Macroeconomic Adjustment and the Balance of Bargaining Power in Rural West African Households

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Introduction

How do macroeconomic adjustment policies that alter the price environments of rural households affect the balance of bargaining power between women and men in them? How do changes in the balance of bargaining power induced by such policies mediate the policies' impact on households' agricultural production, income and their members' physical well-being? This paper explores these two main questions for the case of West African export crop producing households.

Answering the questions requires a full understanding of decision making in West African households, which is marked by a clear separation of male and female decision making spheres. Most resources owned in aggregate by households are controlled and allocated separately by adult household members. Husbands and wives generally control separate portions of total household income and allocate it among day-to-day expenditures without consulting their spouse, i.e., households are non-income-pooling. Following a gender division of expenditure responsibilities, each spouse tends to allocate income to different sets of goods and services. In addition, the spouses manage their own income generating activities independently of one another. Most agricultural production takes place on households' "communal" fields for which the husband is the manager but all household members are expected to provide labor. The spouses may then manage their own personal production activities, for which they provide the majority of the labor (Guyer, Fapohunda).

Wives and husbands both contribute to the maintenance of household members' physical well-being, i.e., to "well-being provisioning". Both are responsible for providing goods (e.g., food and medicines) to the process. Following a gender division of labor, however, it is generally wives alone who provide the time in reproductive activities that is so crucial to health and nutritional well-being, especially of children. Examples of these activities are birthing and care of children, food processing and preparation, gathering fuel wood and water, maintaining cleanliness, and care of elderly and ill members.

While most day-to-day resource allocation decisions are taken separately by husbands and wives, decisions over the share of total household resources--both income and household members' time--controlled individually by each generally involves some negotiation. Negotiation is especially likely in the face of any major change in households' economic environments. For example, conflict-laden negotiations between husbands and wives over who bears the labor costs and who reaps the income benefits arising from the dramatic increases in cash crop production that have occurred in the region over the last few decades have been documented (Whitehead).

It is in negotiations over resource control that bargaining power becomes an important factor: the person with the greatest bargaining power will control the larger share of household income and time. In turn, who controls household resources has implications for how they are allocated. Because women have more limited access to productive resources from outside of their households than do men, their life options outside of marriage are more limited than men's. Women thus tend to have lower bargaining power than men (Stamp), and resource control negotiations are settled in favor of men. Nevertheless, women do have some degree of bargaining power through viable alternatives to their current marriages, as evidenced in the frequency of wife-instigated divorce (Funk).

The balance of bargaining power in households is not set in stone, however. Indeed, it can be altered by policy-induced changes in households' economic environments (Haddad et al.). Many macroeconomic adjustment programs in West Africa have contained agricultural price liberalization components in which the prices of exportable cash crops (e.g., palm nuts, cotton) produced on male-managed communal fields have increased. Because the outside options of men are improved when these crops' prices are increased, the balance of bargaining power in households is implicitly tipped further in favor of husbands.

Traditional analyses of the effects of output price changes have only considered their *feasibility* effects, i.e., effects on behavior resulting from direct changes in households' time and income constraints.

However, a shift in the balance of bargaining power between wives and husbands in households will induce additional changes in all household resource allocation outcomes, including crop production, household incomes, and household members' health. How big are the bargaining power components of price effects compared to their feasibility components? What difference do they make to policy impacts on production, income and physical well-being? These questions are difficult to answer since bargaining power is not easily measured. However, using a game-theoretic model of intrahousehold decision making and simulation techniques, this paper takes the first steps towards answering using the example of agricultural price liberalization in Burkina Faso in the early 1980s.

The Role of Bargaining Power in Household Decision Making

The role of bargaining power in decision making in rural West African households can be elucidated by a formal game-theoretic model of a non-income-pooling agricultural household.[1] The commonly polygynous West African household is simplified to consider a unit composed of two decision makers: a woman (agent i=f) and her husband (agent i=m). Production activities include communal (c) as well as the personal production (p) of each agent, with technologies represented by production functions $Q_c(T_c^f, T_c^m, V_c)$, and $Q_p^i(T_p^i, V_p^i)$, i=f,m. Inputs T_c^i and T_p^i, i=f,m are the agents' time inputs; V_c and V_p^i are non-labor inputs. Prices of personal and communal output are given by $q=(q_c, q_p^f, q_p^m)$, and non-labor input prices are given $v=(v_c, v_p^f, v_p^m)$.

The maintenance of household members' physical well-being is modelled as a non-market production process (Reid, Becker). A well-being provisioning function is given by:

$$W = W(T_r^f, X_r^f, X_r^m) \qquad \textbf{(1)}$$

where W is an aggregated measure of all household members' physical well-being, T_r^f is agent f's time in

[1] See Smith for a more detailed presentation of this model.

reproductive activities and the X_r^i, i=f,m are "well-being inputs" purchased by agent i.

Agent f and agent m face the following time constraints:

$$T_r^i + T_c^i + T_p^i + T_o^i = T \quad i=f,m\,, \;\; T_r^m = 0 \tag{2}$$

where T_o^i is agent i's leisure time and T is each agent's total time endowment. The condition on T_r^m reflects women's specialized reproductive role. The agents' expenditures among income-generating productive inputs (V_p^i), well-being inputs (X_r^i) and consumption goods (X_o^i), the latter two at prices $p^i = (p_r^i, p_o^i)$, i=f,m, must equal their receipts from income-generating activities, plus their exogenous incomes (denoted E^i), and net receipts of income transfers from the other agent. The household member who is the manager of an activity receives the income generated from it. Agent f's receipts come from her personal production alone, while agent m receives income from both (his) personal production and household communal production. Agent f's and agent m's income constraints, respectively, are

$$p_r^f X_r^f + p_o^f X_o^f + v_p^f V_p^f = q_p^f Q_p^f(T_p^f) + E^f + t \tag{3}$$

$$p_r^m X_r^m + p_o^m X_o^m + v_p^m V_p^m + v_c V_c = q_p^m Q_p^m(T_p^m) + q_c Q_c(T_c^f, T_c^m) + E^m - t \tag{4}$$

The variable "t" is an income transfer from agent m to agent f. Note that agent m receives income from an activity (Q_c) to which agent f's labor (T_c^f) is devoted.

Utility is assumed to be a function of physical well-being (W), purchased consumption goods (X_o^i, i=f,m), and agents' leisure time (T_o^i, i=f,m). To allow for preference heterogeneity between the agents, individualized utility functions are specified as follows:

$$U^i(W, X_o^f, X_o^m, T_o^f, T_o^m) \quad i=f,m. \tag{5}$$

Decision making is modeled as a two-stage game (Carter and Katz). The first stage represents ongoing day-to-day decisions marked by the characteristic West African household separate-spheres structure. Agent m's unilateral decision variables are $\xi^m = (X_o^m, X_r^m, V_c, V_p^m, T_o^m, T_p^m, T_c^m)$, and agent f's are $\xi^f = (X_o^f, X_r^f, V_p^f, T_o^f, T_r^f, T_p^f)$. In the second stage, bargaining over resource control takes place. In a

practical sense, such bargaining manifests itself in negotiations over two key variables: women's time in communal production and income transfers from husbands to wives (Smith). The bargained variables are $\xi_b = (T_c^f, t)$.

First-stage resource allocation decisions are modelled as a Nash noncooperative game. Agents take resource allocation decisions unilaterally given their expectations of the other agent's behavior. Agent f chooses ξ^f to maximize utility in (5) (with i=f) subject to (1), (2, i=f) and (3), given fixed ξ^m. Similarly, agent m chooses ξ^m to maximize (5) (with i=m) subject to (1), (2, i=m), and (4) given fixed ξ^f. Both agent's decisions are conditional on ξ_b, which are held fixed. The first-stage game yields reaction functions of the form $R^f = R^f(p^f, q_p^f, v_p^f, T^f - T_c^f, E^f + t \mid \xi^m)$ for agent f's choice variables and $R^m = R^m(p^m, q_p^m, q_c, v_p^m, v_c T_c^f, E^m - t \mid \xi^f)$ for agent m's. Reduced-form equations for ξ^f, ξ^m for every combination of T_c^f and t are:

$$\xi^i(p^i, q_c, q_p^f, q_p^m, v, E^f, E^m, T_c^f, t) = \xi^i(p^i, q_p^f, q_p^m, v, T_c^f, T^f - T_c^f, E^m - t, E^f + t) \quad i = f,m. \qquad \textbf{(6)}$$

They are functions of the prices faced by the agents, the amount of agent f's time controlled by each agent, and the income they control.

The second-stage negotiation over $\xi_b = (T_c^f, t)$ is modeled as a Nash cooperative bargaining game in which the outcome depends on the relative bargaining powers of the agents. First-stage indirect utility functions (denoted V^i) conditional on ξ_b serve as the utility metric for second-stage decision making. Agents' bargaining powers are represented by their fall-back positions, defined to be the maximum utility they would receive in the event of divorce. In such a situation no transfers of income would take place between the agents (t=0), no labor would be provided by agent f to communal production ($T_c^f = 0$), and agents' (first-stage) resource allocation decisions would no longer be interdependent. Agent f's fall-back position is given by $\Phi^f(p_\phi^f, q_\phi^f, v_\phi^f, E^f, \alpha^f)$. Agent m's is given by $\Phi^m(p_\phi^m, q_\phi^m, q_c, v_\phi^m, E^m, \alpha^m)$. The positions are functions of the prices agents would face, $\psi_\phi^f = (p_\phi^f, q_\phi^f, v_\phi^f)$, and $\psi_\phi^m(p_\phi^m, q_\phi^m, q_c, v_\phi^m)$, their exogenous incomes, and nonmonetary variables α^i, i=f,m that affect their utility in the event of divorce (McElroy). Note that

agent m's fall-back position is a function of q_c, the output price of communally-produced crops.

Agents f and m jointly choose ξ_b to maximize a Nash objective function:

$$N(T_c^f, t) = [V^f(p^i, q_c, q_p^f, q_p^m, v, E^f, E^m, T_c^f, t) - \phi^f(p_\phi^f, q_\phi^f, v_\phi^f, E^f, \alpha^f)] * [V^m(p^i, q_c, q_p^f, q_p^m, v, E^f, E^m, T_c^f, t) - \phi^m(p_\phi^m, q_\phi^m, q_c, v_\phi^m, E^m, \alpha^m)] \quad \textbf{(7)}$$

The function is the product of the agents' gains from membership in the joint decision making unit: the difference between their current utilities and fall-back positions ϕ^i.[2] The higher an agent's fall-back position relative to current utility, the greater the agent's preferences influence the negotiated outcome.

The second stage of the game yields reduced-form equations for t and T_c^f as follows:

$$t^*(p^i, q_c, q_p^f, q_p^m, v, \psi_\phi^f, \psi_\phi^m, E^f, E^m, \alpha^f, \alpha^m) = t(p^i, q_c, q_p^f, q_p^m, v, E^f, E^m, \phi^f(.), \phi^m(.)) \quad \textbf{(8)}$$

$$T_c^{f^*}(p^i, q_c, q_p^f, q_p^m, v, \psi_\phi^f, \psi_\phi^m, E^f, E^m, \alpha^f, \alpha^m) = t(p^i, q_c, q_p^f, q_p^m, v, E^f, E^m, \phi^f(.), \phi^m(.)) \quad \textbf{(9)}$$

Final reduced-form equations for the agents' unilateral decision variables are derived by substituting (8) and (9) into equations (6). These reduced-form equations take the form:

$$\xi^*(p^i, q_c, q_p^f, q_p^m, v, \psi_\phi^f, \psi_\phi^m, E^f, E^m, \alpha^f, \alpha^m) = \xi^*[p^i, q_c, q_p^f, q_p^m, v, T_c^f(q_c, ..., E^m, \phi^f(p_\phi^f, q_\phi^f, v_\phi^f, E^f, \alpha^f), \phi^m(p_\phi^m, q_\phi^m, q_c, v_\phi^m, E^m, \alpha^m), t(q_c, ..., E^m, \phi^f(p_\phi^f, q_\phi^f, v_\phi^f, E^f, \alpha^f), \phi^m(p_\phi^m, q_\phi^m, q_c, v_\phi^m, E^m, \alpha^m)] \quad \textbf{(10)}$$

The first main question of the paper--How do macroeconomic adjustment policies that alter the price environments of rural households affect the balance of bargaining power between women and men in them?--can now be answered. For agricultural production in particular, the effect depends on who manages the crop whose price changed, which determines who receives any income generated. For example, if the

[2] Individual rationality ($V^i - \phi^i > 0$, i=f,m) is assumed.

output price of a crop managed by a man (q_c, q_p^m) is increased, then the man's bargaining power is enhanced relative to his wife's. If the output price of a crop managed by a woman (q_p^f) is increased, then the woman's bargaining power is enhanced relative to her husband's.

The second main question of the paper--How do changes in the balance of bargaining power induced by such policies mediate the policies' impacts on households' agricultural production, income and members' well-being?--can also be partially answered. Equation (10) aids us in isolating the effects of changes in bargaining power from their feasibility effects for any decision variable ξ^*. The partial derivative of (10) with respect to q_c, for example, is:

$$\frac{\partial \xi^*}{\partial q_c} = \frac{\partial \xi^*}{\partial q_c} + \frac{\partial \xi^*}{\partial T_c^f}\frac{\partial T_c^f}{\partial q_c} + \frac{\partial \xi^*}{\partial t}\frac{\partial t}{\partial q_c} + \frac{\partial \xi^*}{\partial T_c^f}\frac{\partial T_c^f}{\partial \phi^m}\frac{\partial \phi^m}{\partial q_c} + \frac{\partial \xi^*}{\partial t}\frac{\partial t}{\partial \phi^m}\frac{\partial \phi^m}{\partial q_c} \qquad \textbf{(11)}$$

A: feasibility effects; B: feasibility effects; C: bargaining power effect

The direct feasibility effect of the price change (term A) is that brought about through the release of agent m's budget constraint (equation 4) holding the resource control variables and agents' fall-back positions constant. The indirect feasibility effect (term B) is the additional effect allowing T_c^f and t to vary (thus shifting equations 2(i=f), 3 and 4) while still holding the fall-back positions constant. Term C gives the remaining effect induced by a shift in the balance of bargaining power in favor of agent m and resulting changes in T_c^f and t. Changes induced in decision variables (vectors ξ^f and ξ^m) will in turn induce changes in agricultural production, income, and well-being.

Agricultural Liberalization in the Cotton Belt of Burkina Faso:
Quantifying the Effects of Policy-induced Changes in Bargaining Power

This section uses the above model to simulate the feasibility and bargaining power effects of macroeconomic adjustment in Burkina Faso taking place from 1981 to 1985. An agricultural price liberalization component of the adjustment program led to a 60% rise in the price of communally-produced cotton, Burkina Faso's main export crop, and a 120% rise in the price of chemical fertilizer, greatly enhancing the profitability of cotton production overall. Liberalization took place through a combination of exchange rate devaluation and price decontrol (Savadogo and Wetta).

The simulation model employed is parameterized using data collected by the International Crops Research Institute of the Semi-Arid Tropics from monogamous households in Burkina Faso's cotton belt complemented with secondary data. Communal cotton and food production functions are specified as Cobb-Douglas. The utility functions and well-being provisioning functions are Stone-Geary. Personal income-generating activities are assumed to be remunerated at fixed wages. To determine an appropriate degree of intrahousehold preference heterogeneity and base-case balance of bargaining power, a validation exercise based on six differing degrees of preference heterogeneity (ranging from none to "high") and six differing balances of bargaining power (ranging from one highly in favor of the husband to one in which the spouses have relatively equal bargaining powers) is undertaken. Of the thirty-six resulting scenarios, one of high preference heterogeneity and bargaining power moderately in favor of husbands is found to conform most closely to the case of (monogamous) cotton producing households in Burkina Faso. It is this scenario on which the following analysis is based. The simulations are undertaken using nonlinear mathematical programming and grid search techniques (Smith).

A breakdown of the effects of the price changes on various variables of interest is given in Table 1. First consider changes in the spouses' utilities and fall-back positions. The price increases lead to a 7.8% increase in the wife's utility and an 18.5% increase in the husband's (column 7). While both spouses gain

from the price increases, due to his bargaining power advantage, the husband gains more than the wife. Because the profitability of an income generating activity managed by husbands was enhanced, it is the husband who also gains in bargaining power. The husband's fall-back utility increases by 17.5%, while the wife's does not change, tipping the balance of bargaining power further in his favor.

Table 1. Simulated Feasibility and Bargaining Power Effects of Adjustment Policy-Induced Price Changes, Burkina Faso (1981-85)

Variable	Pre-Adjustment Level (1)	Direct Feasibility Effect (2)	Indirect Feasibility Effect (3)	Bargaining Power Effect (4)	Total Effect (5)	Post-Adjustment Level (6)	Percent Change (%) (7)
Utility							
Wife's utility**	399	33.3	90.4	-62.7	31	430	7.8
Husband's utility**	667	128	-83	79	124	791	18.6
Bargaining Power							
Wife's fall-back utility**	315	--	--	0	0	315	0
Husband's fall-back utility**	607	--	--	106	106	713	17.5
Resource Control							
Income transfer ('000s francs CFA)*	10.5	--	32.5	-13.5	19	29.5	181
Wife's time in communal production (hours/year)	840	--	185	125	310	1150	37
Production, Income, and Well-Being							
Cotton production (kg)	1131	252	209	-4.9	456	1587	40
Income ('000s CFA)	178	57.5	16.8	0.2	74.5	252	42
Physical Well-being**	167	8.32	13.79	-7.12	15	182	9

Table Notes:
* CFA francs are those issued by the Communauté Financière Africaine. The 1982 exchange rate was 325 CFA per $US.
** These variables have no measurable units. While their levels have no significance for model simulation outcomes, *changes* in them do.

How do the price changes affect resource control in the household? Because the husband's income constraint has been released, greater income is available to allocate among both the goods he purchases and income transfers to his wife. The (indirect) feasibility affect is thus positive, increasing the income transfer by 32,500 CFA. However, because the husband's bargaining power has increased relative to the wife's, he is able to bargaining the income transfer down by 13,500 CFA. Thus the increase in the income transfer is only 19,000 CFA. With respect to control over the wife's time, the feasibility and bargaining power effects are both positive. Because cotton production has become more profitable, both the wife and husband will see it in their interests to increase the amount of the wife's time in its production. However, since the husband receives income from the labor, he will have greater incentive than the wife. As his bargaining power increases relative to hers, he is able to bargain for even more of her labor (125 hours per year), leading to a total increase in her time in communal production of 310 hours per year.

Turning next to the effects of the price increases on production, income, and physical well-being in the household, the simulation results indicate that the bargaining power effect on the former two are minimal. Cotton production increases by 40%. The bargaining power effect is negative but minuscule (-4.9 kg). Similarly, there is a substantial increase in household income of 42%, but the (positive) bargaining power component of the price effect is very small (200 CFA).

For the case of household physical well-being, however, the bargaining power component of the price effect is quite large relative to the feasibility component. Recall that the inputs into the well-being provisioning process are the purchased inputs of both spouses and the wife's time in reproductive activities (equation 1). The direct feasibility effect leads to a 5% increase in physical well-being, corresponding to increases in the husband's purchases of well-being inputs. The indirect feasibility effect gives the additional effect of changes in income transfers and the wife's time in communal production holding bargaining power fixed. Well-being is enhanced by the wife's increased purchases of well-being inputs despite possible reductions in her time in reproductive activities. However, the shift in the balance of bargaining power in

favor of the husband leads to a decline in household physical well-being that almost washes out the direct (positive) feasibility effect of the price changes, leading to an overall increase in physical well-being of only 9%.

Conclusion

Macroeconomic adjustment policies that alter the price environments of rural households have the potential to shift the balance of bargaining power between women and men in them. For the example considered here, that of agricultural price liberalization in Burkina Faso, both women and men were found to benefit from the price changes. However, they resulted in a shift in the balance of bargaining power in favor of men, in turn increasing the share of household resources controlled by them. Thus, while the policy was gender neutral in its implementation, its effects were gender-biased.

Shifts in the balance of bargaining power in households have implications not only for gender equity, but also for households' production of cash crops, their incomes, and household members' physical well-being. In the Burkina Faso example, adjustment was beneficial for all three. However, the shift in the balance of bargaining power in favor of husbands compromised women's ability to fulfill their reproductive roles, washing out a fairly big portion of the policy's potentially large positive effect on household physical well-being.

The price effect estimations presented in this paper are based on a simulated household model. The methodology is limited in its ability to capture the true magnitude of the effects of price-induced shifts in the balance of bargaining power. Nevertheless, the estimates indicate that these effects may be quite large and especially important for physical well-being outcomes such as household members' health and nutritional statuses. Policy makers wishing to maximize the benefits of price-shifting macroeconomic adjustment policies for people's physical well-being should consider directing them towards enhancing the profitability of income generating activities managed by both men and women.

References

Becker, Gary (1965). "A Theory of the Allocation of Time." *Economic Journal*. September 1965, pp. 493-517.

Carter, Michael and Elizabeth Katz (1997). "Separate Spheres and the Conjugal Contract: Understanding the Impact of Gender-Biased Development." Chapter 6 in Haddad et al.

Fapohunda, Eleanor (1988). "The Nonpooling Household: A Challenge to Theory." in Daisy Dwyer and Judith Bruce, eds. (1988). *A Home Divided: Women and Income in the Third World*. Stanford: Stanford University Press.

Funk, Ursula (1988). "Land Tenure, Agriculture, and Gender in Guinea-Bissau". Ch. 2 in Jean Davison (ed). *Agriculture, Women and Land: The African Experience.* Boulder: Westview Press.

Guyer, Jane (1988). "Dynamic Approaches to Domestic Budgeting: Cases and Methods from Africa." in Daisy Dwyer and Judith Bruce, eds. (1988). *A Home Divided: Women and Income in the Third World*. Stanford: Stanford University Press.

Haddad, Lawrence, John Hoddinott, and Harold Alderman, eds.(1997). *Intrahousehold Resource Allocation in Developing Countries: Models, Methods, and Policy*. Baltimore, M.D.: Johns Hopkins University Press.

McElroy, Marjorie (1990). "The Empirical Content of Nash-Bargained Household Behavior." *Journal of Human Resources*. Vol. 25, No. 4, pp. 559-583.

Reid, Margaret (1934). *Economics of Household Production*. New York: John Wiley and Sons.

Savadogo, Kimseyinga and Claude Wetta (1992). "The Impact of Self-Imposed Adjustment: The Case of Burkina Faso 1983-9." Ch. 2 in *Africa's Recovery in the 1990's: From Stagnation and Adjustment to Human Development*. Cornia, G. A., R. van der Hoeven and T. Mkandawire, eds. New York: St. Martin's Press.

Smith, Lisa C. (1995). *The Impact of Agricultural Price Liberalization on Human Well-Being in West Africa: Implications of Intrahousehold Preference Heterogeneity.* Ph.D. Dissertation, University of Wisconsin-Madison.

Stamp, Patricia (1989). *Technology, Gender, and Power in Africa*. Technical Study No. 63e. Ottawa: International Development Research Center.

Whitehead, Ann (1990). "Rural Women and Food Production in Sub-Saharan Africa." Ch. 11 in *The Political Economy of Hunger (Vol. 1): Entitlement and Well-Being*. Dreze, Jean and Amartya Sen, eds. Oxford: Clarenden Press.