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**GENDER EFFECTS ON AGGREGATE SAVING:
A Theoretical and Empirical Analysis**

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Abstract

This study investigates the hypothesis that shifts in women's relative income, which affects their bargaining power in the household, have discernible effects on aggregate saving due to differing saving propensities by gender. An analytical framework for pooled and non-pooled savings households is developed to examine why women and men's saving propensities may differ and how a change in women's wage earnings relative to men's influences household savings. An empirical analysis is conducted using panel data for a set of 20 semi-industrialized economies, covering the period 1975-95. The results indicate that as some measures of women's discretionary income and bargaining power increase, aggregate saving rates rise, implying a significant effect of gender on aggregate savings. These findings demonstrate the importance of understanding gender relations at the household level in planning for savings mobilization and in the formulation of financial and investment policies.

JEL Codes: D91 Intertemporal Consumer Choice, Life Cycle Models and Saving
E21 Consumption, Saving
O11 Macroeconomic Analysis of Economic Development

DOES GENDER HAVE ANY EFFECT ON AGGREGATE SAVING?: AN EMPIRICAL ANALYSIS

I. Introduction

Aggregate saving is an important source of funds for domestic investment and economic growth and thus the question of what determines its level and rate remains a crucial research and policy agenda. Moreover, in the face of volatile flows of external finance, domestic saving has become even more critical for economic development. In particular, the recent financial turmoil in developing countries, brought about by rapid cross-border movements of capital, has led many countries to seriously consider a larger role for domestic saving (excluding net factor income from abroad) as a source of investment funds.¹ Likewise, savings at the household level are important for the welfare of family members in the course of economic development as a means to smooth income, to fund education, for old age support when members become non-earners, and to leave as bequests to children.

In recent years, the debate on the determinants of aggregate saving has shifted from a focus on Keynesian capacity-to-save factors to the question of interest rate sensitivity of saving as well as the influence of age structure of the population.² In addition, the possible effects of government policies such as taxation and social welfare policies have been examined.³

¹ Even before the recent turmoil in financial markets and despite liberalization of international financial flows, there was evidence of a correlation between investment and domestic saving rates (Carroll and Weil 1993; Feldstein and Bacchetta 1991; Paxson 1995).

² On the effect of interest rates on saving, see, for example, Boskin (1978), de Melo and Tybout (1986), Dornbusch and Reynoso (1989), Fry (1978, 1984, 1996), Fry and Mason (1982), Giovannini (1985), Gupta (1987), and Modigliani (1986). For a review of the literature on the influence of age structure on savings, see Aghevli, Boughton, Montiel, Villanueva, and Woglom (1990), and Masson, Bayoumi, and Samiei (1995).

³ The literature on this subject has been surveyed by Smith (1990). Many countries tax income from saving differently than income from labor and therefore detailed knowledge of the country's tax code is required to assess whether such taxation policy is important in explaining variation in savings rate. Since these data and those

One area that requires further examination is the role that gender relations play in influencing aggregate saving. A small but growing body of literature strongly suggests there are gender differences in saving decisions and in risk attitude, at least in some developed countries.⁴ This study contributes to that literature by investigating the role of gender in influencing aggregate saving in semi-industrialized economies. Given their divergent social and economic circumstances within and outside the household, women and men may have differing propensities to save at the household level. If so, shifts in women's relative bargaining power are likely to affect household saving rates, and by extension, domestic saving rates.

In this paper, we first explore the mechanisms through which gender is likely to affect saving rates. The factors that affect women's and men's propensity to save may be contradictory in their effect. For instance, women's care responsibilities and role in household management may lead to more consumption spending and thus less saving. On the other hand, this responsibility may lead women to save *more* than men for precautionary reasons, due to a stronger perception of the need to smooth family consumption. As a result of these contradictory forces, it is difficult to make predictions based on *a priori* reasoning about gender differences in saving behavior.

Following the theoretical discussion, we present analytical frameworks for exploring the determinants of both pooled and non-pooled savings at the household level. The models highlight the effect of gender-related variables on household saving decisions. Based on these

pertaining to government budget policies are difficult to obtain, these issues are not considered in our empirical analysis.

⁴ See, for example, Bajtelsmit and Bernasek (1996), Bajtelsmit and Van Derhei (1997), Sunden and Surette (1998), Hinz, McCarthy, and Turner (1996), and Hungerford (1999).

models, we derive and test an empirical model of aggregate saving that incorporates gender variables, and controls for a variety of well-established economic, demographic and financial variables. While this paper explores the potential effect of gender relations on saving at the household level, household saving data are unavailable for many countries. Hence the examination of household saving behavior in this analysis is done indirectly through domestic saving which is comprised of household, business, and government saving.⁵ We find strong evidence of gender effects on aggregate saving, a result that underscores the importance of understanding gender relations in planning for domestic resource mobilization and in the formulation of financial and investment policies.

II. Gender and Aggregate Saving

The extensive literature on determinants of domestic saving suggests a variety of motives for saving by households, firms, and government. These motives point to a number of key variables that affect the aggregate saving rate which, for ease, can be grouped into those that affect the capacity of agents to save and those that affect their willingness to save. These include the level of per capita income, growth rate of GDP, interest rate, prevalence of financial institutions and the range of availability of financial assets, inflation rate, government taxation and savings and terms of trade. That literature, which we do not review here, is briefly summarized in Appendix A. We simply note here that in our empirical analysis that evaluates the effects of gender on saving, we draw from the standard models to develop a set of control variables.

Of particular interest, when considering the effects of gender on saving, is the literature

⁵ Note that domestic saving excludes net factor incomes from abroad.

on the determinants of household saving. In most aggregate-level studies, the theoretical relationship between saving and key determinants has been attributed to the life cycle hypothesis, interest rate theory, models of strategic bequest and intergenerational transfers, and household models of consumption smoothing. Typically, theories assume either the (independent) individual or the household as the unit of consumption-saving decision, abstracting from any consideration of gender differences in needs or motives to save. Neither has prior research explored the nature of intra-household relations that may influence the household saving rate.

If gender influences household saving behavior, by implication, there may be important macroeconomic effects of changes in gender relations. In this section, we explore the potential link between gender and household saving, and by extension, aggregate saving.

In considering the role that gender relations play in determining aggregate saving, we take the developing country context, which differs in important ways from that of industrialized economies. Households in developing countries on average are poorer and income is likely to be less stable, so that the allocation of income over time faces severe competing pressures that differ in intensity from those in developed economies. Access to financial institutions and the availability of financial instruments are more uneven in developing economies, and this also may affect saving rates. Further, developing countries tend to have shallow social safety nets. This suggests that families must rely to a greater extent on household-level savings and investments in kinship networks as part of their consumption smoothing strategy.

A. Household Decision-Making

Research on household saving generally makes the assumption of either an independent

individual or a unitary household that seeks to meet several goals: (1) to provide resources for retirement and bequests; (2) to finance expected large lifetime expenditures, including house purchase and education; (3) to finance unexpected losses of income (precautionary saving); and (4) to smooth the availability of resources over time to maintain more stable consumption (consumption smoothing). While the assumption of an individual or a unitary household may be a convenient one, it overlooks the possibility that, in *non-pooled savings* households, there are gender differences in the relative strength of saving motives between men and women as individual savers. Moreover, it does not take into account that, in *households that pool savings*, the differences in saving motives of male and female household members are likely to bring about negotiation and bargaining which influence the rate of household savings.

B. Evidence from Research in Developed Countries

The literature on gender differences in saving behavior is sparse and has focused primarily on developed countries. That research has found significant differences in individual retirement savings and investment decisions by gender. For example, Sunden and Surette (1998) provide empirical evidence demonstrating that gender and marital status influence investment allocation decisions in the United States. Jianakoplos and Bernasek (1998) examined the evidence on gender differences in risk aversion when an individual's entire portfolio of assets is considered, using the U.S. Survey of Consumer Finances. They found that single women are more risk-averse than single men and married couples. As an individual's wealth increases, the proportion held in risky assets was found to increase but for single women, the effect was significantly smaller than for single men and married couples. Using a wide range of variables that measure risk-taking, Palsson (1996), in a study of Swedish households, similarly finds

evidence that women are more risk-averse than men.

A number of studies show that women are more conservative in their investment decisions than men. For example, Bajtelsmit and Bernasek (1996), looking at United States private pensions, find that women hold a much higher proportion of their portfolios in fixed assets than men. Bajtelsmit and VanderHei (1997) also find gender differences in pension decisions, with women significantly less likely to invest in employer stock and equities than men.⁶ Similarly, Hinz, McCarthy, and Turner (1996) examine the allocation patterns of federal government workers in the U.S. Thrift Savings Plan and find that women invest their pensions more conservatively than men. Looking at individual contributions to the 401(K) pension plan in the U.S., Hungerford (1999) shows that women contribute at a significantly higher rate than men to their plan.⁷

These studies do not, however, explore *why* risk attitudes and savings behavior differ by gender. Drawing from an extensive literature in psychology, several studies in the field of psychometrics suggest that women's attitude toward risk differs from men's and demonstrate that gender is a powerful determinant of risk attitudes and judgments. For example, Flynn, Slovic, and Mertz (1994) and Barke, Jenkins-Smith, and Slovic (1997) find in their research on North American scientists that male respondents tend to judge risks as smaller and less problematic than do females.⁸ This finding is consistent with the previously discussed research

⁶ The study makes use of individual plan data on 20,000 employees in a single U.S. firm.

⁷ The 401(K) plan is based on voluntary participation and workers determine how much to contribute to their pension accounts. In 1993, 401(K) plans accounted for 22 percent of all pension plans.

⁸ Flynn, Slovic, and Mertz (1994) find sizable differences in risk assessments between white males and females, which is not found between non-white males and females. This is explained by the fact that people of color, as white women, experience greater vulnerability than white males.

on gender differences in attitudes toward financial risk.

Bernasek (2000: 10) argues that such differences in perceived risk result from women's different experiences and perceived vulnerability. Women on average experience greater vulnerability than men since they earn on average less than men, are more likely to care for children and elderly, are more likely to live in poverty, and are less likely to have health insurance and pension coverage in their jobs. They also have less political power than men. Women's tendency to exhibit greater caution and be more averse to risk may then be a rational response to their greater vulnerability and lack of control over their lives.

C. Evidence from Research in Developing Countries

The relevance of the findings of these studies for gendered saving behavior in developing economies is not clear. Structural conditions differ widely, and most saliently, industrialized economies have higher incomes and broader social safety nets that may substantially alter gendered saving behavior. To consider this issue further, we first turn our attention to research on household decision-making and resource allocation in developing countries.

Research suggests that the decision-making process that determines resource allocation is influenced by the relative bargaining power of adults members of the household.⁹ A household member's bargaining power in turn depends on the strength of that person's outside options or "fallback position," should a negotiated agreement fail. The strength of an individual's bargaining power is determined by two sets of factors, which include: 1) material (economic) factors internal to the household, and 2) factors external to the household that influence material well-being. Material factors include owned assets, education, kinship, wages, and employment.

⁹ See, for example, Guyer (1988), Haddad and Hoddinott (1991), and Thomas (1992).

External factors, which we refer to here as Gender Environmental Parameters (GEPs), include belief systems, political and legal structures such as property rights and divorce laws, and gendered employment practices (Agarwal 1995; Blumberg 1988; Folbre 1997; Katz 1991a). The latter factors affect positions in household bargaining since they mediate the actual power that material resources will confer on an individual in the household.¹⁰ It follows that a relative improvement in any of the factors that affect an individual's bargaining power should exert an influence on the allocation of household income among alternative uses.

How do gender differences in bargaining power affect household decisions on the use and distribution of material resources in the household? The literature on intra-household resource allocation provides increasing evidence that prevailing gender relations and bargaining power among household members affect the *types* of expenditures households make, control over use of income, and other allocation decisions. In contrast to unitary models of household decision-making, a growing number of studies indicate that women's and men's allocational patterns differ significantly.

More specifically, a considerable body of evidence indicates that women's propensity to spend income *under their control* on family provisioning and children's nutrition is greater than men's (Blumberg 1988; Guyer 1988; Handa 1994; Katz 1991b; Kumar 1978; Quisumbing and Maluccio 1999; Roldan 1988; Thomas 1992). For example, Kumar's (1978) study in Kerala, India indicates that a child's nutritional level is positively correlated with the size of mother's income as well as food inputs from subsistence farming, and the quality of available family-

¹⁰ As Sen (1990) points out, the perception of power is the key link between the potential power conferred upon people by access to economic resources and their use of that power to bargain for outcomes consistent with their interests.

based child care. Significantly, children's nutritional level does not increase in direct proportion to increases in paternal income.

Likewise in the Beti population of Cameroon, Guyer (1988) found that women, in addition to their food production, spent fully 74 percent of their cash income on supplements to the family food supply, while men spent only an estimated 22 percent of their income on food. Overall, men supplied 33 percent of cash expenditures for food and other household items, while women contributed 67 percent. Similarly, using Brazilian data on 25,000 urban households, Thomas (1992) found that unearned income in the hands of the mother was estimated to have a larger impact on her family's health than income attributed to the father.¹¹ For child survival probabilities, the effect was almost 20 times greater.

Other studies demonstrate that other sources of women's bargaining power, including women's education and assets, have a significant impact on household expenditure decisions and hence on children's well-being. For example, Thomas and Chen (1993), using household survey data in the United States, Brazil and Ghana, find that the educational status of the mother has a larger effect on daughter's height, while the education of the father has a larger effect on son's height. Doss's (1996) study of Ghanaian households, using data from 1991-92 Ghana Living Standards Survey, shows that the relative level of assets owned by women in urban households significantly affects household expenditure patterns. For urban households, a one percent increase in the share of assets held by women increases the budget share on food to 50.3 percent.

¹¹ Evidence from developed economies also suggests that income controlled by women is spent differently than income controlled by men. For example, Lundberg, Pollak and Wales (1995) examine the impact of a shift in policy in the United Kingdom from a child tax allowance that was primarily realized as a tax credit in men's paychecks to a child benefit scheme that accrued to women. They find that expenditures on women's and children's clothing increased relative to men's clothing as a result of this change. See also Phipps' and Burton's (1998) study, using Canadian data.

Education expenses are found to be positively correlated with the percent of assets held by both urban and rural women, while alcohol, tobacco, and recreation are negatively correlated.

Research on Guatemalan rural households (Katz 1991b) and Mexican urban households (Benería and Roldan 1988) highlights the link between labor allocation, employment and intrahousehold income, and expenditure allocation. Katz (1991b) finds that women in the Guatemalan highlands whose households maintain separate male and female income streams are reluctant to reduce their paid work even in the face of increasing demand for their labor time in other activities. This is because the non-pooled income arrangements enable women to have more income under their control and to allocate this income according to their interests. This suggests a positive correlation between a woman's economic resources and her influence in household decisions such as expenditure allocation. Benería and Roldan (1988) find that, in non-pooling households, labor allocation decisions have direct consequences for how much income will accrue to a given household member.

In households that do pool their incomes, how do women use their economic resources (such as access to employment) in the negotiation process? The bargaining process may be implicit or explicit, with negotiating strategies shaped by the cultural context. Whatever those strategies might be, we may infer more generally from the work of Katz (1991a), Agarwal (1995), and others, that although earning income is not a sufficient condition for claiming control over its use, a person has a greater chance in having a claim over one's own earnings.

Safilios-Rothschild's (1988) study of rural Honduran households, for example, shows that women's ability to control income and influence decision-making is influenced by gender-

associated income disparities. Women's economic contributions are more often allowed to become visible and to lead to control of income when men have economic superiority over women. But when women's income is crucial to household survival, women are less able to translate their economic contribution to higher bargaining power because of the threat to husbands' resistance. Men perceive this as a threat to their masculinity.¹² Similarly, in a study of women outworkers in Mexico City, Roldan (1988) finds that women's access to individual income facilitates re-negotiation of the terms of marital interaction and is associated with greater decision-making power in some areas, including household allocational patterns.

The discussion to this point has focused on how gender and bargaining power interact to influence expenditures within households. What if anything do these findings imply about the role of gender in influencing the distribution of household income between current expenditures and saving? This question has two implicit components. First, do women behave differently than do men in their allocation of income between saving and current expenditures? If so, will improvements in women's bargaining power have any effect on the household's saving rate? More succinctly, we may ask whether changes in sources of women's bargaining power, particularly their wage earnings, affect the average propensity to save and whether this results in a discernible effect on the aggregate saving rate.

D. Gendered Determinants of Saving Preferences

Because the options and constraints that women face in developing economies differ from those of men, their saving behavior may also differ. One of the most important purposes of saving in developing economies is for consumption smoothing purposes (Deaton 1990). There

¹² Kabeer (2000) provides similar evidence for Bangladeshi factory women, who tend to downplay the importance of their earnings for family well-being, fearful of threatening male dominance in the household, which

may be gender differences in responsiveness to this motive. Men who, by their position in the labor market, are more likely to be beneficiaries of social insurance policies may have less need to fall back on savings for consumption smoothing purposes.¹³

Conversely, insofar as women are less able to rely on state-level programs when income flows are interrupted, they may have a greater incentive to save out of their discretionary income than men.¹⁴ Women may also achieve their consumption smoothing goal by maintaining ties to kinship networks which involves kin exchanges. Savings are required to finance these activities, which serve as a form of insurance or risk spreading to be tapped in economic hard times.

The interplay of life cycle factors and social norms may also have differential effects on individual saving behaviors, though the net effect on willingness to save is unclear. Women are likely to outlive men, a factor that propels them to save at higher rates. Also, the need to raise funds for a dowry may lead women to save more than men of the same age cohort in those countries where the dowry system still prevails. Deolalikar and Rao (1998) show that dowry payments in India, which have been increasing in size and incidence in recent years, can amount to several years' worth of household income.

might then lead to women being forced to give up their paid jobs.

¹³ This is because of men's differential benefits from social protection programs, stemming from their greater representation in formal sector employment. The latter is more likely to provide unemployment insurance, disability and pension benefits, and health coverage than are informal sector or part-time jobs, where women tend to be over represented.

¹⁴ In line with this argument, Callen and Thimann (1997) find evidence that the generosity of social security systems explains a portion of cross-country variations in saving in OECD countries, although they do not consider gender differences in assessing generosity. Further, Brenner, Dagenais, and Montmarquette (1994) provide evidence of a gendered link between uncertainty and aggregate saving in developed economies. They show that the increased probability of divorce caused saving rates in the United States to fall. The abrupt rise in divorce rates led, they argue, to women's greater willingness to participate in the labor force, and to invest in education. It is worth noting, that although financial savings diminished, investment in education or human capital rose. The extent to which these circumstances are applicable to semi-industrialized economies is, however, unclear.

In South Korea, where young women are the primary source of labor in export industries, Kim (1997) found that among their highest priorities in the decision of how to allocate earnings were the goals of saving for a dowry and to finance their siblings' education. Women indicated that to achieve this goal, given their low salaries, they were compelled to skip meals, cut back on other necessities, and live in crowded conditions.

On the other hand, young Taiwanese women are expected to pay their debts to families by remitting a large share of their factory earnings to parents, thus reducing their individual savings. The parents use their daughters' wage remittances to finance their sons' educations, with sons later relied on to support them in old age (Greenhalgh 1985). This family system, which socializes girls into filial piety and indebtedness, results in wide educational gaps between girls and boys, reducing women's ability to save in the future. The effect on current saving is ambiguous, however, since it is not clear that daughters' remittances to parents result in a change in average saving rates.

By contrast, in Java, expectations that young factory women support their families are much weaker. Despite this, Wolf (1988) found that factory women she interviewed saved on average 30 percent of their income for use to redistribute to families in times of distress or to finance their own weddings. These studies suggest that cultural factors influence gendered non-pooled savings behavior, and cross-country variations are likely to be important.

Financial market conditions also interact with gender norms in influencing an individual's saving behavior. The extent to which financial institutions provide both women and men access to and control over individual accounts without the spouse's permission is likely to have a differential impact on men and women's savings rate. For example, Bangladeshi women

are constrained from saving in large sums and in cash since this is likely to attract the attention of male household members who then take control of those savings. In these circumstances, women are more likely to save only in small quantities, for example, by reserving a handful of rice before cooking (Goetz and Gupta 1996).¹⁵

Access to an informal savings program may also enable women to save money without other household members knowing the amount, thereby increasing control over the savings. As an example of this, Doss (1996) provides a study of women's bargaining power in Ghanaian households where savings frequently take place through *susu*, an informal savings program. In a typical monthly *susu* plan for market women and petty traders, for example, each person contributes daily to the fund, and at the end of the month receives the lump sum of her savings, minus the charge of one day's savings. One of the reasons that many individuals, especially women, participate in *susu* is that this provides a way to save money and to keep those savings within the individual's control. Similarly, studies of informal savings associations in Asia, Latin America, and Africa, such as chit clubs and *ROSCAs*, show that a substantial number of them are formed by women, especially those with independent sources of income. Many of these groups are all-female to prevent men from monopolizing the funds (Adams and Fitchett 1992).¹⁶

Differences in responsibility for children's well-being may also affect saving behavior,

¹⁵ An important point is that women may make different choices with regard to the *form* of saving than men, particularly when male household heads have greater control over income or have more experience in dealing with financial markets and institutions. It is likely that women in these circumstances will tend to save less in the form of financial assets (e.g., deposits), and will save more in the form of real assets such as gold, jewelry, and livestock, over which they have greater control. These assets, however, can be misinterpreted as current consumption expenses.

¹⁶ Further, Gugerty (1999) finds that women in rural Kenya have a greater preference than men for participation in *ROSCAs*. In this case, their greater participation is explained by women's stronger preference to use the savings for the eventual purchase of consumer durables for the household.

and the direction of this effect too is ambiguous. On the one hand, the household bargaining literature implies that women's greater responsibility and willingness to invest in children's well-being will result in an increase in expenditures on children, should women's bargaining power increase. This implies a lower level of savings. On the other hand, women's desire to smooth income to provide economic security for the family, especially for their children, may result in a higher saving rate as women's bargaining power rises.

The literature exploring the likely impact of children on household savings raises an important issue. Conventional wisdom suggests that children act as a substitute for retirement savings in many developing countries. Children help care for their elderly parents, particularly their widowed mothers, which can reduce the incentive to save. Deaton and Paxson (1997) find for Taiwan that if bequests to children are an important motive for saving, the presence of children may raise their parents' saving throughout the life cycle. Alternatively, if parents—and and this may be more true for mothers—have strategic bequest motives, they may save more to accumulate assets so as to ensure their children's loyalty and sense of obligation to the parent, particularly in their old age.

Whatever the gender effect on saving propensities, economic and cultural factors generate differences in the capacity of women and men to save. On the economic side, although women's labor force participation has been rising in many countries, and in some cases, the gender wage gap has been narrowing, women on average still have lower levels of wealth and earnings than men. This is partially the result of gendered labor market practices in which occupational segregation and discrimination lead to pay inequities with women frequently sequestered in low-wage occupations. Women's lower levels of income have a double effect:

they result in fewer resources available for savings and investment (income level effect) and suggest a greater aversion for absolute risk (saving propensity effect).¹⁷

Women's access to and control over income can affect saving behavior in other ways. Papanek and Schwede (1988) in a Jakarta study show that women are more likely to participate in *arisan*, informal saving groups, if they are employed. Further, increases in women's earnings raise the household's income and can lead to an increase in saving once basic necessities are met. Equally important, higher relative income improves women's ability to influence the amount of saving out of household income since their fallback position and thus bargaining power improve.

Social and gender norms may also influence women's ability to earn and to influence household saving. For example, a study of urban poor households in Honduras shows that the probability of husbands' approval has a significant effect on the wife's labor force participation (Fleck 1998). Further, *purdah* and other similar cultural practices which constrain women's participation in and choice of income-earning activities, may also affect their ability to save.

In sum, women's and men's saving behavior may differ because of differences in the degree of economic vulnerability they face and because gender roles and norms cause their economic interests to diverge. This is likely to be the case, whether or not households pool savings. Further, household-pooled savings are influenced by decision-making patterns that depend on relative bargaining power between household members that interact with gendered differences in savings propensities. Gender differences in control over economic resources,

¹⁷ Bajtelsmit and Bernasek (1996) found that gender differences in investing and risk-taking can be attributed mainly to discrimination and differences in individual preferences. These influence risk aversion directly or through outcomes such as gender differences in wealth, income, and employment.

including access to outside income, may therefore be influential insofar as shifts in control may influence the balance of power within the household to affect saving decisions.

III. Role of Gender in Influencing Saving Behavior: An Analytical Framework

Based on the discussion in the previous section, to formally specify the effects of gender on household saving rates and, by extension, aggregate savings, we present a simple analytical framework for both pooled and non-pooled savings households.¹⁸ More specifically, we examine why and how a change in women's wage earnings relative to men's may influence household savings. Gender differences in wage earnings have a double effect—the income level effect which increases household income and thereby the level of savings, and the saving propensity effect. It is the second effect that will be explored in this section.

Due to lack of household-level saving data for developing countries and of studies on intrahousehold dynamics with regard to saving behavior, we do not have *a priori* information on which to base a model of saving behavior. We assume, therefore, that there exists a continuum of possible saving arrangements within households. For purposes of simplicity, we examine two possible (albeit extreme) cases, one whereby individuals make their own decision on how much to save out of their earned income, and the other where household members pool their savings.¹⁹ To represent these two cases, we develop an individual saving behavior model for non-pooled savings households, and a Nash cooperative household bargaining model for pooled-savings

¹⁸ Aggregate household saving is the sum of the saving of all households, single-person and multi-person, in the economy.

¹⁹ A more realistic but complicated case involves households that pool their income and negotiate the allocation of income to current expenditures versus savings.

households.²⁰ From this, we derive the determinants of household saving, some of which can be quantified and are incorporated into an empirical model of aggregate saving.

A. Individual or Non-Pooled Savings Model

We assume that each income-earning individual in the household is an economic actor that makes her or his own decision on how much to save.²¹ In other words, total household savings is the sum of individual-determined level of savings. We first examine whether, for a given level of income, women are more likely to spend or save than men. Later, we extend the model to consider the effect of gender-based differences in income on household saving rates. The savings function can be written:

$$S^i = a + b^i Y^i, \quad i = F, M \quad (1)$$

where S^i is the level of saving for individual i , a is the level of autonomous saving, which does not depend on the level of income, b^i is the marginal propensity to save, and Y^i is individual income.²²

Rather than assume, as in standard economic models, that b^i is gender-neutral, we explore the likelihood that women and men have different savings propensities, i.e., that $b^F \neq b^M$.

The reasons for this difference, as discussed earlier, are varied. For illustrative purposes, and without loss of generality, we will focus on only three in this model. These are: a) differences in

²⁰ Note that one cannot assume that if households pool their income and have unified budgets, they also necessarily pool their savings. In other words, income and savings arrangements may differ within a given household unit.

²¹ The individual saving model presented here follows the work on decisions with uncertainty by Leland (1968) and Sandmo (1970).

²² At low levels of income, especially below the minimum required subsistence level, the individual is likely to dissave or to borrow in which case a is negative.

perceived interest resulting from gender roles and norms (call this Π), and b) differences in perceived risk resulting from their different experiences, earnings level and vulnerability (call this Ξ). The difference in perceived interest is reflected in the individual agency function while the difference in perceived risk is reflected in the degree of risk concerning future income, defined by the (subjective) probability distribution of future income $f(Y^i_2)$ with mean ξ . We will explore this point later in the section. Consider the following, simplified individual objective function in a two-period model: ²³

$$B^i = B(X^i_t, L^i_t), \quad t = 1, 2 \quad (2)$$

where B^i refers to a person's *agency*,²⁴ X^i is a vector of market goods consumed at period t and L^i is leisure time. Note that here, X^i refers to consumption by individual i , and possibly others, such as children. Gender and social norms influence the person's perceived range of interests by affecting her or his sense of obligation and perception of legitimate behavior. For example, women in India or Cameroon are likely to include children's consumption in their X level. In the first period, X^i_1 is given by:

$$X^i_1 = Y^i_1 - S^i_1 \quad (3)$$

where Y^i_1 is income in the first period, assumed to be known with certainty and S^i_1 is saving.

²³ A more complete model would include as an argument in the well-being function a vector of home production and services that go into social reproduction and maintenance. We recognize the crucial importance of non-market, home sector of the economy but for simplicity, we ignore it in this and the following cooperative household bargaining model.

²⁴ Agency is a broader concept than "well-being" or "utility." While the latter is defined as an abstract measure of satisfaction, well-being is defined as the physical, social, and mental development of human capabilities obtained by means of access to and consumption of basic commodities (such as food, health care, education, and shelter), participation in activities, and access to some level of security and insurance during periods of emergency or difficult economic times. For a more detailed discussion of this topic, see Floro (1995). Agency, on the other hand, refers to the notion that a person who may have various goals and objectives other than the pursuit of his or her well-being. Although there are obvious links between a person's well-being and agency, they are not necessarily closely connected. For a more detailed discussion of this, see Sen (1990).

Consumption of market goods in the second period is given by:

$$X^i_2 = Y^i_2 + S^i_1(I + r) \quad (4)$$

where Y_2 is future income which is not known in period $t = 1$, and r is the nominal rate of interest, assumed to be known. The individual's beliefs about the level of future income can be summarized in a subjective probability density function $f(Y^i_2)$ with mean ξ . On the basis of this, we obtain the following expected objective function (in the von Neumann-Morgenstern sense). Substituting (3) into (4), we can obtain:

$$X^i_2 = Y^i_2 + (Y^i_1 - X^i_1)(I + r) \quad (5)$$

so that the expected objective function is:

$$E[B^i(X^i_t, L^i_t)] = \int B[X^i_1, Y^i_2 + (Y^i_1 - X^i_1)(I + r), L^i_t] f(Y^i_2) dY^i_2 \quad (6)$$

where integration is over the range of Y^i_2 . Maximizing X^i_2 with respect to consumption at $t = 1$, we obtain the first order condition,

$$D_1 = E[B^i_1 - (I + r) B^i_2] = 0 \quad (7)$$

and the second-order condition,

$$D_2 = E[B^i_{11}] - 2(I + r) B^i_{12} - (I + r)^2 E[B^i_{22}] < 0. \quad (8)$$

Differential access to education, gender bias in labor market hiring, promotion and pay as well as gender-based differences in asset ownership and access to other resources, can lead to differences in incomes earned by women and men. In particular,

$$Y^F_t < Y^M_t \quad (9)$$

If women and men's perceived interests are assumed to be the same, the effect of an increase in income, say of Y^i_1 , can be found by implicit differentiation of equation (7):

$$\partial X^i_1 / \partial Y^i_1 = - (I + r) E[B^i_{12} - (I + r) B^i_{22}] / D_2 > 0. \quad (10)$$

This implies that:

$$B^i_{12} - (1+r) B^i_{22} > 0, \quad E[B^i_{12} - (1+r) B^i_{22}] > 0 \quad (11)$$

Note, however, that the sign of equation (10) cannot be determined *a priori* in the case where the perceived interests of men and women are assumed to differ; it is possible that even at lower levels of income, women spend more than men do as a result of sense of obligation or legitimate behavior such as spending for younger sibling's education. On the other hand, women may spend less and save more if there is a socially-defined purpose such as a dowry. In the case, the sign of equation (11) will be ambiguous as well.

We next examine the effects of the differences in men and women's probability density function of future income owing to a vector of gender differences in social, economic, and demographic factors that influence their perceived interest (I) and perceived risk (Ξ) and hence, their perceived probability distribution of future income. As we shall see later, this has a direct impact on the saving decision in period $t=1$.

Women's greater economic vulnerability, their principal role in household maintenance and family provisioning, and hence perceived risk and perceived interest will cause women's probability distribution of Y_2 to differ from that of men. This is demonstrated by two kinds of shifts in men's probability distribution of Y_2 . One is an additive shift, θ , which is equivalent to an increase in the mean with all other moments constant. The other is a variance shift, γ^i , by which the distribution is more dispersed (or stretched) around zero. A higher dispersion in the probability distribution of future income, as in the case for women, is equivalent to a stretching of the distribution around a constant mean—that is, a combination of additive and variance parameter changes in men's probability distribution.

For the sake of simplicity, let us examine the effect on present consumption of an increase in the perceived degree of risk concerning future income for one individual. Holding other factors constant, we then test whether an increase in the individual's uncertainty leads to an increase or decrease in present consumption, and hence, a decrease or increase in present savings. Let the expected value of future income for an individual (we now drop the subscript i) be written:

$$E [\gamma Y_2 + \theta] \quad (12)$$

where γ is the variance shift parameter and θ is the additive one. Because $Y_2 \geq 0$, a variance shift around zero will increase the mean. This has to be counteracted by an additive shift in the negative direction in order for the expected value to remain constant. Differentiating (12), the requirement is that:

$$dE [\gamma Y_2 + \theta] = E[Y_2 d\gamma + d\theta] = 0, \quad (13)$$

which implies:

$$d\theta/d\gamma = -E[Y_2] = -\xi \quad (14)$$

We can now substitute (12) into the first order condition (7), and then differentiate present consumption X_1 with respect to γ , which yields:

$$(\partial X_1 / \partial \gamma) = -1/(D_2) E [B_{12} - (1+r) B_{22}] (Y_2 - \xi) < 0. \quad (15)$$

Equation (15) shows that an increase in perceived risk by women, manifested as an increased dispersion around future income, is likely to decrease present consumption and hence to increase present savings. (The proof of this result is set out in Appendix B). That is:

$$\partial S_1 / \partial \gamma > 0.$$

One implication of the results of this non-pooled household savings model is that individual saving rates are affected not only by the income level and the interest rate in a given time period, but also by the person's perceived interests (I) and perceived risks (Ξ). Insofar as women's perceived interests and risks differ from men's, they are likely to save at a different rate than men. This implies that an increase in women's *share* of income is likely to affect household saving rates and, by consequence, aggregate saving rates through the perceived risk effect (positive) and the perceived interest effect (ambiguous).

Of course, in many cases, household savings are pooled, and the amount of savings out of income is likely to be determined as a result of a bargaining process between women and men. The model in the following section takes up this type of household saving pattern.

B. Nash Cooperative Household Bargaining in Pooled Saving Households

We now consider a two-adult household unit which jointly decides how much savings to set aside. Specifically, saving decisions, as with expenditure allocations, are determined by the outcome of bargaining between female and male adult members. Saving, therefore, depends not only on the household's total income, but also on which member earns it. Each household member makes choices about time and resource allocation that influence household well-being. In a given period, each member has the following simplified agency function:

$$B^i = B^i(X, S^i, L^i), \quad i = F, M \quad (17)$$

where again X is a vector of market goods, S is past saving and L is leisure time. Note that this is a one-period model, with S an argument in the objective function, under the assumption that well-being today is determined not only by current access to market goods and leisure, but also

by how much one is able to put aside as a precautionary measure.

Individual savings are determined by current money income Y , the interest rate r , and a vector of gender-differentiated variables Ω that reflect the individual's perceptions of required future income needs and stability of income sources, such as owned assets, life expectancy, bequests to children, and family law, and can be written:

$$S^i = S^i(Y^i, r, \Omega^i) \quad (18)$$

Measuring savings proportionate to income, we do not have any evidence *a priori* to indicate whether the average female propensity to save (S^F/Y^F) is significantly different than men's (S^M/Y^M). The earlier discussion suggests, however, the possibility that propensities differ, even if income is controlled for, owing to gender differences in the vector of exogenous factors Ω .

If bargaining between women and men breaks down and there is no cooperation, they face the following time and income constraints in a given time period:

$$L^i + \Lambda^i = T^i \quad (19)$$

and

$$w^i \Lambda^i + Q^i = Y = pX + S^i, \quad (20)$$

where L is paid labor time, T is total waking hours per day (excluding time spent in home production and personal care), w is the market wage rate, Q is non-wage income from assets, including past savings, and p is a vector of market good prices.

The decision on whether or not to cooperate depends on the net gain or loss that cooperation confers to each individual.²⁵ To specify the net gains or loss from cooperation, we write indirect objective functions for women and men which indicate their "threat points" gained

²⁵ The nature of the net loss (or gains) from cooperation governs the bargaining process and strongly influences the outcome. It reflects that person's vulnerability or strength in "bargaining," as Sen (1990: 135) puts it.

independent of cooperation, as:

$$V^i = V^i(w^i, \mathbf{p}, Q^i, \boldsymbol{\alpha}). \quad (21)$$

The V 's in (20) are influenced by the individual's market wage, prices, assets (including past savings), and a vector of gender environmental parameters (GEPs) $\boldsymbol{\alpha}$.²⁶

Women and men choose to cooperate if $B^i - V^i > 0$, that is, if there are gains to cooperation. In the event of cooperation, the household maximizes a joint welfare function:

$$N = [B^F - V^F]^\psi [B^M - V^M]^{1-\psi}, \quad 0 < \psi < 1 \quad (22)$$

where the parameter ψ reflects female "voice" or bargaining power, and this acquires the value of 0 where there is patriarchal dominance and 0.5 when household decision-making is characterized by equal bargaining power. Households maximize the joint well-being function, subject to household income and time constraints, derived from combining (19) - (20) or:

$$\mathbf{p}\mathbf{X} + S^F + S^M = w^F A^F + w^M A^M + Q^F + Q^M. \quad (23)$$

A set of demand functions for the vector of X 's, S 's, and L 's can be derived from the constrained maximization problem as follows:

$$\mathbf{X}^* = \mathbf{X}(\mathbf{p}, w^i, Q^i, r, \boldsymbol{\Omega}^i, \boldsymbol{\alpha}, \psi) \quad (24)$$

$$S^{i*} = S^i(\mathbf{p}, w^i, Q^i, r, \boldsymbol{\Omega}^i, \boldsymbol{\alpha}, \psi) \quad (25)$$

$$L^{i*} = L^i(\mathbf{p}, w^i, Q^i, r, \boldsymbol{\Omega}^i, \boldsymbol{\alpha}, \psi) \quad (26)$$

Note that demand functions depend not only on prices and income but also on GEPs and the

²⁶ As noted earlier, GEPs influence the individual's fallback position, should cooperation fail. These include employment and other income-earning opportunities, divorce laws, and access to social support systems. Note that the important distinction between $\boldsymbol{\Omega}$ and $\boldsymbol{\alpha}$ is that the former refers to external factors affecting future social and economic well-being, and the latter refers to those influencing current well-being. This does not preclude that some elements of vector $\boldsymbol{\Omega}$ may be common to $\boldsymbol{\alpha}$.

person's individual bargaining power.

Using the above frameworks, in this paper we jointly test two propositions. We test whether women and men have different preferences with regard to saving, as suggested by the individual savings behavior model. Second, we test, from equation (25), whether a shift in women's bargaining power in a pooled-savings household influences the rate of saving out of household income, and hence aggregate saving. Note that if the first proposition does not hold, then shifts in female bargaining power that raise ψ will not affect household saving rates.

IV. Empirical Analysis of Aggregate Saving

The theoretical models outlined in equations (1) - (26) provide the framework for an empirical model of the determinants of household saving rates. The first model indicates why women's saving propensities may differ from men's. It suggests that the effect of women's share of income (or total wage bill) on household saving in the case of non-pooled savings households depends on the relative strength of the positive perceived risk effect and the ambiguous perceived interest effect. The second model shows how factors that affect women's relative bargaining power may influence saving rates in pooled-savings household. In the empirical analysis that follows, we frame our discussion around these two cases.²⁷ Before proceeding, however, it is useful to specify the determinants of "voice" or female bargaining power, ψ , described in the Nash cooperative bargaining model. As noted, determinants of female

²⁷ As will be clear below, there is overlap in the factors that raise women's bargaining power in pooled savings households and those that exert a positive effect on women's relative income in non-pooled savings households. If, in both cases, overall, women tend to save more than men, then women's share of the total wage bill will have a positive effect on the aggregate saving rate. The reverse will hold if, overall, women save less than men as a percentage of income.

bargaining power have generally been related to women's control over resources, such as assets. The most commonly used measures are women's share of income and assets at marriage including women's educational attainment or human capital relative to men's. Proxies for women's fallback position in terms of income (call this female relative earnings or FY), therefore, are required for estimation of empirical models. One possibility is the economy-wide or aggregate female share of the total wage ($FSHW$), measured as the ratio of average female earnings to the sum of average female and male earnings or:²⁸

$$FSHW = [W_F / (W_F + W_M)]$$

where W_F and W_M are average female and male earnings, respectively. An alternative measure of income earning abilities is women's share of the wage bill (WSH), measured as the ratio of average female to male wages multiplied by women's share of employment or:

$$WSH = RW * \rho$$

where $RW = W_F / W_M$, and ρ is women's share of manufacturing jobs. This measure takes into account not only relative wages but also women's access to jobs.²⁹ An increase in the size of each of these variables is expected to produce, on one hand, a positive effect on female bargaining power in the case of pooled-saving households. On the other hand, it has an ambiguous effect on the level of present consumption to the extent that women have different perceived interests than men.

With regard to assets and resources at marriage, a commonly used measure is the gap

²⁸ There are, of course, numerous alternative ways to measure gender wage differences, such as $[Ln(W_M) - Ln(W_F)]$. Experimentation with other measures provided similar results in the empirical analysis.

²⁹ Because we are using aggregate rather than micro-level data, the two variables that we identify as exogenous measures of household bargaining power ($FSHW$ and WSH) might also be considered to be GEPs, leading to some overlap of ψ and α in the empirical analysis.

between male and female educational attainment or human capital (*DHK*) since this reflects gender differences in access to potential income and a sense of personal efficacy.³⁰ A reduced form equation for the determinants of female bargaining power can be written as:

$$\psi = \psi^{(+)}(FY) \psi^{(-)}(DHK) \quad (27)$$

where *DHK* is measured as $HK_M - HK_F$ or the difference between men's and women's educational attainment. Hypothesized signs are noted above the variables.

We now want to test whether increases in women's share of discretionary income and bargaining power influence household saving rates. We do this, using aggregate data, and controlling for other factors that may affect saving propensities. Modifying equation (25) to represent savings as a share of income, the equation to be estimated is:³¹

$$q_j = \alpha_j + \beta_{1j} PCY + \beta_{2j} ADR + \beta_{3j} FY + \beta_{4j} DHK + \phi_j \sigma_j + \varepsilon_j \quad (28)$$

q_j is saving as a share of income;
 PCY is per capita income;
 ADR is the age dependency ratio;
 FY relative female/male income measure

³⁰ It may be questioned whether in fact education affects women's bargaining power within the household in a way not already captured by income. A few studies such as King (1990) explore the relationship between education and decisionmaking power within the household. King proposes that when the educational gap between husband and wife is wide, the wife's role in decisionmaking is limited. An increasing number of studies show that education can alter women's self-confidence, self-esteem and notions about their roles in society but the impact of education is mitigated by a number of social and cultural variables (Archaya and Bennett 1981, Alo and Adjibeng-Asem 1988 and Floro and Wolf 1990). Nonetheless, the availability of employment is perceived to be a necessary ingredient that interacts with the skills and attitude changes produced by education, leading to increased decisionmaking role of women... Hence, if employment opportunities are greater for more educated workers, again women's bargaining power improves as their educational attainment rises.

³¹ Unfortunately, we lack data on Q (non-wage income) and the full array of GEPs, which may lead to omitted variable bias. Nor do we have information that would allow us to distinguish between female and male rates of return on assets (r). Inflation and interest rates in equation (25) do not show up in equation (28) but are added as control variables to the basic model sequentially, as is shown below. The Ω from equation (25) represents the factors that may influence women to save at a different rate than men, given different expectations about future income. If women's and men's Ω 's differ, we would expect them to have differing saving propensities as shown in the non-pooled savings model. We do not, however, have data on Ω .

σ_j is a vector of country dummies;
 ε_j is the error term; and
 $\alpha_j, \beta_{1j}, \beta_{2j}, \beta_{3j}, \beta_{4j}$, and φ_j are parameters to be estimated.

In particular, we test here for the determinants of saving as a share of household income, or $q_S = S/Y$. We focus on the effects of relative female bargaining power which influence saving rates in pooled-savings households. Income and age dependency ratios are controlled for, under the assumption that saving rates are influenced in Keynesian fashion by the level of income as well as by life cycle factors. The remaining variables test for the effect of female relative income and, by consequence, bargaining power on saving rates. If $\beta_{3j} = \beta_{4j} = 0$, either female and male propensities to save are identical, and/or households may be unitary decision makers. Conversely, if $\beta_3 \neq \beta_{4j} \neq 0$, then saving propensities differ and changes in female bargaining power influence household saving rates. Note that we do not have data that allow us to distinguish between non-pooled savings versus pooled-savings households. We therefore cannot discern the extent to which whether female relative income and education variables improve ability to save, or bargaining power within the household.

C. Specification of the Aggregate Saving Model

The empirical model we test uses cross-country time-series data. Absence of reliable cross-country household-level data on saving, however, requires that we use aggregate data sources. We therefore use the domestic saving rate, obtained from national income accounts, which is comprised of household saving, business saving, and government saving as a share of GDP. In order to test an aggregate saving model, we must control for additional factors (discussed in Section II and in greater detail in Appendix A) that influence aggregate saving.

The first model (Model I) adopts the absolute income approach and is equivalent to the

household model in equation (28):³²

$$DSR_{it} = \alpha_o + \alpha_1 FY_{it} + \alpha_2 DHK_{it} + \alpha_3 ADR_{it} + \alpha_4 PCY_{it} + \theta_{it} \quad (29)$$

where DSR is the domestic savings rate as a percent of GDP, FY is a relative income measure to capture female bargaining power, perceived risks and interests, i is country, t is time, and θ is the random error. (For a complete listing of all variables and their codes, see Appendix C). We test three gender versions of this and subsequent models, using the following measures of FY: (1) female share of the wage (*FSHW*); (2) a decomposition of the female share of the wage bill, or the relative female/male wage (*RW*) and the female share of employment (ρ); and (3) the female share of the wage bill (*WSH*).

The second model takes into account life-cycle influences on savings. Here, saving behavior is assumed to depend positively on the growth rate of GDP, which can be decomposed into the growth rate of per capita income (PCY1) and the population growth rate (POP1). We test both versions, or Model IIa and IIb, respectively as follows:

$$DSR_{it} = \beta_o + \beta_1 FY_{it} + \beta_2 DHK_{it} + \beta_3 ADR_{it} + \beta_4 RGDP1_{it} + \beta_5 PCY_{it} + \varepsilon_{it} \quad (30a)$$

$$DSR_{it} = \zeta_o + \zeta_1 FY_{it} + \zeta_2 DHK_{it} + \zeta_3 ADR_{it} + \zeta_4 PCY1_{it} + \zeta_5 POP1_{it} + \zeta_6 PCY_{it} + \varphi_{it} \quad (30b)$$

The third model expands on Models I and II, incorporating factors that influence the willingness to save. Model IIIa includes a measure of the real interest rate (RIR), which should induce households to save more if the substitution effect dominates the income effect. Also, the degree of financial development, measured as money and quasi money as a share GDP (M2) is

³² Some studies include a measure of income squared (PCYSQ) to take account of non-linearities. We do not find evidence of non-linearities in our sample, and therefore omit PCYSQ. (See the next section on this point).

employed. Inflation (INF) which acts as a tax on savings and therefore is expected to have a negative sign, is included in the model. Tax revenue as a share of GDP is incorporated (TAXREV) to capture the effect of government saving and taxation on saving. Finally, the natural logarithm of the terms of trade index (TOT) is included, and is assumed to have a positive effect on saving. Model IIIa is:

$$DSR_{it} = \delta_0 + \delta_1 FY_{it} + \delta_2 DHK_{it} + \delta_3 ADR_{it} + \delta_4 PCY_{it} + \delta_5 RIR_{it} + \delta_6 M2_{it} + \delta_7 INF_{it} + \delta_8 TAXREV_{it} + \delta_9 TOT_{it} + \eta_{it} \quad (31a)$$

Finally, Model IIIb augments the life-cycle model and, in addition, includes the same willingness-to-save variables used in Model IIIa or:

$$DSR_{it} = \gamma_0 + \gamma_1 FY_{it} + \gamma_2 DHK_{it} + \gamma_3 ADR_{it} + \gamma_4 PCYI_{it} + \gamma_5 RIR_{it} + \gamma_6 INF_{it} + \gamma_7 M2_{it} + \gamma_8 TAXREV_{it} + \gamma_9 TOT_{it} + \gamma_{10} RGDP1_{it} + v_{it} \quad (31b)$$

V. Econometric Tests and Results

The sample is comprised of a set of semi-industrialized countries for which gender-disaggregated wage data are available. The sample was selected from middle-income countries as defined by the *World Development Report 1998*. Future research might usefully expand this data set to include industrialized countries. At this juncture, however, our goal was to examine behavior in countries that were broadly similar in stage of development. The country sample is provided in Appendix D.

A. The Data

The domestic savings rate, as noted above, is measured as a ratio to GDP. GDP is measured in 1985 prices and from this, growth rates are calculated for the sample countries. Per

capita income data are from the PENN World Tables and are measured in international prices. The education variables are from Barro and Lee (1996), and DHK is measured as the difference in average years of secondary education attained by males and females 15 and older.³³ The remaining macro-level variables, described above, are from the World Bank's *World Development Indicators* and the IMF and are measured in a straightforward manner.

Wage and employment data are for the manufacturing sector only and are from the International Labor Organization (various years). With regard to the wage data, maximum coverage is from 1975-95, with many countries having shorter coverage. Manufacturing sector employment data are used rather than economy-wide data since coverage for the latter is not as broad, and several countries would have dropped out of the sample.

Some cautions about the data should be noted. First, while the broadest period of analysis is 1975-95, data coverage varies, resulting in variations in sample sizes and thus unbalanced panels.³⁴ Second, in most cases, the earnings data are corrected for hours worked, but some are not. Further, these data take into account only women's and men's formal employment and wage earnings in the manufacturing sector, serving only as proxies for economy-wide earnings.³⁵ There are two reasons this may not be cause for significant worry. First, the panel data estimations capture variation over time, and sectoral gender wage gaps may trend in a similar fashion. Second, any random measurement error in these variables tends to have a downward

³³ Education was alternatively measured as total years of educational attainment by sex. Results, available upon request, are similar to those obtained using years of secondary education.

³⁴ Hussein and Thirlwall (1999) note, however, that variation in the sample size becomes a useful test of robustness, depending on whether significance of key variables changes as sample size changes.

³⁵ Consequently, we make the implicit assumption that trends in FY in the manufacturing sector track those in other sectors of the economy.

bias on their coefficients. Therefore any evidence that gender is a significant factor influencing saving rates may actually be understated.

A third note of caution relates to the aggregate saving data which often have problems of consistency and reliability. Since gross domestic data is derived from national income accounts, one may expect measurement errors due to inaccuracies in both investment and balance-of-payments data, producing a downward bias on coefficients as well. As Fry (1995) notes, the caveats regarding data inaccuracies need not necessarily lead to misleading econometric results, provided that the saving data biases are constant over time and the errors are random. In addition, the use of pooled time-series data, which yields a large number of observations, permits behavioral relationships to be detected, even though non-trivial random errors in the data may exist.

Finally, it may be difficult to disentangle the separate effects on saving of the gender education gap (DHK) and earnings shares (FY) on saving since these variables are likely to be collinear. Table 1 provides a correlation matrix of the relevant variables. While there is some evidence of multicollinearity between these variables, education and relative income variables are not perfect substitutes. This is not surprising since substantial evidence indicates that wage payments in a number of the countries studied diverge from measured indicators of productivity, such as education, due to discrimination in labor markets (Behrman and Zhang 1995; Birdsall and Behrman 1991; Horton 1996; Psacharopoulos and Tzannatos 1992). Further, educational differences may have implications for men's and women's outside options in the marriage market while wages reflect chances in the labor market. We therefore chose to include both variables.

B. Characteristics of Sample Data

Figures 1 and 2 present time series data of the gender variables used in this analysis for selected countries. The data exhibit substantial variation both across countries and over time in women's share of the wage and the wage bill. Given this, if there are detectable differences in saving propensities by gender, we would anticipate a significant effect of the gender distribution of wages (or the wage bill) on aggregate saving. Table 2 gives summary data on the variables used in the econometric analysis, averaged for the period 1975-95. Figure 3 provides a look at the relationship between the dependent variable, the domestic savings rate (DSR), and the level of per capita income against DSR. The data exhibit a positive relationship, but indicate little evidence of non-linearities.

C. Econometric Results

The regressions are conducted with panel data to capture the effect of changes in variables within countries over to time to account for time-varying country-specific effects. Regressions are estimated using a two-way error components model. The basic model can be summarized as:

$$Y_{it} = \alpha + X_{it}\beta + v_{it}$$

where the error term v_{it} has three components:

$$v_{it} = \mu_i + \lambda_t + \varepsilon_{it}.$$

Here μ_i captures the country specific-effects while λ_t represents time-varying effects. Country (fixed) effects control for unobserved time-invariant differences that might affect saving.

Several issues need to be considered in estimation: stationarity, heteroskedasticity, autocorrelation, and endogeneity. In this analysis, many of the variables are expressed as ratios,

and are thus stationary in the long run. Two exceptions are TOT and INF which are transformed into first differences. Heteroskedasticity problems are frequently encountered with cross-sectional data, and therefore our regressions use GLS, with cross-sectional weights derived from the residual cross-sectional standard deviations. While this procedure corrects for heteroskedasticity across countries, a more general form is necessary to allow variances within a cross section to vary over time. This was done by obtaining standard errors in accordance with White's variance-covariance matrix in all regressions. We corrected for autocorrelation using an autoregressive process modeled as an AR(1) with a common country coefficient. In separate regressions, reported in Appendix E, the lagged dependent variable was included as a regressor. This reflects that adjustment may take time, and also addresses the autocorrelation problem.

Some right-hand side variables might potentially be endogenous. In particular, the gender variables may be simultaneously determined by the growth rate of GDP. To check for this, Hausmann tests were run on Models I-III with the results indicating no evidence of endogeneity for either gender variable.³⁶

Table 3 summarizes the results obtained from the generalized least squares (GLS) estimates of Model 1. Equation 1 estimates the basic absolute income model, which is the same as the household model in equation (28). The coefficient on FSHW is positive and significant, indicating that a higher relative wage for women raises the aggregate saving rate. As expected the education gap has a negative sign, indicating that the wider the gap between male and female secondary educational attainment, the lower the aggregate saving rate. The age dependency ratio

³⁶ This was done by regressing DSR on all independent variables (the “constrained” model). The “suspect” variable (each of the gender variables) was then regressed on all exogenous variables. The resulting fitted values were then added to the constrained model. T-tests of the significance of that variable did not support the hypothesis of endogeneity of gender variables.

coefficient is negative as would be expected, but is insignificant. Finally, the level of per capita income is positive and significant. In equation 2, we decompose the female share of the wage bill into two parts, RW , the relative female/male wage, and ρ , the female share of employment. Each of these variables is positive and significant. In this case, DHK becomes insignificant, but coefficients on the remaining variables are stable. Finally, equation 3 uses the female share of the wage bill, and this is also positive and significant.

The results of estimating the Life Cycle Model (Model II) are shown in Table 4. For Model IIa, which includes the growth rate of GDP as an explanatory variable, in equations 1 and 2, the gender income variables are positive and significant, while in equation 3, the female share of the wage bill is positive but insignificant. PCY is robust to this alternative specification, while again, DHK is only significant and negative in equation 1. $RGDP1$ is positive and significant in equation 1, but changes sign in equation 2, and is insignificant in equation 3. Model IIb replaces $RGDP1$ with $POP1$ and $PCY1$, and gives results shown in equations 4-6. The gender income variables and PCY are robust to this alternative specification, while $POP1$ is negative as would be expected and $PCY1$ performs perversely or is insignificant.

Table 5 provides the results of testing modified versions of Models I and II. In Model IIIa, we add financial and macroeconomic variables. In equation 1, the coefficient on $FSHW$ is positive and significant but is reduced in size by about one half from Models I and II. PCY continues to perform robustly. All of the financial and macroeconomic variables with the exception of the terms of trade variable are significant. Interestingly, the sign on the real interest rate variable is negative, a finding that is consistent with Keynesian and structuralist perspectives. The robustness of the $FSHW$ variable as the sample size changes is notable. DHK ,

however, changes sign and continues to be insignificant in all versions of Model III. The female share of the wage bill (WSH) does not, however, perform so robustly, nor do its decomposed components (equations 2 and 3). Model IIIb adds RGDP1 as a life cycle variable. The FSHW variable as well as the financial and macroeconomic variables are again robust, but RGDP1 is insignificant. Finally, in equations 5 and 6, again the decomposed FSHW and the WSH are insignificant, and in one case, change signs. Also, the low Durbin-Watson statistic makes the estimates in this equation unreliable.³⁷

In sum, two variables perform robustly in all three models in this analysis, PCY and FSHW. In Models I and II, WSH as well as its decomposed parts also performed as predicted by the household bargaining model. The insight offered by the results obtained from decomposing the wage share is that even if relative wages remain constant, women's greater access to employment improves their outside options sufficiently to raise bargaining power and influence saving rates.

The education variable performed less robustly than the income variables, although this may be in part explained by multicollinearity among these variables. (Running regressions with the education variable as the only bargaining power variable yielded slightly more consistently significant negative coefficients). Table 6 summarizes the econometric results obtained of the gender bargaining power variables.

The preliminary evidence on the role of gender in determining aggregate saving suggests measures of women's access to outside income raises the aggregate saving rate. The size of the effect is not insignificant. Though it varies in our estimates, consider, for example, the results

³⁷ Similar results were obtained using PCY1 and POP1 in place of RGDP1.

given in Table 4. There we see that a one percentage point increase in women's share of the wage raises aggregate saving by roughly a quarter percentage point. Similarly, a percentage point increase in women's share of income raises aggregate saving by about one sixth of a percentage point.

These results are suggestive of differential savings behavior at the household level, with women's propensity to save higher than that of males at least for this set of countries. These results are also consistent with a growing body of research that suggests that gender is an important macroeconomic variable, and links this to micro-level, household behavior.

VI. Conclusion

This paper explores the role that gender plays in influencing aggregate saving rates for a set of semi-industrialized countries. These countries have increasingly relied on female labor in their export manufacturing sectors. A question of interest is whether increases in women's wages relative to men's as well as increases in their share of income have affected aggregate saving rates. Presupposed in this question is that women and men have differing propensities to save due to variations in perceived risks and interests and in gender-related external factors that affect savings behavior.

This paper is exploratory in the sense that little prior evidence existed to indicate whether higher relative wages and income for women will raise or lower saving rates—whether the effect will be so negligible as to be undetectable. Preliminary evidence provided here using a panel data set is consistent with the hypothesis that an increase in women's discretionary income and bargaining power raises household saving and therefore aggregate saving rates. These results are

of interest in that they imply an aggregate role for micro-level gender relations at the household level. A deeper understanding of the determinants of saving rates at the household level is especially useful in planning for savings mobilization and in the formulation of financial and investment policies.

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