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Endogenous Gender Power, Household Labor Supply and the Quantity-Quality Tradeoff

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Abstract

1. I

spouses de

2 shows the gender gap in educational attainment by country income groups. While the gender gap in education narrowed across all but the high-income countries between 1980 and 1993, the lowest female enrollment rates in both the primary and secondary education levels were in South Asia, Middle East and North Africa.

[Tables 1 and 2 and Figure 1 about here.]

Our approach suggests that such changes

determined endogenously according to actual relative earnings. However, while allowing for endogenously determined bargaining power, his approach assumes that both parties

non-c

up households can differ in their preferences, and that household choices reflect not only these differences but also the bargaining power of the two sexes. The crucial feature of our model is the endogenous determination of the marital power of both spouses. In particular, we assume that the relative bargaining power of women is related to how large a share of the total household income they earn in the labor market.

IV)

With the marital balance of power being determined endogenously according to spousal incomes, rational individuals take into account how their labor supply decisions impact{via the bargaining process{the household decisions about consumption, leisure, fertility and education. This sets up a two-stage decision problem: In the first stage, couples play a pure Nash equilibrium. They choose their labor supply recognizing how their choice will interact with that of their spouses in determining the allocation of household resources in the second stage. In the second stage, couples decide their respective consumption and leisure levels as well as how many children to have and how much to educate each, taking as given each partner's labor supply. Thus, conditional on the endogenously determined bargaining weights, household resources are allocated according to the Beckerian model.[8]

In the following section, we incorporate these assumptions into a microeconomic model of the household to show how endogenous bargaining influences the quantity-quality tradeoff. In Section 6, we summarize the model's main implications. And in Section 7, we conclude.

5. The Model

The economy is made up of two overlapping generations. The old (generation 1) and the young (generation 2). In both generations, half the population is male and the other half is female. Within each gender group, people are identical. Households are made up of a

See Basu (2001) for a more complete list.

[8] If one were to accept that, in general, career related decisions precede marriage and decisions that are clearly maritally oriented (such as the number of children, their average education level, and the relative consumption and leisure of the spouses during marriage), the natural sequence of events would also help to justify the two-stage game. It would suggest that, during the first stage, spouses choose their labor supply non-cooperatively but in anticipation of the impact of their choices on marital outcomes that would be determined in cooperative fashion during the second stage.

husband, a wife (of generation 1), and children (of generation 2). Thus, each individual has two parents: a mother and a father. In each household, there are equal numbers of female and male o®spring. The young consume a fraction of their parents' time. The required amount of time increases in the total number of o®spring the parents choose to have. The old live p, $0 < p \quad 1$, fraction of their potential unitary time endowment. The wage rate per unit of labor equals w_i where the subscript index i, $i = f, m$; denotes the gender of person i{i.e., f for female and m for male.[9] The human capital level of the old generation, h_1, is normalized to one. Thus, a couple can generate $p(w_f + w_m)h_1 = p(w_f + w_m)$ amount of potential household income.

5.2.1. Preferences and Budget Constraints

The old generation's preferences are de¯ned over consumption, leisure, and the quantity and quality of their children. Let c_i and l_i denote the consumption and leisure of individual i of the older generation. And let n and h; respectively denote the number of i's children and their average human capital level. Preferences of i are represented by the following inter-temporal utility function:

$$U_i = \ln l_i + ® \ln c_i + ¯ \ln n + ° \ln h; \qquad i = f; m: \tag{1}$$

where ®, ¯, and ° respectively measure the values associated with consumption, the number of o®spring, and their average quality as measured by the o®spring's human capital. Note that (1) re°ects no di®erence between the two sexes in preferences.

Let $\mu; \mu \quad [0; 1]$, denote the marital bargaining power of women. Given μ, and the utility speci¯cation in (1), each couple maximizes the following:

$$\begin{aligned} - &= \mu U_f + (1 \quad \mu) U_m \\ &= \mu(\ln l_f + ® \ln c_f) + (1 \quad \mu)(\ln l_m + ® \ln c_m) + ¯ \ln n + ° \ln h \end{aligned} \tag{2}$$

[9] We allow the wage rates paid to men and women to potentially di®er in order to explore the e®ects of changes in the gendnnt t

Following the standard Beckerian model of household fertility, families decide the optimal number of their children and the education level of each subject to a budget constraint that re°ects the allocation of time between work, leisure, and child rearing. To formalize, let ¿i; i = f; m; denote the time costs of rearing one child. Given the assumption that the time cost of child rearing is greater for women, we have ¿f ¿ > ¿m 0.[10] Then, for the wife and the couple, ¿n denotes the total time cost of child rearing.

In order to employ a relatively simple human capital accumulation process, we assume that each young person's human capital is determined in the following speci¯c way:

$$h = ¸ + Áe; \tag{3}$$

where Á denotes the marginal return to education and e is the level of education of the o®spring. According to (3), if the young receive no education their human capital equals that of the unskilled ¸; ¸ 0. Attaining an education level of e does not involve any time cost but it requires a pecuniary cost of z, z > 0; per unit and a ¯xed start-up cost of est Tj 6.75 0 TD (n) Tj 5.25 0 9.75 0 TD 0

5.2.2. Exogenous Household Bargaining and the Quantity-Quality Tyu

$$\frac{\bar{}}{n} = \frac{\text{®}(1 \quad \mu^{1})(\text{¿}\, w_f + ze)}{c_m} \tag{9}$$

$$\frac{\text{°Á}}{\text{¸} + \text{Áe}} \qquad \frac{\text{®}(1 \quad \mu^{1})(F + zn)}{c_m} \tag{10}$$

where

c_{mr}

Remark 1:

$$\frac{\partial n}{\partial \mu^{1}} = \frac{\partial e}{\partial \mu^{1}} = 0.$$

Proof: See Appendix.

5.2.3. Endogenous Bargaining Power and the Quantity-Quality Tradeo®

When gender power is endogenously determined, both spouses recognize that their labor-leisure choice, as well as that of their partner's, impacts household allocation decisions. As a result, they choose how much to work acknowledging how the relative spousal supply of labor{via its impact on household bargaining{subsequently in°uences consumption, leisure, fertility and education. Thus, we have a two-stage problem: In the ¯rst stage, couples play a pure Nash equilibrium. They choose their labor supply recognizing how their choice will interact with that of their spouses in determining the allocation of household resources in the second stage. In the second stage, couples decide their respective consumption and leisure levels as well as how many children to have and how much to educate each, taking as given each partner's labor supply.

We endogenize the bargaining power variable μ by assuming that it is a function of each spouse's labor income, $w_f s_f$ and $w_m s_m$, and a parameter $\tilde{A}$ that re°ects the social and cultural attitudes towards gender equality. We assume that the bargaining power variable μ is determined by the labor income of women relative to that of men (more on which below) according to the following speci¯cation:

$$\mu = \frac{w_f s_f}{w_f s_f + \tilde{A} w_m s_m}, \tag{14}$$

where as noted above $\tilde{A}$ represents the relative importance of husbands' earnings in determining the household balance of power. Note that for equal levels of spousal income,

there is an equal balance of power (i.e. μ equals 1=2) only if $\tilde{A}$ equals one. If $\tilde{A}$ is larger than one, then the husbands have more household gender power even when the spouses have identical incomes. One can interpret $\tilde{A}$ to be an inverse measure of the social propensity for gender equality. Equation (14) suggests that reductions in the parameter $\tilde{A}$, a closing of the gender wage gap, $w_m - w_f$, and higher life expectancy, p, which given the speci¯cations in (5^0.b) and (5^0.c) bene¯t women more relative to men, all alter the marital balance of power.

To solve for the equilibrium outcome, we begin with the second stage during which couples make

$$\frac{\gamma\phi}{\lambda + \phi e} = \frac{\alpha(1-\theta)(F+zn)}{c_m}, \tag{18}$$

where $c_m = w_f \cdot s_f + w_m \cdot s_m - e(F+zn) - c_f$. Using (16), we substitute for c_f in the preceding equation for c_m. Then we establish $c_m = (1-\theta)[w_f \cdot s_f + w_m \cdot s_m - e(F+zn)]$. Substituting this into (17) and (18) we conclude that the endogeneity of bargaining power θ affects the first-order condition with respect to fertility. The first-order condition with respect to education, now given by (18), remains relatively unchanged and is not directly a function of θ. As we shall show below, however, how much to educate the offspring can be affected by θ indirectly, as spouses' labor supply is influenced by the bargaining variable θ.

Equations (16), (17), and (18) implicitly define the optimal consumption of the wife and the husband, c_f^* and c_m^*, household fertility, n^*; educational attainment, e^*, and the wife's leisure, l_f^*, as functions of the couples' labor supply decisions. Hence, we have

$$c_f^* = c(s_f, s_m); \tag{19}$$

$$c_m^* = c(s_f, s_m); \tag{20}$$

$$n^* = n(s_f, s_m); \tag{21}$$

$$e^* = e(s_f, s_m); \tag{22}$$

$$l_f^* = p - \tau n^*(s_f, s_m) - s_f; \tag{23}$$

$$l_m = p - s_m. \tag{24}$$

We can now turn to the first stage during which the husband and wife choose their labor supply taking as given the labor supply decisions of their spouse and the determination of optimal household choices listed above. Both the husband and wife play a

Nash-equilibrium game taking each other's labor supply decisions as given. Accordingly, we de¯ne the response function for individual i as a function of the labor supply of the spouse as in equation (25):

$$
\begin{aligned}
s_i(s_{ji}) &= \arg\max\ U_i(s_i, s_{ji}) \\
&= \arg\max\ [\ln l_i^{\alpha} + \beta \ln c_i^{\alpha} + \gamma \ln n^{\alpha} + \delta \ln(\phi + \lambda e^{\alpha})]; \qquad i = f, m.
\end{aligned}
\tag{25}
$$

Given that the optimal values of e^{α}, n^{α}, c_m^{α}, c_f^{α}, l_m^{α}, and l_f^{α} are functions of the spouses' labor supply, s_f and s_m, the solution to (25) implicitly yields two response functions: $s_f = s(s_m)$ and $s_m = s(s_f)$. We can now de¯ne the household equilibrium:

De¯nition:

$$
\begin{aligned}
& s_f^{\alpha} = s(s_m^{\alpha}) \qquad \text{and} \qquad s_m^{\alpha} = s(s_f^{\alpha}); \\
& \mu^{\alpha} = \frac{s^*}{s^* + \lambda s^*}, \\
& c_f^{\alpha} = c(s_f^{\alpha}, s_m^{\alpha}), \qquad c_m^{\alpha} = c(s_f^{\alpha}, s_m^{\alpha}); \\
& n^{\alpha} = n(s_f^{\alpha}, s_m^{\alpha}), \qquad e^{\alpha} = e(s_f^{\alpha}, s_m^{\alpha}); \\
& l_f^{\alpha} = p\ \neg n^{\alpha}\ s_f^{\alpha}, \quad \text{and} \quad l_m^{\alpha} = p\ s_m^{\alpha}.
\end{aligned}
\tag{26}
$$

In Figure 2, we illustrate the response functions of the wife and the husb

exogenous marital power of husbands drops, women can work less and still yield more marital power.[12] The opposite is true for men who need to work more to offset the effect on bargaining of a drop in their exogenous marital power.

quantity-quality tradeo®.

In all simulations, parameter values such as the wage per e±ciency units of labor, w, the human capital level of unskilled labor, ¸, and the education premium, Á, are chosen for convenience. We set the arbitrary value of such variables either equal to unity or to some other reasonable level that yields an i,t dtively) sTj a.Tj5360r(0tl)DD0.034(6l.5l(e)512j5 r.she5 f6j.r06uTc TD(40 0Ta

attainment almost doubles and fertility drops by 60 percent. Obviously, this need not be the case universally. Although it is plausible that the gender wage gap and the relative institutional and legal advantages men enjoy in marriage are highly correlated, scaling back the legal advantages men enjoy in marriage can impact the quantity-quality tradeo® more if the gender wage gap is relatively small.

It is rather straightforward to establish why couples alter their fertility and education choices when bargaining power is endogenous: When bargaining power is in°uenced by relative spousal incomes, labor force participation becomes crucial for maintaining intra-household power. As a consequence, policies aimed at empowering women do not generate as large shifts in the labor-leisure choice as they do with exogenous bargaining. And due to the higher rigidity of the labor supply schedules with endogenous bargaining, empowerment policies lead to changes in fertility and education so as to generate more leisure time for women.

Remark 2:

The top panel of Table 4 presents our parameter choices for our second set of simulations. Here we make two distinct modi¯cations to parameters we utilized in the previous round: One, we no longer assume that education involves variable costs only. Instead, we let the ¯xed cost of attaining a given level of education, F, be strictly positive. And two, we let the human capital level of unskilled labor, $\underline{s}$, also be strictly positive. With these two modi¯cations, we can explore a wider range of parameter choices than those we examined above to show speci¯cally how improvements in life expectancy empower women.

[Table 4 about here.]

The ¯rst three columns of Table 4, (a), (b) and (c), show the e®ect of improvements in life expectancy on the household equilibrium. Column (a) shows results with a value of

depicted in the three pre

simulation (where in both simulations men's wages are normalized to 10). Finally, to account for the social progress made in generating equal gender opportunity, mostly in last three decades, we set the parameter Ã respectively at 2 and 1 in the ¯rst and second simulations. A comparison of the columns (d) and (e) show how the combination of such changes alter household choices. Women work much more relative to men and enjoy higher consumption and marital power after the changes. Men, on the other hand, work roughly the same fraction of their time endowment both before and after the changes. Although they consume much more in absolute terms, their consumption relative to that of women is now considerably lower. Men also are left with signi¯cantly less marital power. And ¯nally, as a result of the rise in female marital power, couples have fewer but more educated children.

6. Implications and Further Discussion

The model described above has a number of speci¯c implications, some of which we have already discussed. In this section, we highlight the major points more formally and present the supporting evidence that are relevant to each.

I)

This model demonstrates why marital power sharing arrangements are relevant for long-run economic performance. The biological di®erences between the sexes in the time requirements for parental time investment make marital decision-making an important mechanism through which the economy wide quantity-quality tradeo® is determined. This result complements those found by two strands in the existing literature. On the one hand, the role of marriage emphasized here{that of a gender bargain about quantity versus quality of o®spring{introduces a new dimension through which marriage a®ects macroeconomic performance. A number of recent papers, including Aiyagari, Greenwood and Guner (2000), and Fernandez, Guner and Ortigueira (2001), have argued that

Manser and Brown, McElroy and Horney, Chiappori (1988, 1992), Chiappori, Fortin and Lacroix (2002), Basu, and Rasul (2002), has identi¯ed{theoretically and empirically{the role of marital bargaining in child labor, female labor supply, and fertility.

II) Because men and women di®er in the biological requirements of child rearing, life expectancy plays a crucial role in determining how marital choices are made. And as shown, bargaining in°uences not only the quantity-quality tradeo® but also the labor supply of men and women, and the relative role of women at home and in economic activities. Speci¯cally, the model identi¯es that improvements in life expectancy diminish the relative biological disadvantada

on economic development.[19]

IV) The historical evidence seems to suggest that the role of women in marriage and the economy follow a U-shaped trajectory during the course of development. The framework develop above, identi¯es that both are in°uenced to a great extent by changes in liffn

requirement for c

(A.6) and (A.7) are both independent of μ and they both relate n to e. Hence, optimal fertility and education are independent of the bargaining parameter μ: Using (A.5), we can now establish

$$\frac{@c_m}{@\mu} = \frac{\alpha_i}{1+\alpha}. \tag{A.8}$$

Together with (A.1)-(A.3), (A.8) implies that

$$\frac{@c_f}{@\mu} = \frac{c_m}{(1-\mu)^2}\left(\frac{\mu}{1-\mu}\frac{\alpha_i}{1+\alpha}\right), \tag{A.9}$$

$$\frac{@l_m}{@\mu} = \frac{1}{w_m}\frac{\alpha_i}{1+\alpha}, \tag{A.10}$$

and,

$$\frac{@l_f}{@\mu} = \frac{1}{w_f}\left(\frac{c_m}{(1-\mu)^2}\left(\frac{\mu}{1-\mu}\frac{\alpha_i}{1+\alpha}\right)\right)^{\frac{3}{4}}. \tag{A.11}$$

It is then straightforward to show that the sum of (A.8) and (A.9) and the sum of (A.10) and (A.11) both equal zero. □

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Figure 1

Figure 2: Spousal Response Functions and Changes in Ã

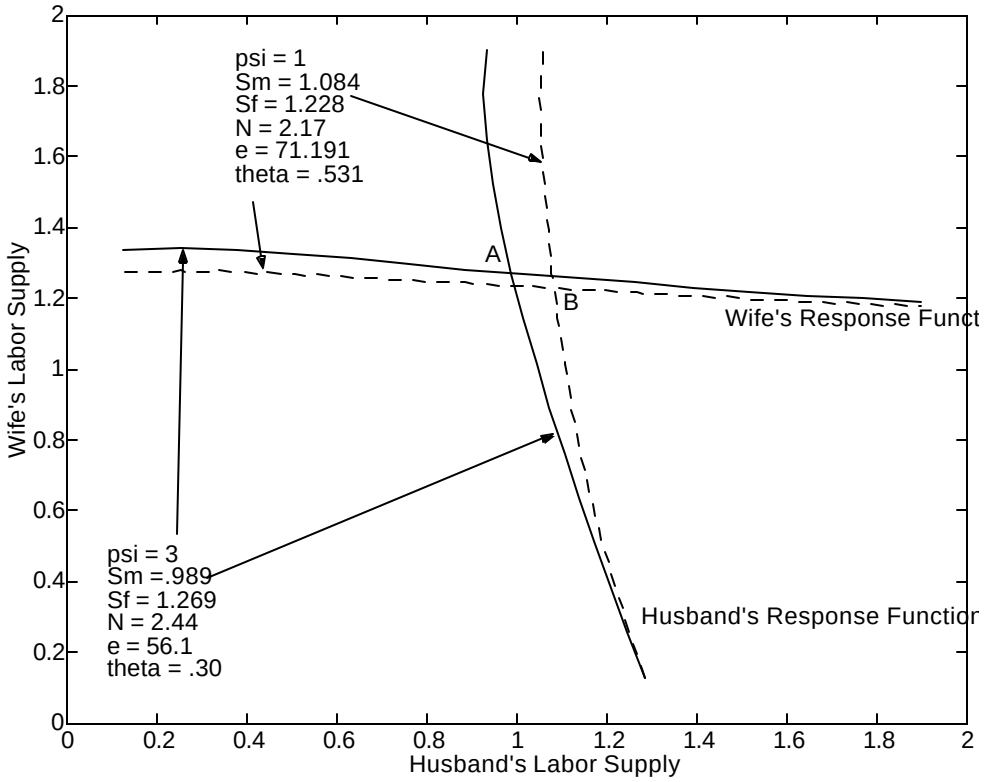

Figure 3: Spousal Response Functions and Changes in $w_f = w_m$

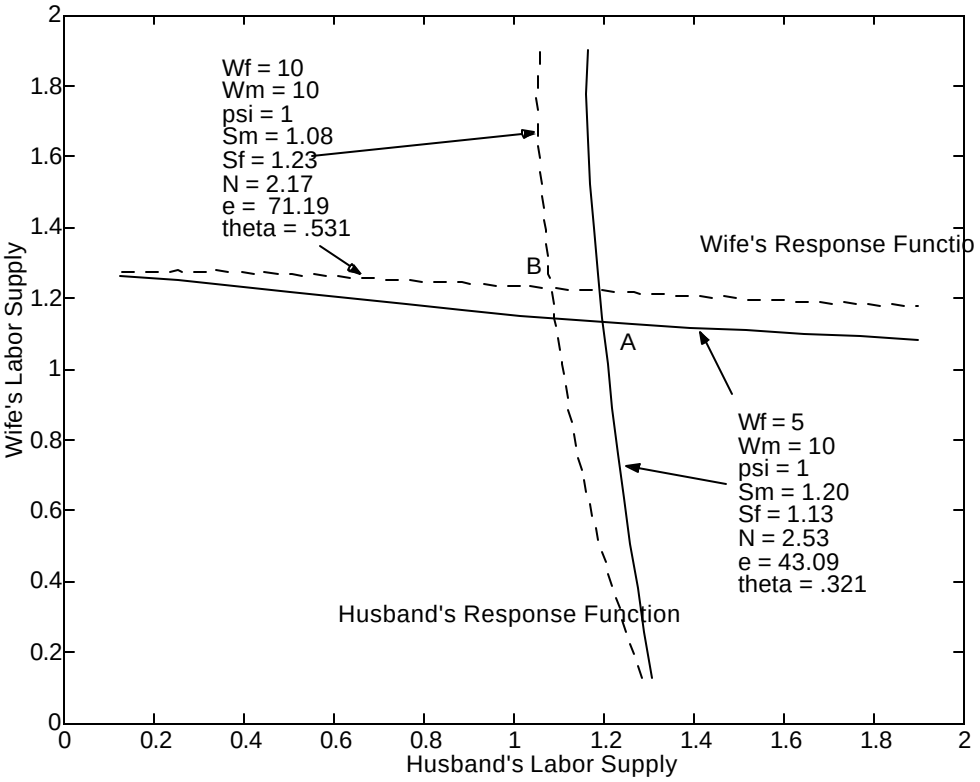

Figure 4: Spousal Response Functions and Changes in p

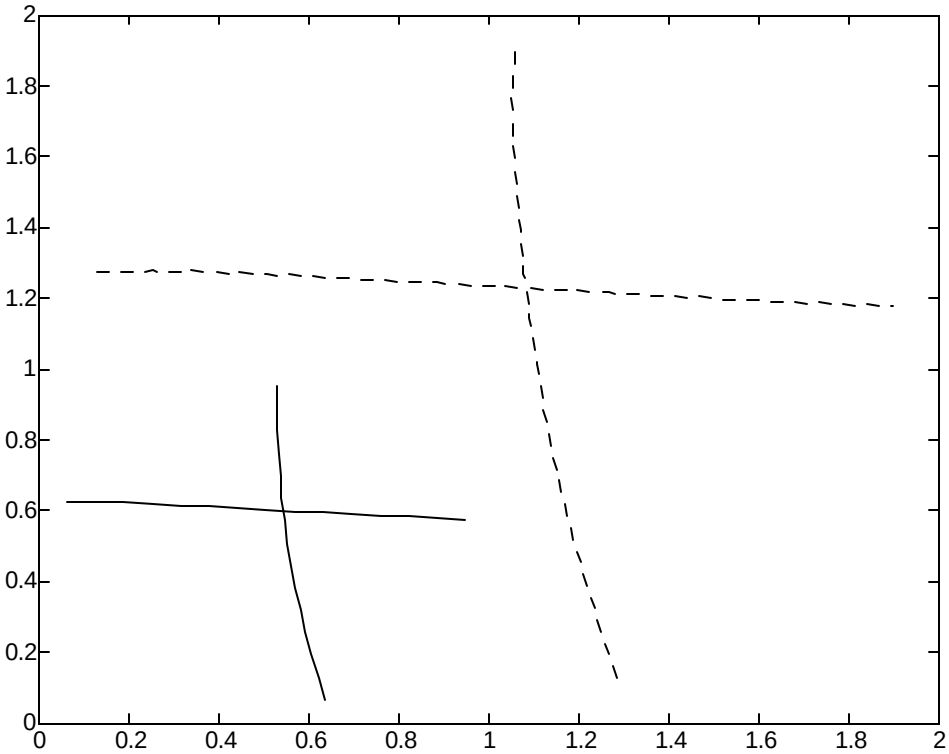

Figure 5: Labor Supply and Changes in Ã

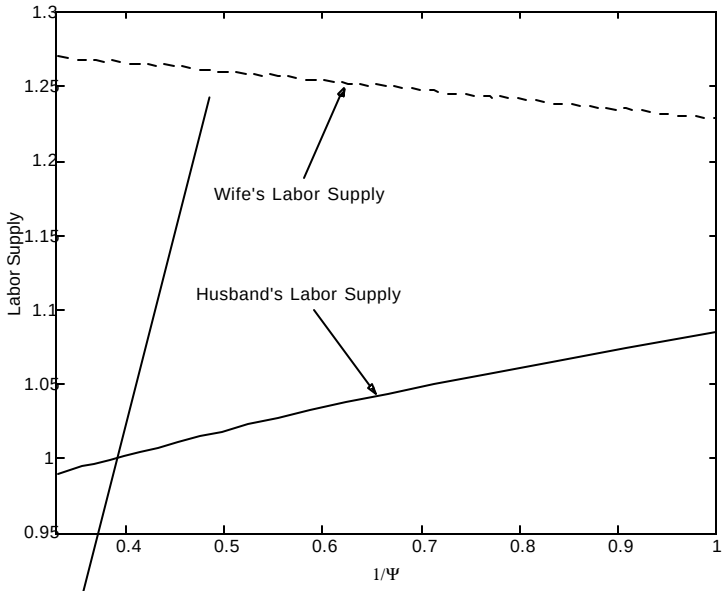

Figure 6: Consumption, Leisure

Figure 7: Fertility, Eduation and Changes in Ã

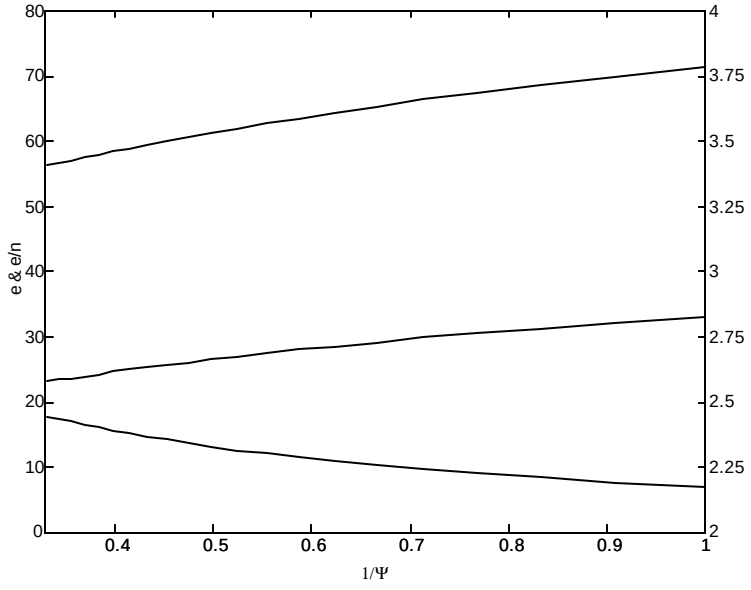

Figure 8: Labor Supply and Changes in $w_f = w_m$

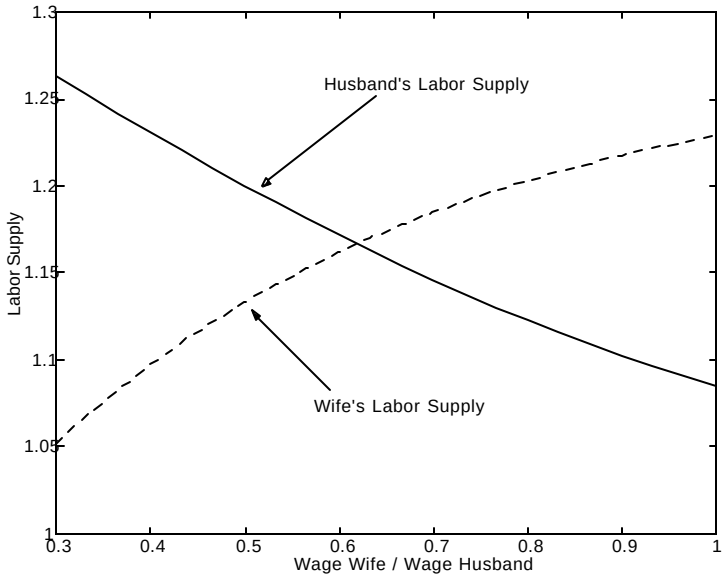

Figure 9: Consumption, Lesiure, and Changes in $w_f = w_m$

Figure 10: Fertility, Education, and Changes in $w_f=w_m$

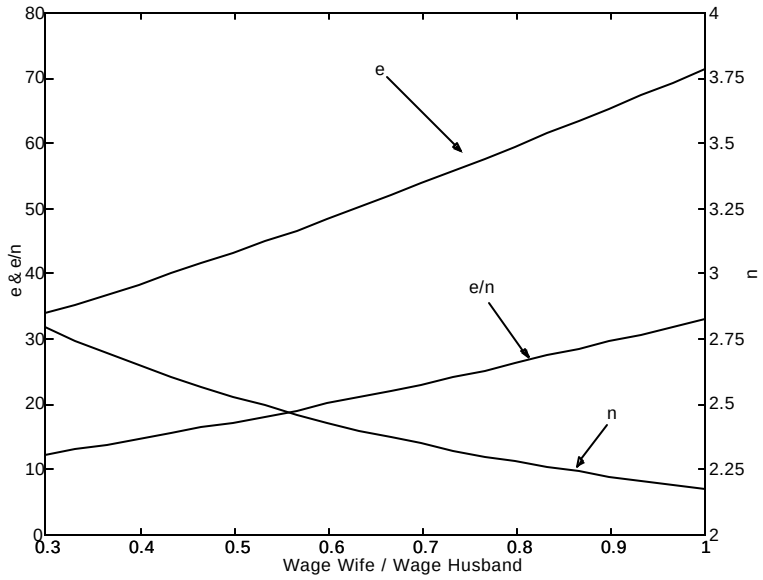

Figure 11: Labor Supply and Changes in p

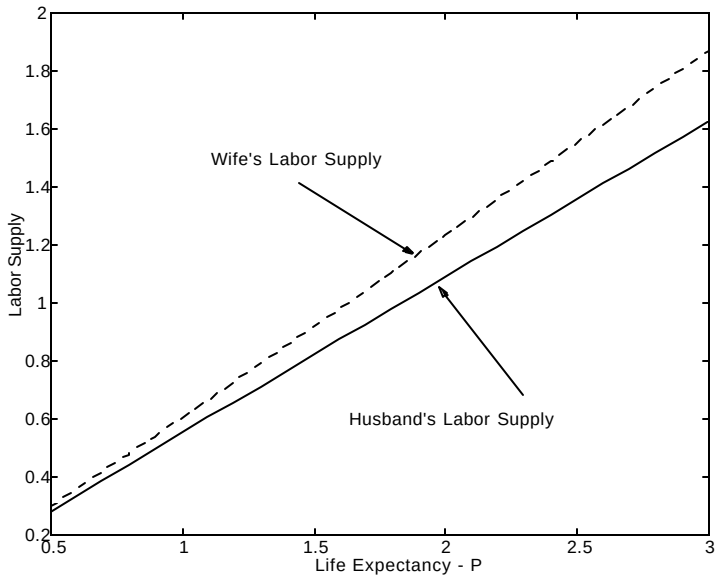

Figure 12: Consumption, Leisure, and Changes in p

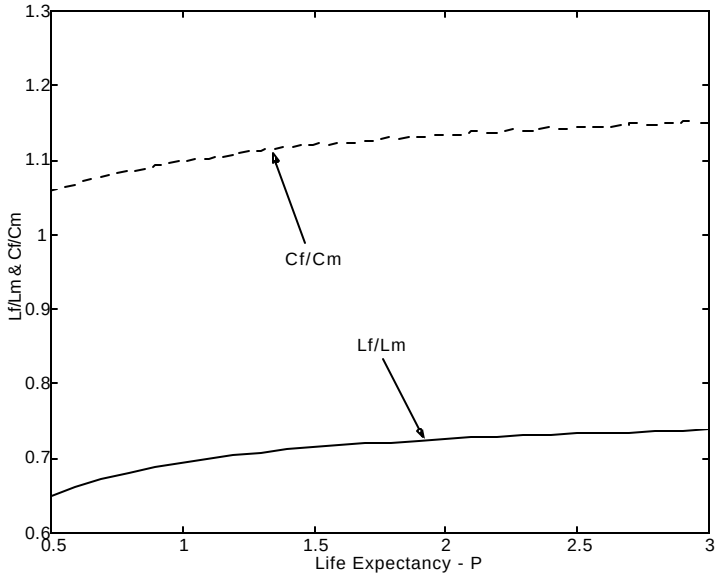

Figure 13: Fertility, Education, and Changes in p

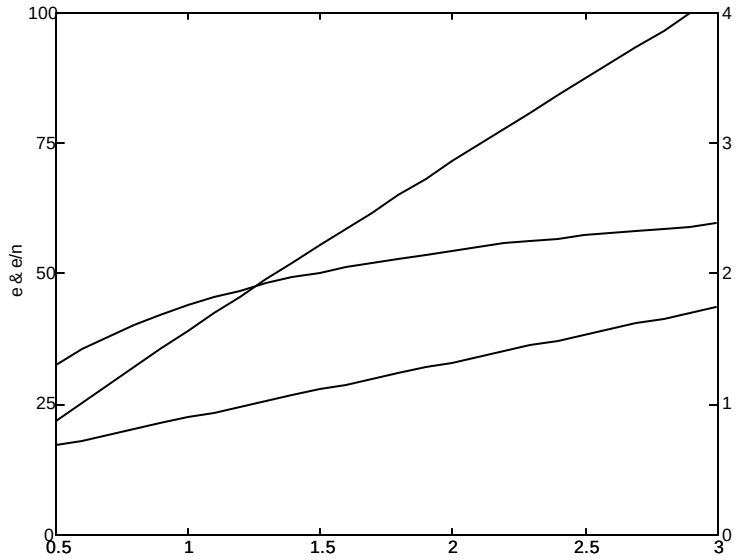

Table 1: U.S. Life Expectancy, Gender Gap, and Labor Force Participation Rates*

Year	Life Expectancy	WLFPR	Earnings
	(years)	(percent)	(percent of of f er s*c4206 T (f)9c (s) Tj 4.5

Table 2: The Gender Gap in Educational Attainment across Country Income Groups*

Income Group		Primary Education	Se11 454.5 0.24 14.25 re S 113.25 454.5 0.214.25 re e S

Table 4: Changes in Life Expectancy and Education Premium (with F > 0 and ¸ > 0)

Parameters	(a)	(b)	(c)	(d)	(e)
¿	0:05	0:05	0:05	0:05	0:05
®	1	1	1	1	1
¯	0:6	0:6	0:6	0:55	0:55