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Women's Employment, Intra-Household Bargaining and Distribution: A Two-Sector Analysis

by

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Abstract

This paper investigates the intra-household impact of an expansion in employment opportunities for women in a dual labor market, when the informal sector functions as a gateway to the formal sector. We use a variant of the Harris-Todaro framework with two-period overlapping generations to model this economy. Labor allocation decisions and distribution of household consumption are determined according to the generalized Nash cooperative bargaining solution, and agents have perfect foresight. It is shown that an increase in demand for women's labor can shift intra-household distribution in favor of men and thereby reduce women's welfare.

Outline

1. Introduction
2. The Model
3. Comparative Statics
4. Variants and Extensions
5. Conclusion

I INTRODUCTION

The purpose of this paper is to provide a qualification to the common view that expansion of employment opportunities for women will necessarily reduce intrahousehold gender-disparity in less developed economies. It shows that, in a two-tier labor market, if the informal sector functions as a *gateway* to the formal sector, it is possible for expansions in employment opportunities to *reduce* women's share of household resources. While some commentators have claimed that increases in paid employment make women worse off by creating a double work-day, our argument is fundamentally different. In our model, an increase in demand for women's labor does not change women's total work. Instead, we explore the implications of the 'gateway' character of the informal sector. Because of the interrelationship between the two sectors, an expansion in one sector, by causing 'overcrowding' in the other sector, reduces average returns from the latter sector. The net effect, on average, can make women worse off by worsening their bargaining position inside the household.

The so-called 'Women in Development' approach to development policy focuses on expanding women's employment opportunities, relative to those of men, as the principal means of improving their well being.[1] Improved relative market opportunities for women are expected to reduce intra-household gender disparity by shifting the intra-household distribution of resources in their favor.

The traditional, "unitary", model of household decision-making (primarily due to Becker (1965, 1981)) provides some theoretical justification for this view. However, a more unambiguous theoretical case is presented by the literature on cooperative bargaining models of intra-household allocation.[2]

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1 Boserup (1970) provided an early, and extremely influential, statement of this view. Klasen (1993) and Tinker (1990) provide overviews of subsequent work.

2 The seminal contributions are McElroy and Horney (1981) and Manser and Brown (1980). Bergstrom (1996), Ott (1992) and McElroy (1990, 1997) provide overviews and discuss extensions. Alderman et al. (1995), Agarwal (1994, Chap. 2), Dasgupta (1993, Chap. 11), and Sen (1990) discuss applications of this framework to LDCs.

The basic unitary model of a two-person household assumes that the household combines domestic labor and commodities purchased from the market to produce a composite consumption good subject to a family budget constraint. Total family output of the consumption good is distributed among members according to a single set of preferences, subject to the constraint that each member must receive at least his/her reservation utility, which in turn is supposed to be determined through optimal sorting in the marriage market. In this framework, an increase in women's market wages relaxes the family budget constraint and thereby increases the amount of the consumption good the household can produce. A part of this increase may be passed on to women through a higher allocation for them. A wage increase may also increase women's reservation utility levels. However, except in the special case where women's reservation utility constraints are binding, household "income pooling" implies that changes in their market earnings impact on intra-household distribution only through changes in the overall family budget constraint. If such changes do not affect the total amount of the household consumption good that is produced, and reservation utility constraints are not binding, then they will not affect its intra-household division either.[3] Thus, the unitary model of household decision-making offers some grounds for assuming that an increase in women's income opportunities may improve their welfare as well, but does not imply that this will necessarily be the case.

Bargaining models of intra-household allocation provide a stronger case. In this literature, intra-household allocation is typically modeled as a cooperative bargaining game with the outcome defined by the Nash bargaining solution. Each member's allocation depends on, and *monotonically* increases with, his/her access to independent income. Thus, contrary to a unitary model, a cooperative bargaining model predicts that women's welfare will improve with an increase in their market wage, *even if* (a) total

3 In unitary household models with children, an increase in the market wage for women is assumed to increase the household's expected future returns from investing resources in female children, and thereby provide an incentive to increase their allocation. Rosenzweig and Schultz (1982) develop such a model and present evidence from rural India that survival chances of female infants increase with relative improvements in women's market opportunities. Thus, if consumption allocation has an investment component, allocation to women over their lifetime may increase with improvements in their market wage even if total (lifetime) household consumption remains constant due to a corresponding fall in male income. Such indirect impact through family investment in human capital is however an issue we are going to abstract from in this paper.

household consumption remains invariant, and (b) reservation utility constraints are not binding.[4]

The standard view rests on the implicit assumption that an expansion in employment opportunities for women will automatically translate into increased access to independent income. While appealing, this assumption is essentially due to intuition derived from simple single sector models of the labor market. Given a cooperative bargaining framework, it is clear that an expansion in demand for women's labor in an integrated female labor market cannot reduce their share of household resources. However, it has long been recognized that many developing economies exhibit dualism in the labor market. While parts of such economies, characterized as the formal sector, are marked by high returns with employment and credit rationing, other parts, characterized as the informal sector, exhibit low and market clearing returns to participation. Furthermore, workers rationed out of the formal sector tend to be disproportionately female.[5] It is therefore worthwhile to explore the robustness of the standard result in such a context by means of a model that integrates Nash-bargained labor supply decisions with gender-biased labor demand in a two-sector economy.

In modeling dualism for our purposes, one question assumes critical importance. How does one model the interaction between the formal and the informal sectors? Even if the labor market is dualistic, it may be the case in some institutional contexts that the extent of movement by workers across sectors is negligible. Then, clearly, an expansion in demand for women's labor in any sector becomes conceptually similar to an expansion in an integrated labor market, and may be expected to have the same effect. Thus, the traditional view would seem to be robust for such cases.

Alternatively, however, the informal sector, broadly defined to include all occupations that can be freely entered and provide a market-clearing rate of return, may serve to some extent as a gateway to the formal sector. Women who fail to find a job initially in the formal sector have the option of either entering the labor market in the informal sector or

4 McElroy (1997) extends this basic partial equilibrium result to a general equilibrium setting by analyzing the comparative static properties of the core of a marriage market. For comparative discussions of the two approaches, see, in particular, Haddad et al. (1997), Bergstrom (1996) and Alderman et al. (1995).

not taking up employment at all. Experience in the informal sector may however improve one's prospects of being absorbed in some types of formal sector jobs at a later date, as compared to the alternative of staying out of the labor market altogether for an extended period. Indeed, the seminal analysis of rural-urban migration by Harris and Todaro (1970) rationalized the informal sector *exclusively* as a transit point for workers along their way to the formal sector. While subsequent research has found that formulation somewhat extreme, movement from the informal sector to the formal sector is significant in many LDCs.[6] Market participation allows agents to acquire human capital, develop networks, acquire information about employment opportunities, establish an independent employment record and/or credit history, etc., all of which may be expected to facilitate one's transition to the formal sector at a later date. This may be true even inside large-scale industry. Individuals who fail to find positions with job security and other benefits which provide a non-market clearing wage rate may have a better chance of acquiring such positions in future, through promotions and internal hires, if they take up shop floor jobs with market-clearing returns today instead of staying outside the labor market entirely for a long time.[7] This is the case we intend to isolate and explore.

Suppose therefore that, for women who fail to find formal sector positions initially, employment in the informal sector indeed provides better opportunities of getting absorbed in the formal sector at a later date, as compared to the alternative of staying out of the labor market altogether. Then the traditional view becomes suspect. A general expansion in the formal sector may also be expected to expand those segments of the formal sector which recruit significantly from the informal sector. This provides an inducement for women to switch from domestic labor to the informal sector. With competitive wage determination, such a movement can be expected to reduce the informal sector wage. Similarly, an expansion in the informal sector, by increasing the number of women in that sector, reduces, for each individual woman, the prospect of being absorbed in the formal sector. Intuitively, it is not apparent that the net effect, on average, must necessarily have a positive impact on women's welfare.

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5 See, for example, UNDP (1995, pp. 36-40) and UN (1995, chapter 5).

6 See Rakowski (1994), Majumdar (1989), Fowler (1981), Fapohunda (1981), Sanchez et al. (1981), Nihan et al. (1979) and Merrick (1976).

The problem of inter-sectoral labor transfer specified above bears a formal resemblance to that of rural-urban migration of the Harris-Todaro variety. It is evident that, if labor market dualism is modeled along similar lines, and if it is assumed in addition that female marginal return from domestic production is non-decreasing in domestic labor, then the following must hold. An expansion in market opportunities will transfer women from the household sector to the market sector without reducing their expected lifetime return. The issue of interest is whether the incorporation of intra-household bargaining into this framework yields a stronger result, namely, that an expansion of market opportunities may *reduce* women's welfare. This paper shows that it does.

We develop a two-period cooperative bargaining model of two-person households embedded in a dual labor market. The exogenously given wage rate in one sector is higher than the competitively determined wage rate in the other sector. Women's labor allocation is determined through the Nash-bargained intra-household allocation procedure. To isolate the implications of the gateway aspect of the informal sector, we assume that women can only find jobs in this sector initially. If women enter the labor market, after one period they have a chance to acquire a job in the formal sector. Employment generation programs targeted towards women either expand the proportion of women in the labor force who succeed in moving to the formal sector or increase the wage rate in the informal sector. This increases female labor participation rates. However, in either case (but for different initial conditions), for reasons already discussed, women as a group may become *worse off* in consequence. This happens *even with perfect foresight* on part of agents, because women get caught in a Prisoners' Dilemma type of situation. Interventions may benefit *men* instead, thus exacerbating existing intra-household inequality.

Section II sets up the basic model. Section III explores the implications of a parametric increase in women's employment for intra-household distribution. Section IV discusses some extensions and modifications of the model. We conclude our discussion in Section V.

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7 For analyses of internal labor markets, see, for example, Wachter and Wright (1990) and Doeringer (1986).

II. THE MODEL

Consider an economy where all labor is provided by identical asset-less households, each consisting of one adult male and one adult female member who live for two periods. These households belong to one of two overlapping generations. The younger generation consists of a continuum of households belonging to the interval $(0,1]$, while the older generation consists of the continuum $(1,2]$.

The labor market is segmented into a formal sector and an informal sector. The formal sector is defined by an exogenously determined return to labor per period, *W*. Men are offered employment in the formal sector at the beginning of their lives. Women however can only find employment in the informal sector initially. Returns to labor are set competitively in this sector, the market clearing wage in any period *t*, w_t, being realized at the end of that period; $t \in \{0,1,2,...\}$. For women, the informal sector is the sole gateway to the formal sector: some positive fraction, p_t, of women who enter the informal sector are absorbed in the formal sector at the end of the period. Thus, p_t is also the probability that any woman entering the informal sector in period *t* will earn the formal sector wage in the next period.[8]

Agents are assumed to have identical expectations. At the beginning of any period, *t*, all agents form expectations about the wage rate in the informal sector for that period, w_t^e, and anticipate that, if women enter the labor market now, their probability of being absorbed in the formal sector at the end of the period will be some p_t^e. As a condition of equilibrium, we shall require that agents predict correctly.

The demand for women's labor in the informal sector in any period *t* is given by $L(w_t)$, $L(w_t) \in [0,2]$, where w_t is the wage rate in the informal sector in that period. The labor demand function is assumed to be continuous and strictly decreasing in w_t. Labor

8 The model can be generalized to allow men also to be employed in the informal sector in the first period, and to be offered formal sector jobs in the second period with probability less than one, so long as a gender-specific wage differential is allowed in the informal sector in order to generate division of labor inside the household. Some women can also be allowed to join the formal sector in the first period itself. The model is also consistent with the case where all women in the informal sector get absorbed in the formal sector in the next period, but women can only retain the formal sector job, on average, for a fraction, p_t, of that period.

demand for women in the formal sector in every period is *H*. Since, by assumption, only women with prior experience in the informal sector qualify for formal sector jobs, $H \in (0,1)$. To develop our argument independently of any 'double workday' consideration, we shall assume that employment is offered in indivisible units, so that domestic production and wage labor are mutually exclusive alternatives.

Consider the representative household consisting of agents M and F, who start their life in period *t*. Both agents derive utility from the consumption of a divisible composite good that can be either purchased at a normalized price of one or produced inside the household with domestic labor and purchased goods. Both agents are risk neutral expected utility maximizers. Each agent's inter-temporal utility function is:

$u^i\left(X_t^i, X_{t+1}^i\right) = X_t^i + X_{t+1}^i,$

where X_t^i, X_{t+1}^i are the amounts of *i*'s consumption in periods *t* and *t*+1; $i \in \{M, F\}$.[9] Each agent is endowed with one unit of labor power per period. Labor allocation decisions are made cooperatively and household consumption is distributed according to the generalized Nash cooperative bargaining solution.

A. Domestic Technology:

Given domestic labor l_t and monetary expenditure m_t in any period *t*, let the maximum amount of the composite good that can be consumed in that period be given by:

$X_t = X(l_t, m_t);\ X_t, l_t, m_t \geq 0.$

If no domestic labor is provided, the composite good is directly purchased from the market. We assume that not all purchased inputs can be substituted by domestic labor.

A2.1: $X(0, m_t) = m_t,\ X(l_t, 0) = 0.$

Let $x(l_t, m_t) = X(l_t, m_t) - m_t$. Given monetary expenditure and domestic labor, $x(l_t, m_t)$ is the money value of the (gross) surplus originating from domestic production of the consumption good as opposed to market purchase. We assume that domestic labor and purchased goods are complementary inputs.

A2.2: When $m_t, l_t > 0$, $x(m_t, l_t) > 0$ and increasing in its arguments.

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9 Introducing a time discount factor $\delta < 1$ does not change the analysis. We are abstracting from the possible presence of externalities in consumption and domestic public goods, which, in turn, rules out the possibility

Let $L^{-1}(0) = w_0$ the maximum wage rate possible in the informal sector. To generate the traditional gender-based division of labor inside the household as the outcome of household optimization, we shall assume that the gross surplus from domestic production by women is higher than w_0.

A2.3: $W > x(1,W) > w_0$.

B. Household Optimization and Labor Supply:

We shall now characterize labor allocation and the distribution of consumption by solving our two-period model recursively. Consider first the problem for the representative household at the beginning of the second period of its life, the period t+1. If the two agents cannot reach an agreement, they will separately seek to maximize their own consumption. In order to do this, each agent can either (i) dissolve the household and remain single, (ii) behave non-cooperatively without formally dissolving the household, or (iii) dissolve the household and remarry. We shall assume that there are significant fixed costs associated with remarriage in the second period, so that at least one of options (i) and (ii) strictly dominates the option of remarriage.[10]

Then, since remarriage is ruled out, and since market and domestic labor are mutually exclusive alternatives, A2.1 implies that the maximum consumption any agent can ensure on his/her own is simply the market wage he/she can command in this period. Hence, each agent's disagreement/threat point (fallback position) relevant for the intra-household bargaining process in the second period is the corresponding market wage. For agent F, this will be W if she was one of the women who got hired in the formal sector. Otherwise, she can always expect to get the market-clearing wage in the informal sector by taking up employment there.[11]

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of gains from forming a family when no member provides any domestic labor. Addition of these aspects, while complicating the analysis, would not change our substantive results.

10 The fixed costs can be variously interpreted as search costs, costs of divorce, etc. We discuss the implications of allowing remarriage in the second period in Section IV(c) below.

11 Lundberg and Pollack (1993) interpret the threat points as the pair of individual payoffs in the Nash equilibrium of a Cournot game with private contributions to a domestic public good, rather than those in case of divorce. Our specification of the threat points is trivially compatible with this interpretation, since we assume away consumption externalities and domestic public goods. If divorce is assumed costless, the threat points can alternatively be interpreted as the utility levels from being single, these in turn being given by the respective market wage rate.

Total household consumption X_{t+1} is shared between M and F according to the division X^M_{t+1}, X^F_{t+1}, this division being given by:

$$\underset{l^M_{t+1}, l^F_{t+1}, X^M_{t+1}, X^F_{t+1}}{Max} \left(X^F_{t+1} - w^F_{t+1}\right)^{\mathrm{l}} \left(X^M_{t+1} - W\right)^{(1-\mathrm{l})}$$

(P2.1)

s. t. $X^F_{t+1} + X^M_{t+1} = X_{t+1}, X_{t+1} = x\left(l^M_{t+1} + l^F_{t+1}, \left(1 - l^M_{t+1}\right)W + \left(1 - l^F_{t+1}\right)w^F_{t+1}\right) + \left[\left(1 - l^M_{t+1}\right)W + \left(1 - l^F_{t+1}\right)w^F_{t+1}\right]$;

where l^M_{t+1}, l^F_{t+1} are the amounts of domestic labor supplied by M and F respectively in this period; $l^M_{t+1}, l^F_{t+1} \in \{0,1\}$, $w^F_{t+1} \in \{W, w^e_{t+1}\}$ and l is an index of the relative bargaining strength of F; $\mathrm{l} \in (0,1)$.

Given any X_{t+1}, the expression in P2.1 is maximized by providing F with the amount $\left[\mathrm{l}\left(X_{t+1} - w^F_{t+1} - W\right) + w^F_{t+1}\right]$. P2.1 therefore reduces to the problem of allocating l^M_{t+1}, l^F_{t+1} so as to maximize X_{t+1}, given the wage rates. A comparison of total domestic consumption under alternative allocations of labor leads to the following.

Lemma 2.1: *Given A2.1 - A2.3, (a)* $l^M_{t+1} = 0$ *, and (b)* $l^F_{t+1} = 0$ *if* $w^F = W; l^F_{t+1} = 1$ *otherwise.*

Since the productivity of domestic labor is increasing in monetary expenditure, a large divergence between male and female wage rates leads to the traditional gender-based division of labor inside the household in the second period.[12] Agent M provides only market labor, regardless of how F's labor is allocated. Domestic production allows the household to generate a positive net domestic surplus if F cannot find employment in the formal sector. If instead F is offered the formal sector wage *W*, no domestic surplus is generated; each agent only gets his/her respective market wage.

We shall now specify the labor allocation decision in the first period. Consider first the case when F decides to enter the labor market at the beginning of period t. Recall that p^e_t is the anticipated probability of finding a job in the formal sector in the next period, if F enters the labor market in period t. Let the gross surplus from domestic production be

12 Alternatively, this can be sustained by assuming gender-based productivity differences in domestic labor.

given by $\bar{x} = x(1, W)$. From P2.1 and Lemma 2.1, the expected lifetime utility that F can ensure for herself by entering the labor market at the beginning of period t, is:

$$f = w_t^e + \left[p_t^e W + (1 - p_t^e)(w_{t+1}^e + \mathrm{l}\,(\bar{x} - w_{t+1}^e))\right], \tag{2.1}$$

while that of M in that case is:

$$m = W + \left[W + (1 - \mathrm{l}\,)(1 - p_t^e)(\bar{x} - w_{t+1}^e)\right]. \tag{2.2}$$

F will not enter the labor market in the first period only if she can be ensured a lifetime expected utility that is at least *f*. Thus, *f* is F's disagreement point/fallback option in the context of the first-period bargaining problem. Total lifetime household consumption, if F does not enter the labor market, is:

$$h = 2\left[\bar{x} + W\right].$$

(2.3)

Then, $[h - m - f]$ measures the net anticipated lifetime gain to the household if F 'specializes' in domestic production, of which a fraction l would be her share. In general, F's lifetime expected consumption is $\max\left[\mathrm{l}\,(h - m - f) + f, f\right]$, while that of M is $\max\left[(1 - \mathrm{l}\,)(h - m - f) + m, m\right]$. Given any expected informal sector wage in period t, w_t^e, (2.1)-(2.3) imply that the higher the anticipated probability of absorption in the formal sector, the lower the anticipated net lifetime gain from specialization. Let $q(w_t^e)$ be a function such that:

$$\text{if } p_t^e = q(w_t^e), \text{ then } [h - m - f] = 0. \tag{2.4}$$

Intuitively, given any expected informal sector wage rate in the current period, w_t^e, $q(w_t^e)$ provides the corresponding threshold value for the anticipated probability of absorption. If $p_t^e = q(w_t^e)$, both agents have the same lifetime expected utility regardless of how F's labor is allocated in the first period. Consequently, all F agents in the younger generation will be indifferent between entering and not entering the informal sector. If the anticipated probability is higher than this threshold value, all F agents in the younger generation will seek employment in the informal sector; if it is lower, none will. Note that this threshold probability is independent of the wage rate that will be expected to prevail in the informal sector in the next period, as can be checked from (2.1)-(2.4). Hence, agents do not need to formulate expectations about the informal sector wage in any period before the beginning of that period. It follows that aggregate supply of female

labor to the informal sector in any period will depend only on the anticipated wage rate for that period and the anticipated probability of transition to the formal sector.

Let the aggregate labor supply correspondence for the informal sector in any period t be given by $L^S\left(p_t^e, w_t^e\right)$. From Lemma 2.1, and the subsequent discussion, the following is immediate**.**

Lemma 2.2: *A2.1-A2.3 imply the following: (a) if* $p_t^e = q\left(w_t^e\right)$ *then* $L^S\left(p_t^e, w_t^e\right) = [0,1]$*; (b) if* $p_t^e > q\left(w_t^e\right)$, $L^S\left(p_t^e, w_t^e\right) = \{1\}$ *and (c) if* $p_t^e < q\left(w_t^e\right)$, $L^S\left(p_t^e, w_t^e\right) = \{0\}$.

Intuitively, given any anticipated informal sector wage for the current period, labor supply is perfectly elastic at the corresponding threshold probability.

C. Equilibrium:

Definition 2.1: A probability wage combination $\left(p_t, w_t\right)$ constitutes a perfect foresight equilibrium in period *t* if and only if it satisfies: (D1) $p_t = \min\{1, H / L\left(w_t\right)\}$ and (D2) $L\left(w_t\right) \in L^S\left(p_t, w_t\right)$.

Recall that p_t is the actual proportion of women working in the informal sector who get absorbed in the formal sector in the next period; hence, it is also the realized probability. By definition, p_t must satisfy (D1). (D2) combines (a) the requirement of market clearing in the informal sector and (b) the restriction that agents correctly anticipate the wage rate in the informal sector in the current period and the probability of absorption in the formal sector at the end of the current period.

If all women enter the informal sector in the first period of their lives in equilibrium, it is obvious that any expansion in demand for women, by unambiguously increasing the returns to market participation, must necessarily improve their well being. The more realistic, as well as analytically more interesting, case that we want to explore is where labor reserves exist in household sector, and women switch from household production to market labor in response to a parametric expansion in demand. For this, we need to ensure that, in equilibrium, some younger women remain in the domestic sector.

Let w_1 be the wage rate at which all younger women are offered employment in the informal sector. It is easy to see that, if $q\left(w_1\right) \leq H$, no younger woman can possibly

provide domestic labor in equilibrium. In addition, we need to rule out the trivial case where it is impossible to induce any woman in the younger generation to enter the labor market.

A2.4: $H < q(w_1) \leq 1$.

Proposition 2.1: *Given A2.1-A2.4, there exists a unique perfect foresight equilibrium* (p_t, w_t) *in every period t. This equilibrium must satisfy* $H < p_t < q(w_1)$.

Proof: See the Appendix.

If all younger women enter the labor market in equilibrium, the transition probability must be H. If none does, it must be 1. The left inequality implies that in equilibrium *labor reserves must exist.* The right one implies that *some women must participate in the labor market.* It should be clear that the perfect foresight equilibrium in any period depends only on informal sector labor demand in that period and formal sector labor demand in the next period. Since the equilibrium is uniquely determined, it follows that, if demand conditions remain invariant across time, the equilibrium must remain invariant as well.[13]

III. COMPARATIVE STATICS

We shall now discuss the consequences of an expansion in the formal sector as well as those in the informal sector. We shall assume that these expansions reduce, but do not eliminate labor reserves.

A. Expansion in the formal sector:

Given a formal sector employment of women per period, H^*, let the corresponding perfect foresight equilibrium in each period be (p^*, w^*). We shall compare the equilibrium (p^*, w^*) with the perfect foresight equilibrium that would be generated by a larger demand for women per period in the formal sector, H'. Let the perfect foresight equilibrium thus generated be (p', w').

Proposition 3.1: *Given A2.1-A2.4, a larger demand for women in the formal sector implies:*

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[13] It can be checked that the equilibrium is stable.

(a) a higher probability of employment in the formal sector and a lower wage in the informal sector, and

(b) if $p' < 1 - p^*$*, a lower lifetime expected utility for women.*

Proof: See the Appendix.

The expansion increases the probability of women finding jobs in the formal sector in the next period and induces more women to enter the informal sector at the beginning of the first period of their lives, thereby depressing the informal sector wage. Proposition 3.1(b) implies that when $p^* < 1/2$, there will necessarily exist a threshold level of expansion in the formal sector, such that women will be worse off if the actual expansion is less than this threshold. Thus, relatively small expansions in formal sector opportunities may reduce women's welfare in an aggregate sense, rather than improving it. When $p^* \leq 1 - q(w_1)$, women will be better off only if $p' \geq q(w_1)$, which is however ruled out by Proposition 2.1. Then, any expansion, however large, that leaves some women in the domestic sector, will reduce the expected lifetime consumption of all women and make women worse off in this sense.[14]

Intuitively, the mechanism is the following. Consider first an F agent who enters the labor market in the first period. Recall that this agent's fallback position (i.e. her threat point) in the second period is simply the wage she can get in that period. The fall in the informal sector wage reduces her fallback position in the second period, if she fails to get absorbed in the formal sector. In case of this eventuality, the F agent would withdraw from market participation and provide only domestic labor, thereby producing the gross domestic surplus, $x(1, W)$, the value of which is independent of the informal sector wage rate. The division of this (invariant) gross domestic surplus between F and M, however, depends on F's fallback position: the informal sector wage. Any reduction in the latter, would weaken her bargaining position inside the household. This, in turn, will alter the intra-household division of the gross domestic surplus, increasing the share of M and

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14 It can be shown that in equilibrium, the mean *ex-post* utilities for women and men during any time period are f/2, m/2 respectively. The expected life-time utilities of the representative agents belonging to the younger generation, f and m, may thus be interpreted as social welfare aggregators for all agents belonging to the respective gender groups. While one can think of alternative criteria, this is intuitively one of the most plausible ones in our context.

decreasing, correspondingly, that of F. The extent of the negative impact of this on her expected lifetime consumption, however, depends also on how likely she is to fail. The larger this likelihood, the larger the negative impact that any given magnitude of wage decline has on her expected lifetime consumption. The expansion in the formal sector reduces the likelihood of failure, but if the initial probability is high, the negative impact of the wage decline would dominate for relatively small expansions. Since in equilibrium the payoff must be the same for all women, this is true as well for those who do not enter the labor force.

To see the Prisoners' Dilemma type of logic underlying this outcome, consider the representative F agent's optimal response to an expansion in the formal sector. It is easy to see that her best strategy is to enter the informal sector, regardless of what other F agents do. This, of course, by reducing the informal sector wage rate, may lead to a new equilibrium where women, on average, are worse off.

B. Expansion in the informal sector:

State policy can alternatively influence intra-household distribution through employment generation schemes in the informal sector. Such schemes would raise the wage rate in that sector.

Proposition 3.2: *Given A2.1-2.4, an expansion in the informal sector that increases the equilibrium wage rate will also:*

(a) reduce p and increase total labor force participation rate for women, and

(b) if $p' > 1 - p^*$*, reduce lifetime expected utility for women.*

Proof: See the Appendix.

The expansion in the informal sector induces more women in the younger generation to enter the labor force today, which reduces their probability of being absorbed in the formal sector in the future. In this case, if $p^* > 1/2$, there will exist a threshold level of expansion in the informal sector, below which women would be worse off. If $p^* \geq 1 - H^*$, Proposition 2.1 and Proposition 3.2(b) together imply that any expansion that does not eliminate labor reserves will necessarily reduce women's welfare. The intuitive explanation for the perverse consequence works in a direction opposite to that in the first case.

For F to be worse off from an expansion in the formal sector, it is necessary that $p^* < 1/2$, in which case an expansion in the informal sector will improve her welfare. This however implies a further reduction in *p*. Thus, a trade-off exists between welfare gains and formal sector representation. Figures 3.1 and 3.2 below show changes in F's payoff with change in *p* for different initial values.

With labor reserves, employment generation schemes in our model have a purely distributive effect: they only change the *division* of total household expected lifetime consumption between household members, not its size. Thus, any fall (rise) in F's lifetime expected consumption is matched by a corresponding rise (fall), of exactly the same magnitude, in that of M. To see this, consider two equilibria where some, but not all, women enter the labor market in the first period. Since households allocate labor so as to maximize total consumption, it must be the case that, in any such equilibrium, households where women enter the labor market in the first period have exactly the same total expected life-time consumption as households where women provide only domestic labor. Hence, in any equilibrium, all households must have the consumption level of the latter class, namely, *h*. It follows that, in either equilibrium,

$h - m - f = 0$.

Hence, we have:

$$\Delta m = \Delta h - \Delta f \ . \qquad (3.1)$$

Recall that, from (2.3) above, $[h = 2[x(1,W) + W]]$, where $x(1,W)$ is the magnitude of gross surplus from domestic specialization in any period and W is the (formal sector) wage earned by men. Since, by assumption, changes in labor market conditions for women do not influence the male wage rate, they do not influence the magnitude of gross surplus from domestic specialization either. Hence, $[\Delta h = 0]$. It follows from (3.1) that:

$$\Delta m = -\Delta f \ . \qquad (3.2)$$

Condition (3.2) above implies that any fall (rise) in F's life-time expected consumption is exactly matched by a corresponding rise (fall) in that of M. It is in this exact sense that an expansion in market opportunities for women may result in a "leakage" of household resources to men.

The basic conclusion derived from our model is that it is *possible* for an expansion in labor demand *in either sector* to make women worse off. The key restriction necessary to generate this conclusion is that any woman's allocation inside the household be monotonically increasing in the market wage she can command. Clearly, the intra-household allocation rule can satisfy this requirement (and that of Pareto efficiency) even

if it violates the Nash cooperative bargaining solution.[15] The Nash cooperative bargaining solution allows us to derive simple explicit characterizations of the conditions under which our conclusion holds, but is not necessary to establish its validity.

Since the unitary household model violates the monotonicity requirement, it cannot generate our results. To see this, suppose that the intra-household allocation mechanism was modeled in a unitary fashion instead. Then, since the household would be maximizing its total expected consumption, labor allocation, aggregate labor supply and (consequently) the perfect foresight equilibrium would be exactly as specified in Lemma 2.1, Lemma 2.2 and Proposition 2.1, respectively. Hence, (3.2) will continue to hold as well, implying that total household consumption remains invariant. The implications of an expansion in any sector for the informal sector wage rate and the absorption probability must also be as specified in Proposition 3.1(a) and Proposition 3.2(a). However, the distributive implications will be quite different.

Consider first the payoff to M in the second period in case F provides domestic labor in that period. Total household consumption will then be $(W + x(1,W))$, which will be allocated between M and F so as to maximize household utility, subject to the constraint that M and F must get at least their reservation utility levels, W and w, respectively. Let the allocation to M, derived as the unconstrained solution to the household utility maximization problem, be given by:

$$s_M = s_M(W + x(1,W))\cdot$$

Therefore, assuming that the reservation utility constraints are not binding in case of domestic production, M's expected life-time payoff in the unitary model will be given by:

$$m_u = W + [W + (1-p)(s_M(W + x(1,W)) - W)]\cdot \tag{3.3}$$

Equation (3.3) implies that an expansion in labor demand for women will decrease (increase) the average lifetime utility of men if and only if it also increases (reduces) the transition probability for women. It follows from (3.2) that the exact opposite will be true for women. Consequently, given our assumptions about the labor market and

15 This disagreement point monotonicity condition is satisfied in the general case by the Nash, Kalai-Smorodinsky and egalitarian solutions (Thomson (1987)). The generalized Nash and Kalai-Smorodinsky

domestic technology, a unitary household model will predict the following: any expansion in the formal sector must necessarily improve the aggregate welfare of women, while any expansion in the informal sector must necessarily reduce it (except in the special case where one reservation utility constraint is binding).16

The "collective sharing rule approach" proposed by Chiappori (1997a, 1997b, 1992), which only assumes that (a) each household member is characterized by his/her own utility function, and (b) intra-household decisions have Pareto optimal outcomes, is too weak to generate the results of either model. In fact, precisely because of the weak nature of its assumptions, the sharing rule approach is compatible with both sets of conclusions.

IV VARIANTS AND EXTENSIONS

We now discuss some extensions and variations of the model.

A. Tax on Male Wage and Gender-specific Quotas:

It should be clear from (3.1) and the subsequent discussion that the particular feature of our model summarized in (3.2), namely, that intra-household distribution is a zero sum game, is essentially due to the assumption that such changes do not affect the male wage rate. This assumption is convenient in that it allows us to derive simple explicit characterizations of the conditions under which an employment expansion program for women will have perverse consequences. Furthermore, this assumption is indeed quite reasonable in a policy context if employment generation programs for women are largely funded from external sources (such as foreign aid or investment), or from domestic productivity gains. If, however, such programs are largely generated through domestic taxation, by changing the pattern of government expenditure, or simply by substituting men by women in the formal sector through gender-specific hiring or lending quotas, we

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solutions yield essentially identical results in our context. Given our linear utility possibility frontier, the egalitarian solution is identical to the symmetric Nash solution.

16 The two models yield identical conclusions when either reservation utility constraint is binding. The assumption of $\mu = 0$ in our bargaining framework is equivalent to assuming, in the unitary version, that F's reservation utility constraint is binding. Since even this extreme case satisfies our monotonicity requirement, both models yield our original results. The assumption $\mu = 1$ in the bargaining formulation is equivalent to assuming, in the unitary case, that M's reservation utility constraint is binding. In this case,

should expect some adverse impact on labor demand for men and/or on the male wage rate. In such a situation, employment/credit generation programs for women may turn the intra-household allocation process into a negative sum game: they may make *both men and women* worse off.

Consider an employment generation program for women in the formal sector that is funded by domestic taxes and/or changes in the composition of government expenditure which, directly or indirectly, reduce the male wage rate. Given A2.2, it follows from (2.3) and (3.1) that, in this case, the policy intervention must also reduce total lifetime household consumption, *h*, in the new equilibrium.

Now, for analytical purposes, such an intervention can be decomposed into (a) an exogenous expansion of the type discussed in Section III, and (b) an exogenous fall in the male wage rate. Starting from an initial equilibrium, first consider the effects of an exogenous fall in the male wage rate. Given A2.2, this will reduce the gross surplus from domestic production. Consequently, more women will enter the labor market in the first period. Given labor demand, this will reduce *both* the informal sector wage rate and the probability of absorption in the formal sector. Clearly, therefore, the reduction in the male wage rate, *by itself*, can only make women worse off. Since, by Propositions 3.1(b) and 3.2(b), even a pure expansion, by itself, may reduce women's welfare, it follows that an expansion associated with a reduction in the male wage rate may also make women worse off. [17]

Now, suppose that F's life-time pay-off is indeed reduced by such a composite intervention. Recall that the fall in the male wage rate must also reduce total household consumption in equilibrium. Therefore, (3.2) no longer follows from (3.1): the reduction in F's expected consumption will not be balanced exactly by an increase in M's payoff any more. In fact, as is clear from (3.2), if the fall in total household consumption due to the

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both models predict that changes in the labor market will have no impact on any agent's expected life-time consumption. See (N11) in the Appendix.

17 While formal versions of Propositions 3.1 and 3.2 corresponding to this situation can be developed, explicit characterizations of the conditions under which an expansion makes agents worse off become cumbersome.

tax is large enough, *both* M and F will be worse off from the tax-funded expansion in formal sector demand.[18]

Now consider an alternative scenario where women are provided employment in the formal sector not through creation of new jobs, but by directly displacing men; e.g. via affirmative action programs or the imposition of gender-specific quotas. An expansion of formal sector employment for women in this case would reduce, by the same amount, male employment in that sector. Our model can be generalized to handle this situation by allowing men thus displaced to find jobs in the informal sector.[19] An expansion in formal sector employment for women will then also increase the proportion of men employed in the informal sector. Since this is going to reduce the average male wage, the consequences will be essentially the same as those of a tax on the male wage rate already discussed.

B. General Equilibrium Effects:

The results presented in Section III are derived from a partial equilibrium analysis, in that, we have taken the demand for labor to be exogenously given, and have not explicitly modeled the production side. However, a movement by women from domestic production to the market sector is going to alter the demand for goods produced by the market sector, and thereby change the demand for labor as well. While a complete formal specification of the problem in a general equilibrium framework is beyond the scope of this paper, it can be shown in an intuitive manner that such general equilibrium effects are unlikely to reverse our basic claim that expansions in demand for their labor, in either sector, may make women worse off, though they may change the conditions under which this would happen.

Consider an exogenous expansion in the formal sector. First suppose that increased market participation by women due to this expansion essentially increases the demand for

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18 Whether this will actually happen in any specific situation clearly depends on the magnitude of the reduction in the male wage and that in the gross domestic surplus. For example, it can be seen from (2.2) that, given A2.3, men must necessarily be worse off if their wage rate is halved. Whether the expansion thus funded will also make women worse off or not depends on its size and the initial distribution of women's labor across the different sectors.

the output of the formal sector. This would merely reinforce the original expansion in the formal sector without materially changing our conclusions: the new equilibrium (assuming it exists) would simply be characterized by an expansion larger than that originally induced by the policy intervention. Indeed, so long as the general equilibrium effects are not strong enough to prevent a fall in the informal sector wage rate, Proposition 3.1 will continue to hold. The more interesting case therefore is where the increased market participation by women in response to the expansion in the formal sector also increases the demand for the output of the informal sector, to the extent that, in the new equilibrium, the informal sector wage rate is actually higher than that in the initial equilibrium.[20] Then, if labor reserves continue to exist in the household sector, it must be the case that the probability of absorption in the formal sector has fallen, since otherwise all women would enter the labor market in the first period. Formally, therefore, the new equilibrium generated by the expansion in the formal sector will have the exactly the same properties as that generated by our partial equilibrium model for an exogenous expansion in the *informal* sector, as specified in Proposition 3.2. Women's aggregate welfare will now be reduced by the expansion in the formal sector if and only if $\lfloor p' > 1 - p^* \rfloor$. Thus, compared to our partial equilibrium specification in Proposition 3.1(b), strong positive general equilibrium effects on the informal sector wage rate will *reverse the conditions* under which an expansion in the formal sector would reduce women's aggregate welfare, but will not alter our basic claim that such a reduction is possible.[21] A symmetric argument establishes the same conclusion for an expansion in the informal sector.

C. Marriage Market Effects with Remarriage:

Lastly, consider the consequences of relaxing the assumption of no remarriage in the second period. So long as $\mathrm{l} < 1$, men married to women holding formal sector jobs are better off by being married, instead, to women who provide domestic labor. The excess

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19 In this case, one has to make an additional assumption that men earn sufficiently more than women *even in the informal sector*, so as to generate the traditional gender-based intra-household division of labor.

20 This may also happen due to simultaneous demand generating state intervention in the informal sector.

21 If the informal sector wage rate remains invariant (say due to state sponsored employment guarantee programs), then, so long as labor reserves exist, expansions in the formal sector will merely transfer female labor from the household sector to the market sector without altering any agent's equilibrium expected life-

demand thus generated for women without formal sector jobs disappears only when competition among all men in the older generation leads to an equilibrium where $l = 1$, since only in that case would such men be indifferent between the two groups of women. Thus, the male reservation utility constraint would be binding in this case. Both our cooperative bargaining specification and a unitary household model then predict that changes in the labor market will merely transfer women from the domestic sector to the market sector without altering any agent's lifetime expected consumption.[22]

V. CONCLUSION

This paper analyzes the implications of employment generation programs targeted towards women for intra-household distribution within the stylized context of a dual economy where the informal sector labor market functions as a gateway to the formal sector. We have modeled such an economy by extending a Harris-Todaro type of framework to incorporate Nash-bargained household labor supply decisions. Using this model, we have shown that expanding employment opportunities for women may actually weaken their bargaining power inside the household, even when agents have perfect foresight. Intra-household gender inequality may consequently increase. This happens as, due to the gateway character of the informal sector, such programs induce more women to enter this sector, which reduces either their wage rate in the informal sector or their chance of entering the formal sector. Women may get caught in a Prisoners' Dilemma type of situation where, while it is individually rational for women to enter the labor market in response to an expansion of labor demand, the aggregate outcome is a reduction in their welfare. Another interpretation of these results may be in terms of the theory of the second best. Two separate distortions exist in the labor markets in our model. One distortion results in low employment opportunities for women in the formal sector, while another leads to a wage gap between the formal sector and the informal sector. The results suggest that the presence of the second distortion may lead to attempts to address only the first distortion becoming counterproductive.[23] There may

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time payoff. Our model in this case behaves essentially like the classic two-sector model developed by Lewis (1954).

[22] This problem does not arise if agents are free to remarry only at the beginning of the first period. Then, since all agents in any gender group are ex ante identical, no agent has any incentive to dissolve his/her existing marriage, even if $l < 1$. Changes in the labor market will indeed affect intrahousehold distribution.

[23] I am grateful to a referee for suggesting this interpretation.

exist an all-or-nothing aspect to expanding women's employment opportunities, in that small incremental expansions could worsen existing intra-household inequality instead of reducing it.

Our results are intended to provide a qualification to the standard view. The importance of this qualification, in a policy context, clearly depends on the extent of informal to formal sector movement by female workers. Future work may assess the empirical importance of this gateway function of the informal sector in alternative institutional contexts. Furthermore, it would be useful to extend the model by incorporating heterogeneity across households. Such extensions would allow one to analyze the impact of employment generation programs for women on inter-household inequality and to assess whether such programs benefit some groups of women disproportionately more than others.

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APPENDIX

Proof of Proposition 2.1:

From Lemma 2.2, it follows that, in any equilibrium (p, w) (dropping the time subscript for notational simplicity), $p \geq H$. Hence, we need to rule out $p = H$. Suppose $p = H$. Then, it must be the case that $L(w) = 1$. It follows from Lemma 2.2 that $p \geq q(w_1)$, which violates A2.4. Now suppose $p \geq q(w_1)$. Then, it follows that $p = H$. We thus have $H \geq q(w_1)$, which violates A2.4. Hence, given A2.1-A2.4, any equilibrium must necessarily satisfy $H < p < q(w_1)$.

Since $p < q(w_1)$ it follows from A2.4 that $p < 1$. Hence, from Definition 2.1 (D1),

$p = H / L(w)$. (N1)

Since $H < p$, it follows from Lemma 2.2 and Definition 2.1 (D2) that

$p = q(w)$. (N2)

(N1) and (N2) imply that if an equilibrium exists, then the equilibrium w must be a solution to $q(w) = H / L(w)$. (N3)

Using (2.1) – (2.4), we have $q(w) = (\bar{x} - w)/(W - \bar{x})$. (N4)

Hence, (N3) can be written as $(\bar{x} - w)/(W - \bar{x}) = H / L(w)$. (N5)

Since, by assumption, L is strictly decreasing in *w*, the right hand term is strictly increasing in *w*. As the left hand term is strictly decreasing in *w*, equilibrium, if it exists, must be unique. By A2.4, the left-hand term is greater than the right hand term when $w = w_1$. Since $L(w_0) = 0$, and since the two functions are continuous, the equilibrium must exist. ◊

Proof of Proposition 3.1:

(a) From (N2) and (N4), we have

$p^* = (\bar{x} - w^*)/(W - \bar{x})$,

(N6) $p' = (\bar{x} - w')/(W - \bar{x})$.

(N7)

Let $p' = p^* + \Delta p$ and $w' = w^* + \Delta w$. Substituting into (N6) and (N7) we get

$$\Delta p(W - \bar{x}) = -\Delta w .$$

(N8)

From (N5), it follows that $\Delta w \neq 0$. Then, given A2.3, (N8) implies

$$\Delta p / \Delta w < 0 . \qquad \text{(N9)}$$

Let $\Delta H = H' - H^*$. From (N1), we get

$$\left[p^* (\Delta L / \Delta w) + L'(\Delta p / \Delta w) \right] \Delta w = \Delta H . \qquad \text{(N10)}$$

Since $\Delta L / \Delta w < 0$, $\Delta H > 0$, (N9) and (N10) imply $\Delta w < 0$. It follows from (N9) that $\Delta p > 0$.

(b) Since not all women enter the labor market, in either equilibrium, the expected life-time payoff to F agents must be such that they are indifferent between entering the labor market and providing domestic labor. Thus, for all F agents, the change in their lifetime expected payoff is $\Delta f = f' - f^*$

$= \Delta p\left[(W - w^*) - \text{I}\,(\bar{x} - w^*) \right] + \Delta w\left[1 + (1 - \text{I})(1 - p^*) \right] - \Delta p \Delta w (1 - \text{I})$ (using (2.1))

$= \Delta p\left[(W - w^*) - \text{I}\,(\bar{x} - w^*) \right] - \Delta p (W - \bar{x})\left[1 + (1 - p^*)(1 - \text{I}) \right] + (\Delta p)^2 (W - \bar{x})(1 - \text{I})$ (using (N8))

$= \Delta p (1 - \text{I})\left[(\bar{x} - w^*) - (W - \bar{x})(1 - p') \right]$

$= \Delta p (1 - \text{I})\left[(\bar{x} - w^*) - \{(1 - p')/p^*\}(\bar{x} - w^*) \right]$ (using (N6))

$= (\Delta p / p^*)(1 - \text{I})(\bar{x} - w^*)(p^* + p' - 1) .$

(N11)

Since $\Delta p > 0$ (by Proposition 3.1(a)) and $(\bar{x} - w^*) > 0$ (by A2.3), we get

$$\Delta f \underset{<}{\overset{>}{=}} 0 \text{ iff } p' \underset{<}{\overset{>}{=}} (1 - p^*) . \qquad \Diamond$$

Proof of Proposition 3.2:

(a) Since $\Delta w > 0$, it follows immediately from (N9) that $\Delta p < 0$. Female labor force participation rate must go up to satisfy the equilibrium condition (N1).

(b) Since now $\Delta p < 0$, (N11) implies:

$$\Delta f \underset{<}{\overset{>}{=}} 0 \text{ iff } p' \underset{>}{\overset{<}{=}} (1 - p^*) . \qquad \Diamond$$

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