GLOBALIZATION, GENDER, AND GROWTH

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We consider the effect of globalization on fertility, human capital, and growth. We view globalization as creating market opportunities for employment in less developed countries. We construct a specific model of household decision making, drawing on empirical observations in the development economics literature, and show that if the market opportunities produced by globalization are for women, then globalization reduces fertility and increases human capital formation. If the opportunities are for men, then fertility increases and human capital formation falls. We then show that globalization that produces job opportunities for women increases growth and produces a long run steady state with higher per capita consumption than would prevail either without globalization, or with globalization that creates jobs only for men.

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1. INTRODUCTION

Globalization is a term that is often used broadly and rather imprecisely. In this article, we use it narrowly to describe the process by which capital flows to developing countries in order to set up factories that take advantage of low cost labor to produce goods that are then exported to developed countries. Opponents of globalization often refer to these as "sweatshops" and regard them as uniformly bad.

The word "gender" occurs in the title because we want to distinguish between factories that use predominantly female labor and those that use predominantly male labor. We make this distinction because we believe that the gender employed in the sweatshops makes an important difference to the implications of the investment for economic growth and development. This in turn rests on an approach to the economics of the household based on models of intra-household conflicts of interest.[1] This view of households is becoming increasingly prevalent in economics, though it has by no means yet become the dominant paradigm.

[1]For a recent survey of the literature, see Apps and Rees (2009, chs 3,4).

We model the household as consisting of two individuals, one male and the other female. They have their own individual preferences that differ in one important way. Specifically, their utility depends in general on their individual consumption, a household public good that we call the number of children or fertility,[2] and a household public good that we call the quality of children or human capital.[3] We use empirical work in the development literature[4] to guide our formulation of preferences. Accordingly, we assume that, while both the male and the female have identical preferences with respect to consumption and fertility, the latter has a stronger relative preference for average child quality. We base this assumption on the empirical work that suggests that mothers care more about the nutrition, medical care, and education their daughters receive than do fathers,[5] while there is no evidence that they care any less about their sons, and so they place a higher weight on average child quality overall.

Pre-globalization, the male devotes all his time to working on the family farm, producing a good which is sold at a fixed market price. The female divides her time between working on the farm and child care. They allocate their household resources over the consumption good and the household public goods by some decision process which could, but need not, take the form of bargaining. The central assumption we make about this process is that it results in a Pareto efficient allocation,[6] but that the precise allocation chosen in the Pareto efficient set depends on the individuals' outside options, especially their market employment possibilities, as measured by their wage rates.[7] We will make this more precise in the next section.

The basic story is very simple. Pre-globalization, because of his higher productivity on the farm, the male has more power within the household and therefore his preferences play the major role in determining the household allocation. This will be a (relatively speaking) high consumption, high fertility, low average child quality equilibrium. Consider now the impact of globalization. If this takes the form of investment that provides female jobs, then the female's power within the household increases, due for example to the increase in the value of her outside option. This in turn moves the household allocation in the direction of her preferences, which we show implies fewer children but higher average child quality. Female labor-oriented globalization works through the household allocation process in such a way as to reduce fertility and increase human capital.

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[2]Throughout we will ignore integer problems and treat the number of children as a real number.
[3]We also measure child quality with a real number.
[4]See, for example, Schultz (1990), Singh *et al.* (1986), and Thomas (1990), and the more recent work discussed below.
[5]Empirical support for this assumption can be found in Thomas (1990), Duflo and Udry (2001), Duflo (2003), and Quisumbing and Maluccio (2003).
[6]Standard bargaining models, such as the Nash bargaining model (for applications in a household context, see Manser and Brown (1980), McElroy and Horney (1981), and Ott (1992), and the "separate spheres" bargaining model of Lundberg and Pollak (1993)) of course have this property. For a more general treatment on which the approach here is based, see Apps and Rees (1988), Chiappori (1988), and Browning and Chiappori (1998).
[7]If we were restricting attention to Nash bargaining models, we would label these "threat points." However, we take a simpler and more general model of the household welfare function than that based on Nash bargaining.

If, on the other hand, globalization takes the form of investment that provides male jobs, then the male will have even more power within the household. This results in increased consumption and fertility but lower child quality and human capital. In this case, the economy converges to a lower per capita income and higher fertility in the steady state equilibrium. Thus, we argue that the form that globalization takes is crucial. If globalization results in new jobs for females, it will lead to higher levels of human capital and growth. In the following section we go on to test the consistency of this story in a formal model.

Our approach fits well with the large empirical literature on female labor supply and economic development. Goldin's (1995) hypothesis of a U-shaped relationship between female labor force participation and economic development has received substantial empirical support.[8] In the earlier stage in the process of development, jobs are created for men and their market labor supply increases, and this is associated with falling levels of female labor force participation. As the process of economic development proceeds however, white-collar jobs are created in sectors such as banking, retailing, and services generally, which increase the demand for female labor. Galor and Weil (1996) provide a macroeconomic growth model which explores the effect of the changing composition of labor demands, in terms of the mix of jobs requiring brains versus brawn, on, among other things, fertility levels, but their model of the household is still very much of the "black box" type. This work is extended by Kimura and Yasui (2010), who add a third use of time, non-market work, into the model. Their model explains the joint evolution of production structure, household time allocation, and fertility. In their model production shifts out of households and into markets, which leads to increases in male and female labor supply. This in turns leads to a long run decline in fertility. In this article we provide a microfoundation for the U-shaped hypothesis in terms of the structure of within-household decision taking and the way in which this interacts with the developments, exogenous to the household, in market labor demands and male and female wage rates.

This differs from the model proposed in Fernandez (2010), which centers on the tension between a man's conflicting interests as a husband, where he would prefer to restrict a woman's rights, and as a father, where "he is hurt by a system that afforded few rights to [his] daughters," with the latter force coming to dominate at a sufficiently high level of development. Fernandez' model therefore provides an explanation in terms of a change in the balance of interests of the single dominant decision taker in the household, rather than, as in the present article, by a change in the balance of power within the household between parents with different attitudes (preferences) concerning their daughters' health, nutrition, and education. Recent work by Doepke and Tertilt (2009) also focuses on the conflict between the male interest as husband and father. They argue that as technology becomes more important, men are increasingly willing to surrender power to their wives in order to improve the rights of their daughters. Lagerlöf (2003) shows in a growth model that more equality in female/male human capital ratios produces more robust growth results.

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[8]See, in particular, Mammen and Paxson (2000), Sinha (1967), Durand (1975), Psacharopoulos and Tzannatos (1989), and Horton (1996).

Further empirical support for our approach is provided by Klasen (2002) and Oostendorp (2009). The former article finds robust results suggesting that gender inequality in education directly affects economic growth by lowering the average level of human capital, and so reductions in this inequality can be expected to increase economic growth. Oostendorp finds, in a large cross-country study of the impact of globalization on the gender wage gap, that this tends to decrease with increasing economic development and with trade and foreign direct investment. In our model, rises in the female wage rate relative to that of males increase child quality and therefore the human capital of females, which in turn further raises their relative wage rate. The result of this is a virtuous circle in which the economy reaches a steady state with higher per capita consumption than if a high gender wage gap, and consequently lower levels of household decision taking power for women, were to persist.

2. The Household Model

We assume that the two adults in the household, indexed respectively f and m, have identical preferences in respect of consumption x and fertility, n, a real number rather than an integer. They differ however in their preferences toward average child quality q, with f having a stronger preference for this than m. As pointed out in the Introduction, this is supported by a large literature which shows that mothers care more for the health, nutrition, and education of female children than do fathers, implying that, given the same preferences toward male children, they care more about average child quality.

To make the results as sharp as possible, we assume quasi-linear utility functions of the form

$$(1) \qquad u_i(x_i, n, q) = x_i + \phi(n) + \varphi_i(q), \quad i = f, m$$

with $\phi(n)$ and $\varphi_i(q)$ strictly concave and increasing, and

$$(2) \qquad \varphi'_f(q) > \varphi'_m(q) \quad \text{at all } q.$$

The quasilinearity, with consumption as numeraire good, means that there are no income effects on the child-related goods, which allows us to bring out more sharply the implications of the household model for fertility and child quality. The consequences of introducing income effects on these are easy to describe and will be discussed after the main analysis.

We assume that the value of farm output y is given by the strictly concave and increasing production function $h(t_f, t_m)$, where t_i is the time $i = f, m$ spends in farm production. We also assume a very simple linear child rearing technology:

$$(3) \qquad c = an \quad a > 0$$

where c is the time f spends in child care, and only maternal time is used for this.

If there is an outside labor market, the adults supply $l_i \geq 0$ to this and receive a wage w_i, $i = f, m$. We normalize total time available to each individual to 1 and ignore leisure, so that the individual time constraints are respectively

$$(4) \qquad\qquad l_f + t_f + c = 1$$

$$(5) \qquad\qquad l_m + t_m = 1.$$

The budget constraint, with both[9] $l_i > 0$, is given by

$$(6) \qquad x + n\left(x_0 + bq + aw_f\right) \leq \sum_{i=f,m} w_i(1 - t_i) + h\left(t_f, t_m\right)$$

where $\sum_{i=f,m} x_i = x$, b is the cost of a unit of child quality and x_0 is a given consumption level per child.

To model the joint decision-taking of the household we adopt the collective model,[10] which assumes that the household maximizes a weighted sum of the utilities of its adult members, where the weights are functions of, among other things, their respective wage rates

$$(7) \qquad V\left(u_f, u_m; w_f, w_m\right) = \alpha\left(w_f, w_m\right)u_f + \left[1 - \alpha\left(w_f, w_m\right)\right]u_m$$

subject to the budget constraint in (6). The substantive assumptions underlying this formulation are that the household achieves a Pareto efficient allocation[11] and that it has no inequality aversion—hence the weighted utilitarian form of the function V.[12] We assume that[13] $\alpha_f > 0$, $\alpha_m < 0$. We might rationalize this by arguing, for example, that the individual would have a more favorable bargaining position within the household the better her outside option, which will vary positively with her wage rate. However, we are not restricted to bargaining-type rationales. For example, we could follow Sen in arguing that the position of an individual in the household is more favorable, the greater her perceived contribution to the household budget.

The assumption of identical preferences in respect of consumption and fertility implies that we can take $V = x + \phi(n) + \alpha\varphi_f(q) + (1 - \alpha)\varphi_m(q)$ for purposes of the maximization. Because of the quasilinearity of the utility functions the Lagrange multiplier on the budget constraint equals 1, and so the first order conditions on the optimal n^* and q^* are:

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[9]If $l_i = 0$, the opportunity cost of i's time is an internal shadow price equal to the marginal value product in farm production. Since we are concerned with the effects of wage changes on the household allocation, it is useful to assume at the outset that $l_i > 0$, $i = f, m$.

[10]See Apps and Rees (1988), Chiappori (1988) and Browning and Chiappori (1998) for discussion of this model. It can be thought of as a convenient generalization of the bargaining models of McElroy and Horney (1981) and Lundberg and Pollak (1993). For a survey of the literature on cooperative household models, see Apps and Rees (2009).

[11]As, for example, would be achieved in a Nash bargaining model.

[12]This is a less plausible assumption than that of efficiency, but nothing essential is lost in the present case by adopting it, and it very much simplifies the analysis.

[13]$\alpha_i = \partial\alpha/\partial w_i$, $i = f, m$.

$$(8) \qquad \phi'(n^*) - \left(x_0 + bq^* + aw_f\right) = 0$$

$$(9) \qquad \alpha\varphi_f'(q^*) + (1-\alpha)\varphi_m'(q^*) - n^*b = 0.$$

The second order condition requires b, the unit cost of child quality, not to be "too high," in that we require:

$$(10) \qquad D = \phi''(n^*)\left[\alpha\varphi_f''(q^*) + (1-\alpha)\varphi_m''(q^*)\right] - b^2 > 0$$

which, given the concavity of the utility functions, can be assumed to hold. Denoting $\varphi_f'(q^*) - \varphi_m'(q^*)$ by $\Delta\varphi' > 0$, straightforward comparative statics analysis gives:

Result 1:

$$(11) \qquad \frac{\partial n^*}{\partial w_f} = \left\{a\left[\alpha\varphi_f''(q^*) + (1-\alpha)\varphi_m''(q^*)\right] - b\alpha_f\Delta\varphi'\right\}/D < 0$$

Result 2:

$$(12) \qquad \frac{\partial n^*}{\partial w_m} = -b\alpha_m\Delta\varphi'/D > 0$$

Result 3:

$$(13) \qquad \frac{\partial q^*}{\partial w_f} = -\alpha_f\phi''(n^*)\Delta\varphi'/D > 0$$

Result 4:

$$(14) \qquad \frac{\partial q^*}{\partial w_m} = -\alpha_m\phi''(n^*)\Delta\varphi'/D < 0.$$

The terms in $\Delta\varphi'$ reflect the effects of wage rate changes on the "balance of power" within the household. If this term were zero, both effects of the change in m's wage, and the effect on quality of a change in f's wage, would disappear. The effect on fertility of a change in f's wage would remain negative, because of the increase in the opportunity cost of f's time on the cost of children—a standard result in the absence of income effects—though it would be weaker than in the present case. With $\alpha_f\Delta\varphi' > 0$ there is the added effect of an increase in the household's demand for child quality, which further increases the cost per child and therefore reduces fertility.

On the other hand, when m's wage increases, the demand for fertility increases and for quality falls because of the change in the weights α and $1 - \alpha$ in the household's marginal valuation of quality, $\alpha\varphi_f'(q^*) + (1-\alpha)\varphi_m'(q^*)$. The "balance of power" shifts toward the individual with the lower marginal valuation of average quality. The cost of a child then falls because of the reduced quality cost and so fertility increases.

To introduce income effects by relaxing the quasilinearity assumption is unlikely to change these results qualitatively. The income effects of an increase in w_f would strengthen the effect on child quality, but would work against the above effect on fertility. However, the strong negative empirical association between female labor supply and fertility in most countries suggests that the income effect would not be sufficiently strong as to reverse the above result.

The effect of an increase in w_m in increasing the demand for children, and also male labor supply, will result in a diversion of the female's time to child care and farm production. This will have a negative effect on household income which will at least partly offset the positive income effect on x, n, and q of the rise in the male wage. Whether the overall effect on q will continue to be negative is of course an empirical matter, but it seems reasonable to maintain the assumption that it is negative for the remainder of this article.

3. THE AGGREGATE GROWTH MODEL

From the household model we conclude that fertility is a decreasing function and child quality or human capital an increasing function of the female wage rate paid on the post-globalization labor market, while these relationships are reversed with respect to the male wage rate. This suggests that it should not be too difficult to put together an aggregate model that shows how the introduction of a labor market for women as a result of globalization leads to a process of growing per capita income and a steady state with higher per capita consumption than that prevailing pre-globalization. It also leads to a higher per capita consumption steady state than if globalization takes the form of jobs for men. This we now show, in terms of a two-generation overlapping generations model.

Consider first the female labor market, and assume that the jobs that are on offer involve a fixed number of labor hours[14] l_f^0. Let H_t be the number of two-person households at time t and let n_t be interpreted as the number of *pairs* of children each household has at time t, where it is assumed that one of each pair is male, the other female. Then we have

$$(15) \qquad H_t = n_{t-1}H_{t-1} \quad t = 1, \ldots \infty$$

with $t = 0$ the first period. We must assume that

$$(16) \qquad w_0 l_f^0 > \int_0^{l_f^0} h_f\left(1 - l_f - an_0, t_m\right) dl_f$$

so that women choose to work at the new factory rather than on the farm because their labor income is thereby higher than the value of the farm output foregone. A sufficient, though not necessary, condition for this would be

$$(17) \qquad w_0 \geq h_f\left(1 - l_f - an_0, t_m\right)$$

[14]This simplifies the model a little and is not unrealistic. A straightforward alternative is to allow her labor supply to be determined by the condition that her marginal productivity in home farm production be equal to her wage rate.

the factory wage is at least as great as f's marginal value product on the farm when she is employed at the factory—she would choose to work more at the factory if she could. As we show below, under standard assumptions the female wage at the factory will be increasing and the female marginal value product on the farm will be non-increasing over time. Therefore, as long as this condition is satisfied at the outset there will be no switch out of factory work.

The number of female workers at time t is H_t, and so total labor supply at t is

$$(18) \qquad L_t = H_t l_f^0.$$

Let $q_t = q(w_{t-1})$ be the quality of a female worker at t, where this depends on the choice of quality made by the household at $t - 1$, when the worker was a child. We have just seen that $q'(.) > 0$. For simplicity, assume that capital K does not depreciate,[15] and the production function is a standard linear homogeneous function

$$(19) \qquad Y_t = S(q_t L_t, K_t)$$

with labor given in efficiency units. The economy in question is a small open economy in which there is an exogenously given constant rate of return r, and a price of the output (in domestic currency) e, so that total wages are

$$(20) \qquad W_t = eS(q_t L_t, K_t) - rK_t$$

and the wage rate is

$$(21) \qquad w_t = W_t / L_t = es(q_t, k_t) - rk_t$$

with k_t the capital/labor ratio. Then, since n_t is a decreasing function of w_t we can write $k_t = k(w_{t-1})$ with $k'(.) > 0$. Thus, we have

$$(22) \qquad \frac{dw_t}{dw_{t-1}} = es_q q' + (es_k - r)k'.$$

But the profit maximization condition that the marginal value product of capital equals the rate of return implies that the second term drops out. Thus, the wage rate increases over time, in particular $w_1 > w_0$. There is then a unique steady state in this market if

$$(23) \qquad \frac{d^2 w_t}{dw_{t-1}^2} = es_q q'' + eq' s_{qq} < 0,$$

that is, if w_t is a strictly concave function of w_{t-1}. Given that $s_{qq} < 0$, a sufficient condition for this is that child quality be a concave function of the mother's wage rate, which seems to be a reasonable type of "diminishing returns" assumption.

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[15]We do not explicitly model the capital formation process, so capital could come from foreign or domestic sources.

Turning to the farm sector, per household output at t is given by

$$(24) \qquad h_t = h\left(1 - l_f^0 - an_t, 1\right)$$

where it is assumed for simplicity that improving child quality does not effect farm productivity (the argument would be strengthened by having farm output increasing in child quality, since this increases the benefit from increasing quality). Then since n_t is decreasing in w_t, we must have that per household output is increasing in w_t, and specifically

$$(25) \qquad \frac{dh_t}{dw_t} = -h_f a \frac{dn_t}{dw_t}.$$

Declining fertility releases female labor time for farm work. Then, since the number of children in each farm family is falling over time while output per farm is increasing, per capita farm output must also be increasing. Thus, we have that per capita incomes from both female market work and farm output increase until the market wage rate reaches its steady state. Globalization in the form of providing jobs for women is unambiguously welfare-improving for women and children. Whether it is so for men depends on the value of their increase in utility from increased consumption and child quality in relation to their loss in utility from having fewer children, where the latter is associated with the increased bargaining power of women within the household.

Turning now to the case in which globalisztion only creates jobs for men, we have in fact a very Malthusian story. We can apply the above model, but with the key difference that now $q'(w_{t-1}) < 0$: the higher is the man's wage, the greater his power within the household, therefore the higher is fertility (and his consumption) and the lower is child quality. We therefore have from (22):

$$(26) \qquad \frac{dw_t}{dw_{t-1}} = es_q q' < 0.$$

This therefore implies that $w_1 < w_0$ and the wage rate is falling over time. Moreover, since n_t is increasing, f's time input $1 - an_t$ into farm production is decreasing, and so is this output. Thus household per capita income must be falling.

There are two possible equilibria:

(1) The factory wage falls until it would just pay m to switch back from the factory into farm production. This happens at the wage $\tilde{w}$ (and corresponding fertility level $\tilde{n}$), where

$$(27) \qquad \tilde{w} = p \int_0^{l_m^0} h_m\left(1 - a\tilde{n}, 1 - l_m\right) dl_m / l_m^0$$

since clearly m will not work in the factory for a lower income than he can generate on the farm with the same time input. This implies a minimum market wage that the firm will have to pay to retain its workers, and is the counterpart in this model of a Malthusian subsistence wage.
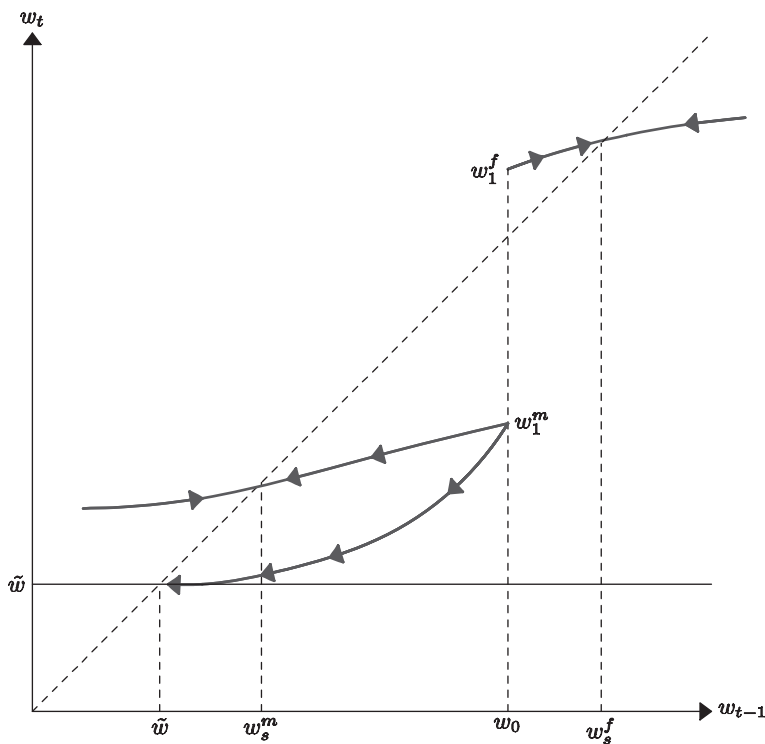
Figure 1. Equilibrium Steady States Under Alternative Globalization Assumptions

(2) A steady state in which m works in the factory for a wage $w^* \in [\tilde{w}, w_0)$ that is constant over time and lower than that at which the factory opened.

Figure 1 illustrates these two types of "male equilibria," as well as the "female equilibrium," on the assumption that both types of globalization are associated with the same opening wage w_0. The steady state female wage converges to w_s^f while the steady state male wage converges either to the minimum required to keep the male worker employed, $\tilde{w}$ or to the higher w_s^m.

4. Conclusions

We have developed a very simple model of how globalization affects development. Our model focuses on how globalization effects the intra-household balance of decision taking power and the effects this has on child quality. We find that globalization that results in improved job opportunities for women leads to lower fertility and higher rates of human capital formation. If globalization results in improved opportunities for men, the results are reversed. We embed these results in a very simple growth model and show that, with standard assumptions, globalization that favors women leads unambiguously to higher growth rates and higher long run steady state per capita consumption than would exist either without globalization, or with globalization that creates jobs only for men.

REFERENCES

Apps, P. F. and R. Rees, "Taxation and the Household," *Journal of Public Economics*, 35, 355–69, 1988.

———, *Public Economics and the Household*, Cambridge University Press, Cambridge, 2009.

Browning, M. and P-A. Chiappori, "Efficient Intra-Household Allocation: A Characterization and Tests," *Econometrica*, 66, 1241–78, 1998.

Chiappori, P-A., "Rational Household Labour Supply," *Econometrica*, 56, 63–90, 1988.

Doepke, M. and M. Tertilt, "Women's Liberation: What's in It for Men?" *Quarterly Journal of Economics*, 124, 1541–91, 2009.

Duflo, E., "Grandmothers and Granddaughters: Old Age Pension and Intra-Household Allocation in South Africa," *World Bank Economic Review*, 17(1), 1–25, 2003.

Duflo, E. and C. Udry, "Intra-Household Resource Allocation in Côte d'Ivoire: Social Norms, Separate Accounts and Consumption Choices," NBER Working Paper Series, No. 10498, 2001.

Durand, J., *The Labor Force in Economic Development*, Princeton University Press, Princeton, NJ, pp. 131–8, 1975.

Fernandez, R., "Women's Rights and Development," Discussion Paper, New York University, 2010.

Galor, O. and D. N. Weil, "The Gender Gap, Fertility and Growth," *American Economic Review*, 3, 374–87, 1996.

Goldin, C., "The U-Shaped Female Labor Force Function in Economic Development and Economic History," in T. P. Schultz (ed.), *Investment in Women's Human Capital*, University of Chicago Press, Chicage, IL, 1995.

Horton, S., *Women and Industrialization in Asia*, Routledge, London, 1996.

Kimura, M. and D. Yasui, "The Galor-Weil Gender-Gap Model Revisited: From Home to Market," *Journal of Economic Growth*, 15, 323–51, 2010.

Klasen, S., "Low Schooling for Girls, Slower Growth for All? Cross-Country Evidence on the Effect of Gender Inequality in Education on Economic Development," *World Bank Economic Review*, 16, 345–73, 2002.

Lagerlöf, N-P., "Gender Equality and Long-Run Growth," *Journal of Economic Growth*, 8, 403–26, 2003.

Lundberg, S. and R. A. Pollak, "Separate Spheres Bargaining and the Marriage Market," *Journal of Political Economy*, 101, 988–1009, 1993.

Mammen, K. and C. Paxson, "Women's Work and Economic Development," *Journal of Economic Perspectives*, 14, 141–64, 2000.

Manser, M. and M. Brown, "Marriage and Household Decision Taking: A Bargaining Analysis," *International Economic Review*, 21, 31–44, 1980.

McElroy, M. and M. J. Horney, "Nash-Bargained Household Decisions: Toward a Generalized Theory of Demand," *International Economic Review*, 22, 333–49, 1981.

Oostendorp, R. H., "Globalization and the Gender Wage Gap," *World Bank Economic Review*, 23(1), 141–61, 2009.

Ott, N., *Intrafamily Bargaining and Household Decisions*, Springer Verlag, Berlin, 1992.

Psacharopoulos, G. and Z. Tzannatos, "Female Labor Force Participation: An International Perspective," *World Bank Research Observer*, 4, 187–201, 1989.

Quisumbing, A. and J. Maluccio, "Resources at Marriage and Intrahousehold Allocation: Evidence from Bangladesh, Ethiopia, Indonesia and South Africa," *Oxford Bulletin of Economics and Statistics*, 65, 283–327, 2003.

Schultz, T. P., "Testing the Neoclassical Model of Family Labour Supply and Fertility," *Journal of Human Resources*, 25, 599–634, 1990.

Singh, I., L. Squire, and J. Strauss (eds), *Agricultural Household Models: Extensions, Applications, and Policy*, Johns Hopkins Press (for World Bank), Baltimore, MD, 1986.

Sinha, J. N., "Dynamics of Female Participation in Economic Activity in a Developing Economy," in *Proceedings of the World Population Conference, Belgrade 1965, Vol. IV, Migration, Urbanization, Economic Development*, New York, United Nations, 336–7, 1967.

Thomas, D., "Intra-Household Resource Allocation: An Inferential Approach," *Journal of Human Resources*, 25, 635–64, 1990.