When the Cat's Away

The Effects of Spousal Migration on Investments on Children

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Abstract

Household expenditures for children-related goods may change when one of the parent migrates and do so differently depending on whether it is the mother or the father that leaves. A sequential model that explains migration and budget allocation choices is proposed and its predictions are tested on data from Indonesia. Selection of households into female migration is accounted for using a set of instrumental

variables derived from the model. Results show that when children are left with fathers, the household budget is significantly diverted toward the purchase of adult private goods, but the share of budget devoted to children remains unaffected because mothers compensate by giving up their own private consumption and sending home more remittances.

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In a context of global increase of international migration of workers, a more recent phenomenon is represented by female independent migration, sometimes referred to as *feminization of migration*. The most significant flows of female migrants are those of women from less developed countries who leave their families behind and migrate on their own to richer countries where they are usually employed as domestic workers and where they remain for a few years before going back to their country of origin to rejoin their families. Scholars have suggestively labeled this phenomenon as “the servants of globalization” (Parrenas 2001) or “the global nanny chain” (Lan 2006) or “the globalization of household production” (Kremer and Watt 2006).

In the light of the rising importance of this phenomenon, it becomes imperative to understand its consequences for the household left behind and, in particular, for the children. The present work contributes to answering this question by analyzing the differences in the effects of parental migration on investments on children depending on whether it is the mother of the child that leaves or the father.

From a policy perspective, understanding whether and how migration of the father or of the mother differently affects the children left behind can have important implications: for instance it can help governments as well as nongovernmental organizations decide about how to target financial and nonfinancial support to the families of migrants,¹ or provide useful insights for the regulation of migration both in sending and receiving countries; indeed, while receiving countries increasingly adopt policies that allow the immigration of female domestic workers from developing countries to face the aging of their population and to encourage the labor force participation of local women,² sending countries are starting to perceive the dangers entailed by the massive outflows of women and react by putting legal limits to emigration.³

This paper also provides an original contribution to the existing literature on migration: while numerous studies have analyzed the impact of migrant inflows on the destination countries’ labor markets (Card 1990; Altonji and Card 1991; Borjas 1994, 1999; Kremer and Watt 2006), considerably fewer have considered the effects on the sending country and on the households of origin (Cox-Edwards and Ureta 2003; Yang 2008). In this context, some authors have provided estimates of the impact of parental migration on the well-being of children left behind (Hanson and Woodruff 2003; McKenzie and Hildebrandt 2005; Mansuri 2006; Chen 2013), but these typically considered cases of paternal migration. Extending the results found for fathers to mothers is nontrivial for several reasons: first, because the migration experience of men and women is generally different, for example, women tend to migrate for shorter periods of time and to maintain stronger links with the household of origin (de la Brire et al. 2002); second, because mothers typically provide more care to the children, so that when the mother is away

¹ UNICEF, for example, promotes policy research on migration and children left behind with a special focus on gender issues.

² Similar policies are for instance in place in Hong Kong and Singapore, as analyzed in Kremer and Watt (2006).

³ In 2008, the government of Sri Lanka, passed a law that banned the international migration of mothers of children under the age of five.

children may suffer a more severe emotional loss (Cortes 2015); finally, because men and women have different preferences over investments on children (Thomas 1990; Duflo 2003; Qian 2008), so that the change in the structure of the household induced by migration of one of the spouses is likely to have different effects depending on who migrates and who stays.⁴ The present paper moves in the latter direction and complements the existing literature by investigating the allocation of resources within the household in order to understand whether spousal migration generates diversions of the household budget that affect children.

Answering this question requires understanding what are the determinants of female migration. The few existing papers that investigated this aspect seem to suggest that female migration would be a means to provide the family left behind with a more stable and reliable source of income than what would be in case of male migration, this would happen because the jobs chosen by migrant women are typically less risky than those chosen by men (Lauby and Stark 1988) and because women are intrinsically more attached to the family left behind and thus tend to send more remittances (de la Brière et al. 2002). Building on this literature, I propose a sequential model in which first the two spouses cooperatively decide who should migrate so as to maximize the expected returns from migration while minimizing the associated risk, second, the migrant spouse chooses how much to send back home through remittances, and finally the spouse left behind chooses how to allocate the available household budget across different commodities. The resulting subgame perfect Nash equilibrium will be one in which diversions of the budget off of children-related expenditures are offset by a strategic change in the amount of remittances that the migrant sends back, so that the share of budget devoted to children-related expenditures is the same no matter whether it is the mother or the father that migrates, even if the two have different preferences over investments on children.

The empirical analysis, based on Indonesian data, shows indeed that, when the mother migrates and the husband is left behind with the children, the share of income spent for exclusively adult goods increases but that devoted to children-related expenditures does not change significantly. The results are obtained through a two-stage least squares estimation procedure that exploits a set of instrumental variables derived from the theoretical setup, that is, the expected value and volatility of previous migrants' earnings. Note that these results do not necessarily imply that children are no worse off when left behind with the father instead of the mother because other mechanisms, different from that of the allocation of the budget may play a crucial role; to shed light on this, I further estimate the effects of maternal versus paternal migration on children's health and education indicators and find no difference in health measures but a significant decrease in the amount of time spent at school for children left with their fathers mirrored by an increase in the amount of time devoted to housework. This type of disruptive effect is likely to explain the result found by Cortes (2015) that children of migrant mothers are more likely to lag behind at school than children of migrant fathers.

⁴ A similar reasoning has been applied to the case in which one of the spouses passes away by Gertler et al. (2004).

The remainder of the paper is structured as follows: Section I describes the model of migration choice and of intra-household allocation of resources of the household; section II introduces the data; section III is dedicated to the identification and estimation strategy; section IV shows the estimation results; section V provides some robustness checks; and section VI concludes.

I. THEORETICAL FRAMEWORK

I propose a three-stage decision process in which first the spouses cooperatively⁵ decide whether and who should migrate so as to insure the household against income shocks; second, the spouse who migrates decides how much of her income to remit back to the household of origin; finally, the spouse left behind allocates all the available budget, made of her own income plus the remittances received, among different categories of goods.

General Setup

Consider a rational, utility optimizing, risk averse household faced with a risky source of income. Following Levhari and Stark (1982) and Lucas and Stark (1985), the household decides to reduce this risk by diversifying its income sources and specifically by placing one member of the household to a different location so that her income streams are less correlated with those of the household left behind. In a household composed of parents and children the choice becomes who to send away between the two spouses. We can call this a *portfolio* choice (Markowitz 1952) where “woman migrates” and “man migrates” are two risky assets that can be combined with other two risky assets that are “man stays” and “woman stays,” so that either both spouses stay or one of the two migrates and the other stays.⁶ I refer to the latter type as *mixed migration portfolios*.

I assume that the household decides *whether* someone should migrate and *who* migrates but does not decide *where* the migrant will go, just men and women may migrate to different predetermined destinations. This assumption is supported by the sociological and economic literature that has widely documented that migrants tend to show very little variation in the choice of their destinations, following instead quite stable patterns of migration from one place to the other (Bartel 1989; Altonji and Card 1991).

In this setting the expected returns associated with each of the three possible portfolios will be the sum of the expected wages of the two spouses, specifically:

⁵ Individual migration choices are similar to individual labor supply choices, for which collective models have been proposed (Chiappori 1992).

⁶ Note that the model would potentially allow for the definition of a fourth portfolio, that is, a *full migration portfolio* in which both spouses migrate. Yet this portfolio will be excluded from the analysis in that it would not be feasible for a household with children because migrants cannot typically bring their children with them, given the types of jobs and accommodation they get upon migration, and cannot leave their children alone either.

$$\begin{aligned}
E(R_0) &= E(w_m^h) + E(w_f^h) \\
E(R_M) &= E(w_m^d) + E(w_f^h) \\
E(R_F) &= E(w_f^d) + E(w_m^h)
\end{aligned} \tag{1}$$

where $E(R_0)$, $E(R_M)$ and $E(R_F)$ are, respectively, the expected returns to the household when none of the spouses migrates, when the man only migrates and when the woman only migrates; w_m^d and w_f^d are the wages of men and women upon migration (at destination d) and w_m^h and w_f^h the wages of men and women if they do not migrate (in the home village h). The risk associated with each of the three portfolios is instead:

$$\begin{aligned}
\sigma_0^2 &= Var(w_f^h) + Var(w_m^h) + 2Cov(w_m^h, w_f^h) \\
\sigma_M^2 &= Var(w_f^h) + Var(w_m^d) + 2Cov(w_m^d, w_f^h) \\
\sigma_F^2 &= Var(w_m^h) + Var(w_f^d) + 2Cov(w_f^d, w_m^h)
\end{aligned} \tag{2}$$

If the household's utility is increasing in the expected returns of the portfolio chosen and decreasing in the associated risk, the migration choice will also be affected by the household's degree of risk aversion (RA_h) so that more risk averse households will choose the migration portfolio with lower risk, even if the expected returns are lower.

The Allocation of Resources within the Household

Each of the two risk averse spouses, i , obtains utility from the consumption of some private good X_i and from that of a common good Z that yields utility to both of them. The vector of common goods Z will contain all children-related expenditure, that is, both parents care about investment on children. Assuming Cobb-Douglas preferences, I express the preferences of men and women in the following way:

$$\begin{aligned}
U_m &= \alpha \log X_m + (1 - \alpha) \log Z \\
U_f &= \beta \log X_f + (1 - \beta) \log Z
\end{aligned}$$

where $(1 - \alpha)$ and $(1 - \beta)$, respectively, indicate the man's and the woman's willingness to contribute to the common good, and thus can be interpreted as measures of their generosity toward children.⁷

No migration portfolio. In the case in which none of the spouses migrates, they cooperatively choose how to allocate the available resources under income pooling so as

⁷ A large and well established literature, among which Thomas (1990), Duflo (2003), Qian (2008), documented that women have stronger preferences for investing on children than men, this paper will provide an indirect test of this hypothesis.

to maximize the sum of their private utilities with equal weights assigned to each of the two:

$$\begin{aligned} \max_{X_f, X_m, Z} \quad & \alpha \log X_m + (1 - \alpha) \log Z + \beta \log X_f + (1 - \beta) \log Z \\ \text{s.t.} : \quad & X_m + X_f + Z = E(R_0) \end{aligned}$$

The household utility maximization problem yields the following optimal allocations:⁸

$$\begin{aligned} X_m^0 &= \frac{\alpha}{2} E(R_0) \\ X_f^0 &= \frac{\beta}{2} E(R_0) \\ Z^0 &= \left(1 - \frac{\alpha + \beta}{2}\right) E(R_0) \end{aligned} \tag{3}$$

Mixed migration portfolios. Suppose now that the household prefers a mixed migration portfolio, for illustration, that in which the wife migrates and the husband stays with the children. In this case, the wife chooses how much remittances to send back home and the husband decides how to spend the available resources. The absence of the spouse induces the spouse left behind to deviate from the Pareto efficient equilibrium that would arise if they were together and divert resources toward his own private good. This situation can thus be seen as a noncooperative sequential game in which the subgame perfect Nash equilibrium (SPNE) can be obtained by backward induction: the husband decides how to allocate the budget available to him according to his own preferences; the wife anticipates this allocation and incorporates the husband's choice in her decision problem of how much of her income to send back in remittances (R). Thus at the final stage of this game the husband left behind solves:

$$\begin{aligned} \max_{X_m, Z} \quad & \alpha \log X_m + (1 - \alpha) \log Z \\ \text{s.t.} : \quad & X_m + Z = E(w_m^h) + R \end{aligned}$$

which yields:

$$\begin{aligned} Z^* &= (1 - \alpha)(E(w_m^h) + R) \\ X_m^* &= \alpha(E(w_m^h) + R) \end{aligned}$$

In the previous stage of the game, instead, the migrant wife anticipates the husband's choice and decides how much to send back through remittances by solving:

⁸ These are Pareto efficient (Chiappori and Donni 2009).

$$\begin{aligned}
\max_R \quad & \beta \log X_f + (1 - \beta) \log Z \\
s.t.: \quad & X_f = E(w_f^d) - R \geq 0 \\
& Z = Z^* = (1 - \alpha)(E(w_m^h) + R)
\end{aligned}$$

The wife's problem allows for only one possible internal solution.⁹ In this case, the migrant will choose to send remittances:

$$R^* = E(w_f^d) - \beta E(R_F)$$

and the resulting allocations will be:

$$\begin{aligned}
X_m^* &= \alpha(1 - \beta)E(R_F) \\
X_f^* &= \beta E(R_F) \\
Z^* &= (1 - \alpha)(1 - \beta)E(R_F)
\end{aligned} \tag{4}$$

Symmetrically, when it is the husband that migrates and sends back remittances to the wife, the resulting equilibrium allocations will be:

$$\begin{aligned}
X_m^{**} &= \alpha E(R_M) \\
X_f^{**} &= \beta(1 - \alpha)E(R_M) \\
Z^{**} &= (1 - \alpha)(1 - \beta)E(R_M)
\end{aligned} \tag{5}$$

with remittances sent by the husband:

$$R^{**} = E(w_m^d) - \alpha E(R_M)$$

Clearly, these allocations are second best compared to the allocations that would be chosen if the spouses decided together how to spend the (higher) available budget. The first best allocation would be analogous to those in 3.

The Migration Choice

The subgame perfect Nash equilibrium (SPNE) of the three-stage migration game is found by comparing the level of utility that the household obtains from the three portfolios. Foreseeing that the final allocations will be 3, 4, and 5, the two spouses cooperatively decide, at the first stage, which migration portfolio maximizes the joint expected utility.

⁹ A corner solution arises instead when the migrant's expected income is too low to send remittances; this case is discussed in the appendix.

$$\max \left\{ \sum_{i=f,m} EU_i(X_i^0, Z^0), \sum_{i=f,m} EU_i(X_i^*, Z^*), \sum_{i=f,m} EU_i(X_i^{**}, Z^{**}) \right\}$$

Pairwise comparison of the expected values of indirect utility of the three portfolios delivers the following:

Proposition 1 *When the spouses cooperatively choose the migration portfolio that ex-ante maximizes their joint expected utility,*

1. *Female migration is preferred to male migration if:*

$$\left(\frac{E(R_F)}{E(R_M)} \right)^2 \geq \frac{(1-\alpha)^\beta}{(1-\beta)^\alpha} \quad (6)$$

2. *Female migration is preferred to no migration if:*

$$\left(\frac{E(R_F)}{E(R_0)} \right)^2 \geq \frac{(2-\alpha-\beta)^{2-\alpha-\beta}}{4(1-\beta)^{2-\beta}(1-\alpha)^{2-\alpha-\beta}} \quad (7)$$

3. *Male migration is preferred to no migration if:*

$$\left(\frac{E(R_M)}{E(R_0)} \right)^2 \geq \frac{(2-\alpha-\beta)^{2-\alpha-\beta}}{4(1-\alpha)^{2-\alpha}(1-\beta)^{2-\alpha-\beta}} \quad (8)$$

These conditions highlight that the main driver of the choice is the expected financial gain from migration. Indeed, if the expected returns from migration do not exceed those of no migration, the spouses will prefer to stay in their village of origin. Similarly, if the expected gains from female migration significantly exceed those from male migration, households will prefer the former.

The comparisons above neglected the risk dimension of the three portfolios, which is implicit in the structure of individual and household preferences. Proposition 1 is indeed based on the comparison between levels of utility of the expected returns of each portfolio. But because individuals are risk averse the difference between utility of the expected returns may differ from that between levels of expected utility. For example, a riskier portfolio, that is, one with more volatile returns, may give lower expected utility than a safer one even if the associated expected returns are higher. Therefore, the final migration portfolio choice will crucially depend on relative expected risk too.

Finally, the spouses' individual preferences may still play a key role in determining the optimal migration portfolio. Figure 1 shows how the optimal choice varies depending on α (horizontal axis) and β (vertical axis) when the expected returns from male and female

migration are the same and are 50% higher than in the case in which no one migrates. It turns out that when both spouses are very selfish (high values of α and β), it will be optimal not to migrate. This happens because the spouse left behind would allocate very little resources to the common goods and the migrant spouse would not be willing to compensate for this by sending more remittances. This relation is not linear though: when the spouse left behind is very selfish, no migration will be preferred also in the case in which the migrant is very generous, because in this situation, the utility of the latter will be too low compared to the case of no migration. Finally, condition (6) also implies that when the expected returns from male and female migration are the same, the spouses will prefer the more generous spouse to leave as she would extract less private gains from her first mover advantage.

Figure 1. Optimal Migration Portfolios, by parental preferences.

Notes: $ER_f = ER_m = 1.5ER_0$. Gray area is where male migration is preferred to no migration. Horizontal dashed area where female migration is preferred to no migration. Dotted area is where female migration is preferred to male migration.

Comparative Statics

Having derived the optimal allocations in each scenario and the conditions under which the corresponding portfolios are SPNE, I can examine some comparative statics to understand how much of the (maximized) household income is spent on which types of goods and who benefits the most from the increase in the available budget that results from migration. Indeed, let small letters denote the share of household income devoted to each type of consumption goods. The model delivers the following prediction:

Proposition 2 *The share of total household income spent on expenditure on children will be the same no matter which of the parents migrates:*

$$z^* = z^{**} \quad (9)$$

where $z^* = \frac{Z^*}{E(R_F)}$ and $z^{**} = \frac{Z^{**}}{E(R_M)}$.

Proposition 2 results from the ability of the migrant to anticipate the allocation that will be chosen by the spouse left behind and offset the implied shift of resources away from the children by sending back more remittances. Note that, because these are shares of different amounts of income, proposition 2 does not imply that the *amount* spent for children is the same in the two scenarios but only that their share, relative to the available income, is.¹⁰

On the other hand, when comparing the shares of income spent for the private consumption of the adults I obtain the following:

Proposition 3 *The share of total household income spent for adult private goods is higher when the wife migrates and the husband stays than when the husband migrates and the wife stays if and only if women have stronger preferences for expenditure for children than men ($\alpha \geq \beta$):*

$$x_m^* - x_f^{**} = \alpha(1 - \beta) - \beta(1 - \alpha) = \alpha - \beta = \begin{cases} \geq 0 & \text{if } \alpha \geq \beta \\ < 0 & \text{otherwise} \end{cases} \quad (10)$$

This result derives from the fact that the share of income available for private consumption of the spouse left behind depends on the “generosity” of the migrant so that if women are more generous than men, the latter can enjoy more private consumption out of the wife’s remittances. Symmetrically, the implied loss of private good consumption of the migrant will be larger if she is more generous than the spouse left behind.

Finally, I can compare the allocations resulting from the mixed migration portfolios with those chosen when no migration takes place. It turns out that:

Proposition 4 *The migrant spouse consumes a larger share of the available income with respect to the situation in which no one migrates:*

$$x_f^* - x_f^0 > 0 \quad (11)$$

¹⁰ This result depends on the assumption that preferences have either unitary elasticity of substitution, that is, they are Cobb-Douglas, or null elasticity of substitution, that is, they are Leontief.

The spouse left behind gains from migration of the spouse, in terms of shares of income spent on his own private consumption, only when the migrant spouse is “generous enough”

$$x_m^* - x_m^0 \geq 0 \text{ if } \beta \geq \frac{1}{2} \quad (12)$$

Children always receive a larger share of income when none of their parents migrates, because either of them has incentives to shift resources onto own private consumption when alone.

$$z^* = z^{**} < z^0 \quad (13)$$

These results should not be interpreted as suggesting that, for example, children are always worse off when either of their parents migrates, or that the spouse left behind would prefer no migration to take place, because the allocations compared are in terms of shares of the total household budget available, which is generally larger than the budget available in the case of no migration, as suggested in proposition 1. Yet they highlight how, in the absence of a moral hazard problem, children of migrant parents would instead receive a larger share of the household income.

II. DATA

The empirical analysis is based on data from the Indonesia Family Life Survey (IFLS), an ongoing longitudinal survey of Indonesian households, which started in 1993, was repeated in 1997, 2000, and 2007, and contains a sample that is representative of about 83% of the total Indonesian population, including over 30,000 individuals living in 13 of the 27 provinces of the country.¹¹

By tracking individuals over time, these data allow detecting migration. Indeed, for all individuals who appeared in the first wave of the survey the IFLS roster provides information on where they currently are (if they are not in the household anymore), why and when they left and how much they earned in the past twelve months.

I define migrants as those adult people who have left the household and are reported to having done so for work reasons or explicitly to help the family. Table 1 shows that from the time of the first interview in 1993, fourteen years later more than one household out of four had at least one member that had migrated and not come back while, among individuals, migrants represented about 9%.

Table 1. Migration in the IFLS.

Wave	Individuals	Migrants	%	Households	Migrant Households	%
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¹¹ For a more detailed description of the dataset see Thomas et al. (2012).

1993	33,081	-	-	7,224	-	-
1997	39,714	1,701	4.28	7,699	1,304	16.94
2000	54,991	2,835	5.16	10,435	2,022	19.38
2007	73,016	6,352	8.70	13,536	3,787	27.98

Table 2 shows the gender composition of these migration flows: almost two thirds of those recorded as migrants in 2007 are men, but women are more than twice as likely as men to migrate internationally, and this is particularly true for mothers who leave their family behind. On the other hand women, especially those who leave their children behind, tend to stay away for a period of time that is significantly shorter than that of men.¹²

Table 2. Migrants by Gender. IFLS 2007.

	Number	% of total migrants	% international	Migration spell (months)
Migrants	6,352	-	11.04	62.89
Men	4,046	63.70	7.74	64.83
without children	3,255	51.24	7.74	64.10
with children along	493	7.76	2.44	78.23
with children left behind	298	4.69	16.55	51.23
Women	2,306	36.30	17.00	59.48
without children	1,892	29.79	13.27	59.76
with children along	222	3.49	10.36	76.43
with children left behind	192	3.02	60.32	37.48

To identify households who have chosen the different migration portfolios described in section I, I check, for every child under the age of 18, whether his father or mother migrated and the other parent is in the household. Table 3 shows the partition of households with children in the 2007 IFLS sample: the vast majority of them, over 95% chose a no migration portfolio, while 1.6% chose the female migration portfolio and 2.7% the male migration portfolio. A negligible share, about 0.4% chose a portfolio in which both parents migrated leaving their children behind with other relatives.

Table 3. Migration Portfolio Choices of Households with Children. IFLS 2007.

	Mother migrates	Mother stays
Father migrates	40	258
Father stays	152	9186

Table 4 provides a comparison between households that have chosen different migration portfolios: column (1) reports the characteristics of the households in which none of the parents migrated, column (2) refers to households in which either the mother or the father

¹² Table S.1 in the supplemental appendix reports descriptive statistics of the characteristics of migrants by gender, comparing those who have no children with those who migrate with their families and those who leave their family behind. While there are sizable differences between migrants who have children and those who don't, parents who bring their children along when they migrate do not appear to be significantly different from those who leave them behind, except for the fact that those who bring their children along are generally more educated.

migrated, while columns (3) and (4) split this sample between male and female migration. It appears that the differences between nonmigrant households (column 5) and migrant households are very stark: households with no migrants are more likely than migrant households to reside in urban areas, they generally have less children and are richer and more educated. The comparison between households in which the mother migrated and the father stayed and households in which the father migrated and the mother stayed (column 6) further reveals that these differences are amplified for households with migrant mothers; these are indeed more likely to live in rural areas, to be less educated and poorer, and to have more children, though these are on average older than those of migrant fathers. The last row of table 4 finally shows differences in terms of degree of risk aversion of the head of household.¹³ This measure is a 1–4 score derived from the answers to a sequence of questions in which respondents are faced with hypothetical lotteries with high stakes.¹⁴ It appears that migrant households are on average more risk averse than nonmigrant ones, while there is no significant difference between households who choose female migration and those who choose male migration.

Table 4. Descriptive Statistics, Households with Children. IFLS 2007.

	(1) Nonmigrant households	(2) Migrant households	(3) Migrant father	(4) Migrant mother	(5) Difference (1)-(2)	(6) Difference (3)-(4)
Size of household	4.623 (1.797)	4.590 (1.933)	4.570 (2.014)	4.558 (1.790)	0.033	0.012
Rural	0.545 (0.498)	0.643 (0.480)	0.587 (0.493)	0.711 (0.455)	-0.098***	-0.124*
Number of children	1.728 (1.009)	2.066 (1.114)	2.050 (1.135)	2.079 (1.077)	-0.338***	-0.029***
Age of children	8.456 (4.701)	10.05 (3.502)	9.680 (3.706)	10.39 (3.299)	-1.594***	-0.71*
Share of female children	0.494 (0.403)	0.474 (0.363)	0.462 (0.363)	0.499 (0.360)	0.02	-0.037
Mother's years of education	8.301 (4.333)	7.250 (3.364)	7.325 (3.593)	6.994 (2.789)	1.051***	0.331*
log total expenditure	15.22 (0.937)	15.08 (0.849)	15.15 (0.905)	14.93 (0.659)	0.14***	0.22**
Risk aversion of head	3.693	3.757	3.738	3.784	-0.064*	-0.046

¹³ Or the spouse when no measure for the head is available. Indeed the data show that the head's and her spouse's degree of risk aversion are significantly positively correlated, $\rho = 0.34$.

¹⁴ For example the first question asks: "Suppose you are offered two ways to earn income. With option 1, you are guaranteed an income of Rp 4 million per month. With option 2, you have an equal chance of earning either the same income, Rp 4 million per month, or, if you are unlucky, Rp 2 million per month, which is less. Which option will you choose?"

	(0.794)	(0.706)	(0.732)	(0.666)
N	9186	450	258	152

Notes: Standard deviations reported in parenthesis. Differences computed with standard errors clustered at village level. *** p<0.01, ** p<0.05, * p<0.1

III. EMPIRICAL STRATEGY

The equation of interest is one in which I estimate the shifts in the shares of total household expenditure from one category of consumption goods to the other when the parent that migrates is the mother rather than the father. This is:

$$w_{ih} = \alpha_{ih} + \beta \ln n_h + \gamma F_h + \delta X_h + u_{ih} \quad (14)$$

where on the left-hand side is the share of total household income allocated to expenditure for commodity i by household h , and on the right-hand side is the (log) number of members in the household n_h together with several household's observable characteristics X_h and a term F_h equal to one if the household is one in which the mother of the children has migrated, while the father did not, and zero if instead it was the father who is away and the mother remained with the children. The coefficient of interest is γ , associated with the term F_h ; this provides us with a measure of the *difference* between the budget allocation of households with migrant mothers and households with migrant fathers.

Equation (14) provides an empirical test of propositions 2 and 3. We will consider that there are some types of goods that are exclusively consumed by adults (X_m and X_f), while all other goods are, to different extents, consumed by both adults and children (Z). Specifically, expenditure for food, health, education, and durables will be proxies of Z , where education is a purely child-related expenditure, while food, health, and durables also partly pertain to adults; on the other hand, alcohol, tea, coffee, and tobacco will proxy for adults' exclusive private consumption, following Deaton (1989).¹⁵

Estimating the effects of migration and how they differ depending on the gender of the migrant spouse entails problems of endogenous selection into treatment of two types, as suggested in table 4: first there is a problem of *selection into migration* as households that decide to send some member out for migration will likely differ from the others on both observable and unobservable characteristics; second, there is a problem of *selection into female migration* because households from which it is the mother that migrates are likely to differ from those from which the father migrates in a number of unobservable factors that might as well influence the outcomes of interest.

¹⁵ Note that these adult goods are typically consumed more by men than women. In female headed households, the share of total income spent on these items is about 2% for each adult member, while in male headed households over 4%. This difference is larger if one compares households with no adult men with households with no women, in the former the share of total income spent on alcohol, tea, coffee, and tobacco is about 2.6% per adult, while in all men households it exceeds 9%. These figures, therefore, confirm that men have stronger preferences than women for this type of goods but also show that women, too, consume positive amounts of them.

The focus of the paper will be addressing the second type of selection so as to be able to compare households with migrant mothers to households with migrant fathers. On the other hand, the results of proposition 1 will provide a guide for interpreting the direction of the bias that may arise from conditioning on *selection of households into migration*. I thus build on the intuition of the theoretical model introduced in section I to derive a set of instrumental variables that may influence the decision of migrant households about which of the spouses to send out for migration but will not have any direct effect on the outcome variables of equation (14). The model of section I is translated to the data by first assigning “counterfactual” gender specific destinations to each household. To this purpose I identify, for each household, the year in which the migration decision has been taken as that in which the migrant has departed; I then consider the destinations chosen by previous migrants from the same village and take the destination that was most common among female migrants as counterfactual destination for women and the one that was most common among male migrants as counterfactual destination for men. Counterfactual destinations will vary by gender, time of departure, and village. The choice of assigning the most common destination of migrants from the same village to perspective migrants is supported by the evidence reported in table 5, which shows that over 60% of migrants from the same village had chosen the same destinations. This is in line with the literature that has documented the formation of *networks of migrants* (Bartel 1989; Altonji and Card 1991; Lafortune and Tessada 2012; Patel and Vella 2013) but can also, in this particular context, be explained by the widespread use in South Asia of recruiting agencies that are connected to other agencies in a foreign country and, therefore, typically send all of the people of the village they visit to the same destination (Parrenas 2001; Suradji 2004). Table 6 shows the gender specific destinations assigned to each household for the whole IFLS sample and for the restricted sample of households with a migrant parent. The only significant difference between the two samples is that migrant mothers are much more likely to be assigned Saudi Arabia as counterfactual destinations than the full sample of women, this is in line with the evidence in table 2 that women who leave children behind are much more likely to migrate internationally than any other type of migrant.

Table 5. Migrants per Village. IFLS 2007.

	Men	Women
Adults per village	55.31 (40.99)	58.70 (42.29)
Migrants per village	15.64 (14.002)	9.39 (9.185)
% Migrants at same destination	.617 (0.231)	.622 (0.234)

Notes: Standard deviations reported in parenthesis.

Table 6. Households' Counterfactual Gender Specific Destinations, 2007.

Counterfactual destinations	Men		Women	
	Full sample	Restricted sample	Full sample	Restricted sample
West Java	24.19	34.99	19.49	21.53
East Java	17.2	8.68	19.74	9.53
Central Java	13.43	14.66	14.41	14.48
Jakarta	12.02	15.69	12.49	15.08
North Sumatra	6.16	2.87	5.3	6.7
Lampung	4.44	5.76	2.93	2.73
South Sumatra	3.93	2.99	3.06	2.58
South Sulawesi	3	2.09	2.94	2.75
West Nusa Tenggara	2.29	3.32	1.96	3.10
Bali	2.16	1.07	1.86	1.08
South Kalimantan	2.08	0.52	2.06	0.53
West Sumatra	1.97	0.95	2.28	3.7
Yogyakarta	1.86	0.45	1.89	0.43
Riau	0.74	0.30	0.39	0.33
Banten	0.35		0.1	
Southeast Sulawesi	0.24	0.50		
East Kalimantan	0.18	0.37	0.49	0.50
Central Kalimantan	0.09			
N Aceh Darussalam	0.03		0.07	
Irian Jaya	0.02			
Sumatra	0.01			
Bengkulu	0.01			
West Sulawesi	0.01			
Central Sulawesi			0.28	
North Sulawesi		0.11		
Malaysia	3.43	4.74	1.98	3.83
Singapore				0.03
Taiwan				0.02
Saudi Arabia	0.01		5.65	18.60
Timor Leste		0.03		
United Arab Emirates			0.56	0.43
N	13273	335	13134	336

Once I have assigned gender specific destinations to each household, I exploit again the information about previous migrants and generate, for every destination and year of migration decision, a measure of expected returns and risk by taking the mean and standard deviation of the incomes of all male and female migrants that previously migrated to that destination, and combining them as in equations (1) and (2). Note that these instrumental variables will take different values depending on the village of origin and time of migration, so that they will eventually be household specific, in that, once households from the same village have been ordered on the basis of the time of departure, the values of wages of previous migrants will be different from one another. For what concerns the covariance between income at home and income at destination, instead, I exploit the longitudinal dimension of the data, and compute the covariance for every village-destination pair across waves. Table 7 shows that, on average, the expected wages

of men upon migration are higher than those of women, but also more volatile. The difference between men's and women's expected wages is even larger if they remain in the home village, while the difference in variance remains similar. In terms of covariance between migrant's and spouse's wages, men's migration is associated with higher risk. Finally, when combining the expected wages and the associated risk as in expressions (1) and (2), the difference between the two portfolios becomes much less clear with male migration being slightly less remunerative and riskier.

Table 7. Expected Returns and Risk from Migration Portfolios (Log).

	Men		Women		(5)	(6)
	(1)	(2)	(3)	(4)		
	Full sample	Restricted sample	Full sample	Restricted sample	Difference (1)-(3)	Difference (2)-(4)
$E(w_i^d)$	16.218 (0.516)	16.205 (0.403)	15.945 (0.361)	16.067 (0.353)	0.273***	0.138***
$E(w_i^h)$	16.056 (0.494)	15.964 (0.490)	15.641 (0.614)	15.647 (0.604)	0.415***	0.317***
$Var(w_i^d)$	16.390 (0.881)	16.345 (0.766)	15.912 (0.556)	15.934 (0.529)	0.478***	0.411***
$Var(w_i^h)$	16.133 (0.731)	16.007 (0.734)	15.723 (0.766)	15.779 (0.834)	0.41***	0.228***
$Cov(w_i^d, w_{-i}^h)$	32.051 (1.235)	32.094 (1.110)	32.030 (0.903)	31.928 (0.947)	0.021***	0.166***
$E(R_i)$	16.722 (0.408)	16.719 (0.365)	16.739 (0.347)	16.755 (0.336)	-0.017***	-0.036*
σ_i	16.870 (0.788)	16.905 (0.728)	16.799 (0.567)	16.744 (0.562)	0.071***	0.161***
N	13507	337	13457	337		

Notes: Standard deviations reported in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

The first stage specification for selection into female migration will include relative expected returns of the two migration portfolios as suggested in proposition 1, but also relative risk of the two portfolios and risk aversion of the household. The latter will be included as a control variable on its own and then as an instrumental variable when interacted with the level of risk:

$$F_h = a_h + b_1 \left(\frac{ER_f}{ER_m} \right)_h + b_2 \left(\frac{\sigma_f}{\sigma_m} \right)_h + b_3 RA_h \times \left(\frac{\sigma_f}{\sigma_m} \right)_h + c_1 RA_h + c_2 \ln n_h + c_3 X_h + v_h \quad (15)$$

The coefficients of the instrumental variables are b_1 , b_2 and b_3 , while the other variables will not be excluded from regression (14).

In terms of validity of these instruments, I imagine that households will make their migration decision based on their information about the possibilities they might have at destination; thus, it is reasonable to believe that the experience of previous migrants best represents the information set available to potential migrants. The implicit assumption is that migrants' wages are not determined by the individual characteristics of the migrant but are somehow exogenously set so that nonmigrants would be faced with the same wages if they migrated. This assumption is supported by the data reported by the Indonesian Statistical Office (Badan Pusat Statistik 2007) about jobs of international migrants. These show that there is strikingly little variation in the types of jobs Indonesian migrants get at destination: 53% of migrants who were abroad in 2007 worked as domestic helpers, while 42% as either construction, factory, or plantation workers. Although this information is not available by gender, one can see a clear difference between typical female jobs and typical male jobs: domestic workers are very likely to be the female migrants (whose total percentage is in fact around 55% of total international migrants in the IFLS), while the construction, factory, and plantation workers are likely to be the men. As these are all very low skilled jobs, it becomes reasonable to assume that wages are fixed and exogenous. Moreover, at least for women, there is vast anecdotal evidence that they are hired to go work abroad as domestic workers under standard contracts that specify the same wage and duration of employment for all (Lan 2006; Parrenas 2001; Suradji 2004).

IV. RESULTS

The outcomes of interest are the shares of total household income spent for a given type of commodity. To compute the denominator, I follow Dai et al. (2011) who have estimated the distribution of household income using the same data from the fourth wave of the IFLS. Income is thus obtained summing up five components: labor income; income from agricultural business; income from nonagricultural business; household nonlabor income (scholarships, pensions, other transfers); household assets income. Moreover, to correct for attrition, a two step Heckman procedure is applied, in which the probability of response is predicted by dummy variable for whether the respondent is the head of the household. Levels of (log) income and predicted income are reported in table 8 suggesting, as in table 4 that migrant households are on average poorer than nonmigrant households and households with migrant mothers poorer than households with migrant fathers.

Table 8 further shows descriptive statistics for the shares of income allocated to the various types of commodities, distinguishing, in particular, between common goods, that is, food, education, health, and durables and exclusively adult goods, which include

alcohol, tobacco, coffee, and tea.¹⁶ It appears that generally migrant and nonmigrant households devote similar shares of household income to the various commodities, with the exception of adult goods, whose share is significantly larger in nonmigrant households. This is somehow suggestive of the fact that both parents consume alcohol, tobacco, coffee, and tea, so that when there is only one of them in the household, the share of income spent on these items falls. Yet this drop is larger in the case in which the husband migrates, because men generally have stronger preferences for these goods. Indeed, the comparison between households with migrant mothers and households with migrant fathers reveals that the latter devote a significantly larger share of income to food expenditure and less to adult goods, reflecting differences in tastes between men and women.

Table 8. Household Income Levels and Shares.

	Nonmigrant households	Migrant households	Migrant father	Migrant mother	Difference (1)-(2)	Difference (3)-(4)
Household income (log)	16.56 (0.711)	16.26 (0.704)	16.25 (0.717)	16.26 (0.621)	0.3***	-0.01
Predicted household income (log)	16.47 (0.711)	16.36 (0.644)	16.42 (0.687)	16.25 (0.500)	0.11***	0.17**
Shares of income spent on:						
Food	0.634 (4.717)	0.711 (0.800)	0.764 (0.858)	0.582 (0.668)	-0.077	0.182**
Education	0.153 (1.460)	0.161 (0.255)	0.171 (0.304)	0.137 (0.158)	-0.008	0.034
Health	0.0513 (0.586)	0.0481 (0.228)	0.058 (0.292)	0.027 (0.094)	0.003	0.031
Durables	0.0139 (0.528)	0.130 (2.188)	0.0202 (0.377)	0.001 (0.007)	-0.116	0.019
Adult goods	0.117 (0.826)	0.080 (0.135)	0.060 (0.133)	0.108 (0.133)	0.037***	-0.048***

Notes: Standard deviations reported in parenthesis. Differences computed with standard errors clustered at village level. *** p<0.01, ** p<0.05, * p<0.1

Equation (14) is first estimated through OLS; the results are reported in table 9, controlling only for household size in the first panel, and adding an indicator for rural households, the number of years of education of the mother and the (log of) total household expenditure in the second panel. To correct for correlation of errors within villages, standard errors are heteroskedastic robust and clustered at village level in all specifications. The OLS results confirm that households in which mothers have migrated spend significantly more on adult goods, the shift being about 6 percentage points, and less on common goods,

¹⁶ Note that these shares do not add up to one for two reasons: the first is that the denominator is a measure of predicted income and not total household expenditure; this is done to better replicate the theoretical predictions. Second, there is a residual, unobserved category of expenditure, which is that for private consumption of the migrant.

although these coefficients are not statistically significant once I control for those characteristics that most differ between the two groups of households. Indeed, the inclusion of control variables seems to amplify the difference in adult goods consumption revealed in table 8 and to reduce the difference in terms of food consumption.

Table 9. OLS Estimation. Household Level.

	Shares of household income spent on:				
	(1)	(2)	(3)	(4)	(5)
	Food	Education	Health	Durables	Adult
A. No controls					
Migrant mother	-0.206** (0.096)	-0.036 (0.029)	-0.034 (0.023)	-0.024 (0.018)	0.057*** (0.017)
Size of household	-0.402*** (0.104)	-0.078*** (0.023)	-0.105* (0.062)	-0.004 (0.005)	-0.019 (0.020)
Observations	337	337	337	337	337
R ²	0.053	0.019	0.033	0.001	0.045
B. Controls included					
Migrant mother	-0.104 (0.079)	-0.012 (0.022)	-0.019 (0.019)	-0.024 (0.019)	0.062*** (0.017)
Size of household	-0.032 (0.099)	-0.036 (0.031)	-0.080 (0.052)	0.000 (0.006)	0.000 (0.019)
Observations	337	337	337	337	337
R ²	0.376	0.097	0.064	0.003	0.078

Notes: Controls are rural household, years of education of mother, log total household expenditure. Standard errors robust to village level clustering in parenthesis. *** p < 0.01, ** p < 0.05, * p < 0.1

If households from which mothers migrate are on average poorer, more rural and less educated than households from which fathers migrate (table 4), the OLS coefficient associated with common goods will likely be downward biased. For this reason, in order to control for the possibility that households from which mothers migrate differ from those from which it is the father who leaves, I proceed to estimate equation (14) by two-stage least squares (TSLS).

Table 10 shows the results of the first stage regression: columns (1)–(3) use the measures of expected returns and risk of migration portfolios constructed according to equations (1) and (2). The signs confirm the existence of a trade off between expected returns and expected risk and acknowledge the amplifying effect of risk aversion. Moreover, more risk averse households tend to prefer female migration thus confirming the idea, suggested in Lauby and Stark (1988) and de la Brière et al. (2002), that female migration is perceived as a “safer” investment than male migration. Columns (4)–(6) then use only the *destination side* of the migration portfolios; this is done to reduce the number of instruments and their potential collinearity and hence increase the power of the first stage

predictions. These regressions confirm that female migration is more likely when it is associated with higher expected returns and lower variance relative to male migration. For all specifications, the last three rows of the table report the values of the F statistic of excluded instruments. A first look at these values convinces us that the most efficient specification is that of column (7), which displays the highest level of the F statistic and includes the control variables.

Table 10. First Stage Regression.

	Migrant mother							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$E(R_f) / E(R_m)$	0.059 (0.069)	0.241 (0.185)	0.362** (0.180)	0.379** (0.174)				
σ_f / σ_m		-0.089 (0.081)	-0.113 (0.078)	0.000 (0.127)				
$RA \times \sigma_f / \sigma_m$				-0.029 (0.031)				
$E(w_f^d) / E(w_m^d)$					0.149*** (0.057)	0.297*** (0.101)	0.316*** (0.100)	0.308*** (0.100)
$Var(w_f^d) / Var(w_m^d)$						-0.092* (0.048)	-0.090* (0.047)	0.039 (0.106)
$RA \times Var(w_f^d) / Var(w_m^d)$								-0.032 (0.026)
RA				0.032 (0.040)				0.013 (0.043)
Controls	n	n	y	y	n	n	y	y
Observations	377	369	334	318	379	372	337	321
R^2	0.002	0.010	0.053	0.067	0.026	0.046	0.081	0.090
F statistic	0.746	1.919	3.941	3.232	10.03	8.840	9.374	6.297

Notes: $E(R_i)$ are the expected returns from migration of individual i , σ_f is the associated risk, RA is the degree of risk aversion, $E(w_i^d)$ are the expected wages of migrant i at destination, $Var(w_f^d)$ is their variance. Controls are: size of household, rural household, years of education of mother, log total household expenditure. Standard errors robust to village level clustering in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 11 shows the results of the TSLS estimation of equation (14). Comparing these with those of the OLS, we observe that the increase in adult goods expenditure is larger than it was in the OLS, while the effect on all types of common goods is not statistically different from zero.

Table 11. Two-Stage Least-Squares Estimation. Household Level.

Shares of household income spent on:				
(1)	(2)	(3)	(4)	(5)

	Shares of household income spent on:				
	Food	Education	Health	Durables	Adult
A. No controls					
Migrant mother	0.026 (0.335)	-0.082 (0.112)	0.089 (0.150)	-0.007 (0.019)	0.165** (0.083)
Size of household	-0.419*** (0.102)	-0.074*** (0.023)	-0.114 (0.070)	-0.005 (0.005)	-0.027 (0.022)
Observations	337	337	337	337	337
Uncentered R^2	0.443	0.278	0.0163	0.00285	0.162
F statistic	8.604	8.604	8.604	8.604	8.604
Hansen J statistic	0.847	1.025	1.018	2.127	0.812
p-value	0.357	0.311	0.313	0.145	0.367
B. Controls included					
Migrant mother	-0.293 (0.337)	-0.082 (0.102)	0.082 (0.135)	-0.017 (0.020)	0.149** (0.074)
Size of household	-0.027 (0.102)	-0.034 (0.030)	-0.083 (0.054)	0.000 (0.005)	-0.002 (0.021)
Observations	337	337	337	337	337
Uncentered R^2	0.633	0.329	0.0652	0.00462	0.230
F statistic	9.374	9.374	9.374	9.374	9.374
Hansen J statistic	0.723	0.775	0.771	1.938	0.637
p-value	0.395	0.379	0.380	0.164	0.425

Notes: Controls are rural household, years of education of mother, log total household expenditure. Standard errors robust to village level clustering in parenthesis. *** p < 0.01, ** p < 0.05, * p < 0.1

These findings confirm the predictions of the model in section I for which the difference in the share of household income devoted to investment on children, here expenditure on food, health, education, and durables, is the same in households from which the father migrated and households from which it was the mother that migrated, $z^* = z^{**}$. This would be due to the fact that the migrant spouse can use remittances as a way to offset the shifts in the allocation of the household budget that would be made by the spouse left behind. On the other hand, proposition 3 was predicting that the difference in the share of household income devoted to adult's private consumption between the case in which the mother migrated and that in which the father migrated, $x_m^* - x_f^{**}$, was equal to $\alpha - \beta$, positive if women have a stronger preference for investment on children with respect to men. The estimated coefficient thus suggests that men's preferences are such that they would like to spend around 15% more than women on private consumption rather than on expenditure on common goods. These results also implicitly indicate that the migrant

mother suffers a loss of private consumption that is larger than that suffered from a migrant father.¹⁷

The estimates may be biased by *selection into migration* if households that choose to send one of the spouses away for migration systematically differ from nonmigrant households in terms of spouses' preferences.¹⁸ Indeed, figure 1 suggested that, if the returns to migration are not high enough, a mixed migration portfolio may not be optimal if either of the spouses was excessively selfish, that is, if either α or β were particularly high. In this sense, the estimated difference would be a *lower bound* of the actual difference between men's and women's generosity toward children.¹⁹

That women have stronger preferences for consumption on common goods than men has been highlighted by many studies: Thomas (1990), Lundberg et al. (1997), Duflo (2003), Qian (2008), and Ashraf (2009) all show that income accruing to women generates larger benefits for children than that accruing to men. Unfortunately, it is generally difficult to compare the magnitude of these estimates with those found in this paper because in most cases both the outcome and the explanatory variables are defined differently. Yet there are at least three papers that contain comparable estimates as they use as outcome variables the shifts in the shares of household expenditure. Aggregating their shares in a way that is comparable to the one used in this paper, Hoddinott and Haddad (1995) show that the shares of the household budget allocated to adult goods are between 3.2 and 6.6 percentage points lower in the case in which the woman earns the whole household budget with respect to the case in which it is the man. Similarly, Attanasio and Lechene (2002) find

¹⁷ An alternative mechanism underlying these results could be that women and men, when migrating, change their preferences over investment on children. Specifically, if women experienced very low returns to education when migrating, relative to what they observed before migrating, it may be that they decide to invest less on children's education. This would explain the result that investments on children's education are not affected by female versus male migration. To rule out this mechanism, I computed returns to education at each counterfactual destination and compared them to returns to education in the migrant's home village. Results are reported in table S.4 in the supplemental appendix and show that there is no significant difference between returns to education observed in the home village and those observed by the migrant at destination. It is thus unlikely that the pattern of results observed can be explained by changes in preferences over investment on children's human capital generated by the different migration experience of men and women.

¹⁸ Another source of selection bias may be due to differences between migrants who bring their children along and those who leave them behind. Table S.1 in the supplemental appendix shows that these are very similar, the only significant difference being the level of education, which is controlled for in all specifications.

¹⁹ Tables S.2 and S.3 in the supplemental appendix report the results of two different empirical specifications which are meant to account for *selection into migration*. The first is panel fixed effect estimation in which I distinguish the effect of having one spouse away from that of having the mother instead of the father. The estimates show that households with migrant mothers still spend significantly more on adult goods. The difference (+6%) is smaller but not statistically different from that of table 11. Table S.3 in the supplemental appendix, instead, reports the estimates of a three-stage estimation (Wooldridge 2010) in which risk aversion is used in a first stage as instrument for selection into migration, and then, in a second stage, the usual instruments are used to correct for selection into female migration and the Inverse Mills Ratio from the first stage is included. Unfortunately, the inclusion of the IMR, weakens the instruments so that the final coefficients are very imprecisely estimated. The coefficient for adult goods yet is now considerably larger in magnitude.

that a 100% increase of the woman's household income share generates a decrease in the share of expenditure allocated to alcohol and tobacco between 19 and 40 percentage points. The two papers just cited do not provide an exact test of the model introduced in this paper because the presence of the spouse, even when she does not contribute to the household's income at all, is likely to affect the choice of how to allocate it and because in the case of migration the migrant spouse does not typically earn the full household income although generally becomes the main income earner. Finally, the paper by Ashraf (2009) offers an interesting comparison: she uses an experimental setting in the Philippines to test whether husbands and wives have different preferences over the allocation of the household budget and how information and communication affect their choices. Interestingly, she shows that in situations in which one of the spouses receives a temporary shock to income and the other spouse is not able to control how she spends this extra budget (in the setting of her experiment this is the "Private" treatment), 60.4% of men versus 52.1% of women choose to deposit that money on their own private account rather than converting it into food vouchers. This is a rough test of the difference in the "generosity" parameters included in the parents' utility functions as described in section I and suggests that $\alpha - \beta = 8.3\%$, a number lower but still close enough to the estimates of table 11.

V. ROBUSTNESS CHECKS

Table 12 reports the results obtained under several alternative empirical specifications together with the main OLS and TSLS estimates. The first alternative specification is a method proposed by Wooldridge (2010) to improve efficiency of TSLS estimates. This consists in estimating first a binary response model $P(F_h = 1 | x, z) = G(x, z, \gamma)$ by maximum likelihood (typically probit), obtaining the fitted probabilities $\hat{F}_h$ and then estimating the outcome equation by IV using as instrument $\hat{F}_h$. The estimates obtained through this method are very similar in magnitude to the TSLS ones but more precise.

The main concern, though, relates to the possibility that the instruments employed may be weak and thus the TSLS estimates would be biased toward the corresponding OLS estimates. Indeed, the F statistic of the TSLS only exceeds the critical value corresponding to 20% size of test as of Stock and Yogo (2002). To test the robustness of the TSLS results to instruments' weakness I first estimate equation (14) using only the most powerful instrument I have, namely $E(w_f^d) / E(w_m^d)$. As suggested by the higher value of the corresponding F statistic, these estimates are less biased toward the OLS. The coefficient for adult goods is larger in magnitude than the TSLS one but not statistically different from it. Second, in the case of over identified models, the limited information maximum likelihood estimator (LIML) and the Fuller- k estimator (with $\alpha = 1$) are less subject to weak instruments bias than TSLS, as showed by Stock et al. (2002). Indeed, the LIML estimates reported in table 12 turn out to be associated with the lowest critical values of the F statistic and are thus the most unbiased as the corresponding value of the F statistic exceeds the 10% critical value. As predicted by Blomquist and Dahlberg (1999), the absolute magnitude of the coefficients estimated through LIML is slightly larger than the

TSLS estimates, as are the standard errors, but the fact that the difference between the coefficients estimated with the two methods is negligible reinforces the hypothesis that the instruments have enough predictive power. Indeed, if they were weak, the TSLS estimates would have been much closer to the OLS ones than to the LIML ones. Also, the Fuller specifications²⁰ with $\alpha = 1$ and $\alpha = 4$ produce lower threshold values for the F statistic and thus are less biased than the TSLS coefficients, and their magnitude is almost identical to the TSLS.

Table 12. Robustness Checks: Weak Instruments.

	Shares of household income spent on:					F <i>statistic</i>	Stock-Yogo weak ID test critical values		
	(1) Food	(2) Education	(3) Health	(4) Durables	(5) Adult		10%	20%	30%
OLS	-0.104 (0.079)	-0.012 (0.022)	-0.019 (0.019)	-0.024 (0.019)	0.062*** (0.017)				
TSLS	-0.293 (0.337)	-0.082 (0.102)	0.082 (0.135)	-0.017 (0.020)	0.149** (0.074)	9.374	19.93	8.75	7.25
Wooldridge	-0.096 (0.251)	-0.079 (0.094)	0.074 (0.131)	-0.028 (0.020)	0.143** (0.071)	18.61	16.38	6.66	5.53
IV	-0.153 (0.342)	-0.017 (0.126)	0.150 (0.158)	-0.053 (0.041)	0.186** (0.087)	14.03	16.38	6.66	5.53
LIML	-0.299 (0.348)	-0.086 (0.107)	0.088 (0.143)	-0.017 (0.020)	0.154** (0.078)	9.374	8.68	4.42	3.92
Fuller ($\alpha = 1$)	-0.288 (0.329)	-0.081 (0.101)	0.082 (0.135)	-0.018 (0.019)	0.149** (0.073)	9.374	10.89	9	7.49
Fuller ($\alpha = 4$)	-0.262 (0.282)	-0.071 (0.087)	0.067 (0.116)	-0.019 (0.016)	0.136** (0.062)	9.374	10.89	9	7.49

Notes: Controls are size of household, rural household, education of mother, log total household expenditure. Standard errors robust to village level clustering in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

In terms of exogeneity of the instruments, as those I am employing are time (of migration) and village specific, one may be concerned that some villages have unobserved characteristics that simultaneously affect the share of household income devoted to a certain commodity and the destination, or the wages at destination, of the migrants. For example, suppose a village has a very good nursing school, women there will mainly be nurses and thus obtain, when they migrate, a certain specific wage. Yet the fact that the

²⁰. When errors are normally distributed and instruments are fixed, the Fuller- k with $\alpha = 1$ is best unbiased to second order (Rothenberg 1984). While the critical values for the F statistic are not significantly lower than those for TSLS, this estimator has been proved to yield more precise estimates than both TSLS and LIML when instruments are weak.

village hosts a good nursing school will presumably be correlated to a higher taste for expenditure on health. To rule out similar possibilities, I regress a number of village specific characteristics on the instruments to check that there is no correlation between the two. The results are reported in table 13 and show no clear pattern of correlations that give enough confidence about the exogeneity of the instruments.

Table 13. Robustness Checks: Exogenous Instruments.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	% of households with electricity	elementary schools	junior high schools	number of midwives	health posts	distance to coach station	distance to post office
$E(w_f^d) / E(w_m^d)$	-5.901 (4.430)	-0.599 (0.499)	0.316 (0.283)	-0.115 (0.106)	0.950 (1.233)	23.984 (21.131)	-0.950 (1.940)
$Var(w_f^d) / Var(w_m^d)$	3.782** (1.815)	0.293 (0.226)	-0.336** (0.163)	0.015 (0.048)	0.264 (0.540)	-11.480 (8.781)	-1.190 (0.872)
Observations	12,217	12,766	12,686	8,796	12,190	9,229	10,183
R^2	0.0188	0.0046	0.0217	0.0056	0.0155	0.0105	0.0299

Notes: Unit of observation is household. Standard errors robust to village level clustering in parenthesis. *** p < 0.01, ** p < 0.05, * p < 0.1

As a last check I performed some Montecarlo simulations to assess the robustness of the estimates. I have drawn 1,000 random samples, adequately calibrated to reproduce the correlation between endogenous and outcome variable of the real sample, and I estimated the TSLS and the LIML coefficients for each drawn. Table 13 reports the averages and standard deviations of the coefficients estimated, together with the corresponding F statistic, the p-value of the test of over identifying restrictions and the confidence interval corresponding to the test of equality between the coefficient estimated from the simulated sample and the ones estimated from the real sample and reported in table 12. The coefficients estimated are very similar to those of table 11, I do not reject that they are equal in more than 95% of the cases (*coverage*). Moreover, the F statistic is now systematically larger than 10, which is above the 20% level of the Stock and Yogo (2002) critical values for the TSLS, and above the 10% one for the LIML estimator. Finally, the Hansen J test of overidentifying restrictions leaves us little doubt about the possibility that the instruments are not exogenous.

Table 14. Robustness Checks: Montecarlo Simulations.

	Shares of household income spent on:				
	(1) Food	(2) Education	(3) Health	(4) Durables	(5) Adult
OLS	-0.104 (0.079)	-0.011 (0.033)	-0.020 (0.028)	-0.032 (0.066)	0.062 (0.016)
TSLs	-0.113 (0.348)	-0.084 (0.141)	0.068 (0.124)	-0.042 (0.283)	0.14 (0.075)
<i>Coverage</i>	[0.969]	[0.964]	[0.964]	[0.967]	[0.951]
<i>F</i> statistic	10.669	10.723	10.719	10.654	10.624
Hansen J Statistic - p value	0.502	0.503	0.502	0.993	0.504
LIML	-0.113 (0.393)	-0.092 (0.164)	0.074 (0.139)	-0.043 (0.319)	0.146 (0.084)
<i>Coverage</i>	[0.968]	[0.965]	[0.968]	[0.966]	[0.956]
<i>F</i> statistic	10.669	10.723	10.719	10.654	10.624
Hansen J Statistic - p value	0.504	0.506	0.505	0.957	0.508

Notes: Standard deviations in parenthesis. Number of iterations = 1,000. *Coverage* is the frequency with which the hypothesis of equality between coefficient estimated from actual sample and coefficient estimated from simulated sample has not been rejected. Controls included. Standard errors robust to village level clustering.

VI. CONCLUDING REMARKS

This paper explores the effects of parental migration on investments on children left behind. The main concern is that migration of one of the spouses may be associated with a shift of resources away from the children due to a moral hazard problem: as the migrant loses the ability to observe the behavior of the spouse left behind, this creates for the latter incentives to shift resources away from the common goods, which include investments on children, onto the private ones.

I showed that in a model in which first the two spouses cooperatively choose whether and who should migrate, then the migrant decides how much to send back home in the form of remittances and, finally, the spouse left behind chooses how to allocate the available budget within the household, the subgame perfect Nash equilibrium is one in which the share of total income devoted to children is the same no matter which of the parents migrates. This is because remittances act as a device in the hands of the migrant to offset the decisions of the spouse left behind.

I tested the predictions of this model on data from Indonesia, where female migration is particularly widespread. To account for endogenous selection into migration, I exploited information about previous migrants' earnings and built measures of expected returns and risks of, respectively, male and female migration to use as instrumental variables. I thus showed that households prefer to send away the member who is expected to earn more upon migration and whose earnings will be less volatile. The estimation results revealed

that the share of total income devoted to children-related expenditure does not change significantly between the case in which the father migrates and that in which it is the mother that leaves. On the other hand, the difference in the share of total household income devoted to private adult consumption between the case in which the mother migrates and that in which it is the father is positive and reflects the difference in tastes for investment on children. This would be about 15 percentage points.

The findings of this paper indicate that, at least through the channel of household expenditure, mother's migration has no detrimental effects on children compared to father's migration as long as the migrant mother has the possibility of compensating the shift of resources away from children by sending more remittances back home. As this comes at the expenses of the mother's own private consumption, it may be desirable to improve the control of migrants over the money they send back home, for example by allowing them to directly pay for children's schools and cares. A similar policy would reduce the moral hazard problem that arises when one of the spouses migrates and generate an allocation of the household budget closer to the first best one. Moreover, if migrants were better able to control the allocation of the remittances they send back home, more people, especially women, would be willing to migrate to increase the household budget and, through this, investment on children.

Clearly, parental migration may well affect children's wellbeing through channels that go beyond the financial resources spent on their health or education. While quantifying these "non-monetary" effects of parents' migration on children is beyond the aim of this paper, in table 15 I estimated the direct effects of mother's versus father's migration on several indicators of children welfare, which I split into health, education, and work measures. These estimates reveal no differences in the effects on conventional anthropometric measures, nor on cognitive test scores. On the other hand, there appears to be a significant drop in the amount of time children spend at school, mirrored by an increase in the time they spend on house work when the children's mother migrates. This *disruption effect* may have long lasting consequences on human capital accumulation that are not observable in the short term (as, for example an increase in grade repetition as documented by Cortes [2015]). It may therefore be desirable to provide more assistance to households of migrant mothers in terms of housework aid and school support for children.

Further research should investigate the long term effects on children's human capital so as to provide a broader assessment of the effects of the *feminization of migration*. This would also require some analysis of the behaviors of female migrants upon return to their country of origin and to their household. The experience acquired by these women during their migration spell may, indeed, induce significant changes in the household's decision making process and thus on children's welfare.

Table 15. Effects on Children. IFLS 2007.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Weight for height z-score	Height for age z-score	Weight for age z-score	Hours at school weekly	Cognitive test score	Hours work for wage weekly	Hours work family business weekly	Hours work househol d weekly
OLS								
Migrant mother	-0.008 (0.034)	0.057 (0.113)	0.017 (0.108)	-3.699** (1.468)	-0.014 (0.023)	0.063 (0.437)	0.382 (0.655)	0.144 (0.730)
Age	0.083*** (0.003)	-0.018* (0.010)	-0.020** (0.009)	1.260*** (0.252)	0.022*** (0.003)	0.142 (0.094)	0.222*** (0.069)	0.462*** (0.108)
Female	0.035 (0.032)	-0.307*** (0.098)	-0.038 (0.087)	0.939 (1.225)	0.032* (0.019)	0.222 (0.433)	0.640 (0.662)	1.616*** (0.543)
Controls	y	y	y	y	y	y	y	y
Observations	610	611	610	348	439	404	404	404
R ²	0.546	0.042	0.033	0.110	0.173	0.013	0.049	0.082
TSLS								
Migrant mother	-0.139 (0.106)	0.511 (0.373)	-0.070 (0.370)	-15.505*** (6.409)	0.010 (0.078)	0.605 (1.199)	0.203 (1.932)	6.406** (3.177)
Age	0.084*** (0.003)	-0.019* (0.012)	-0.014 (0.010)	1.174*** (0.279)	0.022*** (0.003)	0.151 (0.100)	0.226*** (0.072)	0.474*** (0.121)
Female	0.027 (0.034)	-0.327*** (0.104)	-0.079 (0.087)	1.789 (1.370)	0.036* (0.020)	0.183 (0.517)	0.713 (0.649)	1.367** (0.589)
Controls	y	y	y	y	y	y	y	y
Observations	566	567	566	324	404	378	378	378
R-squared	0.537	0.009	0.027	-0.081	0.166	0.009	0.049	-0.202
Uncentered R ²	0.769	0.0334	0.0595	0.710	0.923	0.0200	0.0741	0.00585
F statistic	22.57	22.59	22.57	10.62	21.23	11.49	11.49	11.49

Notes: Controls are size of household, rural household, mother's years of education, log total household expenditure. Standard errors robust to household level clustering in parenthesis. *** p < 0.01, ** p < 0.05, * p < 0.1.

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Supplemental Appendix

This Appendix provides supplemental material for Rizzica (2016) "*When the cat's away...* The effects of spousal migration on investments on children", *World Bank Economic Review*.

S.1. CORNER SOLUTION OF SPNE

When:

$$\frac{E(w_f^d)}{E(w_h^m)} \leq \frac{\beta}{1-\beta} \quad (1)$$

the migrant will not be able to send remittances because her income at destination is not high enough to compensate for her selfishness (β). In this case a corner solution arises, in which:

$$\begin{aligned} R^* &= 0 \\ X_m^* &= \alpha E(w_h^m) \\ X_f^* &= E(w_d^f) \\ Z^* &= (1-\alpha) E(w_h^m) \end{aligned} \quad (2)$$

Comparing ex-ante the levels of utility achievable in each scenario, the following conditions are derived:

Proposition S.1 *When the spouses cooperatively choose the migration portfolio that ex ante maximizes their joint expected utility, and the expected wage of the migrant is "relatively low":*

1. *Female migration is preferred to male migration if:*

$$\left(\frac{E(w_f^d)}{E(w_m^d)} \right)^{\alpha-\beta} \leq \frac{\alpha^\alpha (1-\alpha)^{2-\alpha-\beta}}{\beta^\beta (1-\beta)^{2-\alpha-\beta}} \quad (3)$$

2. *Female migration is preferred to no migration if:*

$$\left(\frac{E(w_f^d)}{E(w_h)} \right)^\beta \geq \frac{\beta^\beta (2-\alpha-\beta)^{2-\alpha-\beta}}{(1-\alpha)^{2-\alpha-\beta}} \quad (4)$$

3. *Male migration is preferred to no migration if:*

$$\left(\frac{E(w_m^d)}{E(w_h)} \right)^\alpha \geq \frac{\alpha^\alpha (2 - \alpha - \beta)^{2-\alpha-\beta}}{(1 - \beta)^{2-\alpha-\beta}} \quad (5)$$

As in the case of the internal solution, the main driver of the choice is the expected gain from migration. The conditions above are derived for the case in which the expected wage in the home village is the same for men and women. In this case migration arises when the expected wage of the migrant is sufficiently larger than that of the spouse left behind. If it is equal or smaller, the spouses prefer no one to migrate. If the expected wage of the woman and the man upon migration is the same, the spouses prefer the more selfish of the two to migrate. This happens because in this case the allocation of resources to the public good is entirely in the hands of the spouse left behind.

Figure S.1 shows the optimal choices for varying values of α (horizontal axis) and β (vertical axis). Migration with no remittances is preferred to no migration for very high values of β (female migration) and α (male migration). Indeed, the more the migrant is selfish, the less she would contribute to the common good if she was in the household. Yet, if both are very selfish migration is less likely to be optimal because the spouse left behind would allocate too little resources to the common good.

In terms of allocations, the difference between the *share of expenditure* for private adult good between the case of female and male migration is $\alpha - \beta$ ($\beta - \alpha$ for common goods). On the other hand, the difference in the *share of total household income* devoted to private adult goods will be equal to $\alpha - \beta$ only if $E(w_f^d) = E(w_m^d)$ and $E(w_m^h) = E(w_f^h)$.

Figure S.1: Optimal migration portfolios, by parental preferences.

Notes: $E(w_f^d) = E(w_m^d) = 1.1 E(w_m^h) = 1.1 E(w_f^h)$. Horizontal dashed lines area is where Female migration is preferred to no migration. Vertical dashed lines area where Male migration is preferred to no migration. Dotted area is where Female migration is preferred to Male migration. Large horizontal dashed area is where condition (1) holds, large vertical area is the equivalent for the case of male migration.

S.2. SUPPLEMENTARY TABLES

Table S.1: Descriptive statistics, migrants. IFLS 2007.

	(1)	(2)	(3)	(4)	(5)
Migrants	without children	with children along	with children left behind	Difference (1)-(3)	Difference (2)-(3)
Men					
Age	29.88 (9.482)	38.89 (6.889)	40.13 (8.586)	-10.25***	-1.24**
Years of education	9.689 (4.075)	9.024 (4.175)	8.383 (4.140)	1.306***	0.641**
Married	0.565 (0.496)	0.957 (0.202)	0.943 (0.232)	-0.378***	0.014
Rural	0.492 (0.500)	0.493 (0.500)	0.537 (0.499)	-0.045	-0.044
Size of household	4.425 (2.173)	4.191 (2.214)	4.651 (1.973)	-0.226*	-0.46***
Risk aversion	3.568 (0.918)	3.598 (0.866)	3.528 (1.007)	0.04	0.07
<i>N</i>	3255	493	298		
Women					
Age	29.38 (12.37)	36.58 (6.931)	33.97 (7.789)	-4.59***	2.61**
Years of education	9.053 (4.169)	7.822 (4.131)	7.070 (3.154)	1.983***	0.752**
Married	0.458 (0.498)	0.896 (0.305)	0.755 (0.431)	-0.297***	0.141
Rural	0.493 (0.500)	0.486 (0.501)	0.667 (0.473)	-0.174***	-0.181
Size of household	4.510 (2.360)	4.207 (2.155)	4.719 (1.874)	-0.209	-0.512***
Risk aversion	3.812 (0.609)	3.912 (0.373)	3.781 (0.751)	0.031	0.131
<i>N</i>	1892	222	192		

Notes: Standard deviations reported in parenthesis. Differences computed with standard errors clustered at village level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table S.2: Differences in returns to human capital investments

(1)	(2)	(3)	(4)	(5)	(6)
β^h	β^{md}	β^{fd}	Difference (1)-(2)	Difference (1)-(3)	Difference (2)-(3)
0.103 (0.058) [336]	0.115 (0.024) [333]	0.099 (0.042) [335]	-0.012	0.004	0.016***

Notes: Standard deviations in parenthesis. Returns to years of schooling are computed from Mincerian equation with age and age² as controls. β^h are the returns to education observed in the home village; β^{md} are the returns to education observed in the counterfactual mens destinations; β^{fd} are the returns to education observed in the counterfactual womens destinations. Sample restricted to households included in main regressions and sample size indicated in brackets. *** p<0.01, ** p<0.05, * p<0.1

Table S.3: Panel household fixed effects regression: all households with children, IFLS1-IFLS4.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Food	Food	Education	Education	Health	Health	Durables	Durables	Adult	Adult
Migrant Parent	-0.027* (0.016)	-0.007 (0.020)	0.007 (0.009)	0.007 (0.012)	0.008 (0.007)	0.018** (0.007)	-0.050*** (0.017)	-0.074*** (0.026)	-0.023*** (0.008)	-0.047*** (0.010)
Migrant Mother		-0.049* (0.029)		-0.000 (0.016)		-0.025 (0.018)		0.058** (0.027)		0.061*** (0.016)
Size of Household	0.038** (0.018)	0.037** (0.018)	-0.006 (0.013)	-0.006 (0.013)	-0.020* (0.011)	-0.021* (0.011)	-0.021 (0.020)	-0.020 (0.020)	0.000 (0.010)	0.001 (0.010)
Controls	y	y	y	y	y	y	y	y	y	y
Year/village fixed effects	y	y	y	y	y	y	y	y	y	y
Observations	19,041	19,041	19,041	19,041	19,041	19,041	19,041	19,041	19,041	19,041
R-squared	0.528	0.528	0.342	0.342	0.181	0.181	0.142	0.142	0.261	0.263
Number of id	9,851	9,851	9,851	9,851	9,851	9,851	9,851	9,851	9,851	9,851

Notes: Controls are rural household, average years of education, log total household expenditure. Standard errors robust to village level clustering in parenthesis.

*** p<0.01, ** p<0.05, * p<0.1

Table S.4: Three stage model: all households with children. IFLS4.

	(1)	(2)	Shares of Total Household Income spent on:				
			(3)	(4)	(5)	(6)	(7)
	Migrant parent	Migrant mother	Food	Education	Health	Durables	Adult
Migrant Mother			0.908 (2.603)	0.663 (1.245)	0.886 (1.697)	-0.452 (0.725)	0.497 (0.900)
Size of Household	-0.269*** (0.088)	0.147 (0.162)	-0.216 (0.409)	-0.156 (0.195)	-0.210 (0.310)	0.064 (0.120)	-0.059 (0.150)
<i>RA</i>	0.066* (0.038)						
$E(w_f^d)/E(w_m^d)$	0.629*** (0.131)	-0.013 (0.326)					
$Var(w_f^d)/Var(w_m^d)$	-0.200*** (0.054)	0.022 (0.105)					
IMR		-0.605 (0.600)	0.812 (1.644)	0.477 (0.790)	0.470 (1.057)	-0.271 (0.454)	0.207 (0.569)
Controls	y	y	y	y	y	y	y
Observations	7,882	321	321	321	321	321	321
R-squared		0.087	-0.003	-1.235	-2.695	-0.383	-2.351
Pseudo R2	0.0392						
Uncentered R2			0.446	-0.631	-2.544	-0.380	-1.537
F Statistic			0.192	0.192	0.192	0.192	0.192
Hansen J Statistic			0.106	0.416	0.255	0.147	0.229
p-value			0.744	0.519	0.614	0.701	0.632

Notes: Column (1) is probit regression for selection into migration. Column (2) is the first stage of columns (3)-(7), IMR is the Inverse Mills ratio calculated from column (1) regression. The procedure follows ?. Controls are rural household, average years of education, log total household expenditure. Standard errors robust to village level clustering in parenthesis.

*** p<0.01, ** p<0.05, * p<0.1