Policy Research Working Paper 5714

Does Female Empowerment Promote Economic Development?

Matthias Doepke
Michèle Tertilt

The World Bank
Poverty Reduction and Economic Management Network
Gender and Development Unit
June 2011

Policy Research Working Paper 5714

Abstract

Empirical evidence suggests that money in the hands of mothers (as opposed to their husbands) benefits children. Does this observation imply that targeting transfers to women is good economic policy? The authors develop a series of noncooperative family bargaining models to understand what kind of frictions can give rise to the observed empirical relationships. Then they assess the policy implications of these models. The authors find that targeting transfers to women can have unintended consequences and may fail to make children better off. Moreover, different forms of empowering women may lead to opposite results. More research is needed to distinguish between alternative theoretical models.

This paper is a product of the Gender and Development Unit, Poverty Reduction and Economic Management Network; and was funded in part by the GAP. It is part of a larger effort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The authors may be contacted at doepke@northwestern.edu and tertilt@stanford.edu.

Does Female Empowerment Promote Economic Development?[1]

Matthias Doepke
Michèle Tertilt

[1] We thank Nava Ashraf, Abhijit Banerjee, Lori Beaman, Chris Blattman, Areendam Chanda, Stefan Dercon, Doug Gollin, Dean Karlan, Ghazala Mansuri, Sonia Oreffice, Josefina Posadas, Mark Rosenzweig, Silvana Tenreyro, Duncan Thomas, Dominique van de Walle, Martin Zelder, and seminar participants at Brown, Northwestern, the NBER/BREAD Conference on Economic Development, the IGC Growth Week, SITE, and the SED Annual Meeting for helpful comments that greatly improved the paper. Financial support from the World Bank's Gender Action Plan, the National Science Foundation (grants SES-0820409 and SES-0748889), and the Alfred P. Sloan Foundation is gratefully acknowledged. Marit Hinnosaar and Vuong Nguyen provided excellent research assistance. Doepke: Department of Economics, Northwestern University, 2001 Sheridan Road, Evanston, IL 60208 (e-mail: doepke@northwestern.edu). Tertilt: Department of Economics, Stanford University, 579 Serra Mall, Stanford, CA 94305-6072 (email: tertilt@stanford.edu).

1 Introduction

The relationship of gender and development is a central issue in development research and policy today. Some of the great interest in the topic stems from empirical findings suggesting that empowering women may not just be a worthy goal in its own right, but may in fact promote overall economic development. Specifically, there is evidence that when transfer payments are given to women rather than to their husbands, expenditures on children go up disproportionately. To the extent that higher spending on children promotes human-capital accumulation, this suggests that empowering women may ultimately lead to faster economic growth.

Already, much practical development policy (such as cash-transfer programs like PROGRESA or micro-credit programs that are targeted exclusively to women) is based on the premise of a link from female empowerment to development. Nevertheless, there is a lack of work on the issue that uses economic theory to understand the specific channels that may lead to such a relationship.

In this paper, we examine the link between female empowerment and economic development from the perspective of economic theories of household decision making. We develop models that are consistent with the empirical observation that an increase in female resources leads to more spending on children. We use these models to address two related questions. First, we focus specifically on programs that target transfers to women and aim to raise female income, and ask whether such policies really make children better off. Second, we consider a wider range of policies, and ask whether alternative forms of female empowerment have similar effects.

While at first sight it may seem that existing empirical evidence is sufficient to answer these questions, our theoretical analysis shows that this is not the case. We demonstrate that the link from the observed empirical patterns to policy implications is far from obvious: the effects of policy interventions are highly sensitive to the details of the underlying economic model, unintended consequences can arise, and different forms of female empowerment can have opposite effects.

As our main theoretical framework, we develop a tractable theory of noncooperative spousal decision-making with a continuum of household public goods. Here public goods are goods that both spouses derive utility from; examples include shelter, furniture, and children. We show that for targeted transfers to have an effect on the public-good allocation within the household, frictions have to be introduced that limit the substitution between male and female provision of public goods. The precise nature of these frictions determines the overall effects of policy interventions.

One option is to assume hard-wired preference differences between men and women in terms of the relative appreciation of different public goods (with women caring more about child-related goods). Such a setting easily reproduces the empirical finding that transferring money to women leads to more spending on children. However, whether such targeted transfers really benefit children is not obvious: an increase in spending on child-specific goods comes at the expense of other household public goods that may also benefit children (such as shelter), and total

spending on public goods may go down.

In an alternative setup, we show that the observed empirical patterns can also be reproduced without assuming that women and men have different preferences. Instead, we assume that husband and wife have a different market wage. Household public goods are differentiated by the importance of goods and time in producing them. In equilibrium, the low-wage spouse specializes in providing relatively time-intensive household public goods. Even though preferences are symmetric, targeted transfers or changes in wages affect male- and female-provided public goods differently, due to the endogenous specialization pattern in household production. The model implies that an intervention that leads to more spending on children does not have to make children better off. One channel behind this result is the endogenous allocation of time: spending on child goods and time investments in children can move in opposite directions, leading to an ambiguous total impact on public good provision and welfare.

Turning to alternative forms of female empowerment, we focus on gender discrimination in private consumption markets. For example, women are sometimes excluded from bars and other forms of entertainment, and the sale of certain goods to women may be prohibited. We show that when women's access to private consumption goods is restricted, women's behavior is as if their preferences placed more weight on public goods such as spending on children. In this way, gender discrimination can be one source of the gender-specific spending patterns observed in the data. If now female empowerment takes the form of reducing such gender discrimination, the apparent preferences of women will become closer to those of men, leading to less spending on children. Thus, in this setting female empowerment in terms of reducing discrimination has the opposite effect of empowerment in terms of giving money to women. Similar findings can be derived in a dynamic model where gender discrimination takes the form of limited access for women to savings and investment opportunities.

While our findings lead to doubts about the effectiveness of female empowerment policies as a tool for promoting economic development, taken by themselves they do not imply that such policies are misguided. For examples, regarding the effect of targeted transfers on public-good provision, in all model variants that we have considered there are forces pulling in different directions, so that the overall impact becomes a quantitative question. Moreover, even at a qualitative level the potential repercussions of female-empowerment policies are sensitive to the details of the economic mechanism that breaks the income-pooling result.

As a consequence, the main conclusion arising from this work is that more measurement and theory is needed to arrive at a robust analysis of gender-based development policies. Concerning the impact on children, all models suggest that changes in the provision of a wider range of public goods and time inputs over multiple years should be measured to paint a more complete picture. Similarly, studies that measure outcomes (such as anthropometric status) should be preferred over studies that measure expenditures. In addition, the different models we have described here have distinct empirical implications that could be tested directly. Only once we have some confidence in which of these models is a good description of reality can specific policy recommendations be given.

On the theoretical side, an important challenge for future research is to model the link between public-good provision and economic development more explicitly. The main reason why public-good provision in the household is thought to promote development is that investments in children lead to more human-capital accumulation. However, explicit models of human-capital accumulation in the family distinguish between the quantity and quality dimension of children, i.e., the tradeoff between how many children to have and how much education to provide them with. Even if an intervention produces an unambiguous increase in spending on children, there still would be no benefit for development if the additional spending resulted in higher fertility rather than an increase in education. Thus, combining models of marital bargaining with explicit theories of human-capital investment will be another important step towards an encompassing analysis of gender-based development policies.

The remainder of this paper is organized as follows. In Section 2 we provide an overview of the empirical findings that motivate our study. In Section 3, we review the main theories of marital bargaining and justify our focus on the noncooperative bargaining model. In Section 4 we introduce our baseline model and demonstrate that frictions in the substitution of public-good provision between women and men are required to overcome the income pooling result. Section 5 introduces such frictions in different ways and contains our main results on the effects of female empowerment polices. In Section 6 we extend our framework to a dynamic setting. Section 7 concludes.

2 What are the Facts?

In this section, we survey the empirical literature on the link between female empowerment and development. Claims that female empowerment promotes development are largely based on empirical evidence that higher female resources (in the form of income, education, or assets) are associated with higher spending on children. We provide a review of this evidence, and in the remainder of the paper we will develop economic models that can reproduce these findings. We also briefly discuss a number of studies that focus on other aspects of the link between female empowerment and development.

2.1 Correlations between Female Income and Child Outcomes

There exists a sizeable literature that uses household data to document correlations between gender-specific resources and outcomes, specifically with regard to spending on children and children's outcomes. For an early survey of this literature see Haddad, Hoddinot, and Alderman (1997). Since these studies are based on observational data, one cannot rule out that the results are driven by unobserved heterogeneity, i.e., there may be unmeasured ways in which households with larger female income shares are special. Nevertheless, the findings in this literature are suggestive, and they motivate much of the subsequent research in the area.

Hoddinott and Haddad (1995) uses cross sectional data from the 1986/87 Living Standards Survey of the Cote d'Ivoire. The authors find that an increase in the wife's share of income is associated with an increase in the share of expenditures on food, and a decrease in the share of expenditures on alcohol and cigarettes.[2] Based on the same data, Haddad and Hoddinott (1994)

[2]The study also finds a decrease in meals eaten out, children's clothing and adult clothing. But these findings are not

find that a higher female income share is associated with a better nutritional status of children (as measured by height for age), suggesting that at least some of the higher food expenditures are child related.

Other authors have documented similar findings for other countries and time periods. Engle (1993) provides cross-sectional data from Guatemala to show that a higher female budget share is associated with better children's nutritional status (measured by height for age, weight for age, and weight for height). Phipps and Burton (1998) use data from the 1992 Expenditure Survey in Canada and focus on married-couple households where both spouses work full time. The authors find that a higher share of wives' income is correlated with higher expenditures on child care, children's clothing, women's clothing, and food. Kennedy and Peters (1992) compare female headed with male headed households in Kenya and Malawi and find that in female headed households (typically headed by a widow, who is often the grandmother of the children in the household), a larger share of the budget is spent on food. The paper also documents better anthropometric outcomes (weight for age and height for age). For Malawi, the paper also documents smaller expenditure shares on alcohol. The econometric specification does not control for income, but interestingly female-headed households have better child anthropometric outcomes despite overall lower incomes. Thomas (1990) uses Brazilian survey data collected in 1974/75 to study gender differences in the impact of non-wage income on health and nutrition in Brazil. He finds that maternal income increases family nutrition by four to seven times more than income of men. Both total calory intake as well as protein intake is affected more by female than by male income. Child survival is highly positively related to unearned income of mothers, and the effect is 20 times larger compared to unearned income of men. Maternal income also has a larger effect on two anthropometric outcomes (weight for height and height for age).

2.2 Natural Experiments on Female Income and Child Outcomes

A second group of papers focuses on natural experiments to verify whether the observed association between female resources and spending on children has a causal interpretation. In Lundberg, Pollak, and Wales (1997), such an experiment is provided by a change in the Child Allowance Law in the 1970s. The universal child benefit that previously consisted of reduced tax withholding from the father was replaced by a cash payment to the mother. The authors find that the change in the law significantly increased the expenditure of children's clothing (and women's clothing) relative to men's clothing.[3]

Duflo and Udry (2004) use a natural experiment where exogenous variation in women's relative income is produced by variation in rainfall. In Cote d'Ivoire, women and men cultivate different crops that are differently affected by rainfall. Duflo and Udry (2004) find that a rainfall shock that increases women's relative income increases expenditures on food. A 10 percent increase in income from women's crops is associated with a 4 percent increase in expenditure on purchased foods, while the same increase in men's crops is associated with a 0.3 percent decrease.

Several studies analyze the effects of a major expansion of pension benefits in South

---

robust to different specifications.

[3]See also Ward-Batts (2008) for similar findings based on a broader set of goods categories.

Africa, using national survey data from 1993.[4] The question is whether the gender of a transfer recipient matters for child outcomes. While pension recipients are unlikely to be parents of little children, about one-third of pension recipients live with children, typically their grandchildren. Duflo (2000) finds in households where there is a woman receiving an old-age pension compared to households where no one receives a pension, girls have better anthropometric status (weight for height and height for age).[5] More specifically, girls in households with a women receiving the pension have 1.19 standard deviations larger weight for height. Interestingly, the effect is only significant in households where the pension recipient is the mother of child's mother, whereas there is no effect for paternal grandmothers. There is also no significant effect of a man receiving a pension.

Atkin (2009) uses Mexican data to study the effect of mothers' employment in manufacturing on children's height for age. To identify causal effects, geographic variation in the opening of new factories at the time a woman enters the labor market is used. The study finds that child health outcomes improve for mothers who end up working in manufacturing due to a new factory opening: their children are between 1.18 and 1.75 standard deviations taller than children whose mothers did not have their first job in manufacturing. One shortcoming of this study is that male and female income shares within the household are not observed, so that it is not possible to separate between a general household-level income effect and an effect that is specific to female income.

2.3 Randomized Cash Transfer Programs

Several studies have analyzed on the effects of the PROGRESA program in Mexico (Attanasio and Lechene 2002, Rubalcava, Teruel, and Thomas 2009, and Bobonis 2009). PROGRESA is a conditional cash-transfer program that makes transfers to mothers as long as their children meet certain criteria such as keeping up on immunizations and attending school. The introduction of PROGRESA was randomized, so that causal effects can be isolated. However, randomization took place only in terms of which families received the benefit, but not in terms of who in the family received the transfer (all transfers were given to women). This complicates the identification of gender effects, but attempts are made to separate the effect of a larger female budget share from a simple income effect due to the transfer.

The studies find that in households that receive the transfer compared to households that have the same after-transfer income but did not receive the transfer, the share of income spent on children's clothing is higher. Attanasio and Lechene (2002) find that an increase in the female income share of 10 percentage points is associated with an increase in the expenditure share of girls' clothing by 12 percent and of boys' clothing by 6 percent. In contrast, higher female income is associated with a lower share of spending on alcohol. The results regarding food expenditures are mixed and depend on the regression specification (see also Rubalcava, Teruel, and Thomas 2009). Similar to Attanasio and Lechene (2002), Rubalcava, Terual, and Thomas (2009) also find a positive effect on the budget shares of children's clothing as well as education. Bobonis (2009) exploits random variation in rainfall as an instrument for earned income to separate the effect of a

[4]Burns (2005) gives an overview of South Africa's pension system and the literature on the gender dimension of its effects.
[5]See also Duflo (2003) for more details.

general increase in income from transfers to women specifically. Using this methodology, the study confirms the earlier results in that a higher percentage of the female income (compared to general earnings) is spent on children's clothing.[6]

A similar conditional cash transfer program in Nicaragua is analyzed in Gitter and Barham (2008). Once again, the overall finding is that increased transfer income disproportionately benefits children. The outcome variables are total food expenditures, education expenditures, and spending on milk.

2.4 Access to Credit

Several studies analyze the impact of female access to credit on expenditure shares. Pitt and Khandker (1998) study a microcredit quasi-field experiment in Bangladesh in 1991/92. Access to credit was provided in several villages, and data was collected in both treated and non-treated villages. Households owning more than half an acre of land were precluded from the experiment. The treatment effect is identified by comparing households below and above the cutoff for farm size in treatment versus control villages. The gender effect is identified through a specific feature of the lending scheme: all lending is group based and groups are single-sex only. Not all villages have both a male and a female group, which provides variation in access to credit by gender. The authors find that credit provided to women leads to higher household consumption expenditures and to more schooling for girls, while credit provided to men does not have a significant effect on the same variables.[7] In contrast, credit to both men and women has a positive and significant effect on boys' schooling.

Khandker (2005) uses a similar identification strategy, but also exploits the panel dimension of the data by including a follow-up interview in 1998/99. The study finds that at the mean, an additional 100 Bangladeshi Taka (BDT) of cumulative borrowing by women increases annual household expenditures by BDT 15 (BDT 7 for food and BDT 8 for non-food expenditures). The effects are slightly larger in 1998/99 compared to the 1991/92 period. The same numbers for men are small and insignificant. The authors interpret this finding as larger returns to credit for women. However, the effect cannot be distinguished from the alternative hypothesis that women borrow for consumption purposes while men borrow to invest.[8]

---

[6]There are two caveats with the PROGRESA-based studies. First, the gender of the transfer recipient is not random, as all transfers are given to women. Thus, a transfer increase not only the female budget share, but also total family income. To address this issue, the studies control for total income. Therefore, the comparison essentially is between households with identical post-transfer incomes but different female income shares. However, it cannot be ruled out that pre-transfer income differences are related to other unobserved differences across households. A second caveat is that PROGRESA is a conditional cash transfer program that links the transfers to child outcomes, specifically schooling. Attanasio and Lechene (2002) deal with this problem first by controlling for schooling in their demand estimation and second by using lagged schooling decisions as an instrument for schooling. Moreover, Rubalcava, Teruel, and Thomas (2009) finds that PROGRESA increases the budget share of child goods only for households where both mother and father are present, but not for single-parent households.

[7]However, statistical tests cannot reject the equality of men's and women's credit effects on school enrollment of girls and consumption expenditures.

[8]Indeed, de Mel, McKenzie, and Woodruff (2009) find that randomized grants provided to women's micro-enterprises in Sri Lanka have lower returns than those invested in men's micro-enterprises.

2.5 Other Types of Female Empowerment

Whereas the papers discussed so far are concerned with the effects of female access to financial resources, another branch of the literature puts the spotlight on measures of female bargaining power. Thomas (1994) uses the relative education level of the wife compared to the husband as a proxy for bargaining power. Based on data from the United States, Brazil, and Ghana, the paper documents that the mother's education has a bigger effect on the nutritional status of girls (measured by height for age) compared to the father's education, while the opposite is true for boys.

Another important determinant of bargaining power in marriage should be the value of the outside option. Rubalcava and Thomas (2000) exploit variation over time and across U.S. states in the aid paid to single women with children (Aid to Families with Dependent Children, AFDC). AFDC improves the outside option of married women with children, and therefore might affect their bargaining power in marriage. Based on PSID data from 1968 through 1992, the authors show that the presence of AFDC indeed has a significant impact on expenditure shares with marriage. This is especially true for low-income households with children, those most likely to benefit from AFDC in case of separation. Interestingly, and contrary to studies from developing countries, the food budget share is lower when female bargaining power is higher.[9] Additional data from the Consumer Expenditure Survey (CEX) shows that the share allocated to child goods (toys, baby clothing, baby furniture) increases, while the share of "male" goods (alcohol, car maintenance, sports entertainment) decreases. The authors also find an increase in health care spending, which they interpret as human capital investment.

Bargaining power may also increase in asset holdings. This idea is explored by Doss (2006). Using data from the Ghana Living Standards Surveys in 1991/92 and 1998/99, the author finds that in households where women own a larger share of assets (land, savings, and business assets), the share of expenditures on food and education is larger, but the share of alcohol expenditures is smaller. The share of medical expenses, on the other hand, decreases with female asset ownership. The authors argue that medical expenses are primarily curative and speculate that women with higher bargaining power are able to keep their families healthier.

Quisumbing (2003) uses relative education and assets at marriage as measures of bargaining power. Data from Bangladesh, Ethiopia, Indonesia, and South Africa are used to show that bargaining power matters for expenditure shares. The results differ a lot by country, however. For example, in Bangladesh and South Africa women's assets increase expenditure shares on education, while in Ethiopia men's assets have this effect. Similarly, female assets have a negative affect on food budget shares in South Africa. In some countries, women's asset ownership increases boys' schooling relatively more than girls' schooling, while in others the reverse is true.

Another form of female empowerment is political empowerment. Chattopadhyay and Duflo (2004) study how the gender of political leaders affects public good provision in rural India using data from a natural experiment. In India, one third of the local government head positions are randomly reserved for women. The authors find that leaders invest relatively more in infrastructure that is relevant to the needs of their own genders. Namely, female leaders favor

[9] The authors hypothesize that women use their increased bargaining power to spend more time with children and work less in the market, which leads to a decline in food consumed outside the home.

drinking water and roads in West Bengal and drinking water in Rajasthan (women collect drinking water in both places, and are employed building roads in West Bengal). They invest relatively less in public goods that are linked to men's concerns: education in West Bengal and roads in Rajasthan. In a follow-up study, Beaman et al. (2006) analyze how these different policies affect children. They provide evidence from two Indian states that children in villages headed by female leaders have higher immunization rates and that girls experience an improvement in school attendance.

2.6 Direct Evidence on Preference Differences

One potential explanation for the observed differences in spending patterns is that women and men have different preferences. Croson and Gneezy (2009) provide an overview of the experimental evidence on gender differences in preferences. They conclude that there is robust evidence that women are more risk averse than men. They also document gender differences in other-regarding preferences such as altruism, inequality aversion, and reciprocity. However, women are not generally more other-regarding than men. It is not clear how these preference differences affect parents' attitudes towards children.

Bauer and Chylitová (2009) specifically examine how gender differences in preferences depend on the presence of children. They measure the discount rate and risk aversion using data from lab experiments in rural India. They find evidence of gender differences in the discount rate, but not in attitudes toward risk. Interestingly, childless men and women turn out to have the same discount rates, but women with children under 18 are more patient than men with children. The more children the women have, the more patient they are relative to men with the same number of children.

A different kind of evidence on gender differences in preferences is provided by Woolley (2004). The paper surveys a small sample of couples with children in Ottawa, Canada, to study gender differences in spending. People were asked in interviews how they spend their child benefits and what they would do with unexpected additional income. The study finds that women are more likely to say that they would spend a windfall on children and household goods, while men are more likely to say they would spend the money on savings. However, the difference is statistically insignificant.

Table 1: Evidence on Gender Effects on Household Expenditures

Study	Methodology and Data Source	Outcome Variables	Measure of Female Resources	Effect of Increase in Female Resources
Attanasio and Lechene (2002)	Randomized field experiment, PROGRESA, Mexico	Expenditure shares	Woman's income share	Share of expenditure on children's clothing increases, alcohol decreases. In some specifications, the share of expenditures on food decreases.
Case and Deaton (1998)	Natural experiment, pensions in South Africa	Expenditure shares	Female versus male pension recipients	In female-headed households, smaller expenditures on alcohol, tobacco, and transportation.
Doss (2006)	Cross-sectional data, Ghana	Expenditure shares	Woman's asset holdings	Share of expenditure on education and food increases, and alcohol and medical expenditure share decreases.
Duflo and Udry (2004)	Natural experiment using variation in rainfall, Cote d'Ivoire	Expenditure shares and education	Women's income share, instrumented by rainfall	Expenditures on food increase. Mixed evidence on education.
Gitter and Barham (2008)	Cross-sectional data and field experiment, Nicaragua	Expenditure shares and education	Woman's years of schooling relative to her husband	Higher expenditures on children's education and higher school enrollment. However, treatment effect of conditional cash transfer program does not increase in relative education.
Hoddinott and Haddad (1995)	Cross-sectional data, Cote d'Ivoire	Expenditure shares	Woman's income share	Share of expenditure of food increases, while share of alcohol and cigarettes decreases.

Table 2: Evidence on Gender Effects on Household Expenditures, continued

Study	Methodology and Data Source	Outcome Variables	Measure of Female Resources	Effect of Increase in Female Resources
Kennedy and Peters (1992)	Cross-sectional data, Kenya and Malawi	Expenditure shares	Female versus male headed households	In female-headed households, smaller expenditures on alcohol and a larger expenditure share for food.
Khandker (2005)	Quasi-field experiment in Bangladesh	Total expenditures, schooling	Woman's borrowing versus man's borrowing	In households where the woman has borrowed, food as well as non-food expenditures are larger. Also a positive effect on girls' schooling.
Lundberg, Pollak, and Wales (1997)	Natural experiment with child allowance, U.K.	Expenditure shares	Woman's income share	Expenditure on children's and women's clothing increases relative to men's clothing.
Phipps and Burton (1998)	Cross-sectional data, Canada	Expenditure shares	Woman's income share	Expenditures on child care, children's clothing, women's clothing, and food increase.
Rubalcava, Terual, and Thomas (2009)	Field experiment, PROGRESA, Mexico	Expenditure shares	Woman's income share	Share of expenditure on children's clothing increases. Food expenditure share decreases in some specifications.
Rubalcava, and Thomas (2000)	PSID and CEX, using cross-state variation in the introduction of AFDC	Expenditure shares	Aid paid to single mothers	More aid paid to single women associated with an increase in spending on toys, baby clothing, baby furniture, and health, and a decrease in spending on alcohol, car maintenance, sports entertainment, and food outside the home.

2.7 Summary

Several patterns emerge from the empirical literature. First, households do not fully pool income, in the sense that the gender of the income recipient matters. Second, higher female budget shares are associated with higher spending on food, higher spending on children, as well as a better nutritional status of children. Third, higher male budget shares are often associated with higher

spending on alcohol and tobacco, and sometimes with higher savings. Tables 0 and 1 summarize the literature that establishes these findings.[10] Even though each individual study has certain shortcomings and identifying causal effects is difficult, the fact that a variety of studies using different data sources and empirical methodologies arrive at essentially the same conclusions strongly suggests that these findings are robust features of the data.

In the remainder of this paper, we will develop models of household decision making that are consistent with the empirical findings. The empirical evidence has implications for what such a model has to look like. In particular, the data reject income pooling, which implies that some form of conflict of interest between husband and wife is a necessary ingredient for a successful model. However, the data do not give us clear guidance for the nature of this conflict of interest. One possibility is that women and men have fundamentally different preferences, but the empirical evidence on this point is not strong. Indeed, we will see that one can formulate models of household decision making that can reproduce the empirical findings without relying on preference asymmetries between women and men.

3 Alternative Models of Spousal Decision Making

The main part of our analysis of gender and development is based on a noncooperative model of decision making in marriage. This provides a contrast to the majority of the existing literature, where the unitary model and cooperative bargaining models of marital decision making are the most common. In this section, we briefly review these alternative models, and justify our focus on the noncooperative case.

Becker (1973) models marriage as a union in which two economic agents become one: within marriage, couples maximize a single utility function subject to a single budget constraint in which all income is pooled.[11] As a simple example, consider a couple where husband and wife have incomes y_f and y_m, and where this income is spent on the wife's private consumption c_f, the husband's private consumption c_m, and a public good C (such as expenditures on children). The outcome under the unitary model of marriage can be captured by the following maximization problem:

$$\max_{c_f, c_m, C} \{U(c_f, c_m, C)\} \tag{1}$$

subject to:

$$c_f + c_m + C \leq y_f + y_m.$$

An immediate implication of this maximization problem is that the distribution of income between husband and wife has no impact on the outcome of decision making: income only enters as the sum $y_f + y_m$. Hence, even though the unitary model has proved to be useful in many other applications, clearly it cannot speak to the observation that the source of income does affect the consumption allocation.

Recognizing the limitations of the unitary model, cooperative bargaining models of

[10]The tables include only those studies that specifically examine how female resources affect expenditure shares.
[11]The unitary utility function can be interpreted as the joint objective of two spouses who have identical preferences, or alternatively as the personal utility function of the spouse who has sole decision making power, while also being altruistic towards the other spouse.

marriages allow for the possibility of a conflict of interest between the spouses. Rather than positing a joint utility function, each spouse has separate preferences, and to the extent that their preferences are different the spouses have to bargain to arrive at a decision. The defining characteristic of cooperative bargaining models is that the bargaining process is efficient, i.e., the spouses arrive at a decision that is a Pareto optimum. As such, the outcome of any cooperative bargaining model can be represented as the solution of a Pareto problem, with different weights on husband and wife that represent their relative bargaining power. The choice problem therefore becomes:

$$\max_{c_f, c_m, C} \{\theta u_f(c_f, c_m, C) + (1-\theta) u_m(c_f, c_m, C)\} \tag{2}$$

subject to:

$$c_f + c_m + C \leq y_f + y_m.$$

Different cooperative bargaining models differ in how the welfare weights θ and $1-\theta$ are determined. One possibility is to provide an explicit game-theoretic foundation for the bargaining process. In the models studied by Manser and brown (1980) and McElroy and Horney (1981), the spouses engage in Nash bargaining, where the outside option is given by the utility upon divorce. Implicitly, the couple maximizes the product of two partner's marital surpluses. The outcome of this process corresponds to the maximization problem (2) for a particular choice of the welfare weight θ. The separate-spheres bargaining model of Lundberg and Pollak (1993) follows similar lines, but this time the outside option is provided by a state of noncooperation within marriage rather than divorce. The collective bargaining models developed in Chiappori (1988) and Chiappori (1992) generalize this class of models by only requiring the outcome to be Pareto optimal. That is, rather than relying on one particular process for the determination of the welfare weights, the collective model only requires that the outcome is generated by the maximization problem (2) for some relative weight θ, where in empirical implementations θ can be a function of a variety of variables thought to be relevant for marital decision making.

Under which circumstances do cooperative bargaining models imply that the distribution of income between husband and wife affects the household allocation? An inspection of the maximization problem (2) provides the answer. First, it is necessary that the two spouses indeed have different preferences, because otherwise the decision problem reduces to the unitary model as in (1). Second, assuming that preferences are different, the only way in which relative male and female income could matter is through the welfare weight θ. For a fixed θ, income once again only enters as the sum $y_f + y_m$, so that the distribution of income between husband and wife is irrelevant. Thus, cooperative bargaining models can reproduce the empirical findings only if θ is a function of relative male and female income. Under Nash bargaining with divorce as a the threat point, for example, changes in male and female income are only relevant to the extent that they shift relative income after divorce; any changes that apply only while the spouses are married should have no effect.

Some progress can be made by positing that the welfare weights directly depend on the variables one is interested in, such as relative income earned within marriage (see Basu 2006 for some work along these lines). In what follows, we nevertheless focus on a different model of

marital decision making, namely noncooperative bargaining.[12] We offer three complementary justifications of this choice. First, simply assuming that welfare weights depend on income tells us little about the underlying economic process that gives rise to these bargaining weights. Implicitly, it is often assumed that income matters because it would matter in an underlying noncooperative game that serves as the threat point for the cooperative bargaining game, along the lines of Lundberg and Pollak (1993). Thus, even if one preferred the cooperative model, examining the underlying noncooperative game is still a key step in the overall analysis, and our work can be interpreted in this manner. Second, one particular version of the noncooperative model (analyzed in Section 5.1 below) has predictions that are quite similar to the cooperative model with preference differences and welfare weights depending on income. Thus, little is lost by focusing on the noncooperative model throughout. Third, and most importantly, we will see (in Section 5.3) that the noncooperative model can also generate an effect of the spousal income distribution on allocations in a setting where there is no preference asymmetry between husbands and wives at all. Thus, the noncooperative model leads to a more encompassing analysis that nests the main implications of the cooperative model (other than Pareto efficiency), but also gives rise to an alternative interpretation of the empirical findings with quite different policy implications. To the extent that the mechanisms underlying this alternative model are empirically relevant (as we think they are), considering the noncooperative model is essential for a comprehensive analysis of gender-based development policies.

4 Noncooperative Bargaining and Income Pooling

In this section, we introduce our general noncooperative bargaining framework. We envision a family consisting of two decision makers, a wife and a husband, who have separate incomes and who decide on the provision of private goods and public goods (i.e., goods from which both spouses derive utility).[13] A common feature of the various models that we consider is that there is a continuum of public goods. The existence of many of public goods implies that one part of the outcome of the bargaining game is an assignment of which public goods are provided by each spouse. As we will see, the ease of substitution along this dimension will play a key role for the overall results.[14] While the specific assumption of a continuum of goods is an idealized abstraction, we believe it is realistic to posit that a variety of public goods are provided within marriage, ranging from shelter and food to the various time and goods expenditures relating to children.

We start by establishing two different results. First, we show that noncooperative decision making combined with the assumption that one spouse cares more about public good provision is

[12] A hybrid between cooperative- and noncooperative bargaining are provided by limited commitment models, in which spouses can commit to a particular allocation within the marriage, but cannot commit not to walk away from the marriage. Similar to the Nash bargaining models, relative income matters here only insofar they also imply differential income upon divorce, see Ligon (2002) and Voena (2010). Examples of noncooperative bargaining models applied to marriage include Browning (2000) and Anderson and Baland (2002). In the latter paper, the only decision that is taken noncooperatively is whether to join a rotating savings and credit association (ROSCA).

[13] Extensions to more decision makers are possible, including the cases of polygamy, children with some independent decision power, and extended families who are linked by the consumption of joint public goods.

[14] The existing literature on non-cooperative marital bargaining has usually relied on a setting with a finite number of goods (such as one private and one public good), which leads to either local income-pooling or corner solutions.

not sufficient to break the income pooling result. This result serves as a point of departure for our further analysis, where we discuss various ways to break the income pooling result. Second, we briefly discuss one common argument against noncooperative models of marriage, namely that spouses playing a repeated game should be able to find ways to overcome the inefficiency implied by noncooperative behavior. We counter this criticism by arguing that when altruism between the spouses is taken into account, the noncooperative outcome may in fact be fairly close to being efficient. The fact that the spouses play a Nash equilibrium does not imply that they do not care for each other. We show below that with sufficient altruism there is little need for additional cooperation to avoid inefficient outcomes.

4.1 Income Pooling Result in the Basic Model with Continuum of Public Goods

Consider a husband and wife with preferences:

$$u(c_f) + \gamma_f \int_0^1 U(C_i)\ \mathrm{d}i, \tag{3}$$

$$u(c_m) + \gamma_m \int_0^1 U(C_i)\ \mathrm{d}i. \tag{4}$$

Here c_f and c_m are the private-good consumption of wife and husband, and the C_i are a continuum of public goods for the household, indexed from 0 to 1. The parameters $\gamma_f > 0$ and $\gamma_m > 0$ denote the utility wife and husband derive from public goods relative to private goods. The functions u and U are both increasing, strictly concave, continuously differentiable, and satisfy the usual Inada conditions.

The incomes of wife and husband are given by y_f and y_m. Husband and wife face the following separate budget constraints:

$$c_f + \int_0^1 C_{f,i}\ \mathrm{d}i = y_f,$$
$$c_m + \int_0^1 C_{m,i}\ \mathrm{d}i = y_m,$$

where $C_{f,i}$ and $C_{m,i}$ are the wife's and husband's contributions to public good i, so that we have:

$$C_i = C_{f,i} + C_{m,i}.$$

We are interested in Nash equilibria where each spouse separately chooses private consumption and public-good contributions, taking as given the choices of the other spouse. The following proposition characterizes the equilibrium.

Proposition 1 (Income Pooling) *For any y_f and y_m, any Nash equilibrium implies a unique consumption allocation, characterized by:*

$$\frac{u'(c_f)}{\gamma_f} \geq U'(C_i) \leq \frac{u'(c_m)}{\gamma_m} \quad \forall i \in [0,1].$$

The left inequality holds with equality if the wife makes positive contributions to public goods, i.e., $\int_0^1 C_{f,i}\ \mathrm{d}i > 0$, and the right inequality holds with equality if the husband makes a positive contribution. For any y_f, y_m that imply positive contributions from both wife and husband, the allocation depends only on the total income $y_f + y_m$, and not on the allocation of income between the spouses.

Proof: Consider first spending on public goods. Taking as given the expenditures of the spouse, utility maximization of spouse g implies the inequality:

$$U'(C_i) \geq U'(C_j) \tag{5}$$

for all i that spouse g contributes to and all other $j \in [0,1]$. Moreover, given the Inada condition in equilibrium for any public good i there is at least one spouse that makes a positive contribution. Hence, for an $i, j \in [0,1]$ the inequalities (5) and

$$U'(C_i) \leq U'(C_j)$$

are both satisfied, implying that all public goods are provided at the same level $C_i = C$. Next, the joint optimization of public contributions and private consumption implies

$$\frac{u'(c_g)}{\gamma_g} \geq U'(C),$$

with equality if contributions to public goods are positive. Hence, if both spouses contribute we have:

$$\frac{u'(c_f)}{\gamma_f} = U'(C) = \frac{u'(c_m)}{\gamma_m}, \tag{6}$$

where the choices have to satisfy the joint budget constraint:

$$c_f + C + c_m = y_f + y_m \equiv Y. \tag{7}$$

Let $c_f^{å}, c_m^{å}, C^{å}$ denote the consumption values that satisfy (6) given the joint budget constraint (7) with total income Y. Because of the assumed strict concavity of utility, these values are unique. For any income values that satisfy $y_f + y_m = Y$, $y_f \geq c_f^{å}$, and $y_m \geq c_m^{å}$, the allocation $c_f^{å}, c_m^{å}, C^{å}$ satisfies both individual optimality conditions and budget constraints and is therefore the unique equilibrium allocation. In this region we observe income pooling, in the sense that the allocation is uniquely pinned down by $y_f + y_m = Y$. In a case where $y_g < c_g^{å}$, the equilibrium is a corner solution with $c_g = y_g$ and only one spouse contributing to public goods. In a corner solution, redistributing income towards the spouse that provides the public goods will increase total public-good spending.

In the interior region, the equilibrium reacts to changes in relative income by changing the fraction of public goods provided by each spouse. For example, transferring x dollars from husband to wife leads to a decline of public-good spending by the husband of x dollars and an equal increase in the wife's spending, leaving the overall allocation unchanged. Notice that there is an indeterminacy in terms of which public goods are provided by which spouse; only the total spending by each spouse is determined.

Thus, we see that even if there is a preference asymmetry between the spouses and if decision making is noncooperative, reshuffling of income between the spouses still has no effect on the consumption allocation, unless one spouse ends up with so little income that he or she no longer contributes to any of the public goods. This result is familiar from the literature on the private provision of public goods, see Bergstrom, Blume, and Varian (1986), and has previously been established in noncooperative marital bargaining models by Lundberg and Pollak (1994), among others.[15]

Before proceeding to models that overcome the income pooling result, we would like to remark on the efficiency of the noncooperative outcome.

[15]See also Browning, Chiappori, and Lechene (2009).

4.2 Altruism and Efficiency

The income pooling result may suggest that the Nash equilibrium outcome solves a planning problem. This is not quite correct, because the objective function implicitly solved by the Nash equilibrium is:

$$\frac{u(c_f)}{\gamma_f} + \frac{u(c_m)}{\gamma_m} + \int_0^1 U(C_i)\ \mathrm{d}i,$$

whereas a social planner with the same relative welfare weights on female and male consumption would solve:

$$\frac{u(c_f)}{\gamma_f} + \frac{u(c_m)}{\gamma_m} + 2\int_0^1 U(C_i)\ \mathrm{d}i.$$

That is, the planner accounts for the fact that both spouses care about public goods and would therefore give more weight to the public goods. In the Nash equilibrium, each spouse disregards the utility that the other derives from public goods, which leads to an inefficiency in public-good provision. The inefficiency of the Nash outcome is sometimes used to argue against the use of noncooperative bargaining theory in a family context, based on the conjecture that in a long repeated relationship the partners should be able to find ways to avoid this inefficiency. In defense of the noncooperative approach, we would like to point out that the inefficiency would also be lowered by altruism. Consider a variant of our model in which the spouses care for each other with weight $\alpha \in (0,1)$. That is, utility is:

$$u(c_g) + \alpha u(c_{-g}) + \left(\gamma_g + \alpha\gamma_{-g}\right)\int_0^1 U(C_i)\ \mathrm{d}i, \tag{8}$$

where $-g$ denotes the spouse of g. Assuming that income inequality is not sufficiently extreme for one spouse to directly contribute to the other spouse's private consumption, and focusing for simplicity on the case $\gamma_f = \gamma_m = 1$, the objective function implicitly maximized by the Nash equilibrium is:

$$u(c_f) + u(c_m) + (1+\alpha)\int_0^1 U(C_i)\ \mathrm{d}i,$$

whereas a social planner would solve:

$$u(c_f) + u(c_m) + 2\int_0^1 U(C_i)\ \mathrm{d}i.$$

Thus, as α approaches one, the two problems converge, and the inefficiency in public-good consumption becomes arbitrarily small. It is important to recognize that altruism does not rule out noncooperative bargaining; to the contrary, the more altruistic the spouses are, the closer the Nash equilibrium comes to the efficient outcome, and the less need there is to find ways (such as playing complicated trigger strategies in a dynamic-game context) to avoid this inefficiency. Thus, given that in reality spouses probably display at least some altruism, in our view the Nash outcome may be quite reasonable. Introducing altruism does not lead to any qualitative changes in our results. For simplicity, we therefore frame most of the remaining analysis without altruism, but all arguments would carry through if some altruism were introduced.

5 Policy Implications of Models that Overcome the Income-Pooling Result

The intuition for the income pooling result is that if there is a reshuffling of income between the spouses, in equilibrium the spouse receiving a raise in income will use the entire raise to increase spending on public goods, whereas the other spouse will lower public-good spending by the same amount, leaving the allocation unchanged. To formulate a model that overcomes the income pooling result, we need to introduce frictions in the substitution of one spouse's

contribution to public goods by that of the other spouse. In this section, we discuss three extensions of our basic framework that introduce such a friction in different ways.

The first extension uses the brute force of an *ad hoc* assumption, namely, we impose a technological assumption that the public-good contributions of wife and husband are not perfect substitutes. The resulting model provides a plausible representation of the intuition underlying policies that channel funds to women. We use this model to discuss a potential origin of the appearance of gender differences in preferences, namely discrimination in product markets.

From the perspective of economic theory, however, the first model is somewhat unsatisfactory, because it relies on a strong assumption that lacks an obvious justification. We therefore go on to discuss alternative variations of the basic framework that deliver the desired result through more explicit economic mechanisms. One of these extension relies in differences in the relative appreciation of different public goods across genders, while the third model does not require any preference differences at all, and is instead based on variation in the technology used for producing different public goods. We will see that the policy implications arising from these alternative models cast some doubts on the use of gender-targeted transfers in development policy.

5.1 Limited Substitutability of Male and Female Contributions to Public Goods

Given that the income-pooling result is due to substitution between male and female provision of specific goods, the simplest path to breaking the result is to introduce an assumption that male and female contributions are not perfect substitutes. For added tractability, we make this point using specific functional-form assumptions for utility and technology, namely logarithmic utility combined with a Cobb-Douglas technology that combines the two spouses' contributions to public goods. If we denote the wife's and husband's contributions to public good i by $E_{f,i}$ and $E_{m,i}$, the amount C_i of this public good produced and consumed in the household is:[16]

$$C_i = \sqrt{E_{f,i}E_{m,i}}. \tag{9}$$

As in the previous section, we allow for the possibility that women and men have different relative appreciations for private and public goods, so that preferences are given by:

$$\log(c_g) + \gamma_g \int_0^1 \log(C_i)\ \mathrm{d}i, \tag{10}$$

and the budget constraint for spouse $g \in \{f, m\}$ is:

$$c_g + \int_0^1 E_{g,i}\ \mathrm{d}i = y_g. \tag{11}$$

Given logarithmic utility and Cobb-Douglas technology, this model delivers the sharp result that male and female contributions to public goods do not interact at all: male and female choices are independent of each other. If women care more about the provision of public goods, redistributing income to women will lead to more total spending on public goods. However, even if total spending on public goods goes up, consumption may still fall, because unbalanced male and female contributions can also lead to low provision of public goods. The following proposition summarizes these results.

Proposition 2 *For any y_f and y_m, the share of public good spending in total income is given by:*

[16] Allowing for unequal shares in the production of public goods leads to qualitatively identical results.

$$\frac{\int_0^1 (E_{f,i}+E_{m,i})\ \mathrm{d}i}{y_f+y_\mathrm{m}} = \frac{\gamma_f}{2+\gamma_f}\frac{y_f}{y_f+y_m} + \frac{\gamma_m}{2+\gamma_m}\frac{y_m}{y_f+y_m}.$$

If $\gamma_f > \gamma_m$, public-goods expenditure for a given total income $y_f + y_m$ is maximized by allocating all income to the wife. The production and consumption of public goods is maximized by setting:

$$y_f = y_m.$$

Proof: Plugging the production function for public goods into the utility function yields:

$$\log(c_g) + \frac{\gamma_g}{2}\int_0^1 \left[\log(E_{f,i}) + \log(E_{m,i})\right]\ \mathrm{d}i.$$

Given that the other spouse's spending enters as a constant, the wife's and husband's choices are independent of each other. The first-order conditions for optimization imply that public-good spending makes up the share:

$$\frac{\frac{\gamma_g}{2}}{1+\frac{\gamma_g}{2}} = \frac{\gamma_g}{2+\gamma_g}$$

of total spending, as stated in the proposition. Writing $Y = y_f + y_m$ for total income and expressing male income as $Y - y_f$, the provision of public goods is given by:

$$C_i = \sqrt{E_{f,i}E_{m,i}} = \sqrt{\frac{\gamma_f}{2+\gamma_f}\frac{\gamma_m}{2+\gamma_m}}\sqrt{(y_f)(Y-y_f)},$$

which is maximized by setting $y_f = Y/2$ or, equivalently, $y_f = y_m$.

■

To summarize, the model with limited substitutability between female and male contributions to public goods can indeed reproduce the finding that reallocating funds from men to women leads to more spending on public goods (of which spending on children is a specific subcategory). At the same time, in terms of policy implications a first caveat arises, namely that maximizing spending on public goods is not equivalent to maximizing the provision of public goods. In our specific example, spending on public goods is maximized (for a given total household income) by allocating all income to the wife. In contrast, the provision of public goods is maximized by allocating the same income to husband and wife. Maximizing spending would in fact lead to a minimization of the production and consumption of public goods, because the husband's contributions are essential and hence no production is possible without giving at least some income to the husband.[17] Perhaps this caveat is of limited relevance in a world where husbands still command the greater share of resources even after a policy intervention. Nevertheless, it is useful to bear in mind that ultimately outcomes, not spending, is what matters for welfare.

The implications of the noncooperative model with a limited substitutability of female and male contributions to public goods are very similar to those of a cooperative bargaining model where the welfare weights attached to each spouse are increasing in the spouse's share of

[17]If one of the spouses' wealth becomes very low, it would be in the interest of the other spouse to make a voluntary wealth transfer to increase the provision of public goods. In an extended model where such transfers are allowed, there is a range of extreme wealth distributions for which transfers are positive. Within this range redistributing wealth between the spouses has no effect on the margin, because the change would be fully offset by an adjustment of the transfer. Our results (which assume that transfers are impossible) still hold for a range of intermediate wealth distributions where neither partner chooses to make a voluntary transfer.

household income. In either case, giving more income to the wife implies that the distribution of spending between public and private consumption moves towards the wife's preferences, with the opposite being true if the husband gains income. In this sense, this model can be interpreted as also representing the implications of cooperative bargaining models.[18]

The model can also be used to shed light on the question of whether alternative forms of female empowerment have similar effects. So far, we have only considered empowerment in monetary terms, by redistributing income between the spouses. We can bring another dimension of empowerment into the picture by examining potential sources of a preference gap between women and men.

Notice that our results so far rely on the assumption that women have a greater relative appreciation for public goods, $\gamma_f > \gamma_m$. But why would women care more about public goods? One possibility is that such differences have deep-rooted biological sources and ultimately arose through evolution.[19] However, even if biological differences exist, it is not obvious that they can account for all of the observed preference gap between women and men. To elaborate on this point, we now present a variation of the previous model in which the appearance preference differences is itself due to gender discrimination, in the form of limited access for women to private consumption goods.

Consider an extension of the model where there is not just a continuum of public goods, but also a continuum of private consumption goods. N_g denotes the number of private consumption goods that is available for gender g. This number may differ across genders for legal reasons. For example, there may be restrictions in place that prohibit the sale of certain goods (such a alcohol) to women or that limit women's access to bars and other entertainment venues. In the model, such restrictions would be represented as a smaller range of private consumption goods being available for women, $N_f < N_m$. To focus exclusively on the impact of the availability of private consumption goods, we use the model without any biological preference differences, i.e., $\gamma_f = \gamma_m = 1$. The utility function and budget constraint for gender g can then be written as:

$$\int_0^{N_g} \log(c_{g,i})\ \mathrm{d}i + \int_0^1 \log(C_i)\ \mathrm{d}i,$$

$$\int_0^{N_g} c_{g,i}\ \mathrm{d}i + \int_0^1 E_{g,i}\ \mathrm{d}i = y_g.$$

The production function is still given by (9) above. The following proposition summarizes what this model implies for spending on public goods.

Proposition 3 *The share of spending on public goods in the model with limited access to private goods is the same as in the model with a preference gap for the parameters:*

$$\gamma_f = \frac{1}{N_f}, \quad \gamma_m = \frac{1}{N_m}.$$

[18]However, under cooperative bargaining there would be no discrepancy between maximizing spending on public goods and maximizing production of public goods, which is due to the inefficiency of noncooperative decision making.

[19]To the extent that public goods represent spending on and care for children, one possible evolutionary cause of preference differences is paternity uncertainty on the part of men; see the discussion in Doepke and Tertilt (2009). Additional evolutionary theories are summarized in Kokko and Jennions (2008).

Specifically, for any y_f and y_m, the share of public good spending in total income is given by:

$$\frac{\int_0^1 (E_{f,i}+E_{m,i})\ \mathrm{d}i}{y_f+y_m} = \frac{1}{2N_f+1}\frac{y_f}{y_f+y_m} + \frac{1}{2N_m+1}\frac{y_m}{y_f+y_m}.$$

If $N_f < N_m$, public-goods expenditure for a given total income $y_f + y_f$ is maximized by allocating all income to the wife. Thus, empowering women in the sense of allocating them extra income increases public-good spending. In contrast, female empowerment in the sense of increasing access to private consumption, i.e., raising N_f, lowers public good spending.

Proof: It is sufficient to show that the decision problem is equivalent to the original one for the parameters

$$\gamma_f = \frac{1}{N_f}, \quad \gamma_m = \frac{1}{N_m}.$$

To this end, let c_g denote total private-good spending by spouse g:

$$c_g = \int_0^{N_g} c_{g,i}\ \mathrm{d}i.$$

For a given total spending c_g, it is clearly optimal to set spending on each specific private good to $c_{g,i} = c_g/N_g$, i.e., spending across varieties is equalized. We can therefore reformulate the individual decision problem as maximizing:

$$N_g \log\left(\frac{c_g}{N_g}\right)\ \mathrm{d}i + \int_0^1 \log(C_i)\ \mathrm{d}i, \tag{12}$$

subject to the budget constraint:

$$c_g + \int_0^1 E_{g,i}\ \mathrm{d}i = y_g$$

and $C_i = \sqrt{E_{f,i}E_{m,i}}$ as before. Notice that the budget constraint is now identical to (11). We still need to show that the utility function is equivalent to (10). Given that preferences are invariant to monotone transformations of a utility function, we can divide (12) by N_g and add $N_g \log(N_g)$ to get:

$$\log(c_g)\ \mathrm{d}i + \frac{1}{N_g}\int_0^1 \log(C_i)\ \mathrm{d}i.$$

This is (10) for $\gamma_g = 1/N_g$, which shows that the decision problems are indeed equivalent.

■

To summarize, we see that the appearance of a preference gap between men and women may itself be a consequence of gender discrimination. In male-dominated societies, restrictions on private female consumption are quite plausible; there are countries, for example, where women are not allowed to visit bars, movie theaters, or in some cases even to drive cars. Our findings imply that different forms of female empowerment can have opposite implications for spending on public goods. If women are handed more money while restrictions on their private consumption stay in place, by necessity they will spend a large fraction of the funds on public goods, leading to higher public-good spending overall. If, in contrast, empowerment takes the form of improving women's access to markets for private consumption, spending on public goods goes down. The model also hints at the possibility that the effect of income redistribution within the household on public-good spending may vary with the level of development. If in the course of development restrictions on female private consumption are lifted, then women's apparent preferences would converge to those of men, so that redistributing income within the family would have a smaller effect on public-good spending.

5.2 Gender Differences in the Relative Appreciation of Different Public Goods

In the models presented in the previous section, the income-pooling result did not hold because we assumed, essentially, that male and female contributions to public goods enter utility separately. At face value, this assumption seems problematic: why should male and female contributions to public goods be inherently different? We now proceed to models that can break the income pooling result while maintaining the assumption that, in principle, there is no difference between female and male provision. One way of accomplishing this is by introducing a more subtle preference asymmetry: rather than assuming that women place more weight on public goods in general, we assume that women and men differ in their relative appreciation of different public goods. There are some public goods that women find particularly important, while others are relatively more attractive to men.[20] In particular, the female and male utility functions are given by:

$$\log(c_f) + \int_0^1 i \ \log(C_i) \ \mathrm{d}i, \tag{13}$$

$$\log(c_m) + \int_0^1 (1-i) \ \log(C_i) \ \mathrm{d}i, \tag{14}$$

That is, husband and wife have symmetric preferences overall, but they evaluate the continuum of public goods differently. The public goods are indexed in such a manner that women's relative preference for a good rises with the index i. The good with index $i = 0$ is equivalent to a private male good, the good with index $i = 1$ is a private female good, and in between is a continuum of goods that are appreciated by both spouses, but to varying degrees. We return to the assumption that female and male contributions are perfect substitutes, $C_i = C_{f,i} + C_{m,i}$, and the budget constraints are given by:

$$c_f + \int_0^1 C_{f,i} \ \mathrm{d}i = y_f,$$
$$c_m + \int_0^1 C_{m,i} \ \mathrm{d}i = y_m.$$

Once again, each spouse chooses private consumption and public-good contributions to maximize utility, taking as given the choices of the other spouse. The unique Nash equilibrium for this noncooperative bargaining game features specialization: each spouse provides those public goods that he or she cares about the most. A reshuffling of wealth between the spouses still leads to a change in the range of public goods provided by each spouse; in particular, a spouse experiencing an increase in wealth will provide more of the public goods. Unlike in Proposition 1, however, this adjustment no longer implies that the overall allocation is invariant with respect to wealth redistribution. As the cutoff between female and male provision of public goods shifts, there is also a change in the relative appreciation of the public good that forms the cutoff. The spouse that gains in wealth will value the public good that forms the new cutoff relatively less than the good that was formerly at the cutoff. This effect slows down the substitution between female and male provision of public goods, and therefore breaks the income-pooling result. The following proposition summarizes the features of the equilibrium.

Proposition 4 *There is a unique Nash equilibrium. The equilibrium is characterized by a cutoff* $\bar{\imath}$ *such that all public goods in the interval* $i \in [0, \bar{\imath}]$ *are provided by the husband, while public goods in the range* $i \in (\bar{\imath}, 1]$ *are provided by the wife. Private and public consumption*

[20] For example, one could imagine that women care more about expenditures on children while men care more about shelter and transportation.

satisfies:

$$C_i = \begin{cases} (1-i)\ c_m & \text{for} i \in [0, \bar{\imath}], \\ i\ c_f & \text{for} i \in (\bar{\imath}, 1]. \end{cases} \quad (15)$$

The cutoff $\bar{\imath}$ is determined such that female and male provision of public goods is equalized at the cutoff, i.e., $\bar{\imath}$ satisfies:

$$\bar{\imath}\ c_f = (1-\bar{\imath})\ c_m. \quad (16)$$

Proof: The first-order conditions for public-good provision from a female and male perspective imply:

$$C_i \geq i\ c_f, \quad (17)$$

$$C_i \geq (1-i)\ c_m, \quad (18)$$

where (17) holds with equality for public goods that the wife contributes to, and (18) holds with equality for public goods that the husband contributes to. We therefore have:

$$C_i = \max\{i\ c_f, (1-i)\ c_m\},$$

which implies that any equilibrium allocation has to satisfy the cutoff rule described in (15) and (16) for some $\bar{\imath}$.

To establish the existence of a unique allocation satisfying these conditions, we note that the equilibrium allocation also has to satisfy budget constraints. The male budget constraint is:

$$c_m + \int_0^{\bar{\imath}} C_{m,i}\ \mathrm{d}i = y_m,$$

which, using the optimality conditions, can be expressed as a mapping from $\bar{\imath}$ into c_m:

$$c_m = \frac{2y_m}{2+2\bar{\imath}-\bar{\imath}^2}.$$

The husband's preference $C_{m,\bar{\imath}}$ for public-good provision at the cutoff $\bar{\imath}$ can then be expressed as:

$$C_{m,\bar{\imath}} = \frac{(1-\bar{\imath})\ 2y_m}{2+2\bar{\imath}-\bar{\imath}^2} \equiv \bar{C}(m, \bar{\imath}).$$

For $\bar{\imath} \in [0,1]$, this expression is strictly decreasing in $\bar{\imath}$, with $\bar{C}(m,0) = y_m$ and $\bar{C}(m,1) = 0$. Similarly, the female budget constraint yields the following mapping from income into private consumption:

$$c_f = \frac{2y_f}{3-\bar{\imath}^2}.$$

The preference for public-good provision at the cutoff therefore is:

$$C_{f,\bar{\imath}} = \frac{\bar{\imath}\ 2y_f}{3-\bar{\imath}^2} \equiv \bar{C}(f, \bar{\imath}),$$

which is strictly increasing in $\bar{\imath}$ for $\bar{\imath} \in [0,1]$, with $\bar{C}(f,0) = 0$ and $\bar{C}(f,1) = y_f$.

So far we have found unique choices for private consumption ad public-good contributions, taken the cutoff $\bar{\imath}$ as given. To establish the existence of a unique cutoff $\bar{\imath}$, notice that the condition (16) characterizing the cutoff can be written as:

$$\bar{C}(f, \bar{\imath}) = \bar{C}(m, \bar{\imath}).$$

Given that we established that the left-hand side is strictly increasing and the right-hand side is strictly increasing in $\bar{\imath}$, with at least one crossing point in $[0,1]$, there exists a unique cutoff $\bar{\imath}$ satisfying this condition. Therefore, there exists a unique equilibrium.

Notice that unlike in the model considered in Section 5.1, in this framework there can never be a situation where one spouse would like to voluntarily transfer funds to the other to increase the

production of public goods. Similarly, unlike the model considered in Section 4.1 there is no possibility of a corner solution where only one spouse contributes to public goods. Even for extreme distributions of wealth between the spouses, there is always a range of public goods that the poorer spouse appreciates sufficiently more than the richer spouse for the poorer spouse to voluntarily supply these goods.

Given the equilibrium characterization, we can now assess how changes in the division of income or targeted income transfers affect the outcome. When female income increases keeping male income constant, the wife's willingness to pay also goes up relative to that of the husband, so that $\bar{\imath}$ declines and more public goods are provided by the wife. Consumption of all public and private goods increases, because the wife has more money and the husband ends up providing fewer public goods. However, the consumption of public goods provided by the wife increases relatively more. Intuitively, a decline in the cutoff $\bar{\imath}$ implies that the wife cares less about the good at the new cutoff compared to the old one, whereas the husband cares more. This shift in the relative appreciation of the good at the cutoff implies that the cutoff has to move by a smaller amount to equate the wife's and husband's provision at the cutoff compared to the case where the relative appreciation of all public goods is the same for husband and wife. The smaller change in the cutoff implies that the wife's increase in income is spent on a smaller range of public goods, so that provision goes up by more.

We can also characterize how the overall spending on public goods depends on the distribution of income between husband and wife. Here we find that overall spending on public goods is minimized when wife and husband each have one-half of the total household income, whereas spending reaches its highest level when one spouse has all the income. The intuition for this finding is that the inefficiency in public good provision is largest for an even income distribution. With an even income distribution, each spouse disregards the effect of public-goods provision on the other spouse's utility, leading to inefficiently low provision. If, in contrast, one spouse has all the money, spending is Pareto optimal, although of course the allocation is an extreme one where one spouse does not consume at all. The following corollary summarizes these findings.

Corollary 1 *Consider the equilibrium for given incomes y_f, y_m with a corresponding cutoff $\bar{\imath}$ between male and female public good provision. The ratio of total consumption of public goods to total consumption of private goods is given by:*

$$\frac{\int_0^1 C_i \, \mathrm{d}i}{c_f + c_m} = \frac{1}{2}(1 - \bar{\imath} + \bar{\imath}^2). \tag{19}$$

Total public goods expenditures are u-shaped in the income ratio. In particular, the ratio is minimized at $\bar{\imath} = 0.5$, which corresponds to an equal income division $y_f = y_m$, and maximized at the two extremes $\bar{\imath} = 0$ and $\bar{\imath} = 1$, which corresponds to the cases of either the wife or the husband having all the income.

Consider now the change in the equilibrium after a transfer $T_f > 0$ is given to the wife, resulting in total income $\tilde{y}_f = y_f + T_f$. Let $\tilde{c}_f$, $\tilde{c}_m$, and $\tilde{C}_i$ denote the new equilibrium allocation. Given the increase in female resources, the cutoff between male and female public goods provision will shift to the left. Let $\tilde{\imath} < \bar{\imath}$ be the new cutoff. Let $i < \tilde{\imath}$ be a good that is male provided both before and after the change in income, and $j > \bar{\imath}$ be a good that is female-provided in each case.

After the income transfer, the ratio of the female-provided to the male-provided public good goes up by a factor:

$$\frac{\tilde{C}_j/\tilde{C}_i}{C_j/C_i} = \frac{\bar{\iota}}{\tilde{\iota}}\frac{1-\tilde{\iota}}{1-\bar{\iota}} > 1. \tag{20}$$

Proof: Given (15) and using (16), the ratio of total consumption of public goods to total consumption of private goods can be written as:

$$\begin{aligned}
&\frac{\int_0^1 C_i \, \mathrm{d}i}{c_f + c_m} = \frac{\int_0^{\bar{\iota}} (1-i)c_m \, \mathrm{d}i + \int_{\bar{\iota}}^1 i c_f \, \mathrm{d}i}{c_f + c_m} \\
&= \frac{1}{2}\frac{(2-\bar{\iota})\bar{\iota}c_m + (1+\bar{\iota})(1-\bar{\iota})c_f}{c_f + c_m} \\
&= \frac{1}{2}((2-\bar{\iota})\bar{\iota}^2 + (1+\bar{\iota})(1-\bar{\iota})^2) \\
&= \frac{1}{2}(1-\bar{\iota}+\bar{\iota}^2),
\end{aligned}$$

as stated in the proposition. For the second part, notice that (15) implies that for any male provided good i and any female-provided good j (i.e., $i < \bar{\iota} < j$) we have:

$$\frac{1-\bar{\iota}}{1-i} C_i = C_{\bar{\iota}} = \frac{\bar{\iota}}{j} C_j,$$

and hence:

$$\frac{C_j}{C_i} = \frac{j}{\bar{\iota}}\frac{1-\bar{\iota}}{1-i},$$

from which (20) follows.

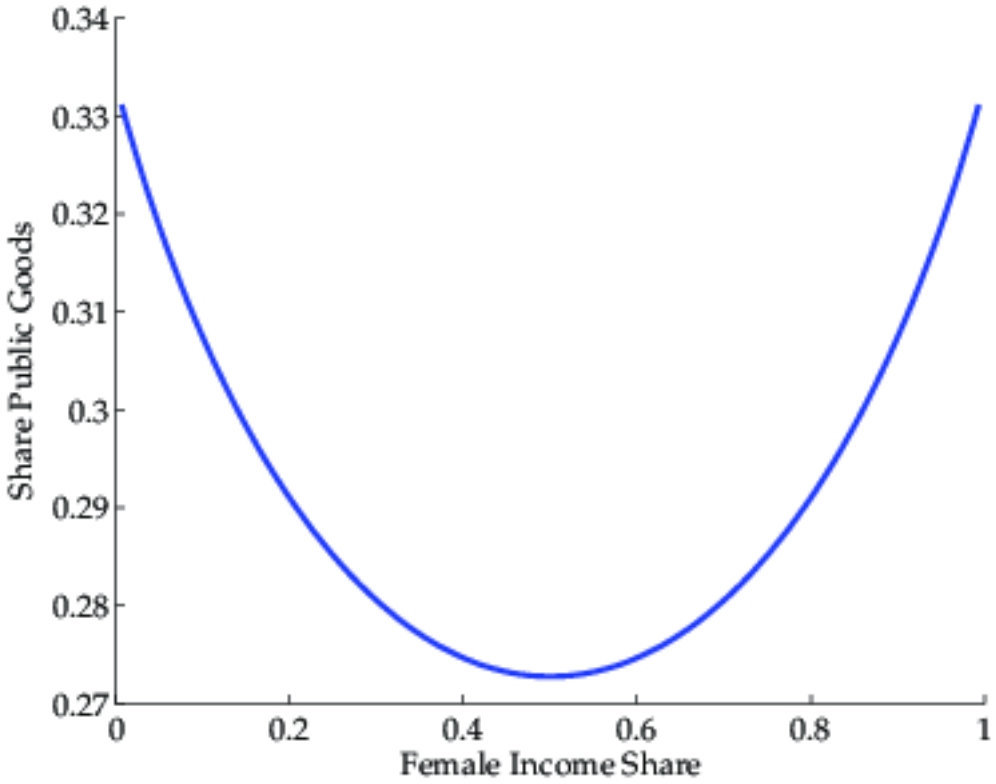

Figure 1: Share of Public Consumption as a Function of Female Income Share

Figures 0 and 1 illustrate these results. Figure 0 display total spending on public goods as a fraction of total income as a function of the female income share. When either the wife or the husband has all the money (income share zero or one), public spending makes up one-third of overall spending, while private goods account for the remaining two-thirds. This outcome is a Pareto optimum where the entire welfare weight is attached to only one of the spouses. Since each spouse, on average, cares only half as much about public goods as about private goods, public spending is one-half of private spending. As the female income share increases, the share of public goods decreases, and reaches a minimum when income is evenly distributed among the spouses (a female income share of 0.5). The decline in spending is due to the inefficiency in public-good provision that arises because each spouse does not take into account the utility that the other spouse derives from public goods. To gain intuition, consider what happens if we start from the point where one spouse has all the income, and then transfer some money to the other spouse. It the transfer is small, the rich spouse will still provide most of the public goods. Consequently, the rich spouse will reduce public and private consumption roughly in proportion with overall spending. The poor spouse, however, ends up providing only few public goods, and therefore spends most of the transferred income on private consumption. The net effect is an increase in private consumption and a decrease in public consumption.

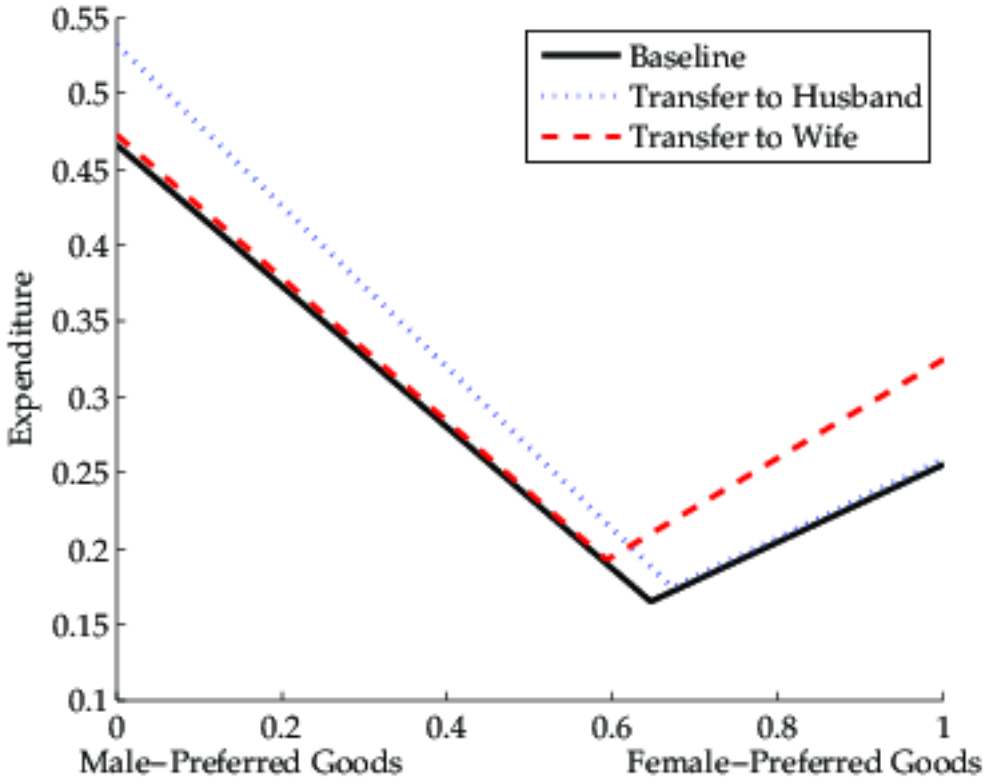

Figure 2: Provision of Public Goods After Transfer to Husband or Wife

Figure 1 displays the pattern of spending across the different public goods as a function of income transfers. The solid line is the baseline case in which the husband's income is twice of wife's income, $y_m/y_f = 2$. Public good provision follows a V-shaped pattern, where the minimum corresponds to the cutoff between male and female provision. The dashed line shows the

new equilibrium after a transfer is given to the wife, keeping the husband's income constant.[21] The cutoff for public-goods provision moves to the left, implying that the wife now provides a wider range of goods. The provision of all public goods increases, on the wife's side because she has more income, and on the husband's side because the income is spread among fewer public goods. However, as shown in Corollary 1, the increase in provision is much larger for the public goods provided by the wife, who is the one receiving the transfer. The dotted line shows what the equilibrium would be if the same transfer had been given to the husband instead. This time the cutoff moves to the right, and as expected we observe a much larger increase in the provision of male-provided goods compared to female-provided goods.

To summarize, we see that the model with variation in the relative appreciation of different public goods reproduces the observation that giving money to women or men has different effects. To be consistent with the empirical finding that women are more likely to spend funds on children, we would have to assume that child goods such as children's clothing and food are goods that women have a relatively high appreciation for (high i). In particular, if child goods are female-provided both before and after an income transfer to women, we would observe a larger increase in spending on child goods compared to the situation where men receive the same transfer. We haven't specified the underlying causes of preference variation across genders, but if the different appreciation of different public goods is related to traditional gender roles and the division of labor within the household, a scenario where women care relatively more about child goods appears plausible.

Does the model imply that targeting transfers to women is good development policy? To give a precise answer we would have to specify a richer model which clarifies exactly how spending on the various public goods affects development. But even at a general level, the model points to a few caveats that suggest that the link between targeted transfers and welfare might be more complicated than apparent at first sight. To begin, one should note that in this framework the key tradeoff is between the provision of different public goods, as opposed to the overall provision of public and private goods. As Figure 1 shows, the increase in the spending on female-preferred goods that can be achieved through a targeted transfer comes at a cost of less provision of other, male-preferred public goods. To give policy advice, one would need to specify how the various public goods affect development and welfare. For empirical research, the outcome suggest that one should look for the impact of targeted transfers on the entire range of public goods, rather than focusing on specific categories such as spending on children.

The concern about the provision of other public goods is amplified by the finding, displayed in in Figure 0, that overall spending on public goods is minimized when women and men have the same income. Assuming that men start out richer than women, targeting transfers to women would move overall public goods provision closer to the minimum. Once again, a full welfare analysis would require a richer model that specifies the welfare implications of the provision of different public goods in detail. Nevertheless, the framework suggests that targeting transfers to women may be more problematic that initially apparent.

[21]The transfer in the example amounts to ten percent of the original family income.

5.3 The Gender Wage Gap and Household Production of Public Goods

So far, we have relied on differences in preferences across genders to reproduce the finding that targeting transfers to women has distinct effects on public-good spending. We now consider a model that achieves the same outcome without assuming any asymmetry in preferences. The key new feature is a household production function that produces public goods by combining goods and time inputs. Different public goods are distinguished by the relative importance of goods and time in producing them. The only asymmetry between men and women is a difference in their market wage. In this model, if women's wages are lower and hence their time is less valuable, they will endogenously specialize in providing the public goods that are the most intensive in time. Even though women don't care about the goods that they provide more than their husbands do, any transfer income given to women has a disproportionate effect on female-provided public goods. Thus, endogenous specialization combined with noncooperative decision making leads to an outcome that may give the appearance of a preference difference between men and women. Assuming that children are relatively time-intensive, the model is consistent with the empirical finding that targeting transfers to women has a disproportionate impact on spending on children.[22]

In this model, we return to the assumption that husbands and wives have the same preferences across all public goods, and there is also no gap in the overall appreciation of public goods. The utility functions are therefore:

$$\ln(c_f) + \int_0^1 \ln(C_i)\ \mathrm{d}i,$$
$$\ln(c_m) + \int_0^1 \ln(C_i)\ \mathrm{d}i.$$

The new elements in the model are endogenous labor supply and household production of public goods. Each public good is produced using a Cobb-Douglas technology using goods and time inputs, where the share of goods and time varies. Specifically, we assume that public good i has share parameter $1-i$ for the goods input and i for time. Each public good can be produced by either spouse; however, each spouse has to combine labor with his or her own goods contribution. For example, it is not possible to only provide the goods input and leave it to the spouse to provide the labor.[23] As before, each spouse maximizes utility, taking the other spouse's behavior (in particular, contributions to public goods $C_{g,i}$) as given. The maximization problem of the spouse of gender $g \in \{f,m\}$ is subject to the following constraints:

$$C_i = C_{f,i} + C_{m,i}, \tag{21}$$
$$C_{g,i} = E_{g,i}^{1-i} H_{g,i}^{i}, \tag{22}$$
$$c_g + \int_0^1 E_{g,i}\ \mathrm{d}i = w_g(1-H_g) + T_g, \tag{23}$$
$$\int_0^1 H_{g,i}\ \mathrm{d}i = H_g. \tag{24}$$

Here $E_{g,i}$ is goods spending on good i by spouse g, $H_{g,i}$ is the time input for good i, H_g is the total amount of time spouse g devotes to public goods production, w_g is the market wage, and T_g is non-earned income (e.g., an initial endowment or lump-sum transfer). Equation (22) is the household production function, where the share parameters depend on i. Equation (23) is the budget constraint. The household has a time endowment of 1, so that $1-H_g$ is the time supplied

[22] A related result in a setting with a single public good that requires only a time input is provided in Konrad and Lommerud (1995).

[23] Below, we consider outcomes when general transfers between the spouses are possible.

to the labor market. Equation (24) is the time constraint, which states that all time contributions to public goods add up to H_g.

Despite the symmetry in preferences, equilibria are generically unique in this setting (i.e., the equilibrium is unique unless husband and wife have exactly the same wage). The reason is that as long as there is a differences in the wage, the spouses have a comparative advantage at providing either time- or goods-intensive public goods. The following proposition summarizes the properties of the equilibrium. We focus on the case of the husband having a higher wage. The case where the wife has a higher wage is analogous.

Proposition 5 *Assume* $0 < w_f < w_m$. *There is a unique Nash equilibrium with the following features. There is a cutoff* $\bar{\imath}$ *such that all public goods in the interval* $i \in [0, \bar{\imath}]$ *are provided by the husband (i.e., the husband provides goods-intensive goods), while public goods in the range* $i \in (\bar{\imath}, 1]$ *are provided by the wife (the wife provides time-intensive goods). Private and public consumption satisfies*

$$C_i = \begin{cases} (1-i)^{1-i}\left(\frac{i}{w_m}\right)^i \; c_m & \text{for} i \in [0, \bar{\imath}], \\ (1-i)^{1-i}\left(\frac{i}{w_f}\right)^i \; c_f & \text{for} i \in (\bar{\imath}, 1]. \end{cases} \tag{25}$$

If the cutoff $\bar{\imath}$ is interior, it is determined such that female and male provision of public goods is equalized at the cutoff. Hence, if $\bar{\imath} \in (0,1)$, the cutoff and private consumption satisfy the condition:

$$\left(\frac{w_m}{w_f}\right)^{\bar{\imath}} = \frac{c_m}{c_f}. \tag{26}$$

Proof: We start by showing that the equilibrium has to satisfy the cutoff rule. The first-order conditions characterizing the wife's optimization problem are given by:

$$c_f = \frac{1}{\lambda_f}, \tag{27}$$

$$E_{f,i} \leq \frac{1-i}{\lambda_f}, \tag{28}$$

$$H_{f,i} \leq \frac{i}{w_f \lambda_f}, \tag{29}$$

where (28) and (29) hold with equality for all public goods i that the wife contributes to, and λ_f denotes the multiplier on the budget constraint. The corresponding optimality conditions for the husband are:

$$c_m = \frac{1}{\lambda_m}, \tag{30}$$

$$E_{m,i} \leq \frac{1-i}{\lambda_m},$$

$$H_{m,i} \leq \frac{i}{w_f \lambda_m}.$$

In Nash equilibrium, each spouse contributes only to those public goods for which she or he has a higher willingness to pay. To show that the equilibrium satisfies the cutoff rule, we therefore have to show that the wife's relative willingness to pay strictly increases with i. Given the first-order conditions, the ratio of female to male preferred public-good provision for good i (in each case assuming that each spouse would be the sole provider) is:

$$\frac{C_{f,i}}{C_{m,i}} = \frac{E_{f,i}^{1-i} H_{f,i}^{i}}{E_{m,i}^{1-i} H_{m,i}^{i}} = \left(\frac{w_m}{w_f}\right)^{i} \frac{\lambda_m}{\lambda_f}. \tag{31}$$

This expression is strictly increasing in i (given the assumption $w_f < w_m$), which shows that the equilibrium has to satisfy the cutoff rule. Intuitively, women provide public goods using relatively more time compared to goods because of their low wages, which induces them to provide relatively more of the time-intensive goods. Given the cutoff rule, (25) follows from substituting the expressions for $E_{g,i}$ and $H_{g,i}$ from the first-order conditions into the production function for public goods, and (26) follows from equating male and female contributions at the cutoff.

To also establish uniqueness of the equilibrium, we need to characterize the cutoff $\bar{\imath}$ more sharply by first solving for the multipliers on the budget constraint. Plugging the first-order conditions for the wife back into the budget constraint and using the cutoff rule gives:

$$\frac{1}{\lambda_f} + \int_{\bar{\imath}}^{1} \frac{1-i}{\lambda_f} \, \mathrm{d}i = w_f - w_f \int_{\bar{\imath}}^{1} \frac{i}{w_f \lambda_f} \, \mathrm{d}i + T_f.$$

Canceling terms we get:

$$\frac{1}{\lambda_f} + \int_{\bar{\imath}}^{1} \frac{1}{\lambda_f} \, \mathrm{d}i = w_f + T_f,$$

which gives:

$$\lambda_f = \frac{2-\bar{\imath}}{w_f + T_f}. \tag{32}$$

Proceeding along the same lines with the male budget constraint gives:

$$\lambda_m = \frac{1+\bar{\imath}}{w_m + T_m}. \tag{33}$$

If the cutoff $\bar{\imath}$ is interior, it is characterized by the condition that at $\bar{\imath}$ female- and male-preferred provision of the public good is equal. Using (31), this can be written as:

$$\left(\frac{2-\bar{\imath}}{1+\bar{\imath}}\right)\left(\frac{w_m + T_m}{w_f + T_f}\right) = \left(\frac{w_m}{w_f}\right)^{\bar{\imath}}. \tag{34}$$

Notice that the left-hand side is strictly decreasing in $\bar{\imath}$ while the right-hand side is strictly increasing. Hence, there can be at most one solution to the equation. When the equation does not have a solution the equilibrium is a corner. Specifically, if:

$$2\left(\frac{w_m + T_m}{w_f + T_f}\right) < 1$$

holds we have $\bar{\imath} = 0$ (the wife is sufficiently rich to provide all public goods). Conversely, if:

$$\frac{1}{2}\left(\frac{w_m + T_m}{w_f + T_f}\right) > \frac{w_m}{w_f}$$

holds, we have $\bar{\imath} = 1$, and the husband provides all public goods.

With the equilibrium characterization at hand, we can now ask how changes in relative female and male income affect outcomes. Different from the other models, we can separately consider the effect of a change in the relative wage and the effect of gender-specific transfers. Parallel to the cases considered in Sections 5.1 and 5.2, consider first a targeted wealth transfer, i.e., a change in unearned income T_f and T_m. Given (25), we see that any two public goods that are provided by the same spouse both before and after a change in transfers will still be provided in the same proportion, because public-good provision is proportional to private consumption. For the same reason, the relative change in the provision of female- and male-provided public goods depends on the change in relative female and male private consumption. Here we find that a transfer of income from husband to wife raises female consumption at the expense of male

consumption, and thus also leads to a relative increase in the provision of female-provided public goods. Under the assumption that child goods are time-intensive and thus provided by women, the model is consistent with the observation that income transfers to women lead to more child-related spending than transfers to men. Overall, the results for income transfers closely mirror our findings for the model with differences in preferences.

We can also use the model to analyze how a rise in the female wage affects public-good provision. This is interesting because some of the empirical literature focuses on relative wages, and because one dimension of gender-based development policies is to attempt to lower labor-market discrimination and increase female earnings through measures such as increased female schooling.

Focusing on private consumption, parallel to the case of income transfers we find that an increase in the female wage leads to a larger increase in female private consumption compared to male private consumption. Unlike the case of a transfer, however, this does not imply that consumption of all female-provided public goods goes up by the same factor. The reason for this discrepancy is that with a wage increase the wife's time allocation also changes, towards more market work and less household production. Given that goods inputs go up and time inputs go down, how the provision of a given public good changes depends on its goods- and time-intensity. Importantly, there is always going to be a range of highly time-intensive goods that will be supplied at a lower level after a female wage increase. The following corollaries summarize these findings.

Corollary 2 *Assume* $0 < w_f < w_m$. *Consider the change in the equilibrium after the wife's transfer income increases from* T_f *to* $\tilde{T}_f > T_f$. *Let* $\tilde{c}_f$, $\tilde{c}_m$, *and* $\tilde{C}_i$ *denote the new equilibrium allocation. Given the increase in female resources, the cutoff between male and female public goods provision shifts to the left. Let* $\tilde{\imath}$ *be the new cutoff. If the cutoff is interior both before and after the change, i.e., if* $0 < \tilde{\imath} < \bar{\imath} < 1$ *holds, the provision of public goods that are male-provided both before and after the change* ($i < \tilde{\imath}$) *goes up by a fixed percentage, and the provision of public goods that are female-provided both before and after the change* ($i > \bar{\imath}$) *goes up by a strictly larger fixed percentage.*

Proof: Condition (34) implies that if the solution is interior both before and after the change we must have $\tilde{\imath} < \bar{\imath}$. Given the change in the cutoff, (33) together with (30) imply that male consumption increases, $\tilde{c}_m > c_m$. Also, condition (26) implies that the ratio of female to male private consumption has to increase after the change, hence $\tilde{c}_f$ has to increase by a larger percentage as $\tilde{c}_m$. Finally, (25) implies that for fixed wages the supply of a given public good is proportional to the private consumption of the provider. The ratio between female-provided and male-provided public goods $\tilde{C}_i/\tilde{C}_j$ (where $i > \bar{\imath} > \tilde{\imath} > j$) therefore goes up in the same proportion as private consumption. W

Corollary 3 *Assume that* $0 < w_f < w_m$ *and that transfer income is zero,* $T_f = T_m = 0$. *Consider the change in the equilibrium after the wife's wage increases from* w_f *to* $\tilde{w}_f > w_f$. *Let* $\tilde{c}_f$, $\tilde{c}_m$, *and* $\tilde{C}_i$ *denote the new equilibrium allocation. Given the increase in the female wage, the cutoff between male and female public goods provision will shift to the left. Let* $\tilde{\imath}$ *be the new*

cutoff. If the cutoff is interior both before and after the change, i.e., $0 < \tilde{\imath} < \bar{\imath} < 1$ *holds, the provision of public goods that are male-provided both before and after the change* ($i < \tilde{\imath}$) *goes up by a fixed percentage. For public goods that are female-provided both before and after the change* ($i > \bar{\imath}$), *the goods input in the home production of these goods goes up by a fixed percentage, and the time input goes down by a fixed percentage. There is a cutoff above which overall provision of public goods declines (i.e., there will be less provision of the most time-intensive goods).*

Proof: Condition (34) implies that if the solution is interior both before and after the change we must have $\tilde{\imath} < \bar{\imath}$. Given the change in the cutoff, condition (26) implies that the ratio c_f/c_m of female to male private consumption has to increase after the change. Also, (33) together with (30) implies that male consumption increases, $\tilde{c}_m > c_m$. The proportionality of private consumption to public consumption for a fixed wage in (25) then implies that the provision of public goods that are male-provided both before and after the change ($i < \tilde{\imath}$) goes up by the same fixed percentage as private consumption c_m. Turning to female-provided goods, equation (32) implies that the Lagrange multiplier λ_f declines, but that the product $w_f\lambda_f$ of wage and multiplier goes up. We can then see from (28) and (29) that the goods spending on all female-provided goods $E_{f,i}$ increases by a fixed fraction, whereas the time input $H_{f,i}$ decreases by a fixed fraction. Since the share of time inputs converges to one as i approaches one, there must be a cutoff above which overall provision of public goods declines.

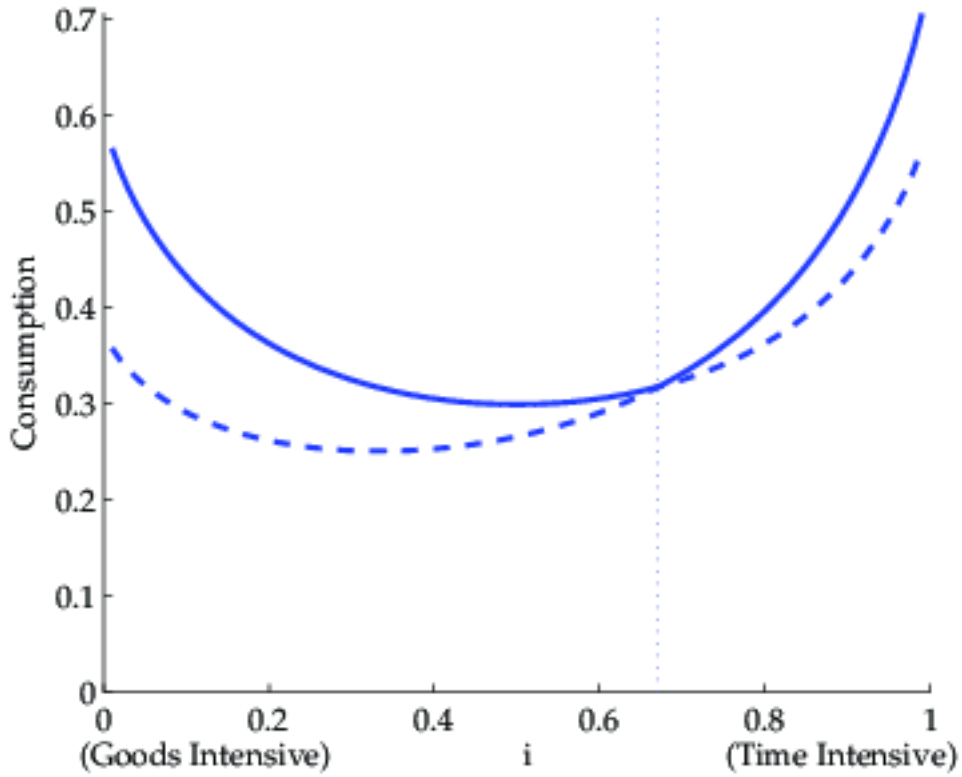

Figure 3: Consumption of Each Public Good for w^f/w^m=0.5. Solid line: Actual Consumption. Dashed Line: Hypothetical Provision by Spouse

We now illustrate these results with a computed example. Figure 2 shows the distribution of public consumption over all public goods for the case where female income is half of male income, $w_f = 0.5$ and $w_m = 1$, and where unearned income is zero, $T_f = T_m = 0$. The solid line is actual consumption, and the dashed line shows the preferred provision of the other spouse (i.e., the level that the spouse who is not actually specializing in this good would have provided). The vertical line denotes the cutoff $\bar{\iota}$: to the left of this point, goods are provided by the husband, to the right they are provided by the wife. In equilibrium, each good is provided by the spouse who is willing to provide a higher amount. The consumption distribution has a kink at the cutoff. The good with the highest provision is the one that requires only a time input.

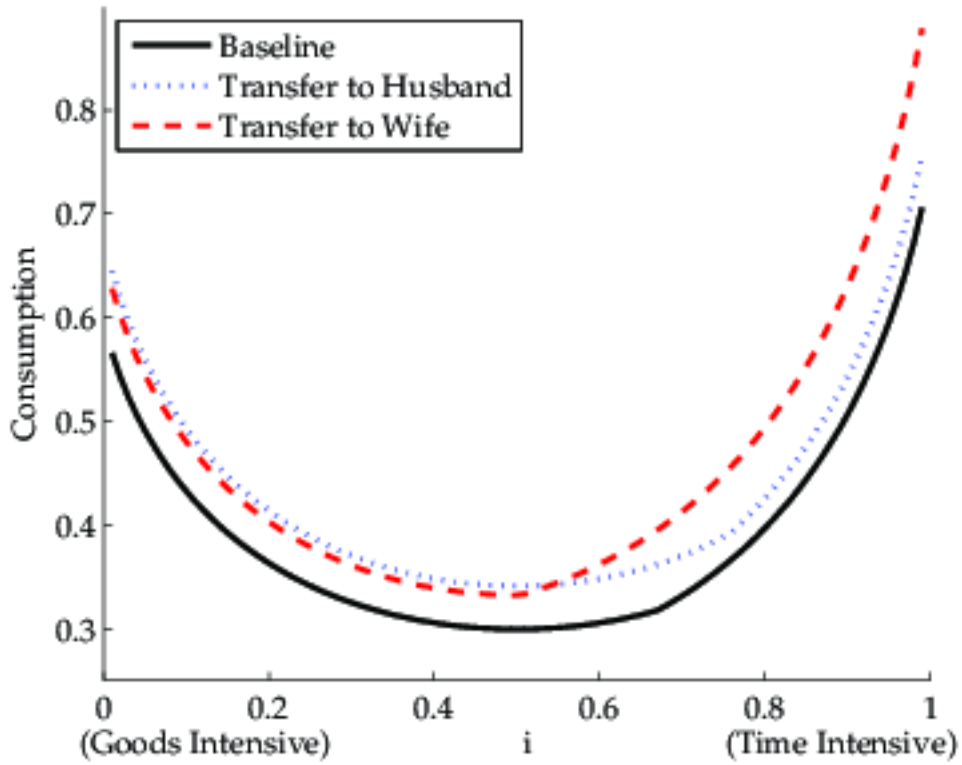

Figure 4: Consumption of Each Public Good with Transfers to Husband or Wife

Next, consider how the equilibrium provision of public goods changes if transfer income is handed to either husband or wife. Figure 3 compares the baseline displayed in Figure 2 to the outcome when the husband receives transfer income of $T_m = 0.2$ (while keeping $T_f = 0$), and the case where the same transfer is handed to the wife instead, $T_f = 0.2$ and $T_m = 0$. In line with Corollary 2, we see that in each case transfer income leads to a higher provision of all public goods, but the impact is larger for the public goods provided by the recipient of the transfer. In particular, consumption of public goods with an index i close to 1, which are time-intensive and therefore provided by the wife, increase much more if the transfer is received by the wife as opposed to the husband. Hence, under the assumption that child goods are time intensive, the model is consistent with the observation that directing transfers to women leads to more spending on children. At the same time, the caveats discussed in the previous section carry over to this model: the higher spending on female-provided public goods comes at the expense of

male-provided public goods, and overall spending on public goods may decline if transfers are redirected towards women.

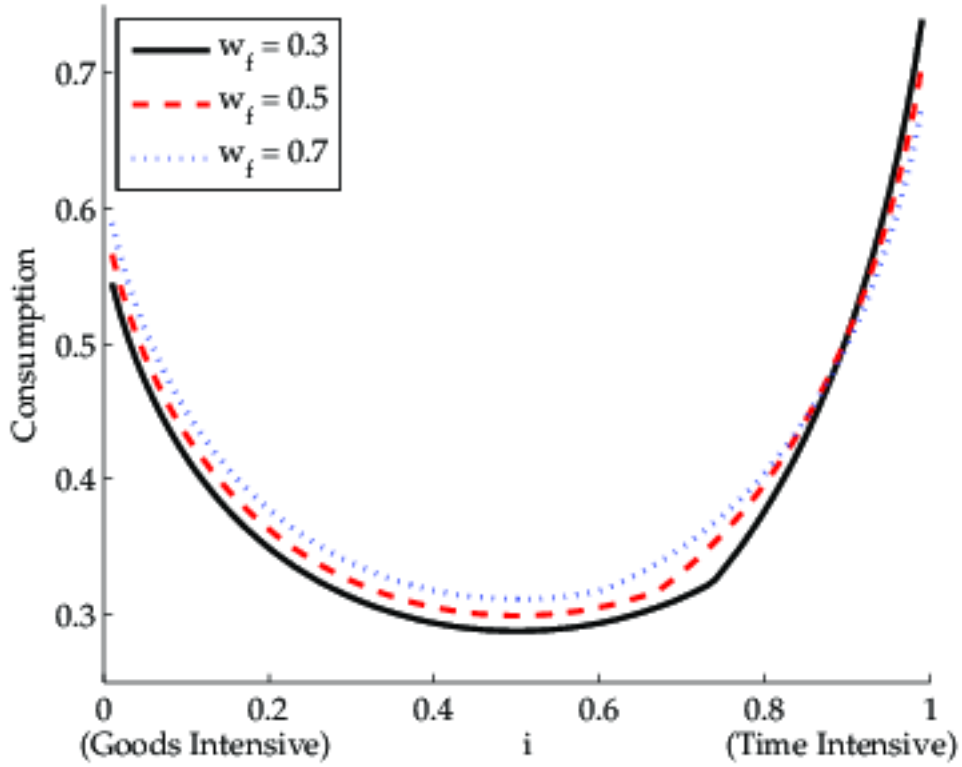

Figure 5: Consumption of Each Public Good for Three Levels of Female Wage, Holding Male Wage Constant at $w^m = 1$

Next, we consider how the provision of public goods depends on the relative female wage. To this end, Figure 4 shows public consumption distributions for varying female wages, holding the male wage constant at $w^m = 1$ and resetting transfer income to zero, $T_f = T_m = 0$. As shown in Corollary 3, the cutoff $\bar{\imath}$ (which corresponds to the kink in the consumption distribution) decreases with the female wage. Consumption of all public goods that are provided by the husband increases as the female wage goes up. From the husband's perspective, the only change is that $\bar{\imath}$ falls, which makes it possible to concentrate spending on fewer goods. For the female-provided goods, there are two different effects. On the one hand, the wife has access to more resources, which tends to increase provision. But on the other hand, because of the higher wage time-intensive goods become expensive relative to goods-intensive goods, which induces a reallocation towards public goods that are less intensive in time. Consequently, we see that provision of the most time-intensive goods declines as female wages go up. If we interpret child goods as being highly time intensive (i.e., i close to one), this would imply that an increase in female earnings power lowers the provision of child goods. Spending on children in terms of goods (which is what is commonly measured in the data) would still go up, however---the decline in provision is entirely due to the time input.

This model can be extended further by allowing for voluntary transfers between the spouses. For example, if the wife is much poorer than the husband, it may be in the husband's interest to give money to the wife in order to increase the provision of public goods. It can be shown that once voluntary transfers are positive in equilibrium, marginal changes in unearned income have the same effect regardless of whether the transfer is given to husband or wife. The reason is that, on the margin, the person providing transfers will exactly offset exogenous changes in transfers. At the same time, there is a wide range of conditions under which neither spouse provides a voluntary transfer, so that we are in the situation described above. Given lack of commitment, the spouse receiving a transfer will use only a portion of the transfer for public goods, and the remainder for private goods that do not enter the other spouse's utility. Voluntary transfers will therefore only arise if the difference in wealth between the spouses is large. Interestingly, it is not enough for the wages of the two spouses to be different. If, for example, the wife has a much lower wage than the husband, in equilibrium she will provide only a fairly small range of the public goods. This also implies that she will use most of any additional transfers for private consumption, which discourages the husband from making transfers. Thus, voluntary transfers only arise if there is a large difference in unearned income between the spouses.

6 Extending the Model to a Dynamic Setting

One common theme of the last few sections was that even if transfers targeted to women have the effect of raising spending on certain categories of public goods, this may come at the expense of things that also matter, such as the total spending on public goods. In this section, we add another facet to this picture by extending our framework to an intertemporal setting. In particular, we will construct examples where targeted transfers lead to higher spending on public goods in the present, but also imply lower household savings and, therefore, lead to lower spending on public goods in the future.

For transfers to matter, as in Section 5 we have to introduce frictions in the substitution between female and male provision of public goods. For simplicity, we base our intertemporal analysis on the model of Section 5.1, which introduces a direct assumption that female and male contributions to public goods are imperfect substitutes. The new results derived in this setting carry over to the settings discussed in Sections 5.2 and 5.3, at the expense of more complicated notation.

6.1 Exogenous Lack of Female Access to Credit Markets

We start by considering a model in which only men have access to the credit market. Consider a two-period version of the model discussed in Section 5.1, but without the assumption of a difference in preferences between men and women. For simplicity, we abstract from discounting. Preferences are therefore given by:

$$\sum_{t=1}^{2} \left[\log(c_{g,t}) + \int_0^1 \log(C_{i,t})\ \mathrm{d}i\right], \tag{35}$$

where $t = 1,2$ denotes time. As in Section 5.1, the technology for producing public goods is given by:

$$C_{i,t} = \sqrt{E_{f,i,t}E_{m,i,t}}. \tag{36}$$

In each period, the wife has income y_f, and the husband has income y_m. We also introduce

transfer income T_f, T_m in the first period, so that we can distinguish the effects of receiving a one-time transfer from changes in permanent income y_g. The new feature is that the husband also has access to credit markets, while the wife does not. For now, we simply take it as given that women cannot save; in the next section we discuss one possible cause of differential credit market access. The husband's savings (or borrowing if negative) is denoted s_m. The risk-free interest rate on the credit market is given by r. The husband's budget constraints therefore are:

$$c_{m,1} + \int_0^1 E_{m,i,1} \, \mathrm{d}i = y_m + T_m - s_m, \tag{37}$$

$$c_{m,2} + \int_0^1 E_{m,i,2} \, \mathrm{d}i = y_m + (1+r)s_m, \tag{38}$$

whereas the wife faces the following constraints:

$$c_{f,1} + \int_0^1 E_{f,i,1} \, \mathrm{d}i = y_f + T_f, \tag{39}$$

$$c_{f,2} + \int_0^1 E_{f,i,2} \, \mathrm{d}i = y_f. \tag{40}$$

The implications of this simple intertemporal framework are straightforward. Men have a positive marginal propensity to save in this model, whereas (by assumption of no access to credit markets) women's propensity to save is zero. Thus, when men receive a transfer $T_m > 0$ in period 1, the additional income is divided between private consumption, public consumption, and saving. If women receive a transfer T_f, they spend a relatively larger amount on private and public goods, because they can't save. The flipside of this difference is that after a transfer men's public-good spending increases in the second period as well, whereas women's does not. Indeed, the present value of the increase in public-good spending across both periods is the same for women and men; the only difference is in the timing of the increase. The following proposition summarizes these results.

Proposition 6 *An increase in the transfer T_f targeted to the wife has a larger impact on current public-good spending than an increase in the transfer T_m going to the husband:*

$$\frac{\partial E_{f,i,1}}{\partial T_f} > \frac{\partial E_{m,i,1}}{\partial T_m}$$

for all i. However, the present value of the increase in public-good spending over both periods is the the same for wife and husband:

$$\frac{\partial E_{f,i,1}}{\partial T_f} + \frac{1}{1+r}\frac{\partial E_{f,i,2}}{\partial T_f} = \frac{\partial E_{m,i,1}}{\partial T_m} + \frac{1}{1+r}\frac{\partial E_{m,i,2}}{\partial T_m}.$$

Proof: Solving the first-order conditions for the female and male decision problem gives:

$$E_{f,i,1} = \frac{1}{3}(y_f + T_f),$$

$$E_{f,i,2} = \frac{1}{3}y_f,$$

$$E_{m,i,1} = \frac{1}{6}\left(\frac{2+r}{1+r}y_m + T_m\right),$$

$$E_{m,i,2} = \frac{1}{6}((2+r)y_m + (1+r)T_m),$$

so that:

$$\frac{\partial E_{f,i,1}}{\partial T_f} = \frac{1}{3} > \frac{1}{6} = \frac{\partial E_{m,i,1}}{\partial T_m}$$

and:

$$\frac{\partial E_{f,i,1}}{\partial T_f} + \frac{1}{1+r}\frac{\partial E_{f,i,2}}{\partial T_f} = \frac{\partial E_{m,i,1}}{\partial T_m} + \frac{1}{1+r}\frac{\partial E_{m,i,2}}{\partial T_m} = \frac{1}{3}.$$

The results here closely mirror the case of a restricted access of women to private consumption goods that was discussed in Section 5.1. In either setting, women's limited range of alternatives to public-good spending leads to a higher current propensity to spend. In the context of savings markets, the result suggest that not just current but also future spending should be examined if one would like to determine the full impact of targeted transfers.

6.2 Endogenous Lack of Female Access to Credit Markets

An obvious shortcoming of the intertemporal model discussed so far is that the lack of access to the credit market directly imposed. Even if women indeed had difficulty saving (as is suggested by a strand of the applied literature), the underlying reason for this friction may still matter for results. While we cannot provide a comprehensive analysis of the issue here, we present one way of endogenizing credit market frictions. Given our emphasis on noncooperative bargaining, we focus on a channel that arises as a direct consequence of this mode of decision making. Specifically, we introduce two new features to our setting: altruism between the spouses, and voluntary transfers. We show that in this setting the expectation of future transfers between spouses can work like an implicit tax on savings, and consequently push one of the spouses to a no-savings corner even if credit markets are accessible in principle.

We extend the preference specification of the model in the previous section by introducing an altruistic concern for the spouse's private consumption. The spouse's utility enters with weight α, where $0 < \alpha < 1$. That is, spouses care about each other, but they still value their own private consumption more than the spouse's consumption. The utility function is:

$$\sum_{t=1}^{2} \left[\log(c_{g,t}) + \alpha \log(c_{-g,t}) + \int_0^1 \log(C_{i,t}) \, \mathrm{d}i\right], \tag{41}$$

where $-g$ denotes the gender opposite to g. The technology for producing public goods is still given by (36) above. Regarding access to credit markets, we assume that both spouses can save, but not borrow, at the constant interest rate r. In each period, women and men receive the fixed income y_f and y_m, respectively, and transfer income in the initial period is denoted by T_f and T_m. Due to the presence of altruism we also allow for the possibility of voluntary transfers between the spouses. In equilibrium, at most one spouse will be making transfers, and for simplicity we assume that this is the husband (i.e., the husband is the richer spouse). In addition, we assume that a voluntary transfer is possible only in the second period.[24] Denoting this voluntary transfer as X, the constraints faced by the husband are:

$$c_{m,1} + \int_0^1 E_{m,i,1} \, \mathrm{d}i = y_m + T_m - s_m, \tag{42}$$

$$c_{m,2} + \int_0^1 E_{m,i,2} \, \mathrm{d}i = y_m + (1+r)s_m - X, \tag{43}$$

$$s_m, X \geq 0, \tag{44}$$

whereas the wife faces the following constraints:

$$c_{f,1} + \int_0^1 E_{f,i,1} \, \mathrm{d}i = y_f + T_f - s_f, \tag{45}$$

$$c_{f,2} + \int_0^1 E_{f,i,2} \, \mathrm{d}i = y_f + (1+r)s_f + X, \tag{46}$$

$$s_f \geq 0. \tag{47}$$

[24] Allowing for transfers in both periods is straightforward, but complicates notation. The key interaction is between current savings and future expected voluntary transfers, which is why we focus on transfers in the second period.

The timing of decisions is as follows. In the first period, the spouses first simultaneously choose savings s_f and s_m, and then decide on the consumption allocation using the remaining funds. In the second period, the husband first decides on the transfer X, and then each spouse decides on consumption. We focus on subgame-perfect equilibria.

We are interested in the interaction of voluntary transfers and savings. Given that altruism is limited ($\alpha < 1$), if the income of the two spouses is not too far apart no transfers will take place, and each spouse will choose the optimal savings and consumption allocation individually. The interesting case is therefore the one where income inequality between the spouses is sufficiently large (y_m much larger than y_f) for the husband to choose $X > 0$. Consider how the expectation of a transfer affects the wife's incentives for saving in the first period. Saving has the net return of r. However, when the wife's resources increase in the second period, the husband will optimally react to this by lowering the transfer X. Hence, when deciding on savings the wife has to take the negative impact of an increase in s_f on X into account. The expectation of an endogenous future transfer thus acts as an implicit tax on savings. This implicit tax may induce the wife not to save at all and go to the corner $s_f = 0$.

Going one further step back, consider how the allocation depends on the initial transfer income T_f and T_m. If we are in the corner region $s_f = 0$, a marginal increase in female transfer income T_f will not affect saving, whereas an increase in the male transfer T_m will. Returning to the child expenditure implications, it follows that a transfer payment to the wife increases child expenditures in the first period by more than a transfer to her husband. However, the picture changes if expenditures in the second period are taken into account. The present value of total public-good spending is defined as:

$$E = \int_0^1 \left[E_{f,i,1} + E_{m,i,1} + \frac{1}{1+r}\left(E_{f,i,2} + E_{m,i,2}\right)\right] di.$$

We will show below that transfers to the wife and the husband have exactly the same impact on the present value of public-good spending; the only difference is in the timing of changes. Thus, the model reproduces the overall implication of the setup with an exogenous restriction on credit market access, with the difference that here abstention from saving is voluntary and driven by expected future transfers within the family. The following proposition summarizes these results.

Proposition 7 *Assume that transfer income is zero initially, $T_f = T_m = 0$. For any interest rate r sufficiently high to induce positive savings, there is a threshold $\chi > 0$ such that if $y_m/y_f > \chi$, voluntary transfers are positive, $X > 0$, male saving is positive, $s_m > 0$, and female saving is zero, $s_f = 0$. In addition, in this region an increase in the transfer T_f targeted to the wife has a larger impact on current public-good spending than an increase in the transfer T_m going to the husband:*

$$\frac{\partial E_{f,i,1}}{\partial T_f} > \frac{\partial E_{m,i,1}}{\partial T_m}$$

for all i. However, the present value of the increase in public-good spending over both periods is the the same for wife and husband:

$$\frac{\partial E}{\partial T_f} = \frac{\partial E}{\partial T_m} = \frac{1}{3}.$$

Proof: Given our focus on subgame-perfect equilibria, we can solve for the equilibrium by backward induction. After the transfer X has been made, the first-order conditions for the wife's and the husband's problem result in the following consumption allocation:

$$c_{f,2} = \frac{2}{3}(y_f + (1+r)s_f + X),$$
$$c_{m,2} = \frac{2}{3}(y_m + (1+r)s_m - X),$$
$$E_{f,i,2} = \frac{1}{3}(y_f + (1+r)s_f + X),$$
$$E_{m,i,2} = \frac{1}{3}(y_m + (1+r)s_m - X).$$

Going back one step, we can now consider the husband's problem of determining X, where the husband takes y_f, y_m, s_f, and s_m as given. Plugging the optimal consumption allocation in the husband's second period utility and dropping constants, the husband solves:

$$\max_{X \geq 0} \{3\log(y_m + (1+r)s_m - X) + (1+2\alpha)\log(y_f + (1+r)s_f + X)\}.$$

The optimal choice is therefore given by:

$$X = \max\left\{\frac{(1+2\alpha)(y_m+(1+r)s_m)-3(y_f+(1+r)s_f)}{4+2\alpha}, 0\right\}. \quad (48)$$

The transfer depends on the pre-transfer income gap between the spouses, and on the degree of altruism. For example, if the husband were fully altruistic ($\alpha = 1$), the husband would transfer exactly half of the income gap to the wife to equalize male and female consumption. The important feature for our purposes is that the transfer is decreasing in female saving s_f, which places an implicit tax on female saving.

Going back one more step, the choice of savings s_f by the wife in the region where $X > 0$ can be expressed as:

$$\max_{s_f \geq 0}\{3\log(y_f + T_f - s_f)$$
$$+3\log(y_f + (1+r)s_f + X(s_f)) + (1+2\alpha)\log(y_m + (1+r)s_m - X(s_f))\}.$$

Here $X(s_f)$ is the transfer received in the second period as a function of own savings. At the savings stage, wife and husband take each other's saving decision as given. Plugging in the expression (48) for X, the problem can be further simplified as:

$$\max_{s_f \geq 0}\{3\log(y_f + T_f - s_f) + (4+2\alpha)\log(y_f + y_m + (1+r)(s_f + s_m))\}.$$

The terms corresponding to the second period simplify, because the optimal choice of X by the husband implies that only total income matters for consumption in this period (as long as X remains interior). The first-order condition for s_f is:

$$\frac{3}{y_f+T_f-s_f} \geq \frac{(4+2\alpha)(1+r)}{y_f+y_m+(1+r)(s_f+s_m)},$$

where the inequality is strict if $s_f = 0$. The corresponding first-order condition for the husband is:

$$\frac{3}{y_m+T_m-s_m} \geq \frac{(4+2\alpha)(1+r)}{y_f+y_m+(1+r)(s_f+s_m)},$$

where the inequality is strict if $s_m = 0$. We would like to show that at $T_m = T_f = 0$ for a sufficiently high interest rate r and a male-female income ratio above a certain threshold, $y_m/y_f > \chi$, the solution to the first order conditions features $s_m > 0$ and $s_f = 0$, i.e., only the husband saves. Solving the husband's first-order condition for s_m under the assumptions $s_f = 0$ and $T_m = T_f = 0$ yields:

$$s_m = \frac{(4+2\alpha)(1+r)y_m-3(y_f+y_m)}{(7+2\alpha)(1+r)}. \quad (49)$$

Plugging this into the wife's first-order condition, the conditions for $s_f = 0$ can be expressed as:

$$\frac{3}{y_f} > \frac{(4+2\alpha)(1+r)}{y_f+y_m+(1+r)\frac{(4+2\alpha)(1+r)y_m-3(y_f+y_m)}{(7+2\alpha)(1+r)}},$$

or:

$$\frac{y_m}{y_f} > \frac{(7+2\alpha)(1+r)-3}{3(2+r)} \equiv \chi. \tag{50}$$

To see that the desired equilibrium exists for sufficiently high r and y_m/y_f, first note that for any given y_f and y_m the interest rate r can be chosen high enough such that s_m in (49) is positive. Then, holding the interest rate fixed we can raise y_m until the condition (50) is satisfied. Notice that raising y_m also increases savings s_m, so that s_m continues to be positive.

As the final step, we would like to determine how introducing transfer income T_f and T_m in the first period affects the equilibrium at the margin. Given the corner solution for savings, a marginal increase in T_f has no effect on saving and on public-good spending in the second period, but affects public-good spending in the first period in the usual way:

$$\frac{\partial E_{f,i,1}}{\partial T_f} = \frac{1}{3}.$$

For the husband, an increase in T_m leads both to an increase in public-good spending in the first and in the second period. Moreover, the wife's public good spending in the second period reacts as well, due to the endogenous transfer X. In particular, we have:

$$\frac{\partial E_{m,i,1}}{\partial T_m} = \frac{1}{7+2\alpha},$$
$$\frac{\partial E_{f,i,1}}{\partial T_m} = 0,$$
$$\frac{\partial E_{m,i,2}}{\partial T_m} = \frac{1+r}{7+2\alpha},$$
$$\frac{\partial E_{f,i,2}}{\partial T_m} = \frac{(1+r)(1+2\alpha)}{3(7+2\alpha)}.$$

Combining these results, as stated in the proposition we have for all i:

$$\frac{\partial E_{f,i,1}}{\partial T_f} = \frac{1}{3} > \frac{1}{7+2\alpha} = \frac{\partial E_{m,i,1}}{\partial T_m},$$

$$\frac{\partial E}{\partial T_f} = \frac{\partial E_{f,i,1}}{\partial T_f} = \frac{1}{3}$$

and

$$\frac{\partial E}{\partial T_m} = \frac{\partial E_{m,i,1}}{\partial T_m} + \frac{1}{1+r}\left(\frac{\partial E_{f,i,2}}{\partial T_m} + \frac{\partial E_{m,i,2}}{\partial T_m}\right) = \frac{1}{3}.$$

Intuitively, no matter how the additional income gets distributed between the two periods and the two spouses, in the end one-third gets spent on public goods and two-thirds on private goods.

The results in this section show that the appearance of a preference difference between men and women (in the sense that women spend more of current income on public goods) can arise as a direct consequence of noncooperative decision making, provided that income inequality between men and women is sufficiently large. Other types of frictions that limit women's access to credit markets would lead to similar findings. The general conclusion is that a comprehensive analysis of the effects of gender-specific transfers should account for possible effects on savings, investment, and future public-goods spending.

7 Summary and Outlook

In this paper, we have addressed from a theoretical perspective the empirical observation that money in the hands of women leads to higher spending on public goods, and in particular to higher spending on child-related goods. These observations have already led to a trend in development policy to target more resources to women and more generally to envision female empowerment as a key measure to foster economic development. However, to fully understand the effects of such gender-based development policies, one needs to know the mechanism that generates the observed empirical findings. To this end, we have developed a series of models of marital decision making that can explain the empirical facts, and we have examined what these models imply for the effects of gender-based development policy.

From the perspective of the theory of the household, a first finding is that a large class of commonly used models of marital decision making are not able to explain the facts. In particular, models such as the unitary model or the collective model imply an income pooling result, which is clearly inconsistent with the data. While this fact is not surprising and well known, we show that the income-pooling result survives even if decision making is noncooperative and if there are preference asymmetries between men and women in terms of the overall appreciation of public goods. To break the income-pooling result, further frictions or asymmetries are needed. We present a series of models that can explain the facts: first, limited availability of female-specific private goods, coupled with imperfect substitutability of male and female contributions to public goods; second, preference asymmetries in the relative appreciation of different public goods; third, household production where goods differ in the importance of time and goods inputs, coupled with a gender wage differential; and fourth, gender-specific distortions in the consumption-saving choice, either through the endogenous provision of transfers between the spouses, or because of institutional restrictions.

While these different models have distinct policy implications, two overall themes stand out. First, even when the models confirm a positive effect of transfers targeted to women on expenditures on child goods, it may be the case that this higher spending comes at the expense of other important public goods. For example, in the model with time and goods components of household production an increase in goods spending may be offset by a decline in time inputs. Similarly, in the intertemporal model an increase in current spending may correspond to a decline in household saving and therefore lower future spending. In such settings, it is far from obvious whether targeting transfers to women is good policy.

Second, the models suggest that different ways of achieving female empowerment may have different or even opposite effects. In some of our models, the differences in gender spending patterns are themselves endogenous and would disappear if other gender differences were removed. Thus, while targeting transfers to women may increase spending on children, reducing gender discrimination in goods or labor markets may result in women behaving more like men, which reduces the effect of targeted transfers on public good provision. The models therefore provide a warning against viewing female empowerment as a generic concept and advocate a more differentiated view that distinguishes various channels.

Perhaps the most important conclusion arising from this work is that more measurement

and empirical work is needed to distinguish between the various theoretical models outlined above. The empirical implications of the models are quite distinct and could in principle be tested. In particular, empirical research to date has mostly focused on expenditures on a few salient public goods that can be easily observed and quantified such as clothing, food, and education. However, our analysis implies that also accounting for effects on savings, consumer durables, and general household public goods is essential to distinguish between the different mechanisms. Only once we have some confidence in which of these models provides the best guide to reality will we be in a position to provide valuable policy recommendation for gender-based development initiatives.

References

Anderson, Siwan, and Jean-Marie Baland. 2002. "The Economics of Roscas and Intrahousehold Resource Allocation." *Quarterly Journal of Economics* 117 (3): 963–995.

Ashraf, Nava. 2009. "Spousal Control and Intra-Household Decision Making: An Experimental Study in the Philippines." *American Economic Review* 99 (4): 1245–1277.

Atkin, David. 2009. "Working for the Future: Female Factory Work and Child Health in Mexico." Unpublished Manuscript, Yale University.

Attanasio, Orazio, and Val´erie Lechene. 2002. "Tests of Income Pooling in Household Decisions." *Review of Economic Dynamics* 5 (4): 720–748.

Basu, Kaushik. 2006. "Gender and Say: A Model of Household Behaviour with Endogenously Determined Balance of Power." *Economic Journal* 116 (511): 558–580.

Bauer, Michal, and Julie Chytilov´a. 2009. "Do Children Make Women More Patient? Experimental Evidence from Indian Villages." Charles University IESWorking Papers 10/2009.

Beaman, Lori, Esther Duflo, Rohini Pande, and Petia Topalova. 2006. "Women Politicians, Gender Bias, and Policy-making in Rural India." Background Paper for 2007 State of theWorlds Children Report, UNICEF.

Becker, Gary S. 1973. "A Theory of Marriage: Part I." *Journal of Political Economy* 81 (4): 813–846.

Bergstrom, Theodore, Lawrence Blume, and Hal Varian. 1986. "On the Private Provision of Public Goods." *Journal of Public Economics* 29 (1): 25–49.

Bobonis, Gustavo J. 2009. "Is the Allocation of Resources within the Household Efficient? New Evidence from a Randomized Experiment." *Journal of Political Economy* 117 (3): 453–503.

Browning, Martin. 2000. "The Saving Behaviour of a Two-Person Household." *Scandinavian Journal of Economics* 102 (2): pp. 235–251.

Browning, Martin, Pierre-Andr´e Chiappori, and Vale´erie Lechene. 2009. "Distributional Effects in Household Models: Separate Spheres and Income Pooling." *Economic Journal* 120 (545): 786–799.

Burns, Justine, Malcolm Keswell, and Murray Leibbrandt. 2005. "Social Assistance,

Gender, and the Aged in South Africa." *Feminist Economics* 11 (2): 103–115.

Case, Anne, and Angus Deaton. 1998. "Large Cash Transfers to the Elderly in South Africa." *Economic Journal* 108 (450): 1330–1361.

Chattopadhyay, Raghabendra, and Esther Duflo. 2004. "Women as Policy Makers: Evidence from a Randomized Policy Experiment in India." *Econometrica* 72 (5): 1409–1443.

Chiappori, Pierre-Andr´e. 1988. "Rational Household Labor Supply." *Econometrica* 56 (1): 63–90.

———. 1992. "Collective Labor Supply andWelfare." *Journal of Political Economy* 100 (3): 437–467.

Croson, Rachel, and Uri Gneezy. 2009. "Gender Differences in Preferences." *Journal of Economic Literature* 47 (2): 448–474.

de Mel, Suresh, David McKenzie, and Christopher Woodruff. 2009. "Are Women More Credit Constrained? Experimental Evidence on Gender and Microenterprise Returns." *American Economic Journal: Applied Economics* 1 (3): 1–32.

Doepke, Matthias, and Mich`ele Tertilt. 2009. "Women's Liberation: What's in It for Men?" *Quarterly Journal of Economics* 124 (4): 1541–1591.
Doss, Cheryl. 2006. "The Effects of Intrahousehold Property Ownership on Expenditure Patterns in Ghana." *Journal of African Economies* 15 (1): 149–180.

Duflo, Esther. 2000. "Child Health and Household Resources in South Africa: Evidence from the Old Age Pension Program." *American Economic Review* 90 (2): 393–398.

———. 2003. "Grandmothers and Granddaughters: Old-Age Pensions and Intrahousehold Allocation in South Africa." *World Bank Economic Review* 17 (1): 1–25.

Duflo, Esther, and Christopher Udry. 2004. "Intrahousehold Resource Allocation in Cote d'Ivoire: Social Norms, Separate Accounts and Consumption Choices." NBERWorking Paper 10498.

Engle, Patrice L. 1993. "Influences of Mothers' and Fathers' Income on Children's Nutritional Status in Guatemala." *Social Science Medicine* 37 (11): 1303–1312.

Gitter, Seth R., and Bradford L. Barham. 2008. "Women's Power, Conditional Cash Transfers, and Schooling in Nicaragua." *World Bank Economic Review* 22 (2): 271–290.

Haddad, Lawrence, John Hoddinot, and Harold Alderman, eds. 1997. *Intra-Household Resource Allocation in Developing Countries: Models, Methods, and Policy*. Baltimore and London: Johns Hopkins University Press.

Haddad, Lawrence, and John Hoddinott. 1994. "Women's Income and Boy-Girl Anthropometric Status in the Cˆote d'Ivoire." *World Development* 22 (4): 543–553.

Hoddinott, John, and Lawrence Haddad. 1995. "Does Female Income Share Influence Household Expenditures? Evidence From Cˆote D'Ivoire." *Oxford Bulletin of Economics and Statistics* 57 (1): 77–96.

Kennedy, Eileen, and Pauline Peters. 1992. "Household Food Security and Child Nutrition: The Interaction of Income and Gender of Household Head." *World Development* 20 (8): 1077–1085.

Khandker, Shahidur R. 2005. "Microfinance and Poverty: Evidence Using Panel Data from Bangladesh." *World Bank Economic Review* 19 (2): 263–286.

Kokko, Hanna, and Michael D. Jennions. 2008. "Parental Investment, Sexual Selection and Sex Ratios." *Journal of Evolutionary Biology* 21 (4): 919–948.

Konrad, Kai A., and Kjell Erik Lommerud. 1995. "Family Policy with Noncooperative Families." *Scandinavian Journal of Economics* 97 (4): 581–601.

Ligon, Ethan. 2002. "Dynamic Bargaining in Households (with an Application to Bangladesh)." Unpublished Manuscript, University of California, Berkeley.

Lundberg, Shelly, and Robert A. Pollak. 1993. "Separate Spheres Bargaining and the Marriage Market." *Journal of Political Economy* 101 (6): 988–1010.

———. 1994. "Noncooperative Bargaining Models of Marriage." *American Economic Review* 84 (2): 132–137.

Lundberg, Shelly J., Robert A. Pollak, and Terence J.Wales. 1997. "Do Husbands andWives Pool Their Resources? Evidence from the United Kingdom Child Benefit." *Journal of Human Resources* 32 (3): 463–480.

Manser, Marilyn, and Murray Brown. 1980. "Marriage and Household Decision-Making: A Bargaining Analysis." *International Economic Review* 21 (1): 31–44.

McElroy, Marjorie B., and Mary Jean Horney. 1981. "Nash-Bargained Household Decisions: Toward a Generalization of the Theory of Demand." *International Economic Review* 22 (2): 333–349.

Phipps, Shelley A., and Peter S. Burton. 1998. "What's Mine is Yours? The Influence

of Male and Female Incomes on Patterns of Household Expenditure." *Economica* 65 (260): 599–613.

Pitt, Mark M., and Shahidur R. Khandker. 1998. "The Impact of Group-Based Credit Programs on Poor Households in Bangladesh: Does the Gender of Participants Matter?" *Journal of Political Economy* 106 (5): 958–996.

Quisumbing, Agnes R.and Maluccio, John A. 2003. "Resources at Marriage and Intrahousehold Allocation: Evidence from Bangladesh, Ethiopia, Indonesia, and South Africa." *Oxford Bulletin of Economics and Statistics* 65 (3): 283–327.

Rubalcava, Luis, Graciela Teruel, and Duncan Thomas. 2009. "Investments, Time Preferences, and Public Transfers Paid to Women." *Economic Development and Cultural Change* 57 (3): 507–538.

Rubalcava, Luis, and Duncan Thomas. 2000. "Family Bargaining andWelfare." California Center for Population ResearchWorking Paper Series 2000-007.

Thomas, Duncan. 1990. "Intra-Household Resource Allocation: An Inferential Approach." *Journal of Human Resources* 25 (4): 635–664.

———. 1994. "Like Father, like Son; Like Mother, like Daughter: Parental Resources and Child Height." *Journal of Human Resources* 29 (4): 950–988.

Voena, Alessandra. 2010. "Yours, Mine, and Ours: Do Divorce Laws Affect the Intertemporal Behavior of Married Couples?" Unpublished Manuscript, Stanford University.

Ward-Batts, Jennifer L. 2008. "Out of theWallet and into the Purse: Using Micro Data to Test Income Pooling." *Journal of Human Resources* 43 (2): 325–351.

Woolley, Frances. 2004. "Why Pay Child Benefits to Mothers?" *Canadian Public Policy/Analyse de Politiques* 30 (1): 47–69.

Zelder, Martin. 1993. "Inefficient Dissolutions as a Consequence of Public Goods: The Case of No-Fault Divorce." *Journal of Legal Studies* 22 (2): 503–520.