Mother's Bargaining Power and Offspring's Migration

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Abstract

The decision to move is likely to be the result of intra-household bargaining, therefore the distribution of power within the family may play a role in determining the outcome of the process. This paper focuses on the migration of young individuals, who may be highly dependent on their parents. More specifically, this work investigates how mother's decision-making power affects her offspring's migration, which represents an opportunity for upward mobility. A collective household model is included and empirically tested using data on Mexico. Results show that a higher power of the mother increases the probability that her offspring move, and the mechanism that underlies this impact refers to the differences in preferences between parents. This implies that interventions aiming to empower women may have positive spillover effects on their children.

Keywords: intra-household bargaining, mother, power, migration, offspring, Mexico

JEL Classification: D1, J13, J16, O15

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Analyses, findings, interpretations and conclusions reported here are those of the authors alone.

1 Introduction

Migration decision-making and determinants have received long-standing attention from social scientists. A large number of theories and empirical investigations have provided insights into the factors that contribute to shaping migration: while income differentials, returns to skills and networks have been widely discussed, there is scope for large improvements in the understanding of the role of intra-household dynamics. Indeed, following the hints from the New Economics of Labour Migration (Stark and Bloom, 1985), migration may be the result of a joint decision made by migrant and non-migrant individuals, who commit themselves to sharing the costs and benefits of the relocation. Therefore, considering that migration decision-making is likely to take place within the household, the bargaining powers of family members may affect the outcome of the process, although their influence has been addressed in relatively few studies. This paper examines the bargaining aspect of the choice to move and focuses on the migration of young individuals, who may be highly dependent on their parents. In particular, this work addresses how the decision-making power of the mother affects the migration of her offspring: migration may indeed represent an opportunity for offspring's personal development, and mothers, whose empowerment has been found to be beneficial to their children thus possibly signalling altruism, may be willing to promote it.

A collective household model is presented and illustrates that, because of differences in preferences between parents, an increased decision-making power of the mother leads to a higher probability that her offspring move. These predictions are empirically tested using longitudinal data from the Mexican Family Life Survey, and results are consistent with the findings of the model, showing that young Mexicans' migration, which increases the likelihood of employment and of the availability of savings, is more likely when their mothers' power is higher.

2 Migration Theories and Collective Bargaining

The understanding of the factors underlying migration movements is pioneered by Ravenstein (1885, 1889), who suggests the existence of mobility from rural to urban areas and provides possible explanations for it, considering the characteristics of the places of origin and destination and the individuals' desire to be better-off. Several decades later, rural-urban movements are theorised as labour migration resulting from the interaction between income differentials and the employment probability at destination (Todaro, 1969): as presented in the Harris-Todaro model, migration originates from a disequilibrium condition, in which the expected income in the urban sector – consisting of the real income adjusted for the proportion of labour force that is employed – exceeds the rural real earnings (Harris and Todaro, 1970).

Referring to the human capital framework, Sjaastad (1962) considers migration as an investment decision, responding to the comparison between costs and returns. Borjas (1989) presents a model of international migration, following Roy's theory (1951) on the distribution of earnings: given the assumption that the migration decision is driven by an income-maximisation rationale and that wage is a function of individual abilities, migrants are self-selected in terms of their education and unobserved qualities according to the returns to skills in the sending and receiving countries. Borjas proposes that there exists a positive selection when migrants are more skilled than the average individual at both origin and destination, and, relatively to earnings, outperform the host country's natives with the same characteristics. Conversely, a negative selection defines the case in which migrants are selected from the lower tail of the skills – and earnings – distributions, and earn a lower income than the one earned by the average native with equal abilities.

While continuing to highlight the role of income and skills, Stark and Bloom's

New Economics of Labour Migration (1985) provides novel contributions to the migration framework. Concerning earnings, this theory introduces the concept of relative deprivation, which indicates that individuals who are in a disadvantaged position with respect to their reference group choose to move in order to improve their relative income-related situation. Yet the most innovative perspective that is offered by this theory refers to the shift from an individual to a collective approach to migration decision-making. Indeed, Stark and Bloom suggest that the choice to move is taken by migrant and non-migrant individuals, who pool the risks of migration by sharing benefits and costs. More specifically, it is likely that migration occurs as the result of a mutually beneficial intertemporal arrangement between migrants and their family members, the latter contributing to migration costs and receiving remittances. Finally, this theory also suggests that migrants are supported by individuals who have migrated before them, an idea that is previously proposed by Choldin (1973) and is followed by theories of migration networks a few years later (Boyd, 1989; Fawcett, 1989).

Like in the case of migration, the family dimension is relevant to decision-making processes and begins to be considered by economists in the 1950s (Becker, 1981). In Becker's model (1965), household dynamics are theorised using a unitary approach, according to which the household behaves as if all members have a unique rational order of preferences, thus acting like a single decision-maker: each family maximises a unique utility function, subject to one household budget constraint. However, given that the properties of this common preference model are repeatedly rejected by empirical evidence, non-unitary theories of household behaviour are developed, proposing either cooperative or non-cooperative attitudes between family members (Manser and Brown, 1980; McElroy and Horney, 1981; Chiappori, 1988; Browning and Chiappori, 1998). The main hints from collective household models are the rejection of the income pooling hypothesis, and the consideration

of individuals' bargaining powers. Indeed, since household members may have different preferences, power dynamics play a role in determining the outcome of the decision-making.

The intra-household distribution of power is influenced by individual incomes and other factors according to Browning and Chiappori (1998), who mention law changes and the existence of discriminatory work environments as examples of what they define as distribution factors. The gendered aspect of the distribution of power is highlighted by Agarwal (1997) and Kabeer (1999): according to Agarwal (1997), social and gender norms, as well as laws like the ones regulating inheritance, may restrict women's decision-making ability and contribute to defining female position within and outside the household. She also indicates other factors that influence bargaining power, such as education, access to income-generating activities, ownership of assets, and support from government and non-governmental organisations. Kabeer (1999) focuses on women's empowerment, explaining how it can be measured and what are its determinants: she proposes three dimensions related to decision-making power, namely resources, agency and achievements. Resources – referring not only to economic ones, but also to social and human capital – are the pre-conditions for empowerment, agency reflects the ability to pursue own objectives – mainly measured by the decisions made by the individual –, and achievements concern the outcomes that are reached through empowerment – for instance, changes in the health of women and children. Indeed, female empowerment is found to be beneficial not only to women themselves, but also to their children: several studies show that, when mothers are empowered – for example, they are more educated, have more control over assets or participate in credit programmes –, there is evidence of benefits for children, such as investments in their human capital and increased resources allocated to their needs (Leibowitz, 1974; Pitt and Khandker, 1998; Quisumbing and Maluccio, 2000; Kabeer, 2001; Ander-

son and Baland, 2002; Gitter and Barham, 2008). This also suggests that mothers may be more altruistically driven than fathers, thus promoting the achievement of positive outcomes for children.

The intuitions from the theories of migration and of household behaviour are merged to create a collective model of migration decision-making, which is presented in the following section. In particular, we consider the decision of young offspring's migration, jointly made by the parents, and we assume that migration can improve both household well-being and offspring's personal development. We allow for differences between parents in bargaining powers[1] and preferences, and we intend to focus on how mother's power influences the decision, given that migration can be a tool for the offspring to achieve positive outcomes and that the mother may be more altruistic than the father.

3 Collective Model of Migration Decision-Making

Consider a household composed of two parents and one child[2], and assume the existence of two periods, $t = 1,\ 2$. In the first period, all family members cohabit, and parents' earnings are the only source of income. In the second period, the child lives either with the parents as in $t = 1$, contributing to the household income with a share of own earnings; or in a new location, sending to the family left-behind a part of own income and a portion of the migration costs that were entirely borne by the parents in the previous period.

Given child's young age, the child lacks own resources and can only express a preference for migration, while the choice is made by the parents. The mother and father are endowed with different bargaining powers, and the outcome of the decision-making is Pareto efficient (Browning and Chiappori, 1998). Income

[1] In the model, we consider bargaining powers as exogenous parameters for simplicity reasons.
[2] The term *child* here refers to a young working-age daughter or son.

differentials between origin and destination (Harris and Todaro, 1970) affect the decision, and migration costs and gains are assumed to be shared between the parents and the child (Stark and Bloom, 1985).

3.1 Maximisation of parents' utility

In the first period, in order to make a decision about child's migration, parents maximise their intertemporal utility W^P, which is composed of the sum of mother's and father's utilities, U^{Moth} and U^{Fath}, weighted by each parent's bargaining power. These two mutually independent utilities are represented by Cobb-Douglas functions, which are assumed to be additive with respect to current and future household consumption and to child's consumption in $t = 2$. This functional form is consistent with previous models of intra-household bargaining, in which decision-makers' utilities may also include altruistic components (Baland and Robinson, 2000; Cigno and Rosati, 2005; Lundberg, Romich, et al., 2009; Del Boca et al., 2014). Therefore, parental utility W^P is expressed as follows:

$$\begin{aligned} W^P(c_{h_1}, c_{p_2}, \bar{c}_{c_2}) &= \varphi\, U^{Moth}(c_{h_1}, c_{p_2}, \bar{c}_{c_2}) + (1-\varphi)\, U^{Fath}(c_{h_1}, c_{p_2}, \bar{c}_{c_2}) \\ &= \varphi(\alpha ln c_{h_1} + \beta ln c_{p_2} + \delta ln \bar{c}_{c_2}) + (1-\varphi)(\alpha' ln c_{h_1} + \beta' ln c_{p_2} + \delta' ln \bar{c}_{c_2}) \end{aligned}$$

The term c_{h_1} stands for household consumption in $t = 1$[3], c_{p_2} represents parents' future consumption, and $\bar{c}_{c_2}$ indicates child's consumption in $t = 2$, which is assumed to be exogenous. Parental preferences are allowed to differ, and φ is mother's bargaining power[4], while $(1 - \varphi)$ is father's one.

The utility maximisation in terms of c_{h_1} and c_{p_2} is subject to two mutually exclusive budget constraints, depending on child's future scenarios. If offspring's migration does not occur, household consumption is constrained by parents' total income

[3] In the first period, the household is made of both parents and child, so household consumption can be decomposed as follows: $c_{h_1} = c_{p_1} + c_{c_1}$.
[4] $0 \leq \varphi \leq 1$.

and a share of child's earnings, as presented in (1). Conversely, if the child moves, the constraint also includes remittances, as shown in (2).

$$\max_{c_{h_1}, c_{p_2}} \; W^P(c_{h_1}, c_{p_2}, \bar{c}_{c_2})$$

subject to

$$c_{h_1}(1+r) + c_{p_2} \leq y_{h_1}(1+r) + y_{p_2} + \sigma y_{c_2}^O \qquad \textit{if } M{=}0 \quad (1)$$

$$c_{h_1}(1+r) + c_{p_2} \leq y_{h_1}(1+r) + y_{p_2} + \sigma y_{c_2}^D - MC_c(1+r)(1-\gamma) \qquad \textit{if } M{=}1 \quad (2)$$

In the conditions (1) and (2), y_{h_1} and y_{p_2} indicate parents' income in $t = 1$ and $t = 2$ respectively[5], and the term r is the interest rate. Child's future income is represented by $y_{c_2}^O$ in condition (1) and by $y_{c_2}^D$ in condition (2)[6], and MC_c stands for migration costs. Moreover, σy_{c_2} is the share of child's future income given to the parents[7] and $\gamma MC_c(1+r)$ is the share of migration costs sent to the parents by the child in the second period.[8]

Maximising parents' utility, the optimal levels of household consumption are $c_{h_1}^{\mathrm{NM}*}$ and $c_{p_2}^{\mathrm{NM}*}$, if the child stays, and $c_{h_1}^{\mathrm{M}*}$ and $c_{p_2}^{\mathrm{M}*}$, if the child migrates[9]. For each migration scenario, these optimal levels represent parents' intertemporal income multiplied by the relative weight of each period's consumption in parents' utility.

$$c_{h_1}^{\mathrm{NM}*} = \frac{\Big(y_{h_1}(1+r) + y_{p_2} + \sigma y_{c_2}^O\Big)\Big(\varphi\alpha + (1-\varphi)\alpha'\Big)}{(1+r)\Big(\varphi(\alpha+\beta) + (1-\varphi)(\alpha'+\beta')\Big)}$$

$$c_{p_2}^{\mathrm{NM}*} = \frac{\Big(y_{h_1}(1+r) + y_{p_2} + \sigma y_{c_2}^O\Big)\Big(\varphi\beta + (1-\varphi)\beta'\Big)}{\Big(\varphi(\alpha+\beta) + (1-\varphi)(\alpha'+\beta')\Big)}$$

[5] In $t = 1$, parents' earnings are the only source of household income; therefore $y_{h_1} = y_{p_1}$.
[6] $y_{c_2}^D > y_{c_2}^O$
[7] For simplicity, σ is assumed to be independent of migration scenarios. However, in case of migration, child's remittances also include a part of migration costs. Therefore, child's total contribution to household income in $t = 2$ is likely to vary when migration occurs.
[8] Note that $0 \leq \sigma \leq 1$ and $0 \leq \gamma \leq 1$.
[9] See *Section 1* in the Appendix for a full description of the maximisation procedure.

$$c_{h_1}^{\mathrm{M}*} = \frac{\Big(y_{h_1}(1+r) + y_{p_2} + \sigma y_{c_2}^{D} - MC_c(1+r)(1-\gamma)\Big)\Big(\varphi\alpha + (1-\varphi)\alpha'\Big)}{(1+r)\Big(\varphi(\alpha+\beta) + (1-\varphi)(\alpha'+\beta')\Big)}$$

$$c_{p_2}^{\mathrm{M}*} = \frac{\Big(y_{h_1}(1+r) + y_{p_2} + \sigma y_{c_2}^{D} - MC_c(1+r)(1-\gamma)\Big)\Big(\varphi\beta + (1-\varphi)\beta'\Big)}{\Big(\varphi(\alpha+\beta) + (1-\varphi)(\alpha'+\beta')\Big)}$$

The comparison between parental indirect utility functions $W^P(c_{h_1}^{\mathrm{M}*}, c_{p_2}^{\mathrm{M}*}, \bar{c}_{c_2}^{\mathrm{D}})$ and $W^P(c_{h_1}^{\mathrm{NM}*}, c_{p_2}^{\mathrm{NM}*}, \bar{c}_{c_2}^{\mathrm{O}})$ indicates which migration scenario is the most advantageous for parents.

3.2 Optimal decision

Parents opt for child's migration if the indirect utility $W^P(c_{h_1}^{\mathrm{M}*}, c_{p_2}^{\mathrm{M}*}, \bar{c}_{c_2}^{\mathrm{D}})$ exceeds the indirect utility $W^P(c_{h_1}^{\mathrm{NM}*}, c_{p_2}^{\mathrm{NM}*}, \bar{c}_{c_2}^{\mathrm{O}})$, namely:

$$W^P(c_{h_1}^{\mathrm{M}*}, c_{p_2}^{\mathrm{M}*}, \bar{c}_{c_2}^{\mathrm{D}}) > W^P(c_{h_1}^{\mathrm{NM}*}, c_{p_2}^{\mathrm{NM}*}, \bar{c}_{c_2}^{\mathrm{O}}) \tag{3}$$

Rearranging condition (3)[10], child's migration is parents' optimal decision when child's relative gains in terms of future consumption, to the power of parental altruistic weight, exceed the possible relative loss in parents' consumption, to the power of parental consumption weight:

$$\left(\frac{\bar{c}_{c_2}^{\mathrm{D}}}{\bar{c}_{c_2}^{\mathrm{O}}}\right)^{A_W} > \left(\frac{FVC^{\mathrm{NM}}}{FVC^{\mathrm{M}}}\right)^{C_W} \tag{4}$$

In condition (4), A_W is the altruistic weight in parents' utility[11] and C_W is the consumption weight in parents' utility[12]. Furthermore, $\bar{c}_{c_2}^{\mathrm{D}}$ and $\bar{c}_{c_2}^{\mathrm{O}}$ stand for child's future consumption when the child migrates and when the child stays, respectively. FVC^{M} and FVC^{NM} represent the future values of parents' total consumption ac-

[10] See *Section 2* in the Appendix for all the steps of this procedure.
[11] $A_W = \varphi\delta + (1-\varphi)\delta'$
[12] $C_W = \varphi(\alpha+\beta) + (1-\varphi)(\alpha'+\beta')$

cording to the different migration scenarios[13].

3.3 Implications

As previously stated, child can only express a preference for migration but does not directly participate in the decision-making. To the child, migration is beneficial if returns exceed remittances, $y_{c_2}^D - \gamma MC(1+r) - \sigma y_{c_2}^D > y_{c_2}^O - \sigma y_{c_2}^O$, a condition that can be rearranged as follows:

$$(y_{c_2}^D - y_{c_2}^O) > \frac{MC(1+r)(\gamma)}{1-\sigma} \tag{5}$$

If parents are egoistic, their altruistic weight A_W is null and condition (4) becomes:

$$\left(\frac{FVC^{\text{NM}}}{FVC^{\text{M}}}\right)^{C_W} < 1 \tag{6}$$

Therefore, migration is beneficial to them and so is opted for if $FVC^{\text{M}} > FVC^{\text{NM}}$, which is equal to:

$$(y_{c_2}^D - y_{c_2}^O) > \frac{MC(1+r)(1-\gamma)}{\sigma} \tag{7}$$

This suggests that, for any given child's income differential, offspring's migration is more likely the lower the migration costs, the higher the share of costs paid back to parents, and the higher the share of child's income that is given to parents. Rearranging conditions (5) and (7), we notice that whether migration is an advantageous outcome for the parents and for the child depends on σ and γ.

Migration is beneficial to the child

$$\frac{(y_{c_2}^D - y_{c_2}^O)}{MC(1+r)} > \frac{\gamma}{1-\sigma} \tag{8}$$

[13] $FVC^{\text{NM}} = y_{h_1}(1+r) + y_{p_2} + \sigma y_{c_2}^O (no\ migration)$ and $FVC^{\text{M}} = y_{h_1}(1+r) + y_{p_2} + \sigma y_{c_2}^D - MC_c(1+r)(1-\gamma)(migration)$.

Migration is beneficial to the parents

$$\frac{(y_{c_2}^D - y_{c_2}^O)}{MC(1+r)} > \frac{(1-\gamma)}{\sigma} \tag{9}$$

Indeed, from conditions (8) and (9), we obtain that whether moving is beneficial or not is determined by $\frac{\gamma}{1-\sigma} \lessgtr \frac{(1-\gamma)}{\sigma}$, more specifically:

$$\sigma + \gamma \lessgtr 1 \tag{10}$$

Therefore, migration generates a gain for the child and a loss for the parents if $\frac{\gamma}{1-\sigma} < \frac{(1-\gamma)}{\sigma}$, so when $\sigma + \gamma < 1$. Conversely, migrationis beneficial to the parents but not to the child if $\frac{\gamma}{1-\sigma} > \frac{(1-\gamma)}{\sigma}$, so when $\sigma + \gamma > 1$. If moving is either a gain or a loss for both parents and child, then $\sigma + \gamma = 1$. Considering these three different situations, the outcome of the decision-making is Pareto efficient for both parents and child, independently of altruism, only when both of them agree on whether migration is advantageous or not, i.e. when $\sigma+\gamma = 1$. Conversely, if parents are egoistic and $\sigma + \gamma < 1$, offspring's migration, which is a good opportunity for the child, does not occur because parents would lose from it. Similarly, if $\sigma + \gamma > 1$, egoistic parents make their child move because they gain from migration, although the child incurs a loss. These last two cases show that parents' altruism is fundamental for child's welfare when optimal migration decisions of parents and child are discordant.

Indeed, if parents are altruistic, the decision about offspring's migration depends on condition (4), which can be rearranged as:

$$\left(\frac{(1-\sigma)y_{c_2}^D - \gamma MC(1+r)}{(1-\sigma)y_{c_2}^O}\right)^{A_W} > \left(\frac{y_T + \sigma(y_{c_2}^D - y_{c_2}^O) - MC(1+r)(1+\gamma)}{y_T}\right)^{-C_W} \tag{11}$$

where $y_T = y_{h_1}(1+r) + y_{p_2} + \sigma y_{c_2}$

Transforming condition (11), we obtain:

$$\approxeq \frac{A_W}{C_W}\left(\frac{(1-\sigma)(y_{c_2}^D - y_{c_2}^O) - MC(1+r)\gamma)}{(1-\sigma)y_{c_2}^O}\right) > \frac{-\sigma(y_{c_2}^D - y_{c_2}^O) - MC(1+r)(1-\gamma)}{y_T}$$

$$\approxeq \frac{A_W}{C_W} > \frac{-(\%\Delta C^P)}{(\%\Delta C^C)} \tag{12}$$

Condition (12) suggests that, if migration generates a gain for the child but a loss for the parents, the higher the percentage increase in child's consumption, the lower A_W needed to make the child migrate. Moreover, the larger the percentage decrease in parents' consumption, the higher A_W required in order for offspring's migration to occur.

Conversely, if migration is advantageous only for parents, the larger the percentage decrease in child's consumption, the lower A_W needed to make the child stay. Furthermore, the greater the percentage rise in parents' consumption, the higher A_W needed to make the child not migrate.

Given the predictions of this model, we expect that the mother is altruistic and is also relatively more generous than the father (Eckel and Grossman, 1998; Andreoni and Vesterlund, 2001; Simmons and Emanuele, 2007; Falk et al., 2018). Therefore, we also expect that a higher power of the mother increases the probability of offspring's migration, given that moving results in a benefit for the child (Thomas et al., 1991; Lundberg, Pollak, et al., 1997; Phipps and Burton, 1998; Allendorf, 2007; Gitter and Barham, 2008; Behrman et al., 2009; Reggio, 2011; Duflo, 2012; Lépine and Strobl, 2013; van den Bold et al., 2013; Brauw et al., 2014; Imai et al., 2014; Parker and Todd, 2017). We acknowledge that a higher power of the mother is not a sufficient condition to increase migration probability and indeed mother's altruism is required for this to happen: in cases in which migration implies a loss

for the parents but is beneficial to the child, the mother needs to be altruistic and the level of her altruism has to reach a certain threshold in order to make child's migration occur.

Finally, we need to address two possible limitations of this model. First of all, it can be possible that the mother values the presence of her child at home and therefore would bear an additional cost if the child moved. Assuming that this is the case, on the one hand, an increase in mother's power may lead to a reduction in offspring's migration probability; on the other hand, since the mother is expected to be altruistic, this increase may also rise the probability that the child migrates. Therefore, even assuming the existence of these two simultaneous counter-effects, we expect that, if the mother was altruistic enough and the child benefitted from migration, the positive impact would be larger than the negative one, thus making the probability of migration rise.

Lastly, we also consider whether the predictions of the model would change if the share of parents' benefits from migration changed with mother's power. If the altruistic mother had more power and made potential remittances increase[14], migration would still occur either (i) when moving would continue to generate a gain for the child or (ii) when migration would result in a loss for the child but a gain for the parents and the mother would not be altruistic enough to let the child stay. Conversely, if an increase in mother's power decreased potential remittances and this created a loss for the parents, the child would migrate only when mother's altruism is large enough to compensate for the reduction in parents' consumption.

[14] A situation that appears to be a contradiction. Indeed, it seems counterintuitive that an altruistic mother asks for more remittances, thus making child's benefits from migration decrease.

4 Migration and Women's Decision Making Power in Mexico

The predictions of the theoretical model are tested using data on Mexico, whose context fits the research question and the assumptions of the model. In 2019, Mexico had the second-highest stock of emigrants globally, since nearly 12 million Mexicans lived abroad – representing 9% of the population of the country (United Nations, 2019a,c). Like international migration, internal movements are common: in 2015, approximately 20 million inhabitants were not residing in their birthplace (16% of Mexican population), and more than 3 million individuals changed their place of residence with respect to 5 years before, moving within the country. Mexican migration has been largely investigated and has been found to be influenced by factors like economic opportunities, skills, assets and networks (Massey and Espinosa, 1997; Lindstrom and Lauster, 2001; Munshi, 2003; VanWey, 2005; Chiquiar and Hanson, 2005; Mckenzie and Rapoport, 2007; McKenzie and Rapoport, 2010; Kaestner and Malamud, 2014; Angelucci, 2015). Migration to the US is generally considered as an opportunity for upward mobility and, in communities where emigration has been high, it has become an expected trajectory in the lives of young Mexicans, men in particular (Kandel and Massey, 2002). Zenteno et al. (2013) suggest that the movements of Mexican adolescents and young adults may also reflect the timing of key life events, namely the end of schooling, the entrance in the labour market and marriage.

The interdependence between Mexican migration and women's position within the household has been examined with a focus on female empowerment as determinant or consequence of partner's migration (Antman, 2015; Nobles and McKelvey, 2015). Conversely, to the best of our knowledge, no studies on Mexico address the effect of women's decision-making power on their offspring's migration, while there

is evidence of benefits for children, such as less child labour and higher school enrolment, when mothers are empowered (Reggio, 2011; Chakraborty and De, 2017). Several analyses evaluate the impacts of the government programme Oportunidades (previously Progresa and lately known as Prospera), which provided poor households with cash payments, conditional on the fulfilment of requirements related to education and health. This intervention targeted women as the recipients of the transfers, given the assumption that an increase in the resources controlled by female family members would benefit the household more than a rise in men's income (Rubalcava, Teruel, and Thomas, 2009). Better outcomes for children are among the effects of Oportunidades, such as improved physical health and growth, increased cognitive development and educational attainment, and reduced behavioural problems (Fernald et al., 2008; Leroy et al., 2008; Fernald et al., 2009; Behrman et al., 2009, 2011; Parker and Todd, 2017). The possible channel through which these effects are achieved is women's empowerment (Barber and Gertler, 2009, 2010), which is a desirable outcome per se considering that gender disparities in labour force participation, earnings, access to credit and asset ownership are still present and reflect the inequality between women and men (World Bank, 2019).

5 Data

Data from the Mexican Family Life Survey (MxFLS) are used to empirically test the collective model of offspring's migration decision-making (Rubalcava and Teruel, 2006, 2008, 2013). This three-round survey is longitudinal and nationally-representing, covering the 10-year time span from 2002 to 2012. The Ibero-American University and the Center for Economic Research and Teaching (CIDE) developed and implemented the MxFLS with the support of the National Institute of Statistics and Geography (INEGI), the National Institute of Public Health (INSP), Duke

University, and the University of California, Los Angeles. The survey provides detailed information about short- and long-term migrations, within Mexico and to other countries – mainly to the United States. Individuals are followed after migration, and retrospective information about pre-survey movements are also collected. A wide range of socio-economic data is available, including details about decision-making dynamics within the household.

This work focuses on the second (2005-2006) and third (2009-2012) rounds of the MxFLS, while it uses the baseline survey only to increase the availability of data about previous migration events. More specifically, the analysis examines migrations of individuals aged 13-25 years[15], occurred between the second and third rounds, and considers as main determinant of interest the information about intra-household bargaining collected during the second round. The sample is restricted to young respondents who were living with both parents in the second round: the presence of both mother and father is needed to provide a better evaluation of the effect of the distribution of power between parents. In this way, the setting is consistent with the assumptions of the collective household model.

Given the age range, the presence of both parents and the availability of information about decision-making, 5,944 individuals are considered. However, migration information from the third round cannot be found for 4.64% of them – mainly because of attrition. Therefore, the sample includes 5,668 respondents whose migration experiences after 2006 are available, and 15% of them are migrants. It is

[15]This age range – referring to the individuals interviewed in the second round (2005-2006) – was chosen considering the years of compulsory schooling and the average age at first marriage in Mexico. Indeed, at the time of the interview, nine years of compulsory primary and secondary schooling were required (UNESCO, 2020), and this means that Mexican children were expected to attend school until the age of 14. Therefore, the selected age group includes individuals who, during the period between the second and third rounds, were at least 14 years old, thus having completed their compulsory education or being in their last year.
Furthermore, in 2000 the mean age at first marriage was 22.7 years for women and 25 years for men (United Nations, 2019b). For this reason, the maximum age considered is 25 years, representing men's average age at first marriage (which is the highest among female and male ones). In this way, it is more likely that the individuals who are included in the analysis highly relied on their parents.

necessary to clarify that, among 844 migrants, data related to 61% of them are taken from specific sections of the third-round survey dedicated to migration, while the rest is recovered by comparing the locations in which the individuals lived in the two rounds. For this reason, details about migration events are not available for 39% of migrants, and it is possible to define the movements that offspring made without their parents and/or because of own motivations[16] – excluding migrations that are explained by reasons related to parents – only for the respondents of the migration sections of the survey[17]. Both internal and international migrations are considered, although 95% of migrants whose destination is specified moved, at least once, within Mexico and only 11% of them migrated, at least one time, to other countries. We do not exclude temporary migrations, which refer to changes in location that lasted more than one month and less than one year[18].

As regards power dynamics within the household, an index for mothers' autonomy is created through principal component analysis (PCA). This variable synthesises several dimensions that can influence or directly express women's decision-making power. Indeed, mothers' age, education and employment status are included in the PCA, as well as twelve different decisions that mothers make on their own. As shown in *Table 1*, the index is higher for educated, employed and young mothers, and increases as they make autonomous decisions – especially about child's education, health and clothes, as well as about major purchases. Dummy variables representing the states in which mothers reside are also added to the PCA, in order to account for state heterogeneity – in terms of possible differences in gender norms in particular. The indicator is then normalised and therefore ranges from 0

[16] These motives are: education, job, marriage, going back to the place of origin, moving to own house, being independent from family, being close to family and being attracted to the place. Reasons that are not taken into account include education or job of a family member, death or health issues of a family member, insecurity, deportation, visit to relatives, and others.

[17] 89% of migrants whose details about migration unit are available moved, at least once, without their parents; and 81% of those whose information about migration reason is available moved, at least once, for own motivations.

[18] We do not include short-term movements whose main reason was going on holidays.

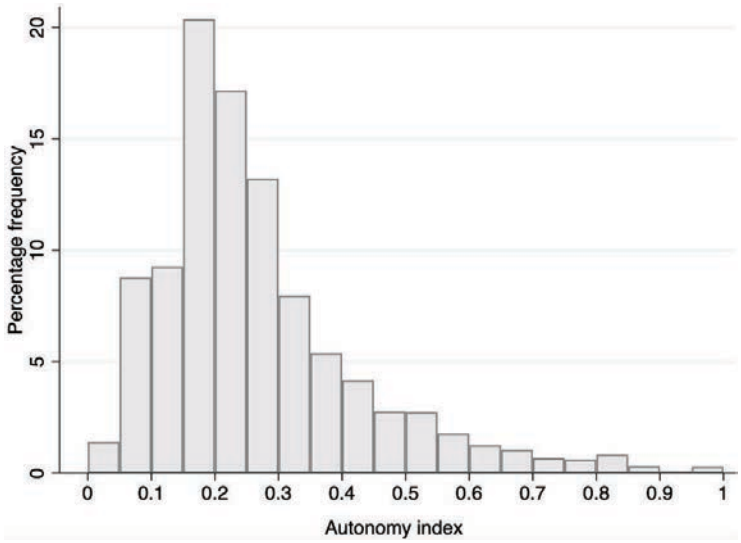
to 1, indicating the lowest and the highest levels of power respectively.

Table 1: First principal component, index for mother's autonomy

Mother characteristics		*State*	
Age	-0.0833	Coahuila	0.0170
Education	0.0647	Distrito Federal	0.0376
Employment	0.0830	Durango	0.0511
Mother's autonomous decisions		Guanajuato	0.0354
Food	0.2224	Jalisco	0.0764
Own clothes	0.2067	Estado de México	0.0156
Spouse's clothes	0.2164	Michoacán	-0.0234
Child's clothes	0.3096	Morelos	-0.0041
Child's education	0.4184	Nuevo León	-0.0318
Child's health	0.4170	Oaxaca	-0.0560
Major purchases	0.3405	Puebla	-0.0061
Transfers to own relatives	0.2932	Sinaloa	-0.0528
Transfers to spouse's relatives	0.2382	Sonora	-0.0495
Own job	0.2181	Veracruz	0.0150
Spouse's job	0.1311	Yucatán	0.0301
Birth control	0.2282		

Figure 1 shows the percentage distribution of this index: the distribution is right-skewed, and the value of the index is lower than 0.3 for approximately 70% of mothers. Using the median of this indicator as benchmark, we create a binary variable, which is coded 1 for mothers whose autonomy index is equal to or higher than the median and 0 for the opposite case, and we use it as main independent variable in the empirical analysis.

Figure 1: Percentage distribution of the normalised index for mother's autonomy



In order to offer insights into the differences in multi-level characteristics according to the level of mother's autonomy, outcomes from t-tests are presented in *Table 2*[19]. Children of high-powered mothers are more likely to migrate, in general terms and more specifically without parents or for own motivations. Excluding migration behaviour, children do not differ by the level of mother's power, except for age and marital status (which are highly correlated, especially given the age range that is considered). Conversely, household characteristics are very different according to mother's autonomy: households where mothers are empowered have a smaller size, are wealthier and are more likely to rely on savings. The fact that in these households there is a higher likelihood of previous shocks can be puzzling, yet it is consistent with less competition within the household between members: indeed, in 73% of cases, households reporting shocks experienced the death and/or health issues of a family member. Moreover, members of families with high-powered mothers are more likely to have relatives in the US: similar to the case of shocks, having relatives who live abroad may be a factor that empower women, because of, for instance, their absence itself or because of remittances. Finally, it is more likely that empowered mothers live in urban areas and more developed communities.

[19]See *Table A1* in the Appendix for a full description of the variables.

Table 2: Multi-level characteristics and mothers' autonomy

	Mother's autonomy				
	Low		High		Difference
	Mean	SE	Mean	SE	
Child's migration					
Migration	0.1395	(0.0065)	0.1580	(0.0069)	-0.0185*
Migration without parents	0.0649	(0.0048)	0.0823	(0.0054)	-0.0174**
Migration for own motivations	0.0569	(0.0046)	0.0748	(0.0052)	-0.0179***
Mother characteristics					
Age	45.6883	(0.1454)	43.4000	(0.1304)	2.2883***
Education	2.2534	(0.0168)	2.5029	(0.0185)	-0.2495***
Employment	0.2011	(0.0074)	0.3221	(0.0086)	-0.1210***
Child characteristics					
Age	18.2989	(0.0649)	17.7683	(0.0637)	0.5306***
Female	0.4717	(0.0092)	0.4887	(0.0092)	-0.0170
Education	3.2686	(0.0171)	3.2687	(0.0167)	-0.0001
Employment	0.2797	(0.0082)	0.2726	(0.0082)	0.0071
Married	0.1074	(0.0057)	0.0942	(0.0054)	0.0132*
Siblings	0.9339	(0.0046)	0.9390	(0.0044)	-0.0051
Household characteristics					
Size	6.4022	(0.0448)	6.2708	(0.0414)	0.1313**
Wealth	0.7193	(0.0040)	0.7464	(0.0038)	-0.0271***
Savings	0.2447	(0.0079)	0.3005	(0.0084)	-0.0558***
Non-labour income	0.1306	(0.0062)	0.1207	(0.0060)	0.0098
Shocks	0.2630	(0.0102)	0.3472	(0.0117)	-0.0842***
Previous migrants	0.6623	(0.0087)	0.6563	(0.0087)	0.0060
Relatives in the US	0.1737	(0.0070)	0.2270	(0.0077)	-0.0532***
Location characteristics					
Rural	0.4744	(0.0092)	0.3997	(0.0090)	0.0747***
Developed community	0.6485	(0.0040)	0.6741	(0.0038)	-0.0256***

Note: low autonomy indicates that mother's power is lower than the median, whereas high autonomy refers to mother's power that is higher than or equal to the median. Standard errors in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

6 Methodology

In order to assess the causal effect of mother's power on offspring's migration, we use the method of propensity score weighting (Hirano and Imbens, 2001). The dummy variable that differentiates high-powered mothers from low-powered ones is not as good as random, and regression adjustment with weights is needed to remove the differences in observables between the two groups. As shown in *equation (1)*, we firstly estimate propensity scores regressing the dummy variable related to mother's power on a number of characteristics relating to the offspring (C_{ihl}), the household (H_{hl}) and the location where the mother lives (L_l)[20].

$$high\text{-}powered\ mother_{ihl} = \theta + \kappa\, C_{ihl} + \lambda\, H_{hl} + \mu\, L_l + \eta_{ihl} \tag{1}$$

where i=child, h=household, l=location

Secondly, we use the estimates of propensity scores to create the weights that allow balancing the observables between high-powered and low-powered mothers: the weight that is assigned to high-powered mothers is w_i^1, which represents the inverse of the probability of being high-powered; conversely, w_i^0 is the weight assigned to low-powered mothers and is inversely related to the likelihood of being low-powered.

$$w_i^1 = \frac{1}{\widehat{ps}} \qquad\qquad w_i^0 = \frac{1}{(1-\widehat{ps})}$$

The rationale behind this method is assigning higher weights to high-powered mothers who are more similar, in terms of observable characteristics, to low-powered mothers, while assigning lower weights to those who are more different; the same procedure is applied to the comparison group. Including these weights

[20] The balancing property is satisfied. See *Figure A1* for a graphical representation of the common support. Information about child, household and location characteristics can be found in *Table A1*.

in the regression from *equation (1)*, we check that the balance is improved and find that, in this way, the pre-existing observable differences between the groups of high-powered and low-powered mothers are removed, as presented in *Table A2*. We acknowledge that the differences between the two groups in terms of unobservables may not be captured by using this impact evaluation method. Therefore, we would like to point out the possible existence of a bias related to unobservable characteristics, especially to those who may influence both mother's power and child's migration. Nevertheless, since the magnitude of this type of bias is linked to the inadequacy of the conditional independence assumption (CIA), we believe that the CIA is adequately respected because we use a large number of observables to calculate the propensity score, so we expect this possible bias to be negligible.

The average treatment effect of the power of the mother on offspring's migration is estimated using *equation (2)*. Independent variables refer to the second round (t), whereas the dependent variable is taken from the third round survey and concerns the period between the second and third rounds (t+1). The outcome variable y_{ihl}^{t+1} represents the migration of the offspring, and three different specifications are used: the first one describes migration as any change in location that lasted at least one month, the second one refers to movements without parents, and the third one regards movements for own motivations. The main independent variable, $\textit{high-powered mother}_{ihl}^{t}$, makes a distinction between mothers based on the median level of power. A set of controls at individual- (C_{ihl}^{t}), household- (H_{hl}^{t}) and location-level (L_{l}^{t}) is considered[21], and logit models – adjusted for propensity score weights – are estimated.

$$y_{ihl}^{t+1} = \alpha + \beta\ \textit{high-powered mother}_{ihl}^{t} + \gamma\ C_{ihl}^{t} + \delta\ H_{hl}^{t} + \zeta\ L_{l}^{t} + \epsilon_{ihl} \qquad (2)$$

where i=child, h=household, l=location

[21] Information about controls can be found in *Table A1*.

Finally, we also check for heterogeneous effects by including the main independent variable interacted with several multi-level characteristics, as shown in *equation (3)*.

$$y_{ihl}^{t+1} = \alpha' + \beta' \; high\text{-}powered \; mother_{ihl}^{t} + \nu \; high\text{-}powered \; mother_{ihl}^{t} * x^{t} + \gamma' \; C_{ihl}^{t} + \delta' \; H_{hl}^{t} + \zeta' \; L_{l}^{t} + \epsilon'_{ihl} \tag{3}$$

where i=child, h=household, l=location

7 Results

Table 3 presents how mother's power shapes the decision of offspring's migration. The first column concerns the effect on migration in general terms and shows that, when mother's power is equal or larger than the median, the likelihood of offspring's migration increases by 2.51 percentage points, corresponding to 18.63 percentage change. Since the specification of this outcome variable allows including movements that are related to other individuals' motives, migrations without parents and for own motivations are specifically considered and represent proxies for changes in location that can be explained by migrant's own reasons: the second and third columns indicate that, for the offspring, having a high-powered mother rises the probability of migration without parents and for own motivations by 1.92 and 1.90 percentage points, respectively (29.03% and 32.54%)[22].

It is necessary to acknowledge that the proxies for individual migration are coded missing for other types of movements (i.e. with parents and for other individuals'

[22]In *Table A3*, we present the estimates without propensity score weights, in order to show the extent and direction of the bias that is corrected by using this method. As regards the variable about migrations in general terms, the absence of propensity score weights leads to an underestimation of the effect by about 29%, while, as regards the other types of migrations, the differences are smaller. Indeed, considering migrations without parents, the effect is underestimated by 5%; and, for migration for own motivations, there is a slight overestimation (2%).

Table 3: Impact of mother's power on offspring's migration

	Offspring's Migration		
	All	Without parents	Own motivations
High-powered mother	0.0251***	0.0192***	0.0190***
	(0.0095)	(0.0074)	(0.0071)
Average migration if T=0	0.1345	0.0661	0.0583
Percentage change	18.63%	29.03%	32.54%
Controls	yes	yes	yes
Observations	5,481	5,069	5,027

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

motivations) and that there are three hundred individuals whose information about migration is not available. In order to account for these issues, we use different specifications of the three outcome variables to check the sensitivity of results. First of all, we substitute either 1 or 0 for missing data about whether the individual moved, as presented in *Table A4*: results related to the new specifications continue to show an increase in the likelihood of migration, although the percentage changes vary according to the mean level of the probability of migration. Similarly, we make the same substitutions for the other two outcome variables and we also assign the value 0 to migrations with parents and migrations for other individuals' reasons[23]. The positive impact on migration continues to be present even when the outcomes are specified in these different ways.

We also make a robustness check considering attriters as migrants and we still find a positive effect on migration, although it is relatively smaller[24](see *Table A5*). As other check, we consider mother's migration networks, which may be correlated with both mother's power and preferences for child's migration. Therefore, we

[23]We do not substitute 1 for other types of migrations because, otherwise, there would be correspondence between these two variables and the one representing migration in general terms.
[24]This check regards only migrations in general terms.

create two new dummies – one that indicates whether the mother has previously migrated and the other one whether another household member has migration experience – and we substitute them for the variable related to household's networks: results in *Table A6* show a slight increase in the magnitude of the impact previously estimated.

Since the positive effect on offspring's migration may be heterogeneous, we check whether mother's power has differential impacts depending on a set of characteristics of the offspring, household, and location. *Table A7* presents the results of the regressions that include the interactions between the main dummy variable and the controls, and we do not find evidence of heterogeneity. We do not present heterogeneity analyses that are conducted by using subsamples because, considering that we employ propensity score weighting to assess causal effects, reducing the number of observations prevents from keeping the balancing property satisfied.

Results are consistent with the predictions of the theoretical model, which suggests that, given that mothers are expected to be altruistic, an increase in their power rises the probability of offspring's migration. The higher likelihood of migration is related to differences in preferences between parents and, more specifically, to the fact that mothers are more generous than fathers. We cannot directly test this mechanism, but we show in *Table A8* that mothers seem to be more caring towards their children than fathers[25]: indeed, they are more likely to consider showing love and care to children as their main parenting priority, and they are also more involved in activities that promote child development, such as reading, singing and playing with children.

The channel related to altruism is also supported by the evidence of positive outcomes after migration, as presented in *Table 4*[26]. Indeed, for the offspring, migra-

[25] However, we recognise that this could also reflect gender norms, according to which childcare may be mainly a female responsibility.

[26] We regress four outcomes – employment, availability of savings and non-labour income, and

tion rises the probability to be employed and to have savings at their disposal. Considering that the average probability of employment for non-migrants is approximately 51 percentage points, migrant offspring are 15.18% more likely to be employed, and the percentage increase is even higher when migrations without parents and migrations for own motivations are investigated – 25.50% and 27.79%, respectively. Furthermore, there is a 13.14% higher probability for the households where migrated individuals live to have savings – a likelihood that is 19.14% and 20.37% higher when the offspring migrate without parents and for own motivations.

Table 4: Outcomes after offspring's migration

		Household		
	Employment	Savings	Non-labour income	Wealth
Migration	0.0775***	0.0461**	-0.0448***	0.0004
	(0.0177)	(0.0185)	(0.0129)	(0.0063)
Migration without parents	0.1301***	0.0672***	-0.0295	0.0011
	(0.0233)	(0.0258)	(0.0196)	(0.0087)
Migration for own motivations	0.1418***	0.0715***	-0.0398**	0.0032
	(0.0241)	(0.0273)	(0.0203)	(0.0090)
Controls	yes	yes	yes	yes

Note: Employment is considered at individual-level, whereas savings, non-labour income and wealth are at household-level. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Migration also reduces the probability that the household relies on non-labour income, when migration in general terms and migration for own motivations are examined: this result may be related to how we define non-labour income, which includes a large number of support programmes implemented by the government or other institutions. Therefore, if individuals became better-off after migration, it

wealth – over migration and the same controls as in equation (2). We use propensity score weighting also in this case, in order to estimate causal impacts.

would be plausible that they would receive less social benefits. Finally, there is no evidence of changes in wealth, which is represented by an index that reflects the characteristics of the house where the individual lives: the effect that we estimate refers to a maximum of 5 years after migration, and it is possible that a variation is not captured because it may be a longer-term consequence.

This analysis provides insights into the benefits of the empowerment of women for their children. Policy-makers should indeed consider that interventions promoting female autonomy may be beneficial to children, not only for their education and health – as it has been previously found – but also for other outcomes reached through migration. Since the majority of migrations that we examine are internal, empowerment may also influence demographic changes within the country, thus possibly leading to other positive effects at aggregate-level.

8 Conclusions

Most theories and empirical studies on migration have disregarded the impact of bargaining powers on migration-decision making, although literature suggests that the process is likely to be collective. We address this gap by focusing on the distribution of power within the household and, in particular, on the effect of mother's power on the migration of her young offspring. Indeed, mothers, who are generally assumed to be more altruistic than fathers, may encourage migration, supposing that moving represents an opportunity for her offspring to obtain positive outcomes.

This paper provides a collective household model, which, to the best of our knowledge, is the first one to theorise the decision of offspring's individual migration, and tests its predictions using data on Mexico. According to the model, households with empowered mothers are more likely to opt for offspring's individual migra-

tion, even in case of household consumption loss.

The empirical analysis uses propensity score weighting to assess the effect of a dummy variable, coded 1 for high-powered mothers and 0 for low-powered ones, on the migration of young Mexicans aged 13-25 years living with their parents. Results are consistent with the predictions of the theoretical model, thus showing that a higher power of the mother increases the likelihood of migration for her offspring and suggesting that the mother is relatively more altruistic than the father. In order to exclude the possibility that the migration of the offspring is explained by factors related to parents, different specifications of the dependent variable account for the motivations of the movement and the people who participate in it: results are not sensitive to the use of different outcome variables and are robust to several checks. The impact of mother's power is not heterogeneous considering a number of characteristics at individual-, household-, and location-level.

Since there is evidence of a higher likelihood, for migrant offspring, to be employed and to have savings at their disposal, this work highlights another positive outcome that women's empowerment may favour. Therefore, policies that aim to empower women may have positive spillover effects like offspring's upward mobility through migration.

Appendix

SECTION 1

Maximisation of Parents' Intertemporal Utility

1. ***If M=0***

$$\max_{c_{h_1},c_{p_2}} W^P(c_{h_1},c_{p_2},\bar{c}_{c_2}) \ \textbf{\textit{s.t.}} \ c_{h_1}(1+r)+c_{p_2} \leq y_{h_1}(1+r)+y_{p_2}+\sigma y_{c_2}^O$$

$$L = W^P(c_{h_1},c_{p_2},\bar{c}_{c_2}) + \lambda\Big(y_{h_1}(1+r)+y_{p_2}+\sigma y_{c_2}^O - c_{h_1}(1+r)-c_{p_2}\Big)$$

$$\frac{\delta L}{\delta c_{h_1}} = \frac{\varphi\alpha}{c_{h_1}} + \frac{(1-\varphi)\alpha'}{c_{h_1}} - \lambda(1+r) = 0$$
$$\frac{\delta L}{\delta c_{p_2}} = \frac{\varphi\beta}{c_{p_2}} + \frac{(1-\varphi)\beta'}{c_{p_2}} - \lambda = 0$$
$$\frac{\delta L}{\delta \lambda} = y_{h_1}(1+r)+y_{p_2}+\sigma y_{c_2}^O - c_{h_1}(1+r)-c_{p_2} = 0$$

Substituting $\lambda = \frac{\varphi\beta}{c_{p_2}} + \frac{(1-\varphi)\beta'}{c_{p_2}}$ into $\frac{\delta L}{\delta c_{h_1}}$:

$$\frac{\varphi\alpha}{c_{h_1}} + \frac{(1-\varphi)\alpha'}{c_{h_1}} - \Big(\frac{\varphi\beta}{c_{p_2}} + \frac{(1-\varphi)\beta'}{c_{p_2}}\Big)(1+r) = 0$$
$$\frac{c_{h_1}}{\varphi\alpha+(1-\varphi)\alpha'} - \frac{c_{p_2}}{\big(\varphi\beta+(1-\varphi)\beta'\big)(1+r)} = 0$$
$$c_{h_1} = \frac{c_{p_2}\big(\varphi\alpha+(1-\varphi)\alpha'\big)}{\big(\varphi\beta+(1-\varphi)\beta'\big)(1+r)}$$

Substituting $c_{h_1} = \frac{c_{p_2}\big(\varphi\alpha+(1-\varphi)\alpha'\big)}{\big(\varphi\beta+(1-\varphi)\beta'\big)(1+r)}$ into $\frac{\delta L}{\delta \lambda}$:

$$y_{h_1}(1+r)+y_{p_2}+\sigma y_{c_2}^O - \left(\frac{c_{p_2}\big(\varphi\alpha+(1-\varphi)\alpha'\big)}{\big(\varphi\beta+(1-\varphi)\beta'\big)(1+r)}\right)(1+r) - c_{p_2} = 0$$
$$c_{p_2} = y_{h_1}(1+r)+y_{p_2}+\sigma y_{c_2}^O - \left(\frac{c_{p_2}\big(\varphi\alpha+(1-\varphi)\alpha'\big)}{\big(\varphi\beta+(1-\varphi)\beta'\big)(1+r)}\right)(1+r)$$
$$c_{p_2} + \left(\frac{c_{p_2}\big(\varphi\alpha+(1-\varphi)\alpha'\big)}{\big(\varphi\beta+(1-\varphi)\beta'\big)}\right) = y_{h_1}(1+r)+y_{p_2}+\sigma y_{c_2}^O$$
$$c_{p_2}^{\mathrm{NM}*} = \frac{\big(y_{h_1}(1+r)+y_{p_2}+\sigma y_{c_2}^O\big)\big(\varphi\beta+(1-\varphi)\beta'\big)}{\varphi(\alpha+\beta)+(1-\varphi)(\alpha'+\beta')}$$

Substituting $c_{p_2}^{\mathrm{NM}*}$ into c_{h_1}:

$$c_{h_1}^{\mathrm{NM}*} = \frac{\big(y_{h_1}(1+r)+y_{p_2}+\sigma y_{c_2}^O\big)\big(\varphi\alpha+(1-\varphi)\alpha'\big)}{(1+r)\Big(\varphi(\alpha+\beta)+(1-\varphi)(\alpha'+\beta')\Big)}$$

2. ***If M=1***

$$\max_{c_{h_1},c_{p_2}} W^P(c_{h_1},c_{p_2},\bar{c}_{c_2}) \textbf{ s.t. } c_{h_1}(1+r)+c_{p_2} \le y_{h_1}(1+r)+y_{p_2}-MC_c(1+r)(1-\gamma)+\sigma y_{c_2}^D$$

$$L = W^P(c_{h_1},c_{p_2},\bar{c}_{c_2}) + \lambda\Big(y_{h_1}(1+r)+y_{p_2}-MC_c(1+r)(1-\gamma)+\sigma y_{c_2}^D - c_{h_1}(1+r)-c_{p_2}\Big)$$

$$\frac{\delta L}{\delta c_{h_1}} = \frac{\varphi\alpha}{c_{h_1}} + \frac{(1-\varphi)\alpha'}{c_{h_1}} - \lambda(1+r) = 0$$
$$\frac{\delta L}{\delta c_{p_2}} = \frac{\varphi\beta}{c_{p_2}} + \frac{(1-\varphi)\beta'}{c_{p_2}} - \lambda = 0$$
$$\frac{\delta L}{\delta \lambda} = y_{h_1}(1+r)+y_{p_2}-MC_c(1+r)(1-\gamma)+\sigma y_{c_2}^D - c_{h_1}(1+r)-c_{p_2} = 0$$

Substituting $\lambda = \dfrac{\varphi\beta}{c_{p_2}} + \dfrac{(1-\varphi)\beta'}{c_{p_2}}$ into $\dfrac{\delta L}{\delta c_{h_1}}$:

$$\frac{\varphi\alpha}{c_{h_1}} + \frac{(1-\varphi)\alpha'}{c_{h_1}} - \Big(\frac{\varphi\beta}{c_{p_2}} + \frac{(1-\varphi)\beta'}{c_{p_2}}\Big)(1+r) = 0$$
$$\frac{c_{h_1}}{\varphi\alpha+(1-\varphi)\alpha'} - \frac{c_{p_2}}{\big(\varphi\beta+(1-\varphi)\beta'\big)(1+r)} = 0$$
$$c_{h_1} = \frac{c_{p_2}\big(\varphi\alpha+(1-\varphi)\alpha'\big)}{\big(\varphi\beta+(1-\varphi)\beta'\big)(1+r)}$$

Substituting $c_{h_1} = \dfrac{c_{p_2}\big(\varphi\alpha+(1-\varphi)\alpha'\big)}{\big(\varphi\beta+(1-\varphi)\beta'\big)(1+r)}$ into $\dfrac{\delta L}{\delta \lambda}$:

$$y_{h_1}(1+r)+y_{p_2}-MC_c(1+r)(1-\gamma)+\sigma y_{c_2}^D - \left(\frac{c_{p_2}\big(\varphi\alpha+(1-\varphi)\alpha'\big)}{\big(\varphi\beta+(1-\varphi)\beta'\big)(1+r)}\right)(1+r) - c_{p_2} = 0$$
$$c_{p_2} = y_{h_1}(1+r)+y_{p_2}-MC_c(1+r)(1-\gamma)+\sigma y_{c_2}^D - \left(\frac{c_{p_2}\big(\varphi\alpha+(1-\varphi)\alpha'\big)}{\big(\varphi\beta+(1-\varphi)\beta'\big)(1+r)}\right)(1+r)$$
$$c_{p_2} + \left(\frac{c_{p_2}\big(\varphi\alpha+(1-\varphi)\alpha'\big)}{\big(\varphi\beta+(1-\varphi)\beta'\big)}\right) = y_{h_1}(1+r)+y_{p_2}-MC_c(1+r)(1-\gamma)+\sigma y_{c_2}^D$$
$$c_{p_2}^{\mathrm{M}*} = \frac{\big(y_{h_1}(1+r)+y_{p_2}-MC_c(1+r)(1-\gamma)+\sigma y_{c_2}^D\big)\big(\varphi\beta+(1-\varphi)\beta'\big)}{\varphi(\alpha+\beta)+(1-\varphi)(\alpha'+\beta')}$$

Substituting $c_{p_2}^{\mathrm{M}*}$ into c_{h_1}:

$$c_{h_1}^{\mathrm{M}*} = \frac{\big(y_{h_1}(1+r)+y_{p_2}-MC_c(1+r)(1-\gamma)+\sigma y_{c_2}^D\big)\big(\varphi\alpha+(1-\varphi)\alpha'\big)}{(1+r)\Big(\varphi(\alpha+\beta)+(1-\varphi)(\alpha'+\beta')\Big)}$$

SECTION 2

Comparison between Parents' Indirect Utility Functions

$$W^P(c_{h_1}^{\mathrm{M}*}, c_{p_2}^{\mathrm{M}*}, \bar{c}_{c_2}^{\mathrm{D}}) > W^P(c_{h_1}^{\mathrm{NM}*}, c_{p_2}^{\mathrm{NM}*}, \bar{c}_{c_2})$$

$$\varphi\big(\alpha \ln c_{h_1}^{\mathrm{M}*} + \beta \ln c_{p_2}^{\mathrm{M}*} + \delta \ln \bar{c}_{c_2}^{D}\big) + (1-\varphi)\big(\alpha' \ln c_{h_1}^{\mathrm{M}*} + \beta' \ln c_{p_2}^{\mathrm{M}*} + \delta' \ln \bar{c}_{c_2}^{D}\big) > \\ \varphi\big(\alpha \ln c_{h_1}^{\mathrm{NM}*} + \beta \ln c_{p_2}^{\mathrm{NM}*} + \delta \ln \bar{c}_{c_2}^{O}\big) + (1-\varphi)\big(\alpha' \ln c_{h_1}^{\mathrm{NM}*} + \beta' \ln c_{p_2}^{\mathrm{NM}*} + \delta' \ln \bar{c}_{c_2}^{O}\big)$$

$$\big(\varphi\alpha + (1-\varphi)\alpha'\big)\big(\Delta_{\text{M-NM}} \ln c_{h_1}\big) + \big(\varphi\beta + (1-\varphi)\beta'\big)\big(\Delta_{\text{M-NM}} \ln c_{p_2}\big) + \big(\varphi\delta + (1-\varphi)\delta'\big)\big(\Delta_{\text{D-O}} \ln \bar{c}_{c_2}\big) > 0$$

$$\big(\varphi\alpha + (1-\varphi)\alpha'\big)\Big(\ln \frac{y_{h_1}(1+r) + y_{p_2} - MC_c(1+r)(1-\gamma) + \sigma y_{c_2}^{D}}{y_{h_1}(1+r) + y_{p_2} + \sigma y_{c_2}^{O}}\Big) + \big(\varphi\beta + (1- \\ \varphi)\beta'\big)\Big(\ln \frac{y_{h_1}(1+r) + y_{p_2} - MC_c(1+r)(1-\gamma) + \sigma y_{c_2}^{D}}{y_{h_1}(1+r) + y_{p_2} + \sigma y_{c_2}^{O}}\Big) + \big(\varphi\delta + (1-\varphi)\delta'\big)\big(\Delta_{\text{D-O}} \ln \bar{c}_{c_2}\big) > 0$$

$$\big(\varphi(\alpha+\beta) + (1-\varphi)(\alpha'+\beta')\big)\Big(\ln \frac{y_{h_1}(1+r) + y_{p_2} - MC_c(1+r)(1-\gamma) + \sigma y_{c_2}^{D}}{y_{h_1}(1+r) + y_{p_2} + \sigma y_{c_2}^{O}}\Big) > \\ -\big(\varphi\delta + (1-\varphi)\delta'\big)\big(\Delta_{\text{D-O}} \ln \bar{c}_{c_2}\big)$$

$$\frac{\varphi(\alpha+\beta) + (1-\varphi)(\alpha'+\beta')}{\varphi\delta + (1-\varphi)\delta'}\Big(\ln \frac{y_{h_1}(1+r) + y_{p_2} - MC_c(1+r)(1-\gamma) + \sigma y_{c_2}^{D}}{y_{h_1}(1+r) + y_{p_2} + \sigma y_{c_2}^{O}}\Big) > \big(\Delta_{\text{O-D}} \ln \bar{c}_{c_2}\big)$$

$$\big(e^{(\ln H)}\big)^{\frac{a}{b}} > e^{\left(\ln \frac{\bar{c}_{c_2}^{O}}{\bar{c}_{c_2}^{D}}\right)}$$

where $\mathrm{H} = \frac{y_{h_1}(1+r) + y_{p_2} - MC_c(1+r)(1-\gamma) + \sigma y_{c_2}^{D}}{y_{h_1}(1+r) + y_{p_2} + \sigma y_{c_2}^{O}}$, $\mathrm{a} = \varphi(\alpha+\beta) + (1-\varphi)(\alpha'+\beta')$ and $\mathrm{b} = \varphi\delta + (1-\varphi)\delta'$

$$(H)^a > \left(\frac{\bar{c}_{c_2}^{D}}{\bar{c}_{c_2}^{O}}\right)^{-b}$$

Adding and subtracting: (i) $\sigma y_{c_2}^{O}$ in H, and (ii) $\bar{c}_{c_2}^{O}$ in $\frac{\bar{c}_{c_2}^{D}}{\bar{c}_{c_2}^{O}}$:

$$\Big(1 + \frac{\sigma(y_{c_2}^{D} - y_{c_2}^{O}) - MC(1+r)(1-\gamma)}{y_{h_1}(1+r) + y_{p_2} + \sigma y_{c_2}^{O}}\Big)^{a} > \Big(1 + \frac{\bar{c}_{c_2}^{D} - \bar{c}_{c_2}^{O}}{\bar{c}_{c_2}^{O}}\Big)^{-b}$$

$$\Big(1 + \frac{\sigma(y_{c_2}^{D} - y_{c_2}^{O}) - MC(1+r)(1-\gamma)}{y_{h_1}(1+r) + y_{p_2} + \sigma y_{c_2}^{O}}\Big)^{a}\Big(1 + \frac{\bar{c}_{c_2}^{D} - \bar{c}_{c_2}^{O}}{\bar{c}_{c_2}^{O}}\Big)^{b} > 1$$

$$\Big(1 + \frac{\sigma(y_{c_2}^{D} - y_{c_2}^{O}) - MC(1+r)(1-\gamma)}{y_{h_1}(1+r) + y_{p_2} + \sigma y_{c_2}^{O}}\Big)^{\varphi(\alpha+\beta)+(1-\varphi)(\alpha'+\beta')}\Big(1 + \frac{\bar{c}_{c_2}^{D} - \bar{c}_{c_2}^{O}}{\bar{c}_{c_2}^{O}}\Big)^{\varphi\delta+(1-\varphi)\delta'} > 1$$

Table A1: Characteristics at individual-, household-, and location-level

Variable	Mean	SD	Type	Note
Child's migration				
Migration	0.1489	0.3560	Binary	Any change in location that lasted at least one month. Holidays are excluded.
Migration without parents	0.0734	0.2608	Binary	Movement that did not involve parents. The individual may be accompanied by other family members or friends.
Migration for own motivations	0.0658	0.2480	Binary	Movement due to own motivations: education, job, marriage, going back to the place of origin, moving to own house, being independent from the family, being close to the family and being attracted to the place.
Mother characteristics				
Age	44.5488	7.6016	Continuous	
Education	2.3794	0.9708	Categorical	1: no education or kindergarten, 2: primary, 3: lower secondary, 4: upper secondary, 5: tertiary
Employment	0.2611	0.4393	Binary	Not specified whether formal or informal work.
Child characteristics				
Age	18.0016	3.5048	Continuous	
Female	0.4825	0.4997	Binary	
Education	3.2488	0.9110	Categorical	See mother's education.
Employment	0.2756	0.4468	Binary	Not specified whether formal or informal work.
Married	0.1007	0.3009	Binary	Married or in union.
Siblings	0.9381	0.2410	Binary	

Variable	Mean	SD	Type	Note
Household characteristics				
Size	6.3844	2.3710	Continuous	
Wealth	0.7268	0.2118	Continuous	Normalised index, in which 0 expresses the lowest wealth and 1 the highest. The index originates from PCA, in which these characteristics of the house are used: owned house; house surrounded by human and animal waste/garbage/ stagnant water; adequate ventilation; low-quality material for floor/wall/roof; kitchen used as bedroom; poor fuel for stove; number of bedrooms; toilet; and telephone.
Savings	0.2717	0.4449	Binary	
Non-labour income	0.1272	0.3332	Binary	Non-labour income from: Procampo programme; Vivah programme; Word credit programme; Social coinvestment programme; Temporary job programme; Alianza por el campo programme; funds for enterprises; Fonaes programme; other governmental support programmes; scholarship or donations from other institutions; indemnities; donated cash; retirement; life insurance; inheritance/dowries/bequests/lottery wins; sale of properties/machinery/assets; or other income.
Shocks	0.2410	0.4277	Binary	The household experienced, in the last 5 years, at least one of the following shocks related to any household member: death/hospitalisation; unemployment or business failure; home or business loss due to earthquake/flood/other natural disaster; crop loss; loss, robbery, or death of livestock.
Previous migrants	0.6621	0.4730	Binary	The household includes individuals who have previously migrated.
Relatives in the US	0.2043	0.4032	Binary	
Location characteristics				
Rural	0.4525	0.4978	Binary	
Developed community	0.6558	0.2150	Continuous	Normalised index, in which 0 indicates the lowest level of development and 1 the highest. The index originates from PCA, in which these characteristics of the community are used: adequate public lighting; piles of garbage; piles of manure; cattle; air pollution; children wearing clean clothes; children wearing shoes; adults wearing clean clothes; adults wearing shoes; tv antennas; glass windows; abandoned buildings; abandoned cars; graffiti; paramilitary guards; private vehicles less than public ones.

Table A2: Balance of observables

High-powered mother		
	Without weights	With weights
Child characteristics		
Age	-0.0151***	0.0002
	(0.0023)	(0.0024)
Female	0.0188	-0.0001
	(0.0137)	(0.0141)
Education	-0.0069	-0.0004
	(0.0086)	(0.0089)
Employment	0.0310*	-0.0008
	(0.0169)	(0.0174)
Married	0.0072	-0.0013
	(0.0238)	(0.0247)
Siblings	0.0196	-0.0002
	(0.0292)	(0.0305)
Household characteristics		
Size	-0.0037	-0.0001
	(0.0031)	(0.0033)
Wealth	0.0604	-0.0015
	(0.0407)	(0.0422)
Savings	0.0504***	0.0013
	(0.0156)	(0.0161)
Non-labour income	-0.0179	-0.0012
	(0.0202)	(0.0210)
Shocks	0.0588***	-0.0011
	(0.0112)	(0.0119)
Previous migrants	-0.0069	0.00004
	(0.0143)	(0.0148)
Relatives in the US	0.0845***	0.0002
	(0.0166)	(0.0174)
Location characteristics		
Rural	-0.0613***	0.0005
	(0.0178)	(0.0182)
Developed community	0.0325	0.0006
	(0.0404)	(0.0413)
Observations	5,481	5,481

Note: linear probability models. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A3: Comparison between estimations without and with weights

Offspring's Migration			
	All	Without parents	Own motivations
Without weights			
High-powered mother	0.0185*	0.0174**	0.0179***
	(0.0095)	(0.0073)	(0.0070)
Average migration if T=0	0.1395	0.0649	0.0569
Percentage change	13.28%	26.89%	31.50%
Controls	no	no	no
Observations	5,653	5,194	5,151
With weights			
High-powered mother	0.0251***	0.0188**	0.0179**
	(0.0096)	(0.0075)	(0.0071)
Average migration if T=0	0.1345	0.0661	0.0583
Percentage change	18.63%	28.41%	30.77%
Controls	no	no	no
Observations	5,481	5,069	5,027

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A4: Sensitivity checks

	Migration		
		Missing=1	Missing=0
High-powered mother	0.0251***	0.0223**	0.0236***
	(0.0095)	(0.0103)	(0.0091)
Average migration if T=0	0.1345	0.1728	0.1286
Percentage change	18.63%	12.90%	18.37%
Controls	yes	yes	yes
Observations	5,481	5,741	5,741

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

	Migration without parents			
		Other migrations=0	Other migrations=0, missing=1	Other migrations=0, missing=0
High-powered mother	0.0192***	0.0167**	0.0140*	0.0155**
	(0.0074)	(0.0069)	(0.0084)	(0.0066)
Average migration if T=0	0.0661	0.0612	0.1028	0.0585
Percentage change	29.03%	27.20%	13.63%	26.46%
Controls	yes	yes	yes	yes
Observations	5,069	5,481	5,741	5,741

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

	Migration for own motivations			
		Other migrations=0	Other migrations=0, missing=1	Other migrations=0, missing=0
High-powered mother	0.0190***	0.0162**	0.0135*	0.0151**
	(0.0071)	(0.0065)	(0.0081)	(0.0062)
Average migration if T=0	0.0583	0.0536	0.0955	0.0512
Percentage change	32.54%	30.20%	14.18%	29.49%
Controls	yes	yes	yes	yes
Observations	5,027	5,481	5,741	5,741

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A5: Robustness check with attriters as migrants

Offspring's Migration		
	without attriters	*with attriters*
High-powered mother	0.0251***	0.0217**
	(0.0095)	(0.0102599)
Average migration if T=0	0.1345	0.1720
Percentage change	18.63%	12.64%
Controls	yes	yes
Observations	5,481	5,733

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A6: Estimation controlling for mother's previous migration

Offspring's Migration			
	All	Without parents	Own motivations
Past migration of household members			
High-powered mother	0.0251***	0.0192***	0.0190***
	(0.0095)	(0.0074)	(0.0071)
Average migration if T=0	0.1345	0.0661	0.0583
Percentage change	18.63%	29.03%	32.54%
Past migration of the mother			
High-powered mother	0.0258***	0.0194***	0.0191***
	(0.0094)	(0.0074)	(0.0071)
Average migration if T=0	0.1345	0.0661	0.0583
Percentage change	19.17%	29.33%	32.80%
Controls	yes	yes	yes
Observations	5,481	5,069	5,027

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A7: Heterogeneity analysis

	Migration		Migration without parents		Migration for own motives	
	Main	Interaction	Main	Interaction	Main	Interaction
Child characteristics						
Female	0.0169	0.0156	0.0065	0.0227	0.0081	0.0201
	(0.0139)	(0.0189)	(0.0109)	(0.0147)	(0.0103)	(0.0140)
Married	0.0275***	-0.0206	0.0173**	0.0167	0.0156**	0.0321
	(0.0101)	(0.0302)	(0.0078)	(0.0233)	(0.0074)	(0.0234)
Employed	0.0192*	0.0200	0.0156*	0.0120	0.0183**	0.0022
	(0.0113)	(0.0206)	(0.0088)	(0.0161)	(0.0086)	(0.0150)
Siblings	0.0093	0.0169	0.0063	0.0138	0.0202	-0.0013
	(0.0384)	(0.0396)	(0.0285)	(0.0295)	(0.0260)	(0.0269)
Household characteristics						
Size $\geq$ median	0.0103	0.0263	0.0173	0.0030	0.0132	.00963
	(0.0145)	(0.0192)	(0.0118)	(0.0151)	(0.0110)	(0.0143)
Savings	0.0332***	-0.0318	0.0256***	-0.0239	0.0275***	-0.0325
	(0.0110)	(0.0217)	(0.0087)	(0.0165)	(0.0083)	(0.0158)
Non-labour income	0.0268***	-0.0106	0.0185**	0.0040	0.0200***	-0.0068
	(0.0102)	(0.0273)	(0.0081)	(0.0201)	(0.0077)	(0.0194)
Shocks	0.0232**	0.0100	0.0211**	-0.0075	0.0199**	-0.0034
	(0.0107)	(0.0232)	(0.0086)	(0.0171)	(0.0082)	(0.0160)
Previous migrants	0.0063	0.0260	0.0011	0.0252	-0.0009	0.0273*
	(0.0183)	(0.0214)	(0.0140)	(0.0165)	(0.0136)	(0.0159)
Relatives in the US	0.0116	0.0628***	0.01116	0.0296*	0.0083	0.0418**
	(0.0107)	(0.0235)	(0.0086)	(0.0168)	(0.0082)	(0.0166)
Location characteristics						
Rural	0.0003	0.0493***	0.0110	0.0156	0.0071	0.0222
	(0.0134)	(0.0190)	(0.0106)	(0.0147)	(0.0101)	(0.0141)
Community developed $\geq$ median	0.0276**	-0.0052	0.0195**	-0.0007	0.0168 *	0.0049
	(0.0116)	(0.0154)	(0.0094)	(0.01221)	(0.0089)	(0.0115)

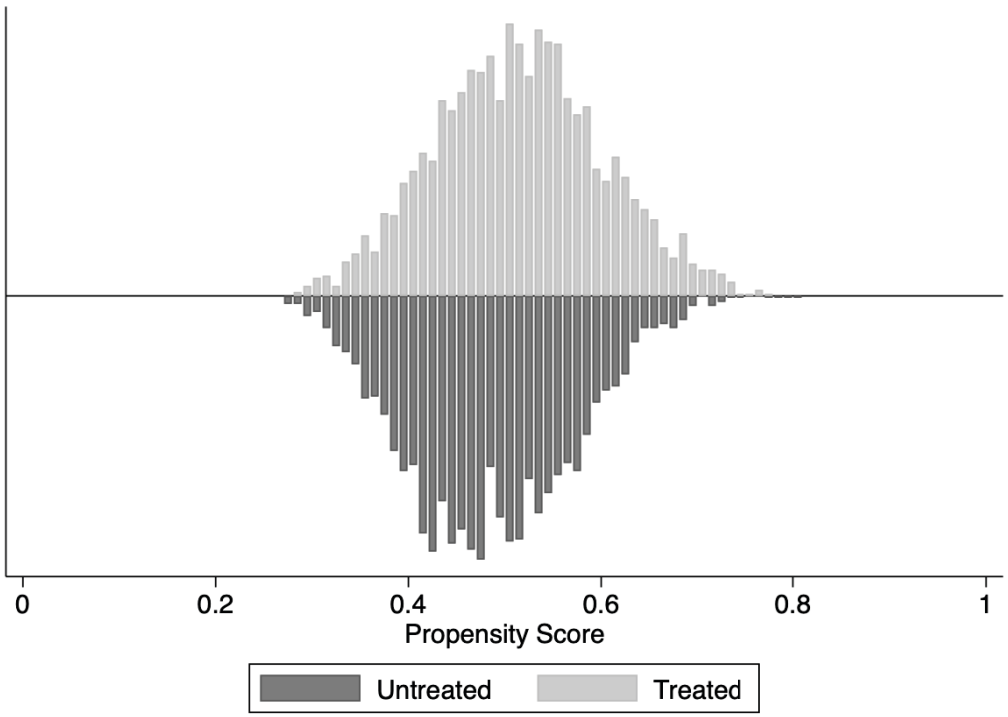
Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A8: Parental care

	Mother	Father	
	Mean	Mean	Difference
Showing love and care as main priority	0.7383	0.6751	0.0632***
Activities with the child			
Reading books	0.3375	0.2263	0.1113***
Telling stories	0.3957	0.3176	0.0781***
Singing songs	0.4332	0.2862	0.1470***
Going out	0.6189	0.4990	0.1199***
Playing	0.6595	0.6169	0.0426***

Note: These data refer to 3,856 cohabiting couples with at least one child younger than 15. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Figure A1: Common support



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Preview of recent developments

1. Theoretical model

In this section we present a theoretical model to understand the determinants of children's migration decision. The aim of the model is to show how parents' preferences (in particular their altruism and rate of time preference) influence the probability of children's migration.

We consider a household with two parents and a child, in a two-period framework. In the first period the child goes to school and live with her parents. In the second period the child has three options: i) work in the region of residence and continue to live with her parents; ii) work in the region of residence and go and live on her own; iii) migrate, to work and live in another region/country. For the child to migrate, some migration costs must be paid in advance (at the end of the first period). In the second period, parents may transfer some money to the child and vice-versa. The amount of these transfers is determined by a negotiation between the parents and the child at the end of the first period (before the child migrates and/or starts working). Both the parents and the child know their future earnings.

We allow for one-sided altruism, i.e. parents may be altruistic, but we assume that the child is egoistic. More precisely, we assume that the child's utility in the second period is a logarithmic function of her consumption, i.e.:

$$W^C(c_{c2}) = ln(c_{c2}) \qquad [1]$$

where c_{c2} indicates child's consumption at $t = 2$.

Parents' welfare is given by:

$$W^P(c_{h1}, c_{p2}, c_{c2}) = \omega_{c1} \ln c_{h1} + \omega_{c2} \ln c_{p2} + \omega_A ln c_{c2} \qquad [2]$$

where c_{h1} represents parents' (and child's) consumption at $t = 1$, and c_{p2} represents parents' consumption at $t = 2$. ω_{c1} and ω_{c2} are the utility weight of present and future consumption respectively,[1] while $\omega_A \in [0,1]$ represents the degree of parents' altruism. If $\omega_A = 0$, parents are egoistic; if $\omega_A = 1$ parents are 'fully' altruistic (i.e. their utility increases one-by-one with child's utility). In order to highlight the role of parental altruism, we normalize the consumption utility weights, such that $\omega_{c1} + \omega_{c2} = 1$.

Both the transfers between the parents and the child and the migration decision depend on the characteristics of capital markets. We assume that the child cannot borrow in the first period (because she is too young). Hence, the child can migrate only if her parents are willing to pay the migration costs. For parents, we consider two cases: i) perfect capital markets (i.e. parents are allowed to save and borrow in the first period at the same interest rate), and ii) presence of credit constraints (i.e., in the first period, parents are allowed to save but not to borrow). We consider first the case of perfect capital markets.

[1] A common assumption is that the weight of future consumption is simply the weight of current consumption multiplied by a discount factor, which depends on parents' rate of time preference (δ), i.e.: $\frac{\omega_{c1}}{\omega_{c2}} \equiv 1 + \delta$

1.1 The migration decision with perfect capital markets.

Parents make a decision about their child's migration by comparing their welfare level in case of migration ('migration scenario') and in case of non-migration ('non-migration scenario'). Since their welfare depends on the transfers between them and the child, we need to determine first the level of these transfers in both scenarios. In each scenario *i* (*i=Migration, Non-Migration)*, the parents-child negotiation involves three steps. First, the child determines the **maximum amount of transfers** that she is **willing to give** to parents ($TR^{i}_{C,Max}$) by comparing her reservation utility (i.e. the utility that she can obtain if an agreement with parents is not reached) with the utility that she can obtain if an agreement with her parents over the amount of transfers is reached. Second, parents determine the **optimal amount** of transfers that **they would like to receive(give)** from(to) the child (TR^{*i}_{P}) by maximizing their utility function subject to the appropriate budget constraint/s. Third, the parents and the child negotiate to determine the **actual amount that will be transferred** between them. Since child's welfare is strictly decreasing in transfers, she will try to give to her parents as little as possible, and she will never give more than $TR^{i}_{C,Max}$. Parents' welfare is increasing in transfers up to TR^{*i}_{P} and then decreasing (if parents are altruistic).[2] Hence, parents will try to get as close as possible to their optimal level of transfers (TR^{*i}_{P}), without exceeding it. As a consequence, if $TR^{*i}_{P} \leq TR^{i}_{Max}$, the child will accept to give/receive parents' optimal amount, and actual transfers will be equal to TR^{*i}_{P}. On the other hand, if $TR^{*i}_{P} > TR^{i}_{Max}$, the child will refuse to pay this optimal amount and offer to pay $TR^{i}_{C,Max}$. Parents will accept, because their welfare increases with child's transfers (up to TR^{*i}_{P}). In other words, actual transfers (which we denote with $\widetilde{TR}^{i}$) are defined by the following function:

$$\widetilde{TR}^{i} = min\{TR^{i}_{C,Max}; TR^{*i}_{P}\} \qquad [3]$$

Before proceeding with the analysis, it is useful to specify the reservation utility of the child in the non-migration scenario ($W^{C,NM}_{res}$). If an agreement with parents is not reached, the child goes and live independently with no help from parents, and her utility is

$$W^{C,NM}_{res} = ln(\, y^{NM}_{c2} - HC\,) \qquad [4]$$

where y^{NM}_{c2} represents the child's income in the non-migration scenario, and HC represents some housing costs (and/or other costs) that the child must bear if she goes and live on her own.
From now on we will assume that $y^{NM}_{c2} \geq HC$, i.e. the child has a feasible outside option. Under this assumption, $TR^{NM}_{C,Max} = HC$.

Lemma 1 and lemma 2 derive the functions defining the actual amount of transfers, child's and parents' welfare, in terms of the exogenous variables and the degree of parental altruism (in the non-migration scenario and in the migration scenario, respectively). By comparing the two lemmas, Proposition 1 derives the condition for child's migration. The proofs of both lemmas and of Proposition 1 can be found in Appendix 1.

[2] If parents are egoistic, their welfare is continuously increasing in transfers.

Lemma 1. In the non-migration scenario, actual transfers, as well as the welfare of the parents and of the child are piecewise functions, with subdomains (and a number of subfunctions) that depend on the degree of parental altruism. In particular, under the assumption that $y_{c2}^{NM} \geq HC$, the level of transfers and the indirect utility of the parents and the child are:

$$\widetilde{TR}^{NM} = \begin{cases} HC & \text{if } \omega_A \leq \omega_A^{*NM} \\ \frac{y_{c2}^{NM} - \omega_A y_p^T}{1+\omega_A} & \text{if } \omega_A > \omega_A^{*NM} \end{cases} \quad [5]$$

$$W^{C,NM} = \begin{cases} ln(y_{c2}^{NM} - HC) & \text{if } \omega_A \leq \omega_A^{*NM} \\ ln\left(\frac{\omega_A}{1+\omega_A}\left(y_p^T + y_{c2}^{NM}\right)\right) & \text{if } \omega_A > \omega_A^{*NM} \end{cases} \quad [6]$$

$$W^{P,NM} = \begin{cases} \ln\left(y_p^T + HC\right) + \omega_A ln(y_{c2}^{NM} - HC) + \Gamma & \text{if } \omega_A \leq \omega_A^{*NM} \\ (1+\omega_A)\ln\left(y_{c2}^{NM} + y_p^T\right) + \Gamma 2 & \text{if } \omega_A > \omega_A^{*NM} \end{cases} \quad [7]$$

where $\omega_A^{*NM} \equiv (y_{c2}^{NM} - HC)/\left(y_p^T + HC\right)$, $y_p^T \equiv y_{p1}(1+r) + y_{p2}$ with y_{p1} and y_{p2} representing parents' income in the first and second period respectively and *r* representing the rate of interest; $\Gamma \equiv \omega_{c1}\ln(\omega_{c1}) + \omega_{c2}\ln(\omega_{c2}) - \omega_{c1}\ln(1+r)$ and $\Gamma 2 \equiv \Gamma + \omega_A ln(\omega_A) - (1+\omega_A) ln(1+\omega_A)$ ♦

Before presenting Lemma 2, it is worth noting that, in the migration scenario, the maximum amount of transfers that the child is willing to give to parents is simply $TR_{C,Max}^{M} = \widetilde{TR}^{NM} + y_{c2}^{M} - y_{c2}^{NM}$ (where y_{c2}^{M} represents the child's income in case of migration; see the Appendix for the proof). We assume that $y_{c2}^{M} \geq y_{c2}^{NM}$, i.e. migration is not a 'dominated' option for the child. However, in order to derive the conditions under which child's migration is an optimal choice for parents, we do not make any other assumption on Δy_{c2} (where $\Delta y_{c2} \equiv y_{c2}^{M} - y_{c2}^{NM}$).

Lemma 2. In the migration scenario, actual transfers, parents' and child's welfare are piecewise functions, with subdomains (and a number of subfunctions) that depend on the degree of parental altruism and on the sign of $\Delta y_{c2} - MC(1+r)$ (where MC represents the migration costs that must be paid in advance). In particular, if $\Delta y_{c2} < MC(1+r)$, $\widetilde{TR}^{M} = TR_{C,Max}^{M}$, child's welfare is equal to [6], and parents' welfare is given by:

$$W^{P,M} = \begin{cases} \ln\left(y_p^T + HC + \Delta y_{c2} - MC(1+r)\right) + \omega_A ln(y_{c2}^{NM} - HC) + \Gamma & \text{if } \omega_A \leq \omega_A^{*NM} \\ \ln\left(y_p^T + y_{c2}^{NM} + (1+\omega_A)(\Delta y_{c2} - MC(1+r))\right) + \omega_A ln\left(y_p^T + y_{c2}^{NM}\right) + \Gamma 2 & \text{if } \omega_A > \omega_A^{*NM} \end{cases} \quad [8]$$

If $\Delta y_{c2} \geq MC(1+r)$, the level of transfers and the indirect utility of the parents and the child are:

$$\widetilde{TR}^{M} = \begin{cases} HC + \Delta y_{c2} & \text{if } \omega_A \leq \omega_A^{*M} \\ \frac{y_{c2}^{M} - \omega_A y_p^T + \omega_A MC(1+r)}{1+\omega_A} & \text{if } \omega_A > \omega_A^{*M} \end{cases} \quad [9]$$

$$W^{C,M} = \begin{cases} ln(y_{c2}^{NM} - HC) & \text{if } \omega_A \leq \omega_A^{*M} \\ ln\left(\frac{\omega_A}{1+\omega_A}\left(y_p^T + y_{c2}^M - MC(1+r)\right)\right) & \text{if } \omega_A > \omega_A^{*M} \end{cases} \quad [10]$$

$$W^{P,M} = \begin{cases} \ln\left(y_p^T + HC + \Delta y_{c2} - MC(1+r)\right) + \omega_A ln(y_{c2}^{NM} - HC) + \Gamma & \text{if } \omega_A \leq \omega_A^{*M} \\ (1+\omega_A)\ln\left(y_p^T + y_{c2}^M - MC(1+r)\right) + \Gamma 2 & \text{if } \omega_A > \omega_A^{*M} \end{cases} \quad [11]$$

where $\omega_A^{*M} \equiv (y_{c2}^{NM} - HC)/\left(y_p^T + HC + \Delta y_{c2} - MC(1+r)\right)$♦

Some implications of Lemma 1 and Lemma 2 are worth noting. For Lemma 2, we focus the attention on the case in which $\Delta y_{c2} \geq MC(1+r)$, because, as shown in Proposition 1, this is the only relevant case.

First, the critical values of altruism that identify the subdomains (ω_A^{*i}) correspond to the ratio between child's resources if an agreement with parents is not reached, and household's total resources at the maximum level of transfers. When the degree of altruism is higher than this critical level, parents obtain a higher utility by allowing the child to have more resources (i.e. a higher level of consumption) and reducing their own consumption. When the degree of altruism is lower than this critical level, parents behave as egoistic parents (i.e. as if $\omega_A = 0$).

Second, actual transfers are a decreasing function of the degree of parental altruism. In particular, they are constant up to ω_A^{*i} (at the maximum levels of HC in the non-migration scenario and of $HC + \Delta y_{c2}$ in the migration scenario) and then strictly decreasing. They become negative (i.e. parents start to give money to the child) when the degree of altruism is higher than the ratio between child's income and parents' total net income (i.e. when $\omega_A > \frac{y_{c2}^i}{y_p^T - I^i \cdot MC(1+r)}$ where I^i is an indicator variable that takes the value 1 when *i=M,* i.e. $I^M = 1, I^{NM} = 0$).

Third, both child's and parents' welfare are increasing in the degree of altruism. Child's welfare is constant and equal to her reservation utility up to ω_A^{*i} and then it is an increasing strictly concave function of ω_A .[3] Parents welfare starts at $W^{P,i} = \ln\left(y_p^T + HC + I^i \cdot \left(\Delta y_{c2} - MC(1+r)\right)\right) + \Gamma$ when $\omega_A = 0$, it increases linearly up to ω_A^{*i} and then it becomes an increasing strictly convex function of ω_A.[4]

In Proposition 1 we derive the conditions under which child's migration is an optimal choice for parents, by comparing lemma 1 and lemma 2 (see the Appendix for the formal proof).

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[3] For $\omega_A > \omega_A^{*i}$ we have: $\frac{\partial W^{C,i}}{\partial \omega_A} = \frac{1}{\omega_A(1+\omega_A)}$ and $\frac{\partial^2 W^{C,i}}{(\partial \omega_A)^2} = -\frac{1+2\omega_A}{(\omega_A(1+\omega_A))^2}$

[4] For $\omega_A < \omega_A^{*i}$ we have: $\frac{\partial W^{P,i}}{\partial \omega_A} = ln\left(y_{c2}^{NM} - HC + I^i \cdot \left(\Delta y_{c2} - MC(1+r)\right)\right)$. For $\omega_A > \omega_A^{*i}$ we have: $\frac{\partial W^{P,i}}{\partial \omega_A} = \ln\left(y_{c2}^{NM} + y_p^T + I^i \cdot \left(\Delta y_{c2} - MC(1+r)\right)\right) + ln(\omega_A) - ln(1+\omega_A)$, which is positive for $\omega_A > \frac{1}{y_{c2}^{NM} + y_p^T + I^i \cdot \left(\Delta y_{c2} - MC(1+r)\right) - 1}$. Since $\frac{1}{y_{c2}^{NM} + y_p^T + I^i \cdot \left(\Delta y_{c2} - MC(1+r)\right) - 1} < \omega_A^{*i}$, parents' welfare is increasing for $\omega_A > \omega_A^{*i}$. Furthermore, for $\omega_A > \omega_A^{*i}$, $\frac{\partial^2 W^{P,i}}{(\partial \omega_A)^2} = \frac{1}{(\omega_A(1+\omega_A))^2}$, which is also positive.

Proposition 1.
With perfect capital markets, the child will migrate *if and only if* $\Delta y_{c2} \geq MC(1+r)$, independently of parents' altruism.
The latter will affect the amount of transfers between the parents, as well as child's and parents' welfare, but it will not change the condition for migration.♦

Proposition 1 demonstrates that, with perfect capital markets, the household (parents and child) behaves efficiently, i.e. it maximizes household total income and then it decides how to redistribute it between its members according to the degree of parental altruism.

We now turn to the case of imperfect capital markets.

1.2 The migration decision with credit constraints.

The presence of credit constraints affects parents' optimal choices and welfare whenever they are binding. Credit constraints are binding when the marginal rate of substitution between first-period and second-period consumption evaluated at consumption equal to each period income (including transfers) is larger than the interest factor. More precisely, liquidity constraints are binding if

$$\frac{\omega_{c1}}{\omega_{c2}} \cdot \frac{y_{p2}+\widetilde{TR}^i}{y_{p1}-MC\cdot I^i} > (1+r) \qquad [x]$$

where I^i is the indicator variable defined above ($I^M = 1, I^{NM} = 0$).

Given the function defining the actual level of transfers ([3]), credit constraints are binding when:

i) $TR_P^{*i} \leq TR_{C,Max}^i$ and [x] is satisfied at $\widetilde{TR}^i = TR_P^{*i}$
ii) $TR_P^{*i} > TR_{C,Max}^i$ and [x] is satisfied at $\widetilde{TR}^i = TR_{C,Max}^i$

By considering the conditions of case i) and ii), we can specify the conditions for credit constraints to be binding as functions of the exogenous variables and of the parameters of parents' utility function. More precisely, credit constraints are binding if (see the Appendix for the proof):

$$\begin{cases} \omega_{c2} < \frac{y_{c2}^i+y_{p2}}{y_{c2}^i+y_p^T} - \omega_A \frac{(y_{p1}-MC\cdot I^i)(1+r)}{y_{c2}^i+y_p^T} \\ \omega_{c2} < \frac{y_{p2}+HC+\Delta y_{c2}\cdot I^i}{y_p^T+HC+\Delta y_{c2}\cdot I^i-MC\cdot I^i(1+r)} \end{cases} \qquad [xx]$$

[xx] identifies an area in the two-dimensional space (ω_{c2}; ω_A) and, as shown in the Appendix, this area is larger for *i=M.* In other words, if liquidity constraints are binding in the non-migration scenario, they will be binding also in the migration scenario but not vice-versa. Since the optimal decision depends on whether liquidity constraints are binding or not, we need to consider two possible situations:
a) liquidity constraints are binding in both the migration and non-migration scenario
b) liquidity constraints are binding only in the migration scenario.

Lemma 3 defines the actual level of transfers and the corresponding welfare of parents and the child in the two scenarios for case a). Lemma 4 derives the conditions for child's migration to be chosen by parents, and Proposition 2 highlights the role of parents' altruism for these conditions to be satisfied, again for case a). Lemma 5, lemma 6 and Proposition 3 do the same for case b).

Lemma 3. When credit constraints are binding in both scenarios (i.e. when [xx] holds for i=M,NM), the level of transfers and the indirect utility of the parents and the child are:

$\widetilde{TR}_{LC}^{i} = HC + \Delta y_{c2} \cdot I^{i}$, $W_{LC}^{C,i} = ln(y_{c2}^{NM} - HC)$, and
$W_{LC}^{P,i} = \omega_{c1}\ln\left(y_{p1} - MC \cdot I^{i}\right) + \omega_{c2}\ln\left(y_{p2} + HC + \Delta y_{c2} \cdot I^{i}\right) + \omega_{A} ln(y_{c2}^{NM} - HC)$

$$\text{if} \qquad \frac{\omega_{c2}}{\omega_{A}} \geq \frac{y_{p2}+HC+\Delta y_{c2}}{y_{c2}^{NM}-HC} \qquad [*]$$

$\widetilde{TR}_{LC}^{NM} = HC, \widetilde{TR}_{LC}^{M} = \frac{\omega_{c2} y_{c2}^{M} - \omega_{A} y_{p2}}{\omega_{c2}+\omega_{A}}$, $W_{LC}^{C,NM} = ln(y_{c2}^{NM} - HC)$, $W_{LC}^{C,M} = ln\left(\frac{\omega_{A}}{\omega_{c2}+\omega_{A}}\left(y_{p2} + y_{c2}^{M}\right)\right)$
$W_{LC}^{P,NM} = \omega_{c1}\ln y_{p1} + \omega_{c2}\ln\left(y_{p2} + HC\right) + \omega_{A} ln(y_{c2}^{NM} - HC)$
$W_{LC}^{P,M} = \omega_{c1}\ln\left(y_{p1} - MC\right) + (\omega_{c2} + \omega_{A})\ln\left(y_{c2}^{M} + y_{p2}\right) + \Phi$

$$\text{if} \qquad \frac{y_{p2}+HC}{y_{c2}^{NM}-HC} < \frac{\omega_{c2}}{\omega_{A}} < \frac{y_{p2}+HC+\Delta y_{c2}}{y_{c2}^{NM}-HC} \qquad [**]$$

$\widetilde{TR}_{LC}^{i} = \frac{\omega_{c2} y_{c2}^{i} - \omega_{A} y_{p2}}{\omega_{c2}+\omega_{A}}$, $W_{LC}^{C,i} = ln\left(\frac{\omega_{A}}{\omega_{c2}+\omega_{A}}\left(y_{p2} + y_{c2}^{i}\right)\right)$ and
$W_{LC}^{P,i} = \omega_{c1}\ln\left(y_{p1} - MC \cdot I^{i}\right) + (\omega_{c2} + \omega_{A})\ln\left(y_{c2}^{i} + y_{p2}\right) + \Phi$

$$\text{if} \qquad \frac{\omega_{c2}}{\omega_{A}} \leq \frac{y_{p2}+HC}{y_{c2}^{NM}-HC} \qquad [***]$$

where $\Phi \equiv \omega_{c2} ln(\omega_{c2}) + \omega_{A} ln(\omega_{A}) - (\omega_{c2} + \omega_{A}) ln(\omega_{c2} + \omega_{A})$ ♦

Lemma 4. When credit constraints are binding in both the migration and the non-migration scenario, the child will migrate if either

$$\begin{cases} \frac{\omega_{c2}}{\omega_{A}} \geq \frac{y_{p2}+HC+\Delta y_{c2}}{y_{c2}^{NM}-HC} \\ \omega_{c2} ln\left(1 + \frac{\Delta y_{c2}}{y_{p2}+HC}\right) \geq \omega_{c1}\ln\left(1 + \frac{MC}{y_{p1}-MC}\right) \end{cases} \qquad [\#]$$

or

$$\begin{cases} \frac{y_{p2}+HC}{y_{c2}^{NM}-HC} < \frac{\omega_{c2}}{\omega_{A}} < \frac{y_{p2}+HC+\Delta y_{c2}}{y_{c2}^{NM}-HC} \\ \omega_{c2} ln\left(\frac{y_{p2}+y_{c2}^{M}}{y_{p2}+HC}\right) + \omega_{A}\ln\left(\frac{y_{p2}+y_{c2}^{M}}{y_{c2}^{NM}-HC}\right) + \Phi \geq \omega_{c1}\ln\left(1 + \frac{MC}{y_{p1}-MC}\right) \end{cases} \qquad [\#\#]$$

or

$$\begin{cases} \frac{\omega_{c2}}{\omega_A} \leq \frac{y_{p2}+HC}{y_{c2}^{NM}-HC} \\ (\omega_{c2}+\omega_A) ln\left(1+\frac{\Delta y_{c2}}{y_{p2}+y_{c2}^{NM}}\right) \geq \omega_{c1} \ln\left(1+\frac{MC}{y_{p1}-MC}\right) \end{cases} \quad [\#\#\#]$$

where Φ is defined in lemma 3. ♦

Proposition 2. When credit constraints are binding in both the migration and the non-migration scenario, the child will migrate, independently of parents' altruism, *if*

$$\omega_{c2} ln\left(1+\frac{\Delta y_{c2}}{y_{p2}+HC}\right) \geq \omega_{c1} \ln\left(1+\frac{MC}{y_{p1}-MC}\right) \quad [!]$$

If [!] does not hold, altruistic parents may still choose migration for their child, and the condition for child's migration is more likely to be satisfied the higher the parents' degree of altruism. ♦

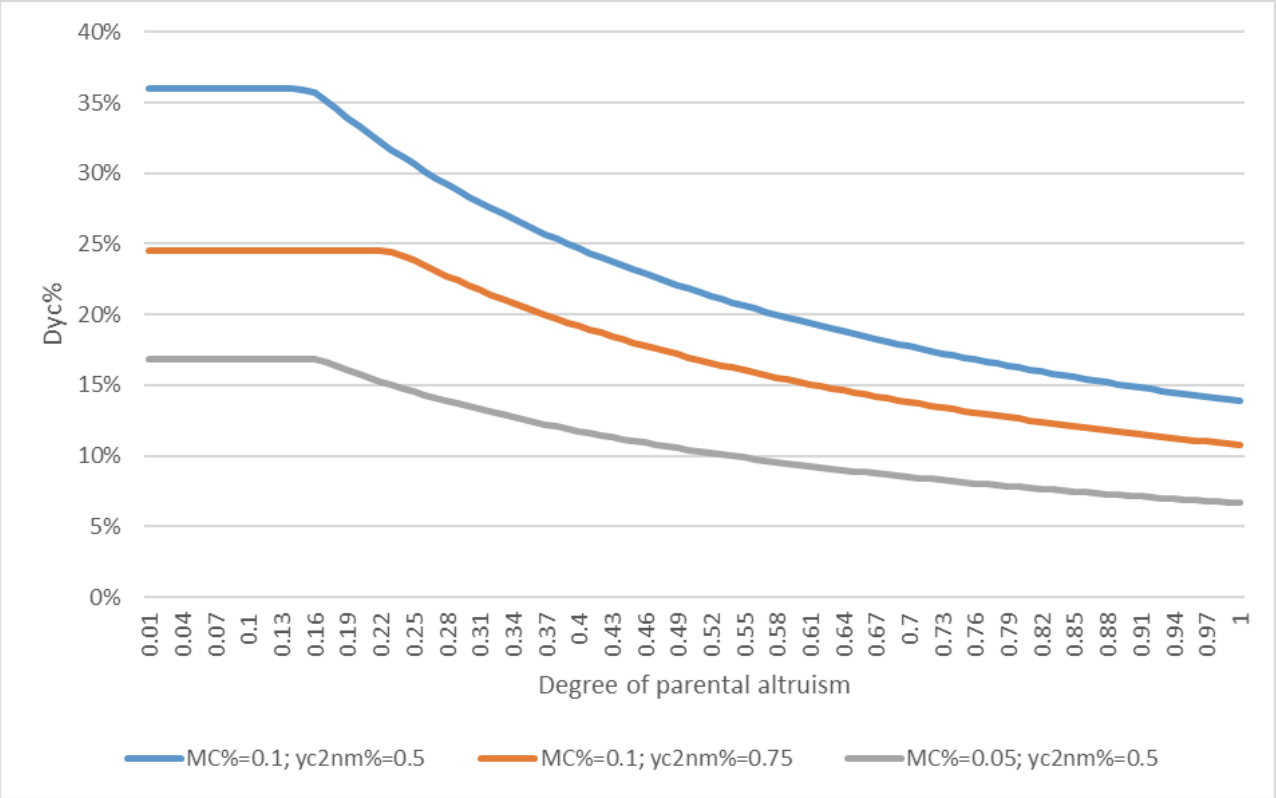
Two implications of Proposition 2 are worth noting.
First, when credit constraints are binding, $\Delta y_{c2} \geq MC(1+r)$ is neither a necessary nor a sufficient condition for child's migration.
Second, when credit constraints are binding, the probability of child's migration increases with parents' altruism.
In order to illustrate this point, we show the minimum increase in child's income that is necessary to satisfy conditions [#]-[###] for some combinations of the other exogenous variables. Suppose that $\frac{HC}{y_{c2}^{NM}} = 0.1$ (in the non-migration scenario, child's housing costs represent 10% of child's earnings) and $\omega_{c2} = 0.4$.[5] Figure 1 shows that, when $\frac{y_{c2}^{NM}}{y_{p2}} = 0.5$ (child's income at origin corresponds to 50% of parents' second-period income) and $\frac{MC}{y_{p1}} = 0.1$ (i.e. migration costs account for 10% of parents' first-period income), all parents are willing to pay the migration costs and let their child migrate if child's income at destination is at least 36% higher than child's income at origin.[6] However, as the degree of altruism increases, the variation in child's income that is necessary to induce parents to pay the migration costs decreases. For example, for the same values of $\frac{y_{c2}^{NM}}{y_{p2}}$ and $\frac{MC}{y_{p1}}$, altruistic parents with ω_A =0.5 would choose migration for their child if child's income at destination is at least 19% higher than child's income at origin, and fully altruistic parents if it is at least 13.9% higher.[7] Similar patterns are depicted in Figure 1 for other values of $\frac{y_{c2}^{NM}}{y_{p2}}$ and $\frac{MC}{y_{p1}}$.

[5] For the values considered in the following simulations, credit constraints for egoistic parents are binding if $\omega_{c2} \leq 0.52$, whenever $y_{p2}/y_{p1} \geq 1+r$. We considered a case in which $\omega_{c2} < 0.5$ to allow for some impatience.

[6] The efficient condition $\Delta y_{c2} \geq MC(1+r)$ requires an additional assumption on the ratio $\frac{y_{p1}(1+r)}{y_{p2}}$. Given $\frac{y_{c2}^{NM}}{y_{p2}} = 0.5$ and $\frac{MC}{y_{p1}} = 0.1$, the increase in child's income that would cover the migration costs (plus the related interests) would be lower or equal to 20% whenever $\frac{y_{p1}(1+r)}{y_{p2}} \leq 1$ (i.e. parents' income increases over time more than the interest factor).

[7] It is important to keep in mind that, as ω_A increases, credit constraints are less likely to be binding. For credit constraints to remain binding as ω_A increases, we need a larger and larger reduction in parents' first period income relative to the

Figure 1: Minimum increase in child's income that is necessary to satisfy conditions [#]-[###] for different values of migration costs and child's income at origin.



Notes: MC% $\equiv \frac{MC}{y_{p1}}$, yc2nm% $\equiv \frac{y_{c2}^{NM}}{y_{p2}}$. All three cases assume that $\omega_{c2} = \omega_{c1} = 0.5$ and $\frac{HC}{y_{c2}^{NM}} = 0.1$

second-period one. For the case at hand, credit constraints are binding up to ω_A =0.25 if $\frac{y_{p1}(1+r)}{y_{p2}} \leq 1$; they would be binding at ω_A =0.5 if $\frac{y_{p1}(1+r)}{y_{p2}} \leq 0.87$, and at ω_A =1 if $\frac{y_{p1}(1+r)}{y_{p2}} \leq 0.65$.

Appendix

Proof of Lemma 1.

With perfect capital markets, parents determine the optimal levels of consumption and child's transfers by maximizing [2] subject to the following budget constraints:

$$\begin{cases} c_{h1}(1+r) + c_{p2} \leq y_p^T + TR^{NM} \\ c_{c2} \leq y_{c2}^{NM} - TR^{NM} \end{cases} \quad [1A]$$

By substituting the constraints into the objective functions the problem becomes:

$$\max_{c_{h1}, TR^{NM}} \quad \omega_{c1} \ln c_{h1} + \omega_{c2} \ln\left(y_p^T + TR^{NM} - c_{h1}(1+r)\right) + \omega_A ln(y_{c2}^{NM} - TR^{NM}) \quad [2A]$$

The FOCs are:

$$\begin{cases} \frac{\omega_{c1}}{c_{h1}} = \frac{\omega_{c2}(1+r)}{y_p^T + TR^{NM} - c_{h1}(1+r)} \\ \frac{\omega_{c2}}{y_p^T + TR^{NM} - c_{h1}(1+r)} = \frac{\omega_A}{y_{c2}^{NM} - TR^{NM}} \end{cases} \quad [3A]$$

By solving the FOCs we determine the optimal level of transfers and consumption, as well as the expressions for parents' consumption and welfare for any possible level of transfers.

a) Parents' consumption as a function of transfers.
Using the normalization assumption $\omega_{c1} + \omega_{c2} = 1$, the first condition in [3A] can be rewritten as:

$$c_{h1,Unc}^{NM} = \omega_{c1} \frac{y_p^T + TR^{NM}}{(1+r)} \quad [4A]$$

where we added the superscript 'NM' and the subscript 'Unc' to c_{h1} in order to remember that it is the first-period consumption in the non-migration scenario with perfect capital markets (the subscript '*Unc*' stands for 'unconstrained solution').
Note that [4A] has the usual form for consumption functions with Cobb-Douglas preferences. Indeed, the second-period consumption function, for a generic amount of transfers, becomes:

$$c_{p2,Unc}^{NM} = \omega_{c2}\left(y_p^T + TR^{NM}\right) \quad [5A]$$

b) Parents' optimal level of transfers and consumption.
The second condition in [3A] becomes

$$TR^{NM} = \frac{\omega_{c2} y_{c2}^{NM} - \omega_A\left(y_p^T - c_{h1}(1+r)\right)}{\omega_{c2} + \omega_A} \quad [6A]$$

By substituting [4A] into [6A], we obtain:

$$TR_{Unc}^{*NM} = \frac{1}{1+\omega_A} y_{c2}^{NM} - \frac{\omega_A}{1+\omega_A} y_p^T \quad [7A]$$

By substituting [7A] into [4A] we obtain the optimal level of consumption when transfers are equal to TR_{Unc}^{*NM}:

$$c_{h1,Unc}^{*NM} = \frac{\omega_{c1}}{1+\omega_A} \frac{(y_p^T + y_{c2}^{NM})}{(1+r)} \quad [8A]$$

c) The actual level of transfers

Negotiation between parents and child will determine the actual amount that will be transferred between them. Recall that $TR_{Max}^{NM} = HC$. Hence, the actual amount of transfers that both parents and child will accept is:

$$TR_{Unc}^{NM} = min\{HC; TR_{Unc}^{*NM}\} = min\left\{HC; \frac{y_{c2}^{NM} - \omega_A y_p^T}{1+\omega_A}\right\} \quad [9A]$$

The first argument in [9A] is lower than the second when $y_{c2}^{NM} - HC \geq \omega_A(y_p^T + HC)$, i.e. when $\omega_A \leq (y_{c2}^{NM} - HC)/(y_p^T + HC)$

Hence, actual transfers are equal to [5].

d) Child's' welfare in the non-migration scenario

Using [1], the second constraint in [1A], and [9A], the child's utility in the non-migration scenario becomes:

$$W^{C,NM} = \begin{cases} ln(y_{c2}^{NM} - HC) & \text{if } \omega_A \leq (y_{c2}^{NM} - HC)/(y_p^T + HC) \\ ln\left(y_{c2}^{NM} - \frac{y_{c2}^{NM} - \omega_A y_p^T}{1+\omega_A}\right) & \text{if } \omega_A > (y_{c2}^{NM} - HC)/(y_p^T + HC) \end{cases}$$

which can be rewritten as in [6].

e) Parents' welfare in the non-migration scenario

When actual transfers are equal to HC (i.e. when $\omega_A \leq (y_{c2}^{NM} - HC)/(y_p^T + HC)$), we can substitute $TR_{Unc}^{NM} = HC$ and [4A] into [2A] and obtain the following expression for parents' welfare:

$$W_{Unc}^{P,NM} = \omega_{c1}\ln(\omega_{c1}) - \omega_{c1}\ln(1+r) + \omega_{c1}\ln(y_p^T + HC) + \omega_{c2}\ln\left((1-\omega_{c1})(y_p^T + HC)\right) + \\ + \omega_A ln(y_{c2}^{NM} - HC)$$

which, using the restriction $\omega_{c1} + \omega_{c2} = 1$, becomes:

$$W_{Unc}^{P,NM} = \ln(y_p^T + HC) + \omega_A ln(y_{c2}^{NM} - HC) + \Gamma \quad [10A]$$

where $\Gamma \equiv \omega_{c1}\ln(\omega_{c1}) + \omega_{c2}\ln(\omega_{c2}) - \omega_{c1}\ln(1+r)$

When actual transfers are equal to TR_{Unc}^{*NM} (i.e. when $\omega_A > (y_{c2}^{NM} - HC)/(y_p^T + HC)$), we can substitute [7A] and [8A] into [2A] and obtain the following expression for parents' welfare:

$$W_{Unc}^{P,NM} = \omega_{c1}\ln\left(\frac{\omega_{c1}}{1+\omega_A}\frac{1}{(1+r)}\right) + \omega_{c1}\ln\left(y_{c2}^{NM} + y_p^T\right) + \omega_{c2}\ln\left(\frac{(1-\omega_{c1})}{1+\omega_A}(y_p^T + y_{c2}^{NM})\right) + \omega_A ln\left(\frac{\omega_A}{1+\omega_A}\right) + \omega_A ln\left(y_{c2}^{NM} + y_p^T\right)$$

By using the restriction $\omega_{c1} + \omega_{c2} = 1$ and rearranging, we have:

$W_{Unc}^{P,NM} = (1+\omega_A)\ln\left(y_{c2}^{NM} + y_p^T\right) + \Gamma 2$ [11A]

where $\Gamma 2 \equiv \Gamma + \omega_A ln(\omega_A) - (1+\omega_A) ln(1+\omega_A)$

[10A] and [11A] with their respective conditions correspond to [7], and this completes the proof of lemma1. ♦

The maximum amount of transfers that the child is willing to give to parents in the migration scenario

The child will migrate only if her utility in case of migration is higher than her utility in case of non migration. Using [6], the maximum amount of transfers that the child is willing to give to parents will be determined by the following conditions:

$$ln(\, y_{c2}^M \, - \, TR^M) \geq \begin{cases} ln(y_{c2}^{NM} - HC) & \text{if } \omega_A \leq (y_{c2}^{NM} - HC)/\left(y_p^T + HC\right) \\ ln\left(\frac{\omega_A}{1+\omega_A}\left(y_p^T + y_{c2}^{NM}\right)\right) & \text{if } \omega_A > (y_{c2}^{NM} - HC)/\left(y_p^T + HC\right) \end{cases}$$

from which we obtain:

$$TR_{Max}^M = \begin{cases} HC + y_{c2}^M - y_{c2}^{NM} & \text{if } \omega_A \leq (y_{c2}^{NM} - HC)/\left(y_p^T + HC\right) \\ y_{c2}^M - \frac{\omega_A}{1+\omega_A}\left(y_p^T + y_{c2}^{NM}\right) & \text{if } \omega_A > (y_{c2}^{NM} - HC)/\left(y_p^T + HC\right) \end{cases}$$

Which can be rewritten as

$$TR_{Max}^M = \begin{cases} HC + y_{c2}^M - y_{c2}^{NM} & \text{if } \omega_A \leq (y_{c2}^{NM} - HC)/\left(y_p^T + HC\right) \\ \frac{y_{c2}^{NM} - \omega_A y_p^T}{1+\omega_A} + y_{c2}^M - y_{c2}^{NM} & \text{if } \omega_A > (y_{c2}^{NM} - HC)/\left(y_p^T + HC\right) \end{cases} \quad [12A]$$

i.e. $TR_{Max}^M = \widetilde{TR}^{NM} + y_{c2}^M - y_{c2}^{NM}$

Proof of Lemma 2.

In the migration scenario, parents choose the optimal levels of consumption and transfers by maximizing [2] subject to the following budget constraints:

$$\begin{cases} c_{h1}(1+r) + c_{p2} = y_p^T - MC(1+r) + TR^M \\ c_{c2} = y_{c2}^M - TR^M \end{cases} \quad [13A]$$

By substituting the constraints into the objective functions the problem becomes:

$$\max_{c_{h1}, TR^M} \quad \omega_{c1}\ln c_{h1} + \omega_{c2}\ln\left(y_p^T - MC(1+r) + TR^M - c_{h1}(1+r)\right) + \omega_A ln(y_{c2}^M - TR^M)$$

[14A]

The solution of this problem is very similar to that of lemma 1. More precisely, since parents must pay the migration costs, their overall resources are reduced by $MC(1+r)$, and y_{c2}^{NM} is replaced by y_{c2}^{M}. Hence, [4A], [6A] and [7A] become:

$$c_{h1,Unc}^{NM} = \omega_{c1}\frac{y_p^T - MC(1+r) + TR^M}{(1+r)} \quad [15A]$$

$$TR_{Unc}^{*M} = \frac{1}{1+\omega_A}y_{c2}^{M} - \frac{\omega_A}{1+\omega_A}y_p^T + \frac{\omega_A}{1+\omega_A}MC(1+r) \quad [16A]$$

$$c_{h1,Unc}^{*NM} = \frac{\omega_{c1}}{1+\omega_A}\frac{(y_p^T - MC(1+r) + y_{c2}^{M})}{(1+r)} \quad [17A]$$

a) The actual level of transfers

By using [12A], transfers in the migration scenario become:

$$TR_{Unc}^{M} = \begin{cases} min\{HC + \Delta y_{c2}; TR_{Unc}^{*M}\} & \text{if } \omega_A \le (y_{c2}^{NM} - HC)/(y_p^T + HC) \\ min\left\{\frac{y_{c2}^{NM} - \omega_A y_p^T}{1+\omega_A} + \Delta y_{c2}; TR_{Unc}^{*M}\right\} & \text{if } \omega_A > (y_{c2}^{NM} - HC)/(y_p^T + HC) \end{cases} \quad [18A]$$

where $\Delta y_{c2} \equiv y_{c2}^{M} - y_{c2}^{NM}$ and TR_{Unc}^{*M} is defined in [16A].

Before proceeding, it is useful to note that:

i) $HC + \Delta y_{c2} \le TR_{Unc}^{*M}$ can be rewritten as:
$y_{c2}^{NM} - HC \ge \omega_A(y_T + \Delta y_{c2} + HC - MC(1+r))$ [19A]

ii) $\frac{y_{c2}^{NM} - \omega_A y_p^T}{1+\omega_A} + \Delta y_{c2} \le TR_{Unc}^{*M}$ reduces to
$y_{c2}^{M} - MC(1+r) \le y_{c2}^{NM}$ [20A]

Hence, we have:

$$TR_{Unc}^{M} = HC + \Delta y_{c2} \quad \text{if} \begin{cases} \omega_A \le (y_{c2}^{NM} - HC)/(y_p^T + HC) \\ \omega_A \le (y_{c2}^{NM} - HC)/(y_T + \Delta y_{c2} + HC - MC(1+r)) \end{cases} \quad [21A]$$

$$TR_{Unc}^{M} = \frac{y_{c2}^{NM} - \omega_A y_p^T}{1+\omega_A} + \Delta y_{c2} \quad \text{if} \begin{cases} \omega_A > (y_{c2}^{NM} - HC)/(y_p^T + HC) \\ y_{c2}^{M} - MC(1+r) \le y_{c2}^{NM} \end{cases} \quad [22A]$$

$$TR_{Unc}^{M} = TR_{Unc}^{*M} \quad \text{if} \begin{cases} \omega_A \le (y_{c2}^{NM} - HC)/(y_p^T + HC) \\ \omega_A > (y_{c2}^{NM} - HC)/(y_T + \Delta y_{c2} + HC - MC(1+r)) \end{cases}$$

$$\text{or} \begin{cases} \omega_A > (y_{c2}^{NM} - HC)/(y_p^T + HC) \\ y_{c2}^M - MC(1+r) > y_{c2}^{NM} \end{cases}$$

[23A]

The first condition in [21A] incorporates the second condition whenever $y_{c2}^M - MC(1+r) \geq y_{c2}^{NM}$. On the contrary, the second condition in [21A] incorporates the first condition whenever $y_{c2}^M - MC(1+r) < y_{c2}^{NM}$.
Hence, we can rewrite [21A] as follows:

$$TR_{Unc}^M = HC + \Delta y_{c2} \qquad \text{if} \qquad \begin{cases} \omega_A \leq (y_{c2}^{NM} - HC)/(y_p^T + HC) \\ y_{c2}^M - MC(1+r) \leq y_{c2}^{NM} \end{cases} \qquad [24A]$$

$$\text{or} \qquad \begin{cases} \omega_A \leq (y_{c2}^{NM} - HC)/(y_T + \Delta y_{c2} + HC - MC(1+r)) \\ y_{c2}^M - MC(1+r) > y_{c2}^{NM} \end{cases}$$

The first two conditions in [23A] can be satisfied simultaneously only if $\Delta y_{c2} - MC(1+r) > 0$. Hence, we can rewrite these two conditions as

$$\begin{cases} (y_{c2}^{NM} - HC)/(y_T + \Delta y_{c2} + HC - MC(1+r)) < \omega_A \leq (y_{c2}^{NM} - HC)/(y_p^T + HC) \\ y_{c2}^M - MC(1+r) > y_{c2}^{NM} \end{cases}$$

[25A]

The second set of conditions in [23A] overcomes the higher limit on ω_A in [25A]. Hence [23A] becomes

$$TR_{Unc}^M = \frac{y_{c2}^M - \omega_A y_p^T + \omega_A MC(1+r)}{1+\omega_A} \qquad \text{if} \begin{cases} \omega_A > (y_{c2}^{NM} - HC)/(y_T + \Delta y_{c2} + HC - MC(1+r)) \\ y_{c2}^M - MC(1+r) > y_{c2}^{NM} \end{cases}$$

[26A]

Summarizing, actual transfers are defined by [22A], [24A] and [26A], which allow us to consider separately the case in which $y_{c2}^M - MC(1+r) \geq y_{c2}^{NM}$ and the opposite case.
When $y_{c2}^M - MC(1+r) < y_{c2}^{NM}$, the actual amount of transfers will be:

$$\widetilde{TR}^M = TR_{Max}^M = \widetilde{TR}^{NM} + y_{c2}^M - y_{c2}^{NM} \qquad [27A]$$

When $y_{c2}^M - MC(1+r) \geq y_{c2}^{NM}$, the actual amount of transfers will be:

$$\widetilde{TR}^M = \begin{cases} HC + \Delta y_{c2} & \text{if } \omega_A \leq (y_{c2}^{NM} - HC)/(y_T + \Delta y_{c2} + HC - MC(1+r)) \\ \frac{y_{c2}^M - \omega_A y_p^T + \omega_A MC(1+r)}{1+\omega_A} & \text{if } \omega_A > (y_{c2}^{NM} - HC)/(y_T + \Delta y_{c2} + HC - MC(1+r)) \end{cases}$$

[28A]

which corresponds to [9].

b) Child's welfare in the migration scenario

From [27A] it is clear that, when $y_{c2}^{M} - MC(1+r) < y_{c2}^{NM}$, child's welfare in the migration scenario is the same as in the non-migration scenario.

When $y_{c2}^{M} - MC(1+r) \geq y_{c2}^{NM}$, we can use [28A] and obtain:

$$W^{C,M} = \begin{cases} ln\left(y_{c2}^{M} - y_{c2}^{M} + (y_{c2}^{NM} - HC)\right) & \text{if } \omega_A \leq (y_{c2}^{NM} - HC)/\left(y_T + \Delta y_{c2} + HC - MC(1+r)\right) \\ ln\left(y_{c2}^{M} - \frac{y_{c2}^{M} - \omega_A y_p^T + \omega_A MC(1+r)}{1+\omega_A}\right) & \text{if } \omega_A > (y_{c2}^{NM} - HC)/\left(y_T + \Delta y_{c2} + HC - MC(1+r)\right) \end{cases}$$

which can be rewritten as:

$$W^{C,M} = \begin{cases} ln(y_{c2}^{NM} - HC) & \text{if } \omega_A \leq (y_{c2}^{NM} - HC)/\left(y_T + \Delta y_{c2} + HC - MC(1+r)\right) \\ ln\left(\frac{\omega_A}{1+\omega_A}\left(y_p^T + y_{c2}^{M} - MC(1+r)\right)\right) & \text{if } \omega_A > (y_{c2}^{NM} - HC)/\left(y_T + \Delta y_{c2} + HC - MC(1+r)\right) \end{cases}$$

and corresponds to [10].

c) Parents' welfare in the non-migration scenario

Parents' welfare as a function of the amount of transfers in the migration scenario can be derived by substituting [15A] into [14A]:

$$W_{Unc}^{P,M} = \omega_{c1}\ln(\omega_{c1}) - \omega_{c1}\ln(1+r) + \omega_{c1}\ln\left(y_p^T - MC(1+r) + TR_{Unc}^{M}\right) + \omega_{c2}\ln\left((1-\omega_{c1})\left(y_p^T - MC(1+r) + TR_{Unc}^{M}\right)\right) + \omega_A ln(y_{c2}^{M} - TR_{Unc}^{M})$$

which, using the restriction $\omega_{c1} + \omega_{c2} = 1$, becomes:

$$W_{Unc}^{P,M} = \ln\left(y_p^T - MC(1+r) + TR_{Unc}^{M}\right) + \omega_A ln(y_{c2}^{M} - TR_{Unc}^{M}) + \Gamma \qquad [29A]$$

where Γ is the same as in [10A].

Hence, when transfers are equal to $HC + \Delta y_{c2}$, parents' welfare becomes:

$$W_{Unc}^{P,M} = \ln\left(y_p^T + HC + \Delta y_{c2} - MC(1+r)\right) + \omega_A ln(y_{c2}^{M} - HC) + \Gamma \qquad [30A]$$

Substituting [16A] into [29A], we have parents' welfare at the optimal level of transfers:

$$W_{Unc}^{P,M} = \ln\left(\frac{y_p^T - MC(1+r) + y_{c2}^{M}}{1+\omega_A}\right) + \omega_A ln\left(\omega_A \frac{y_p^T - MC(1+r) + y_{c2}^{M}}{1+\omega_A}\right) + \Gamma$$

which becomes

$$W_{Unc}^{P,M} = (1+\omega_A)\ln\left(y_p^T + y_{c2}^M - MC(1+r)\right) + \Gamma 2 \qquad [31A]$$

Where Γ2 is the same as in [11A].

Finally, when transfers are equal $\frac{y_{c2}^{NM} - \omega_A y_p^T}{1+\omega_A} + \Delta y_{c2}$, parents' welfare becomes:

$$W_{Unc}^{P,M} = \ln\left(\frac{y_p^T + (1+\omega_A)(y_{c2}^M - MC(1+r)) - \omega_A y_{c2}^{NM}}{(1+\omega_A)}\right) + \omega_A ln\left(\frac{\omega_A}{1+\omega_A}\left(y_p^T + y_{c2}^{NM}\right)\right) + \Gamma$$

which can be rewritten as

$$W_{Unc}^{P,M} = \ln\left(y_p^T + y_{c2}^M - MC(1+r) + \omega_A(y_{c2}^M - MC(1+r) - y_{c2}^{NM})\right) + \omega_A ln\left(y_p^T + y_{c2}^{NM}\right) + \Gamma 2 \qquad [32A]$$

Where Γ2 is the same as in [11A].

[30A], [31A] and [32A], with their respective conditions, correspond to [11], and this completes the proof of lemma 2.♦

Proof of Proposition 1.

Parents will choose migration for their child when their welfare in the migration scenario is higher than their welfare in the non-migration scenario.
Let us first consider the case in which $y_{c2}^M - MC(1+r) < y_{c2}^{NM}$. Under this condition, we need to compare we compare [8] with [7]. When $\omega_A \leq \omega_A^{*NM}$, they differ only for the first element of the RHS. Since we are considering the case $y_{c2}^M - MC(1+r) < y_{c2}^{NM}$, the first element of the RHS of [8] is lower than the first element of the RHS of [7]. Hence, when $\omega_A \leq \omega_A^{*NM}$, [8] is lower than [7]. When $\omega_A > \omega_A^{*NM}$, we can rewrite [7] as:

$$W^{P,NM} = \ln\left(y_{c2}^{NM} + y_p^T\right) + \omega_A \ln\left(y_{c2}^{NM} + y_p^T\right) + \Gamma 2 \qquad [33A]$$

Again, the only difference with [8] is in the first element of the RHS. The first element of the RHS of [8] is lower than the first element of the RHS of [33A] because $(1+\omega_A)(\Delta y_{c2} - MC(1+r)) < 0$. Hence, [8] is always lower than [7] and parents will never choose migration if $y_{c2}^M - MC(1+r) < y_{c2}^{NM}$.

For the case in which $y_{c2}^M - MC(1+r) \geq y_{c2}^{NM}$, we need to compare [11] with [7], keeping in mind that, in this case, $\omega_A^{*M} \leq \omega_A^{*NM}$.
By comparing the appropriate expressions for parents' welfare in [7] and [11], parents choose migration for their child whenever:

a) $(1+\omega_A)\ln\left(y_p^T + y_{c2}^M - MC(1+r)\right) + \Gamma 2 \geq (1+\omega_A)\ln\left(y_p^T + y_{c2}^{NM}\right) + \Gamma 2$

if $\omega_A > \omega_A^{*NM}$

b) $(1+\omega_A)\ln\left(y_p^T + y_{c2}^M - MC(1+r)\right) + \Gamma 2 \geq \ln\left(y_p^T + HC\right) + \omega_A ln(y_{c2}^{NM} - HC) + \Gamma$

if $\omega_A^{*M} \leq \omega_A \leq \omega_A^{*NM}$

c) $\ln\left(y_p^T + HC + \Delta y_{c2} - MC(1+r)\right) + \omega_A ln(y_{c2}^{NM} - HC) + \Gamma \geq$
$\ln\left(y_p^T + HC\right) + \omega_A ln(y_{c2}^{NM} - HC) + \Gamma$ if $\omega_A \leq \omega_A^{*M}$

Since we are considering the case in which $y_{c2}^M - MC(1+r) \geq y_{c2}^{NM}$, it is possible to see immediately that the inequalities in a) and c) are always satisfied.
In order to show that inequality b) is always satisfied, consider that $\omega_A \leq \omega_A^{*NM}$ can be written as:

$$\ln(\omega_A) \leq ln(y_{c2}^{NM} - HC) - ln\left(y_p^T + HC\right)$$

Hence, $ln\left(y_p^T + HC\right) \leq ln(y_{c2}^{NM} - HC) - \ln(\omega_A)$. If we replace $\ln\left(y_p^T + HC\right)$ on the RHS of b) with $ln(y_{c2}^{NM} - HC) - \ln(\omega_A)$, and the inequality is satisfied, it will also be satisfied in its original version.
With the proposed substitution, the inequality in b) becomes:

$$(1+\omega_A)\ln\left(y_p^T + y_{c2}^M - MC(1+r)\right) + \Gamma 2 \geq (1+\omega_A)ln(y_{c2}^{NM} - HC) - \ln(\omega_A) + \Gamma$$

Using the definitions of Γ and Γ2, we have:

$$(1+\omega_A)\ln\left(y_p^T + y_{c2}^M - MC(1+r)\right) + (1+\omega_A)ln(\omega_A)$$
$$\geq (1+\omega_A)ln(y_{c2}^{NM} - HC)) + (1+\omega_A)ln(1+\omega_A)$$

Dividing both sides by $(1+\omega_A)$ and using the properties of the logarithms, we obtain

$$\omega_A\left(y_p^T + y_{c2}^M - MC(1+r)\right) \geq (1+\omega_A)(y_{c2}^{NM} - HC))$$

i.e.

$$\omega_A\left(y_p^T + HC + \Delta y_{c2} - MC(1+r)\right) \geq (y_{c2}^{NM} - HC)$$

which is always satisfied given that the conditions for b) require $\omega_A \geq \omega_A^{*M}$.
Hence, with perfect capital markets, parents will always choose migration if $y_{c2}^M - MC(1+r) \geq y_{c2}^{NM}$, and they will never choose migration if $y_{c2}^M - MC(1+r) < y_{c2}^{NM}$. This means that parents will choose migration *if and only if* $y_{c2}^M - MC(1+r) \geq y_{c2}^{NM}$.
From the implications of lemma 1 and lemma 2 described in the text, we know that, in both scenarios, actual transfers are a decreasing function of the degree of parental altruism, and that both child's and parents' welfare are an increasing function of the degree of parental altruism.
This completes the proof of Proposition 1.♦

The conditions for credit constraints to be binding

Credit constraints are binding at $TR^i_{C,Max}$ if:

$$\frac{y_{p2}+HC+\Delta y_{c2}\cdot I^i}{(y_{p1}-MC\cdot I^i)(1+r)} > \frac{\omega_{c2}}{\omega_{c1}} \quad [34A]$$

i.e. if
$\omega_{c1}\left(y_{p2}+HC+\ \Delta y_{c2}\cdot I^i\right) > \omega_{c2}\left(y_{p1}-MC\cdot I^i\right)(1+r)$

which, using the restriction $\omega_{c1}+\omega_{c2}=1$, can be rewritten as:

$y_{p2}+HC+\ \Delta y_{c2}\cdot I^i > \omega_{c2}\left(y_{p2}+HC+\ \Delta y_{c2}\cdot I^i+\left(y_{p1}-MC\cdot I^i\right)(1+r)\right)$

Using the definition of y_p^T we obtain

$$\omega_{c2} < \frac{y_{p2}+HC+\Delta y_{c2}\cdot I^i}{y_p^T+HC+\left(\Delta y_{c2}-MC(1+r)\right)\cdot I^i} \quad [35A]$$

Credit constraints are binding at TR_P^{*i} if:

$$\frac{y_{p2}+\frac{y^i_{c2}-\omega_A\left(y_p^T-MC\cdot I^i(1+r)\right)}{1+\omega_A}}{(y_{p1}-MC\cdot I^i)(1+r)} > \frac{\omega_{c2}}{\omega_{c1}} \quad [36A]$$

i.e. if
$\omega_{c1}\left(y^i_{c2}+y_{p2}-\omega_A\left(y_{p1}-MC\cdot I^i\right)(1+r)\right) > (1+\omega_A)\omega_{c2}\left(y_{p1}-MC\cdot I^i\right)(1+r)$

which, using the restriction $\omega_{c1}+\omega_{c2}=1$, can be rewritten as:

$(1-\omega_{c2})\left(y^i_{c2}+y_{p2}\right) > \omega_{c2}\left(y_{p1}-MC\cdot I^i\right)(1+r)+\omega_A\left(y_{p1}-MC\cdot I^i\right)(1+r)$
$\left(y^i_{c2}+y_{p2}\right)-\omega_A\left(y_{p1}-MC\cdot I^i\right)(1+r) > \omega_{c2}\left(y^{NM}_{c2}+y_{p2}+\left(y_{p1}-MC\cdot I^i\right)(1+r)\right)$

Using the definition of y_p^T we obtain

$$\omega_{c2} < \frac{y^i_{c2}+y_{p2}}{y^i_{c2}+y_p^T-MC\cdot I^i(1+r)} - \omega_A\frac{\left(y_{p1}-MC\cdot I^i\right)(1+r)}{y^i_{c2}+y_p^T-MC\cdot I^i(1+r)} \quad [37A]$$

We know from Lemma 1 and Lemma 2 that $TR^i_{C,Max} \le TR_P^{*i}$ when $\omega_A \le \omega_A^{*i}$. Hence, credit constraints are binding if

$$\begin{cases}\omega_A \le \omega_A^{*i}\\ \omega_{c2} < \frac{y_{p2}+HC+\Delta y_{c2}\cdot I^i}{y_p^T+HC+\left(\Delta y_{c2}-MC(1+r)\right)\cdot I^i}\end{cases} \quad [38A]$$

or

$$\begin{cases} \omega_A > \omega_A^{*i} \\ \omega_{c2} < \frac{y_{c2}^i + y_{p2}}{y_{c2}^i + y_p^T - MC \cdot I^i (1+r)} - \omega_A \frac{(y_{p1} - MC \cdot I^i)(1+r)}{y_{c2}^i + y_p^T - MC \cdot I^i (1+r)} \end{cases} \quad [39A]$$

Since the second conditions in [38A] and [39A] cross exactly at $\omega_A = \omega_A^{*i}$, [38A] and [39A] reduce to

$$\begin{cases} \omega_{c2} < \frac{y_{p2} + HC + \Delta y_{c2} \cdot I^i}{y_p^T + HC + (\Delta y_{c2} - MC(1+r)) \cdot I^i} \\ \omega_{c2} < \frac{y_{c2}^i + y_{p2}}{y_{c2}^i + y_p^T - MC \cdot I^i (1+r)} - \omega_A \frac{(y_{p1} - MC \cdot I^i)(1+r)}{y_{c2}^i + y_p^T - MC \cdot I^i (1+r)} \end{cases} \quad [40A]$$

which correspond to [xx].

We can describe [40A] as an area in the two-dimensional space $(\omega_{c2};\ \omega_A)$. With few algebraic steps, it is possible to show that the first condition in [40A] identifies a higher value of ω_{c2} for the migration scenario (i.e. that $\frac{y_{p2} + HC + \Delta y_{c2}}{y_p^T + HC + \Delta y_{c2} - MC(1+r)} > \frac{y_{p2} + HC}{y_p^T + HC}$) whenever $\Delta y_{c2} \geq 0$. Moreover, whenever $\Delta y_{c2} \geq 0$, the slope of the line identifying the second condition in [40A] is smaller (in absolute value) in the migration scenario (i.e. $\frac{(y_{p1} - MC)(1+r)}{y_p^T + y_{c2}^M - MC(1+r)} < \frac{y_{p1}(1+r)}{y_p^T + y_{c2}^{NM}}$). Hence, the area in the space $(\omega_{c2};\ \omega_A)$ that identifies the conditions for credit constraints to be binding in the non-migration scenario, is included in the area that identifies the corresponding conditions in the migration scenario. In other words, if liquidity constraints are binding in the non-migration scenario, they will be binding also in the migration scenario but not vice-versa.

We plot these two areas in Figure 1 and Figure 2. Figure 1 refers to the case in which $\Delta y_{c2} \geq MC(1 + r)$, and Figure 2 to the opposite case. We use dark grey for the migration scenario and light grey for the non-migration scenario.

Figure 1. Values of ω_{c2} and ω_A that imply binding credit constraints, when $\Delta y_{c2} \geq MC(1 + r)$.

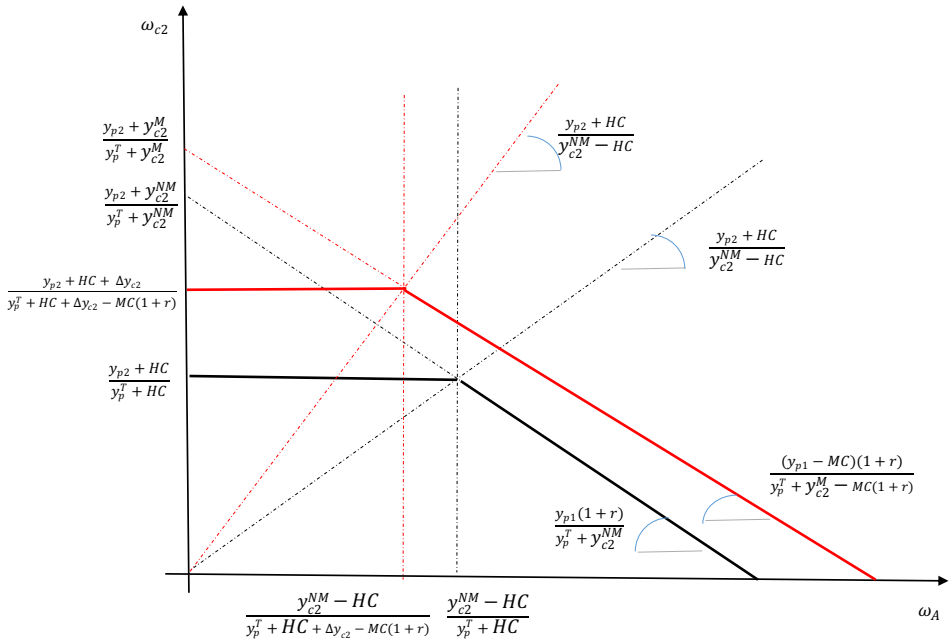
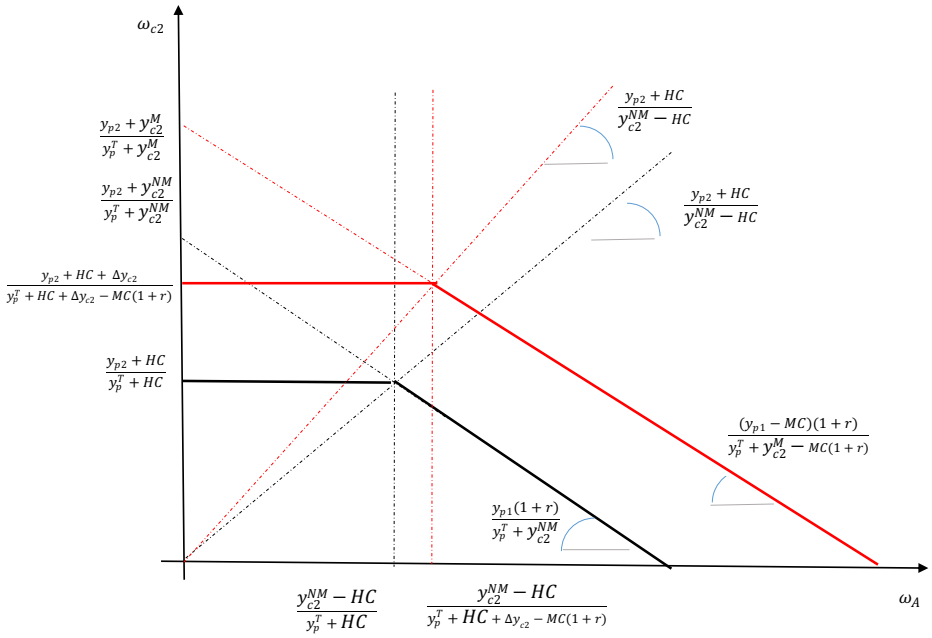


Figure 2. Values of ω_{c2} and ω_A that imply binding credit constraints, when $\Delta y_{c2} < MC(1+r)$.



Proof of Lemma 3

a) Parents' optimal level of transfers.

When credit constraints are binding, parents determine the optimal levels of consumption and child's transfers by maximizing [2] subject to the following budget constraints:

$$\begin{cases} c_{h1}^{i} \leq y_{p1} - MC \cdot I^{i} \\ c_{p2}^{i} \leq y_{p2} + TR^{i} \\ c_{c2} \leq y_{c2}^{i} - TR^{i} \end{cases} \qquad [41A]$$

In this case, in each scenario, the only choice variable for parents is the optimal level of transfers. By substituting the constraints into the objective functions the problem becomes:

$$\max_{TR^{i}} \quad \omega_{c1} \ln\left(y_{p1} - MC \cdot I^{i}\right) + \omega_{c2} \ln\left(y_{p2} + TR^{i}\right) + \omega_{A} ln\left(y_{c2}^{i} - TR^{i}\right) \qquad [42A]$$

The FOC is:

$$\frac{\omega_{c2}}{y_{p2}+TR^{i}} = \frac{\omega_{A}}{y_{c2}^{i} - TR^{i}} \qquad [43A]$$

from which $TR_{P,LC}^{*i} = \frac{\omega_{c2} y_{c2}^{i} - \omega_{A} y_{p2}}{\omega_{c2}+\omega_{A}}$

b) The maximum amount of transfers that the child is willing to give to parents ($TR_{C,Max}^{i,LC}$)

With credit constraints, the reservation utility for the child is the same as with perfect capital markets (i.e. as in [4]). Hence, $TR_{C,Max}^{NM,LC} = HC$.

Note that $TR_{C,Max}^{NM,LC} \leq TR_{P,LC}^{*NM}$ whenever $HC \leq \frac{\omega_{c2} y_{c2}^{NM} - \omega_A y_{p2}}{\omega_{c2} + \omega_A}$, i.e. whenever $\frac{\omega_{c2}}{\omega_A} \geq \frac{y_{p2} + HC}{y_{c2}^{NM} - HC}$

$$\text{Hence, } \widetilde{TR}_{LC}^{NM} = \begin{cases} HC & \text{if } \frac{\omega_{c2}}{\omega_A} \geq \frac{y_{p2} + HC}{y_{c2}^{NM} - HC} \\ \frac{\omega_{c2} y_{c2}^{NM} - \omega_A y_{p2}}{\omega_{c2} + \omega_A} & \text{if } \frac{\omega_{c2}}{\omega_A} < \frac{y_{p2} + HC}{y_{c2}^{NM} - HC} \end{cases} \quad [44A]$$

The child will migrate only if her utility in case of migration is higher than her utility in case of non migration, i.e. if

$$ln(\, y_{c2}^{M} \, - \, TR^{M}) \geq \begin{cases} ln(y_{c2}^{NM} \, - HC) & \text{if } \frac{\omega_{c2}}{\omega_A} \geq \frac{y_{p2} + HC}{y_{c2}^{NM} - HC} \\ ln\left(\frac{\omega_A}{\omega_{c2} + \omega_A} \left(y_{p2} + y_{c2}^{NM} \right) \right) & \text{if } \frac{\omega_{c2}}{\omega_A} < \frac{y_{p2} + HC}{y_{c2}^{NM} - HC} \end{cases}$$

from which we obtain:

$$TR_{C,Max}^{M,LC} = \begin{cases} HC + y_{c2}^{M} - y_{c2}^{NM} & \text{if } \frac{\omega_{c2}}{\omega_A} \geq \frac{y_{p2} + HC}{y_{c2}^{NM} - HC} \\ \frac{\omega_{c2} y_{c2}^{NM} - \omega_A y_{p2}}{\omega_{c2} + \omega_A} + y_{c2}^{M} - y_{c2}^{NM} & \text{if } \frac{\omega_{c2}}{\omega_A} < \frac{y_{p2} + HC}{y_{c2}^{NM} - HC} \end{cases} \quad [45A]$$

i.e. $TR_{C,Max}^{M,LC} = \widetilde{TR}^{NM} + \Delta y_{c2}$

c) The actual level of transfers

When credit constraints are binding, actual transfers in the noon-migration scenario are defined in [46A]. In the migration scenario we have:

$$\widetilde{TR}_{LC}^{M} = \begin{cases} min\left\{ HC + \Delta y_{c2}; \frac{\omega_{c2} y_{c2}^{M} - \omega_A y_{p2}}{\omega_{c2} + \omega_A} \right\} & \text{if } \frac{\omega_{c2}}{\omega_A} \geq \frac{y_{p2} + HC}{y_{c2}^{NM} - HC} \\ min\left\{ \frac{\omega_{c2} y_{c2}^{NM} - \omega_A y_{p2}}{\omega_{c2} + \omega_A} + \Delta y_{c2}; \frac{\omega_{c2} y_{c2}^{M} - \omega_A y_{p2}}{\omega_{c2} + \omega_A} \right\} & \text{if } \frac{\omega_{c2}}{\omega_A} < \frac{y_{p2} + HC}{y_{c2}^{NM} - HC} \end{cases} \quad [46A]$$

The first argument in the first subfunction in [47A] is lower than the second argument if:

$$HC + \Delta y_{c2} \leq \frac{\omega_{c2} y_{c2}^{M} - \omega_A y_{p2}}{\omega_{c2} + \omega_A}$$

which becomes $\frac{\omega_{c2}}{\omega_A} \geq \frac{y_{p2} + HC + \Delta y_{c2}}{y_{c2}^{NM} - HC}$

The second argument in the second subfunction in [46A] is always lower than the first argument. Hence, we can rewrite [46A] as follows:

$$\widetilde{TR}_{LC}^{M} = \begin{cases} HC + \Delta y_{c2} & \text{if } \frac{\omega_{c2}}{\omega_A} \geq \frac{y_{p2}+HC+\Delta y_{c2}}{y_{c2}^{NM}-HC} \\ \frac{\omega_{c2} y_{c2}^{M} - \omega_A y_{p2}}{\omega_{c2}+\omega_A} & \text{if } \frac{\omega_{c2}}{\omega_A} < \frac{y_{p2}+HC+\Delta y_{c2}}{y_{c2}^{NM}-HC} \end{cases} \quad [47A]$$

By combining [44A] and [47A] we have:

$$\widetilde{TR}_{LC}^{i} = \begin{cases} HC + \Delta y_{c2} \cdot I^i & if\ \frac{\omega_{c2}}{\omega_A} \geq \frac{y_{p2}+HC+\Delta y_{c2}}{y_{c2}^{NM}-HC} \\ HC \cdot (1 - I^i) + \frac{\omega_{c2} y_{c2}^{i} - \omega_A y_{p2}}{\omega_{c2}+\omega_A} \cdot I^i & if\ \frac{y_{p2}+HC}{y_{c2}^{NM}-HC} < \frac{\omega_{c2}}{\omega_A} < \frac{y_{p2}+HC+\Delta y_{c2}}{y_{c2}^{NM}-HC} \\ \frac{\omega_{c2} y_{c2}^{i} - \omega_A y_{p2}}{\omega_{c2}+\omega_A} & if\ \frac{\omega_{c2}}{\omega_A} \leq \frac{y_{p2}+HC}{y_{c2}^{NM}-HC} \end{cases} \quad [48A]$$

d) The level of child's and parents' welfare

Since $W_{LC}^{C,i} = ln(y_{c2}^{i} - \widetilde{TR}_{LC}^{i})$, we can substitute [49A] into this function and obtain:

$$W_{LC}^{C,i} = \begin{cases} ln(y_{c2}^{NM} - HC) & if\ \frac{\omega_{c2}}{\omega_A} \geq \frac{y_{p2}+HC+\Delta y_{c2}}{y_{c2}^{NM}-HC} \\ ln(y_{c2}^{NM} - HC) & if\ \frac{y_{p2}+HC}{y_{c2}^{NM}-HC} < \frac{\omega_{c2}}{\omega_A} < \frac{y_{p2}+HC+\Delta y_{c2}}{y_{c2}^{NM}-HC}\ and\ i = NM \\ ln\left(\frac{\omega_A}{\omega_{c2}+\omega_A}\left(y_{p2} + y_{c2}^{M}\right)\right) & if\ \frac{y_{p2}+HC}{y_{c2}^{NM}-HC} < \frac{\omega_{c2}}{\omega_A} < \frac{y_{p2}+HC+\Delta y_{c2}}{y_{c2}^{NM}-HC}\ and\ i = M \\ ln\left(\frac{\omega_A}{\omega_{c2}+\omega_A}\left(y_{p2} + y_{c2}^{i}\right)\right) & if\ \frac{\omega_{c2}}{\omega_A} \leq \frac{y_{p2}+HC}{y_{c2}^{NM}-HC} \end{cases} \quad [49A]$$

Similarly, if we substitute [48A] and [49A] into [42A], we obtain parents' welfare:

$W_{LC}^{P,i} =$

$$\begin{cases} \omega_{c1}\ln\left(y_{p1} - MC \cdot I^i\right) + \omega_{c2}\ln\left(y_{p2} + HC + \Delta y_{c2} \cdot I^i\right) + \omega_A ln(y_{c2}^{NM} - HC) & if\ \frac{\omega_{c2}}{\omega_A} \geq \frac{y_{p2}+HC+\Delta y_{c2}}{y_{c2}^{NM}-HC} \\ \omega_{c1}\ln y_{p1} + \omega_{c2}\ln\left(y_{p2} + HC\right) + \omega_A ln(y_{c2}^{NM} - HC) & if\ \frac{y_{p2}+HC}{y_{c2}^{NM}-HC} < \frac{\omega_{c2}}{\omega_A} < \frac{y_{p2}+HC+\Delta y_{c2}}{y_{c2}^{NM}-HC}\ and\ i = NM \\ \omega_{c1}\ln\left(y_{p1} - MC\right) + (\omega_{c2}+\omega_A)\ln\left(y_{c2}^{M} + y_{p2}\right) + \Phi & if\ \frac{y_{p2}+HC}{y_{c2}^{NM}-HC} < \frac{\omega_{c2}}{\omega_A} < \frac{y_{p2}+HC+\Delta y_{c2}}{y_{c2}^{NM}-HC}\ and\ i = M \\ \omega_{c1}\ln\left(y_{p1} - MC \cdot I^i\right) + (\omega_{c2}+\omega_A)\ln\left(y_{c2}^{i} + y_{p2}\right) + \Phi & if\ \frac{\omega_{c2}}{\omega_A} \leq \frac{y_{p2}+HC}{y_{c2}^{NM}-HC} \end{cases}$$

[50A]

where $\Phi \equiv \omega_{c2} ln(\omega_{c2}) + \omega_A ln(\omega_A) - (\omega_{c2}+\omega_A) ln(\omega_{c2}+\omega_A)$

This completes the proof of Lemma 3 ♦

Proof of Lemma 4

Parents choose migration for their child if $W_{LC}^{P,M} \geq W_{LC}^{P,NM}$. Using [50A], we have that:

- Under the condition $\frac{\omega_{c2}}{\omega_A} \geq \frac{y_{p2}+HC+\Delta y_{c2}}{y_{c2}^{NM}-HC}$, migration is optimal if

  $\omega_{c1}\ln(y_{p1}-MC)+\omega_{c2}\ln(y_{p2}+HC+\Delta y_{c2})+\omega_A ln(y_{c2}^{NM}-HC) \geq$

  $\omega_{c1}\ln(y_{p1})+\omega_{c2}\ln(y_{p2}+HC)+\omega_A ln(y_{c2}^{NM}-HC)$

  i.e. if

  $\omega_{c2} ln\left(\frac{y_{p2}+HC+\Delta y_{c2}}{y_{p2}+HC}\right) \geq \omega_{c1}\ln\left(\frac{y_{p1}}{y_{p1}-MC}\right)$ which can be rewritten as in [#]

- Under the condition $\frac{y_{p2}+HC}{y_{c2}^{NM}-HC} < \frac{\omega_{c2}}{\omega_A} < \frac{y_{p2}+HC+\Delta y_{c2}}{y_{c2}^{NM}-HC}$, migration is optimal if

  $\omega_{c1}\ln(y_{p1}-MC)+(\omega_{c2}+\omega_A)\ln(y_{c2}^{M}+y_{p2})+\Phi \geq$

  $\omega_{c1}\ln(y_{p1})+\omega_{c2}\ln(y_{p2}+HC)+\omega_A ln(y_{c2}^{NM}-HC)$

  i.e. if

  $\omega_{c2} ln\left(\frac{y_{p2}+y_{c2}^{M}}{y_{p2}+HC}\right)+\omega_A \ln\left(\frac{y_{p2}+y_{c2}^{M}}{y_{c2}^{NM}-HC}\right)+\Phi \geq \omega_{c1}\ln\left(\frac{y_{p1}}{y_{p1}-MC}\right)$ which can be rewritten as in [##]

- Under the condition $\frac{\omega_{c2}}{\omega_A} \leq \frac{y_{p2}+HC}{y_{c2}^{NM}-HC}$, migration is optimal if

  $\omega_{c1}\ln(y_{p1}-MC)+(\omega_{c2}+\omega_A)\ln(y_{c2}^{M}+y_{p2})+\Phi \geq$

  $\omega_{c1}\ln(y_{p1})+(\omega_{c2}+\omega_A)\ln(y_{c2}^{NM}+y_{p2})+\Phi$

  i.e. if

  $(\omega_{c2}+\omega_A) ln\left(\frac{y_{c2}^{M}+y_{p2}}{y_{c2}^{NM}+y_{p2}}\right) \geq \omega_{c1}\ln\left(\frac{y_{p1}}{y_{p1}-MC}\right)$ which can be rewritten as in [###]

This completes the proof of Lemma 4♦

Proof of Proposition 2

In order to prove the first part of Proposition 2, we need to prove that, when the second condition in [#] in Lemma 4 is satisfied, the second condition in [##] and [###] are also satisfied.
The RHS of the second condition in [#], [##], and [###] is the same. Hence, when the second condition in [#] is satisfied, the second condition in [##] and [###] are also satisfied if their LHS is greater than (or equal to) the LHS of the second condition in [#].
The LHS of [##] is greater than the LHS of [#] if:

$$\omega_{c2} ln\left(\frac{y_{p2}+y_{c2}^{M}}{y_{p2}+HC}\right)+\omega_A \ln\left(\frac{y_{p2}+y_{c2}^{M}}{y_{c2}^{NM}-HC}\right)+\Phi \geq \omega_{c2} ln\left(1+\frac{\Delta y_{c2}}{y_{p2}+HC}\right) \qquad [51A]$$

where $\Phi \equiv \omega_{c2} ln(\omega_{c2})+\omega_A ln(\omega_A)-(\omega_{c2}+\omega_A) ln(\omega_{c2}+\omega_A)$

The first derivative of [51A] with respect to ω_A is:

$$\ln\left(\frac{y_{p2}+y_{c2}^{M}}{y_{c2}^{NM}-HC}\right)-ln\left(\frac{\omega_{c2}}{\omega_A}+1\right)$$

which is positive because, by the first condition in [##], $\frac{\omega_{c2}}{\omega_A} + 1 < \frac{y_{p2}+y_{c2}^{M}}{y_{c2}^{NM}-HC}$

As a consequence, if [51A] is satisfied at the lower level of altruism, it will be satisfied also for higher levels of ω_A. The lower level of altruism implied by the first condition in [##] is $\omega_A = \omega_{c2}\frac{y_{c2}^{NM}-HC}{y_{p2}+HC+\Delta y_{c2}}$.

If we substitute this value into [51A], [51A] is satisfied with equality (the details of algebraic passages are available from the authors upon request). Hence, when the second condition in [#] is satisfied, the second condition in [##] is also satisfied.

The LHS of [###] is greater than the LHS of [#] if

$$(\omega_{c2} + \omega_A) ln\left(1 + \frac{\Delta y_{c2}}{y_{p2}+y_{c2}^{NM}}\right) \geq \omega_{c2} ln\left(1 + \frac{\Delta y_{c2}}{y_{p2}+HC}\right) \qquad [52A]$$

Since $\frac{\Delta y_{c2}}{y_{p2}+y_{c2}^{NM}} > \frac{\Delta y_{c2}}{y_{p2}+HC}$ (because, by assumption, $y_{c2}^{NM} > HC$), and $\omega_A > 0$, [52A] is always satisfied. Hence, when the second condition in [#] is satisfied, the second condition in [###] is also satisfied.

In order to prove the second part of Proposition 2, we need to prove that the LHS of the second condition in [##] and [###] are increasing in the degree of altruism (ω_A). We showed this above for [##]. It is easy to see that also the LHS of [###] is increasing in the degree of altruism (indeed, its first derivative with respect to ω_A is $ln\left(1 + \frac{\Delta y_{c2}}{y_{p2}+y_{c2}^{NM}}\right) > 0$). Moreover, it is possible to show that the LHS of [##] at the highest boundary of its subdomain (i.e. when $\omega_A = \omega_{c2}\frac{y_{c2}^{NM}-HC}{y_{p2}+HC}$) is equal to the LHS of [###] (at the same value of ω_A). Hence, the function that encompasses the LHS of [#], [##] and [###] is increasing in ω_A, and strictly increasing from $\omega_A = \omega_{c2}\frac{y_{c2}^{NM}-HC}{y_{p2}+HC+\Delta y_{c2}}$. ♦