, in most cases the shift in demand for the wife's labour will be larger. However, the willingness to supply one's own labour is most likely to decrease as a result of higher incomes, i.e.  $S$  shifts leftwards in both panels of Fig. 4, and probably by a larger absolute amount in the case of female household labour than in that of male spousal labour. Assuming market wages for household labour have not changed (e.g. because large numbers of

people are not facing a similar increase in income), this couple is now facing a conflict expressed by excess demands for household labour, the excess demand for the wife's labour being generally the largest. The existence of substitutes for household labour alleviates the conflict, but a downward sloping demand for such labour indicates imperfect substitution.

One solution is to maintain the marriage and reduce the excess demands for household labour, e.g. by increasing it at the expense of labour outside the home. To the extent that there existed an initial division of labour associated with larger amounts of the wife's household labour, this adjustment will require a

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larger reduction in the wife's labour supply than in her husband's. The better the substitutes for household labour, the less additional income will be translated in increased demand for household labour, and the smaller the marital conflict. A compensated decrease in own wage ( $w$ ) affects a woman's supply of labour outside the home through substitution of both labour inside the home and time for herself for labour outside the home. The (compensated) supply of (outside) labour by married women will be more elastic than that of married men in view of the larger possibilities of substitution between the kinds of work married people engage in.

An uncompensated wage ( $w$ ) increase includes (1) a positive income effect leading people to work less in general, and most likely also less outside the home, and (2) a positive compensated wage effect leading to substitution of outside labour for household labour and time for self.

A negative Income Tax (NIT) programme, that transfers income as a function of earnings, includes both a positive income effect and a negative compensated wage effect. It follows from the theory that both these effects will have a stronger discouraging influence on the labour supply of wives than of husbands, if couples stay married. The increase in household labour resulting from the negative wage effect will help the couple in bridging the gap between demanded and supplied household labour that originated from the income transfer to both wife and husband.

Results from NIT experiments confirm the theoretical implications. Keeley (1980) found that among wives and husbands who stayed married, eligibility for a Negative Income Tax (NIT) programme tended to induce more of a negative response in the labour supply of wives than of husbands. An alternative way for couples to readjust to income and wage changes can be derived theoretically if it is assumed that men and women differ in their demand and supply of household labour, as a result of differences in productivity, income opportunities or utility preferences, and that costs of divorce and remarriage are positive. The theory suggests that a married couple can also readjust to higher individual incomes by means of divorce and remarriage.

The husband could obtain more household labour, and the wife would work less not only through a drastic reduction in the wife's labour supply outside the home, but also through divorce and remarriage with appropriate partners. The wife would find a new husband demanding fewer hours of labour in the home, whereas the (original) husband would find a new wife willing to supply more hours of labour in the home. This theory is also consistent therefore with the finding that the Denver and Seattle NIT experiments were associated with a rise in divorce (Hannan et al. (1977)).

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(iv) *The Backward-bending Supply of Labour*

The reasoning behind ethnic or racial differences in the elasticity of labour supply can also provide an additional rationale for backward-bending supply curves, beyond the traditional explanation whereby a negative income effect dominates a positive substitution effect. The backward-bending supply of labour could also result from a positive correlation between  $w$  and  $w^*$ . Higher wage levels could cause leftward shifts of the supply of labour if  $w^*$  and  $w$  are positively correlated (e.g. due to lack of control for ability). If the ensuing shift in supply is large enough in comparison to the slope of the supply function defined at a given  $w^*$ , the *observed* supply schedule could have a negative slope (see Fig. 4).

In view of the larger importance of household labour in the work history of women, it follows that this explanation is more applicable to women, and therefore that a backward-bending supply curve is more likely to be observed among women than among men. It should not come as a surprise, therefore, that one of the few cross-sectional studies finding a backward-bending supply of labour used a sample of nurses (Link and Settle (1981)).

### III. OTHER IMPLICATIONS

This section briefly mentions some additional implications of this theory of allocation of time in markets for labour and marriage regarding consumption, fertility and marriage.

As has been mentioned by Becker (1973; 1981), the relative position of husbands and wives in their respective marriage markets will have implications for their *consumption* patterns. In terms used here, the higher  $w^*f$  relatively to  $w^*m$ , the higher the wife's wellbeing compared to the husband's. One of the means by which this could be expressed is through a large share of household expenditures, benefiting

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the wife rather than the husband. Variation in relative compensations for household labour could also explain related trends in gender differentiation regarding health, longevity, or time spent on recreational activities.

The study of *fertility* is another area that could benefit from this theory. It follows from the theory presented above that there will be no strong contrast between male income effects on the fertility of full-time wives and those effects on married women working outside the home, a contrast derived theoretically by Willis (1971; 1974). According to Willis (1974) and others following his approach, an increase in male income will not affect the time cost of children of a woman employed in the labour force unless she is induced to stop working outside the home. From their point of view, so long as a woman is working outside the home, the value of her time equals her wage and is unaffected by changes in male income (equation (6')). But if male income rises and the wife is not working outside, the demand for household labour shifts upwards, her value of time in the home and cost of children rise, which attenuates the impact of an income effect. This leads Willis to predict that the absolute value of a male income effect on fertility will be larger if the wife works outside the home than if she does not.

In contrast, it follows from this model that a woman's value of time in the home is determined in a market for household labour. Consequently, a rise in the aggregate demand for women's household labour resulting from an overall increase in male income will be associated with an increase in the value of time in the home ( $w^*$ ), even for women working outside the home. However, it remains true that a shift in demand at a point where the supply is closer to vertical will cause a larger increase in  $w^*$  than an upward shift in demand at a point where the supply curve is more elastic, and the latter may be less likely when no women work outside the home. But according to the present approach, it is impossible to predict that the male income effect on fertility will be stronger if labour force participation by married women is more widespread, an implication stated in Willis (1974). It is therefore not surprising that Ermisch's (1979) analysis of British time series of fertility and Butz and

Ward's (1979) analysis of such series for the United States did not show that male income had a stronger positive effect if women participated in the labour force.

Estimating the value of time in the home is interesting not only for the study of fertility but also for such subjects as the determination of alimony or life insurance benefits. Whatever one's source of interest it is important to appreciate that according to equation (6) the value of someone's time in the home does not need to be equal to their wage in the labour market (assuming they work). People showing much higher productivity in the labour market than in marriage, which would be reflected in a  $w^*$  much lower than  $w$ , will probably devote small amounts of time to a spouse. For example, the successful female executive with an average market  $w^*$  may spend few but very enjoyable hours working for her spouse (including time she devotes to their children beyond the amount of work she would contribute being a single parent). One can use some of the ideas presented here in determining optimal methods for property and income distribution at divorce. The emphasis on household

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employment and market-established values of household labour implies (1) less emphasis on the number of hours a person works outside the home than is presently the case: wives (or husbands) who work outside the home should not necessarily be deprived of a compensation at the time of divorce, nor should full-time housewives necessarily receive a large compensation; (2) less emphasis on income unrelated to household labour; (3) a return to the more individualized divorce settlements which many jurisdictions have recently replaced by simplified procedures. Marriages involve a great variety of (often implicit) reciprocal employment contracts, and at dissolution each case needs to be studied separately.

Finally this theory has many insights to offer regarding our understanding of variations in marriage and divorce rates, preference for cohabitation versus formal marriage, acceptance of polygamy, intermarriage, or age at marriage. These are pursued further in Grossbard (1978a; b), and Grossbard-Shechtman (1982a; b, 1983).

#### **IV. SUMMARY AND CONCLUSIONS**

This paper has presented a theory of interrelated labour and marriage markets. Demand and supply schedules for labour and household labour were derived based on a theory of allocation of time and on the assumption that individuals can enter and discontinue marriage contracts. Particular emphasis was given to the theory's implications for the study of labour supply. Among the major insights derived from the model are the hypotheses that labour force participation of married women varies with the sex ratio of those eligible for marriage, that income changes influence wives' labour supply more than husbands', that group differences in patterns of division of household labour influence the elasticity of female labour supply, and that a positive correlation between achievement in markets for labour and household labour can provide an additional explanation for the backward-bending supply of labour. The theory also offers interesting insights regarding consumption, fertility, and marriage.

Further research ought to refine the theoretical apparatus presented here, test it against further empirical evidence, and to explore its implications for public policy. Numerous laws and government programmes affect women's labour force participation, marriage, fertility, and divorce, as well as the relative welfare of men and women, whether married or not. This theory will perhaps provide a useful framework for analysing the consequences of public policy for production, reproduction, and the distribution of wealth.

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