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ABSTRACT

In rural areas of most developing countries, intergenerational coresidence is both widespread and an important determinant of well-being for the elderly. Most parents want at least one adult child to remain at home (e.g., so they can work on the family farm or provide care and assistance around the house). However, children themselves may prefer to migrate when they grow up, and parents cannot directly prevent them from doing so. We present a model where parents may strategically limit investments in some children's education so that they will not find it optimal to migrate when they reach maturity, and will thus voluntarily choose to remain home. We provide evidence for the model's predictions using an intervention that provided recruiting services for the business process outsourcing industry in randomly selected rural Indian villages. Because awareness of these high-paying, high education, urban jobs was limited at baseline, the intervention increased the attractiveness of migration for educated children. Consistent with the model, in response to the treatment we find declines in school enrollment among children that parents reported wanting to remain home at baseline. Children that parents want to migrate have increased enrollment, and parents want more children to migrate.

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I. INTRODUCTION

In most developing countries, children play an important role in the well-being of their parents in old age. Adult children provide financial support, labor on the family farm or business, insurance in case of illness or disability, physical care and assistance around the home, protection and security, as well as attention and affection. These benefits are often provided through parents and children living together. Over 70 percent of individuals in the developing world age 60 and older live with their children, with rates as high as 80 to 90 percent in countries such as Bangladesh, India, Pakistan and Senegal (UN 2005).[1]

Increasing urban economic opportunities associated with economic development cause many children to migrate either temporarily or permanently out of rural areas. For many households, migration is a critical strategy for increasing wealth, with children sending money home. However, parents cannot always rely on these transfers, and the amount sent may be less than what the parents would prefer, or what they would get if the child stayed on the farm and the parent, rather than the child, controlled the distribution of wealth between them. Further, market-based substitutes for the other benefits of coresidence, such as care and assistance around the home, are often imperfect or non-existent.[2] In short, in rural areas of most developing countries, intergenerational coresidence is among the most important determinants of the well-being of the elderly, and most parents hope that at least some of their children will live with or near them when they get older.[3]

Parents' hopes that their children will live with them are complicated by the fact that parents cannot directly control whether their children migrate, and what the child finds optimal may deviate from what parents would prefer. This creates an incentive problem between the parents and their children. While parents cannot directly control their children's migration decisions, parents do control the amount of schooling they provide their children, and as such may

[1] Similar patterns held in currently-wealthy countries in the past. In the U.S., 70 percent of the elderly lived with their adult children in the mid- to late-19th century (Costa 1998, 1999, Ruggles 2007).

[2] Knodel et al. (2007) note that while migration led to financial gains for rural elderly in Thailand, migrant children are much less likely to provide care and other services around the home. Though Knodel et al. (2010) note that extended households adapt to the changes brought about by migration, and that technologies such as cell phones and faster transportation reduce the losses caused by not living together.

[3] In wealthier countries, the elderly may prefer to live on their own when they can afford to. Costa (1999) and McGarry and Schoeni (2000) show that social security reduced intergenerational coresidence in the U.S. In contrast, Manacorda and Moretti (2006) argue that coresidence is a normal good for Italian parents. They also present evidence that the preference for coresidence may vary across countries.

be able to limit their children's potential future benefits from migration. In this paper, we test whether some parents strategically limit investments in their children's education so that the children will not find it optimal to migrate when they reach maturity, and thus will voluntarily choose to remain "down on the farm."

We first present a simple model of rural human capital investment in the face of possible urban migration that captures the principal-agent problem between a parent and child. The key feature of the model is that when parents cannot control their children's migration decisions directly, they must offer children a share of household income greater than what the child could earn (net of any remittances) in the city in order to induce him to remain at home. Since urban earnings increase with education, the resources needed to keep the child "down on the farm," which we call the incentive cost of education, increases as well.

The model predicts that when parents control schooling but not migration decisions, when the urban returns to schooling increase, more rural parents will be better off if their children migrate (via greater expected remittances). Parents who are better off with their children migrating will also give them more education. Both predictions are consistent with standard models. However, our model also yields the unique prediction that parents who are better off if their children remain at home may respond to increases in the urban returns by *decreasing* their children's schooling so that those children will later choose not to migrate. This prediction is driven by the fact that as urban returns to schooling increase, parents must offer children a greater share of household resources in order to induce them to remain at home, but this incentive cost of education can be reduced if children are given less education.

We test these predictions using an intervention that, in effect, increased urban economic opportunities for households in randomly selected rural Indian villages. For three years, professional recruiters were employed to help young men and women become aware of and secure jobs in the newly burgeoning (at the time of our study) business process outsourcing (BPO) industry (e.g., call centers, online technical support, etc.). The BPO industry presents an ideal setting for testing our theory because jobs in this sector are almost exclusively urban-based, require more education than traditional jobs, and pay more than other jobs with comparable education requirements, thus raising the urban returns to schooling (while largely leaving rural opportunities unchanged). And because the sector was so new at the time of our study, awareness of these jobs was low in rural areas, which allows the intervention to serve as a shock to perceived urban returns to schooling (while largely leaving rural returns unchanged) and the desirability of future migration for more educated children. Jensen (2012) uses the same experiment, but with a different set of villages where recruiters only assisted women with BPO placement, to examine the role of labor market opportunities in women's education, work, marriage and fertility outcomes.

Using a panel survey of rural households, we find support for the theory of strategic investment. The survey asked parents where they would prefer each of their children to live when they are older; parents want about 44 percent of boys to live in the same dwelling as them, and another 24 percent to live in the same village. Thus, parents express a strong preference for sons to remain nearby.

Overall, the net effect of the treatment on the likelihood of enrollment for boys is very close to zero. However, those boys that parents stated at baseline they would like to remain in their home or in the same village experience large reductions in school enrolment in response to the treatment, consistent with the strategic investment motive. By contrast, enrollment does increase for those boys that parents report at baseline wanting to migrate. Further, parents want more boys to migrate at endline than baseline. The treatment increased schooling for girls, almost none whom are expected to remain at or near home, due to prevailing marriage patterns.

We believe that the conditions that generate our predictions, namely a highly rural population with limited means of old age support and a strong preference for having children remain nearby, alongside increasing urban returns and opportunities, are common in low income countries. Beyond providing insight into educational decision-making in such countries, the results may help explain some recent trends and patterns in educational investments. For example, despite apparent large increases in the urban returns to schooling in many developing countries, education levels, particularly at the secondary level, have not grown as rapidly. The model and results may also help explain the more recent phenomenon in many developing countries that girls' schooling has been increasing more rapidly than that of boys, and in some cases overtaking it (since in most countries, the elderly typically live with sons, not daughters). The results also suggest that factors and policies outside of the education sector, such as social security, health or nursing care, or the functioning of land and labor markets, may affect educational attainment, through their potential effects on the well-being of the elderly in the absence of coresidence. Finally, the results may also provide an additional rationale for compulsory schooling laws, since parents do not appear to always invest in a way that promotes the child's best interest.

Previous studies have explore the conflict arising from the fact that although parents decide and pay for investments in their children’s schooling, the returns directly accrue to children. For example, Chakrabarti, Lord and Rangazas (1993) argue that since parents can't contract with their children, uncertainty over future support can lead to inefficiently low educational investments.[4] Though we share this prediction, a key distinction is our model's prediction of *declines* in education for some children in response to increases in urban returns, as opposed to just a weaker response.

Our study is also related to two other literatures. First, others have considered whether parents act to ensure greater attention or support from children in old age. Bernheim, Shleifer and Summers (1985) argue that parents strategically condition bequests in order to maximize attention provided by their children. Hoddinott (1991) finds broadly similar results for Western Kenya with respect to children's contributions of both money and time. Manacorda and Moretti (2006) argue that Italian parents use transfers to "bribe" their children into living with them.

Additionally, many studies have considered the effects of migration on education. Most studies focus on the potential for increased schooling, either due to greater household income (e.g., Yang 2008) or increased returns to education. Kochar (2004) finds that rural education in India increases in response to increases in the returns in the nearest urban labor market. She also finds that the gains are smaller for households with the most land, where children are more likely to remain home rather than migrate. A few studies have considered the possibility that migration could worsen educational outcomes. de Brauw and Giles (forthcoming) find that increasing urban migration possibilities in rural China cause declines in high school enrollment. They argue that this is due to increases in the opportunity cost of schooling, via an increase in the local wage rate (due to decreased local labor supply) or by the high wage opportunities for unskilled workers available through migration. McKenzie and Rapoport (2010) also find that migration may harm education because when an adult leaves, their time inputs in the production of children's human capital is lost, and children may also have to take over household production activities.[5] Antman (2011) similarly finds a negative effect of parental migration to the U.S. on children in Mexico, with children spending less time in school and more time working. Though our study shares with these papers a common finding of some declines in education associated with migration, our

[4] Baland and Robinson (2000) and Bommier and Dubois (2004) argue that child labor may be inefficient if parents don't internalize, respectively, the child's reduced future earnings or disutility of labor.
[5] They also note that if international migrants can only get unskilled jobs in the destination country because most migration is illegal, the returns to education may be lower than without migration.

primary emphasis is specifically on testing the strategic investment motive for the decline. We will also show that the mechanisms underlying these other papers are unlikely to explain our results.

The remainder of this paper proceeds as follows. Section II discusses the model and the testable predictions. Section III discusses the data, empirical strategy and experimental design. Section IV shows the results and Section V concludes.

II. THE MODEL

In this section, we present a simple model of schooling investment in a two sector economy with migration. Our goal is not to provide a complete model of such behavior, but rather to demonstrate the key dynamics that generate testable predictions. We discuss the importance of key simplifying assumptions at the end of the section. In particular, we consider a household where the parent seeks to maximize income and there is only a single child. Doing so allows us to clearly identify the driving force behind our results: if increasing education makes migrating to the city marginally more attractive to the child, a parent who wishes to prevent the child from migrating may respond to an increase in the marginal returns to education in the city by reducing the child's education in order to reduce the relative attractiveness of migration, which we call the "incentive cost" of education. Having identified this basic force, we go on to discuss how the same idea would arise in other models, such as with multiple children or bilateral altruism, with more complete models incorporating these factors presented in the appendixes.

The economy has two sectors, a rural or agricultural sector and an urban sector. Each household consists of a parent and a child. In the rural sector, parents are endowed with a unit of land. If the child lives on the farm, he supplies one unit of labor, i.e., the quantity of labor is inelastic. However, their productivity does depend on their education. Let $f(e)$ be farm output as a function of the child's education, where $f' > 0$, $f'' < 0$. Parents do not work (alternatively, they are not very productive or their labor supply is inelastic). We assume for now that both land and labor markets do not exist, so the parent is unable to sell or rent their land or hire-in labor to work on the farm.

Children can either stay at home (H) or migrate (M) to the urban area. If the child migrates, they send home a fraction, r, of their earnings to their parents. For simplicity, we take r to be exogenous.[6] There is also a cost t associated with migration, which for simplicity we assume is paid by the child. While we treat t as a fixed parameter for the theoretical analysis, which considers decision making within a household, t is a source of heterogeneity across households. Thus, children from households with high migration costs due to factors such as distance or cultural/linguistic differences will be less likely to migrate, while households with lower migration costs will be more likely to migrate. A model relying on variation in the desirability of migration driven by heterogeneity in endowments, child's ability (and thus either productivity or the returns to schooling), the parent's idiosyncratic taste for coresidence, etc., would yield similar results.

Let $w(e)$ be the wage earned by the child if he migrates to the city, where $w' > 0$ and $w'' < 0$. We assume that productivity is higher in farm work at low levels of education, $f(0) > w(0)$, but that productivity increases more rapidly in education in the urban sector, i.e., $w'(e) > f'(e)$, so that at higher levels of education, productivity is higher in the urban sector, i.e., $w(e) > f(e)$, for some sufficiently large e. The cost of education is $c(e)$, an increasing and convex function of the level of education. The results do not change if education instead has a constant marginal cost.

Parents and children are assumed to be risk neutral and maximize wealth. The decisions to be made are how much education, e, the child should receive and whether the child should migrate to the city.

II.A. Parent Controls Education and Migration

We begin by considering the outcome when the parent makes all decisions, i.e., the level of education and whether the child should migrate, and chooses them in order to maximize total household wealth. Since there are no incentive problems in this case, it represents the household's efficient, or first-best, outcome. The analysis first derives the optimal level of education for a child who remains at home and for a child who migrates, and then considers the question of whether it is better for the family to have the child migrate or stay at home.

If the child remains at home, total household wealth is the difference between output on the farm and the cost of schooling, $f(e) - c(e)$. Let e_h^* denote the optimal education level in this case, where $f'(e_h^*) = c'(e_h^*)$. If the child migrates, total household wealth is given by $w(e) - c(e) -$

[6] If parents are risk averse, any uncertainty over the amount the child will remit (or the child's income if they migrate) will reinforce the predictions of the model by lowering expected utility in old age under the scenario where the child migrates.

t. Let e_m^* denote the optimal education level for children who migrate, where $w'(e_m^*) = c'(e_m^*)$. Under the assumption that $w'(e) > f'(e)$, i.e., the marginal product of education is greater in the city, then schooling levels will be higher among children who migrate, $e_m^* > e_h^*$.

If the parent keeps the child at home, the child gets e_h^* years of education. If the parent lets the child migrate, he gets e_m^*. The former is preferred to the latter whenever:

$$f\left(e_h^*\right) - c\left(e_h^*\right) \geq w\left(e_m^*\right) - c\left(e_m^*\right) - t\ ,$$

which implies that households with $t \geq t^*$ choose to keep their children at home, where:

$$t^* = \left(w\left(e_m^*\right) - c\left(e_m^*\right)\right) - \left(f\left(e_h^*\right) - c\left(e_h^*\right)\right)$$

In other words, as one expects, the parent sends the child to the city whenever the maximized surplus in the city exceeds the maximized surplus at home by at least the cost of migration.

II.B. Parent Controls Schooling but Cannot Control Migration

This above solution will arise if the parent is able to choose the child's level of education as well as whether the child migrates. However, in reality while parents are able to exercise control over education decisions, they are less able to control migration decisions, which gives rise to an incentive problem between the parent and the child. Further, in real contexts there is an additional incentive issue that arises due to the fact that once a child has left the parent's home, the parent is no longer able to control the allocation of the child's income. To the extent that parents are unable to appropriate all of the child's income, this may affect their schooling and/or migration decisions. We now consider such situations.

If the parent cannot control whether the child migrates, we can recast the problem as a two-stage principal-agent problem between parent and child. In the first stage the parent chooses the level of education. In the second stage, the child chooses whether to migrate. We continue to assume, that the child remits home a fraction r of their earnings if they migrate.

In this version of the problem, the parent and child each choose strategies to maximize their own wealth (as opposed to the parent maximizing total household wealth, as in the previous section). If the child goes to the city, he remits fraction r of his wage, leaving him net wealth $v = (1\text{-}r)\ w(e) - t$.[7] Thus, in order to induce the child to choose to remain at home, the parent must

[7] While for simplicity, we take the remittance rate r as exogenous here, in Appendix A we show that the main comparative statics of interest hold in a model where a child who migrates endogenously chooses how much income to remit to the parent.

offer him a share of household wealth of at least v. To simplify the analysis and focus on the interesting cases, we assume that $v > 0$ for relevant levels of e and t. That is, the child is always tempted to move to the city. If we were to relax this assumption, then there could be a range of t and e for which $v < 0$. In this case, the child would choose to stay home even if the parent gave him no resources.

In order to induce the child to remain at home, the parent must give the child share s of household resources, where $s \geq v$. This leaves the parent wealth $f(e) - c(e) - s$. Since the parent will never choose to give the child more resources than necessary to keep him at home, this expression becomes:

$$f(e) - c(e) - \left[(1 - r)\, w(e) - t\right]. \tag{1}$$

Written this way, the term $[(1-r)\, w(e) - t]$ represents the additional cost to the parent of educating a child and keeping him at home given that the parent can no longer control the migration decision. The more education the parent gives the child, the more attractive the child finds migration, and thus the more resources the parent must give the child to prevent him from migrating. We refer to this cost as the *incentive cost of education***.**

If the parent wants the child to stay at home, they choose e_h to maximize (1), which occurs at:

$$f'\left(e_h^{**}\right) - (1-r)\, w'\left(e_h^{**}\right) = c'\left(e_h^{**}\right).$$

On the other hand, the parent's net surplus if the child leaves is given by $r\, w(e) - c(e)$, which is maximized at e_m^{**}, where $r\, w'(e_m^{**}) = c'(e_m^{**})$.

Using these conditions, we can state the following propositions:

Proposition 1: If $r < 1$, when parents cannot control migration decisions, children who stay home and those who migrate receive less education than they do when the parent can control the migration decision. If $r = 1$, then both levels of schooling are efficient.

When the parent cannot control the migration decision, both types of children receive less education than when the parent can control migration, but for different reasons. For children who migrate, the parent reduces education because the remittance rate less than one implies parents receive less than the full marginal benefit of education. For children who do not migrate, parents lower the child's education because of the incentive cost of education. That is, as education increases, the child's ability to claim household resources increases, which reduces the marginal return to the parent of education.[8]

While both types of children receive less education when the parent cannot control migration decisions, it nevertheless remains true that children who migrate receive more education than children who do not.

Proposition 2: $e_m^{**} > e_h^{**}$: children who migrate receive more education than children who do not.

Proof: It is sufficient to show that $r\,w'(e) > f'(e) - (1-r)w'(e)$. But, note that

$$w'(e) > f'(e)$$
$$rw'(e) + (1-r)w'(e) > f'(e)$$
$$rw'(e) > f'(e) - (1-r)w'(e). \blacksquare$$

Our main comparative static of interest is what happens to education levels and migration decisions when parents cannot control migration decisions and the urban returns to education increase, as they did in our BPO recruiting experiment. To consider the impact of an increase in returns to education in the city, for simplicity we replace the wage function $w(e)$ with $\theta\, w(e)$, where $\theta > 0$. Here, an increase in θ represents an increase in the returns to education in the city. When migration cannot be controlled by the parent, the solution to the parent's problem, (e_H, e_M, t^*) solves:

$$f\left(e_h^{**}\right) - c\left(e_h^{**}\right) - [(1-r)\theta w\left(e_h^{**}\right) - t^{**}] = r\theta w\left(e_m^{**}\right) - c\left(e_m^{**}\right),$$
$$f'\left(e_h^{**}\right) - (1-r)\theta w'\left(e_h^{**}\right) = c'\left(e_h^{**}\right), \quad and$$
$$r\theta w'\left(e_m^{**}\right) = c'\left(e_m^{**}\right).$$

Implicitly differentiating these conditions with respect to θ yields Proposition 3:

[8] Parents may have other instruments available to either keep children at home or ensure an optimal level of transfers from migrated children, such as threatening to withhold inheritance (in rural areas of poor countries, this would primarily take the form of land), as in Bernheim, Shleifer and Summers (1985). However, if the urban returns are sufficiently high or the value of land or other assets sufficiently low, the child could still be better off forgoing inheritance in favor of migration. Further, since rural land markets are relatively thin in many low income countries, bequests often require the child to return to the rural area to get value from the bequests, which may make remaining in the urban area and forgoing the bequest optimal. Finally, there many landless households, for whom bequests are generally very small.

Proposition 3: An increase in the returns to education (θ) increases education for children who migrate ($e'_m(\theta) > 0$), decreases education for children who stay home ($e'_h(\theta) < 0$), and increases the set of households whose children migrate, ($t'(\theta)>0$).

Proof: Let $e_m(\theta)$, $e_h(\theta)$, and $t(\theta)$ denote the parameterized version of the solution. Implicitly differentiating the above conditions and simplifying using the first-order conditions yields the following, from which the proposition is immediate:

$$t'(\theta) = (1-r)\,w\left(e_h^{**}\right) + rw\left(e_m^{**}\right) > 0$$

$$e_h'(\theta) = \frac{(1-r)\,w'\left(e_h^{**}\right)}{f''\left(e_h^{**}\right) - (1-r)\,\theta w''\left(e_h^{**}\right) - c''\left(e_h^{**}\right)} < 0$$

$$e_m'(\theta) = \frac{rw'\left(e_m^{**}\right)}{c''\left(e_m^{**}\right) - r\theta w''\left(e_m^{**}\right)} > 0$$

The intuition underlying Proposition 3 is driven by the idea that, in order to keep the child from choosing to migrate, the parent must give him share $v = (1 - r)\, w(e) - t$ of household wealth, which represents the incentive cost of education. As described above, the optimal choice of education for children who remain at home sets the marginal product of education on the farm, $f'(e)$, equal to the sum of the marginal cost of education, $c'(e)$, and the marginal incentive cost of education, $(1 - r)\,\theta\, w'(e)$. Since an increase in θ increases the marginal incentive cost of education, education becomes less attractive to the parent as θ increases. The result is a reduction in the parent's optimal choice of education for children who remain at home.

While these children do receive less education, it is important to note that there is a countervailing benefit in the form of a greater claim on household assets. This benefit will, at the very least, reduce the harm done by the reduction in education. In fact, in cases where the reduction in education is small, these children may even be better off overall following an increase in the returns to urban education, as their increased claim on household assets more than compensates for the loss in education.

In the case where a parent chooses to allow the child to migrate, he does so because the incentive cost of inducing the child to remain at home is too large relative to the additional income that could be earned by allowing him to migrate. An increase in θ only makes this gap even larger. For children who migrate, the increase in θ increases the marginal return to education and increases education even further, while for children who were nearly indifferent between migrating and not, the increase in city wages following the increase in θ results in the parent no longer being willing to give up enough resources to keep them at home. The result is that more children migrate after the increase in θ.[9]

Thus, an increase in the urban returns to education decreases schooling of children who remain in the rural area, and increases it among children who migrate. If enough children will remain in the rural area, the net, overall education of rural children could decrease. Additionally, these effects will lead to greater inequality in educational attainment among rural children.

Finally, since an increase in the urban returns to education increases the parents' cost of inducing children to stay at home and increases remittances in the event that children migrate, it becomes optimal for parents to allow more children to migrate. That is, after the returns to education increase the set of transportation cost parameters, t, for which migration is optimal grows.

The incentive cost of education is the primary factor that leads to the prediction that parents who wish their children to remain at home may respond to increases in the returns to education in the city by reducing the child's education. This force will be present in a wide variety of models. For example, although our simple model takes the parent as maximizing income, similar predictions would arise in a model where the parent is altruistic if, given those altruistic preferences, the parent wishes the child to remain at home while the child prefers to migrate. If this is the case, then the parent will have to dedicate more of the household's resources to the child to keep him from migrating than what is ideal *even when the parent is altruistic.* Thus, a parent who ideally would like to split household resources evenly between parent and child might have to divert 60 percent of household resources to the child to keep him from migrating. An increase in the returns to education in the city would increase the child's temptation to migrate, causing the parent to have to divert even more resources to the child to prevent migration. However, if the parent can reduce the relative attractiveness of migration by reducing the child's education, then

[9] Although the parameterization of the returns to schooling as $\theta w(e)$ allows us to easily compute the effects of an increase in θ on education levels and t^{**}, the result holds more generally. In particular, the same qualitative conclusions hold if we instead consider a general upward shift in $w'(e)$. To see this, note that e_H is defined by $f'(e_H) - (1-r)w'(e_H) = c'(e_H)$. An upward shift in $w'(e)$ decreases the left-hand side, which decreases the optimal choice of e_H and lowers the parent's maximal surplus from keeping the child at home. Similarly, e_M is defined by $rw'(e_M) = c'(e_M)$, and an upward shift in $w'(e)$ increases the left-hand side, which increases the optimal choice of e_M and increases the parent's optimal surplus from letting the child migrate. t^{**} then necessarily increases because the cut-off level of t is where:

$$t^{**} = \{r\theta w(e_M) - c(e_M)\} - \{f(e_H) - c(e_H) - (1-r)\theta w(e_H)\}$$

the parent may respond to an increase in the urban returns by reducing the child's education. See Appendix A for a treatment of this case.

The incentive cost of education can also arise in a model with multiple children. Briefly, consider a parent with N total children who wishes to keep H of them at home and to allow $M = N - H$ to migrate. In order to prevent the H children from migrating, the parent will have to ensure that they are as well off at home as they would be if they migrated. This constraint gives rise to the incentive cost of education. Beginning with the case where the parent has optimally chosen education levels for the children and which should migrate, an increase in the returns to education will increase the temptation to migrate of those who stay at home. Once again, if the parent wishes to prevent the children from migrating, they will have to be given more income. However, the parent can also reduce the temptation to migrate by reducing the children's education. We show in Appendix B that reducing education in response to an increase in the returns to education may be optimal for the parent.[10]

We have abstracted thus far from the portfolio decision allocating education and migration across multiple children. In such a setting, for any particular child the education and migration effects of increasing urban returns are likely to be influenced by what is optimal across the collection of siblings. Thus for example, in response to an increase in the urban returns, credit constrained parents may find it optimal to focus their limited resources on fewer children, with some gaining at the expense of others. Parents with two children may decide that rather than providing both with an intermediate amount of schooling, they should instead now provide one with a high level of education (and/or higher quality or more expensive private schooling) so they can get a BPO job, requiring a schooling reduction for the other.[11] Whether this is optimal from the parent's perspective will depend on the shape of both the urban and rural returns functions and the schooling cost function. Such cross-sibling effects could also occur through a reallocation of time in household production activities (the child expected to remain at home takes on more so that the child expected to migrate can focus more on schooling, leaving the former with less time for school). We will not analyze this portfolio decision, since our focus is on testing the down on

[10] When there are multiple children at home, one complication is that reducing the education for any one child affects the marginal productivity of the other children. Under relatively weak assumptions, it can be shown (Appendix B) that it remains optimal for the parent to reduce education for all children who remain home following an increase in the returns to education in the city.

[11] See Appendix C for an illustration of how this might occur.

the farm hypothesis. However, the multiple child case does raise an important issue for the empirical analysis, since both our model and credit or household production constraints when there are multiple children predict gains for children expected to migrate alongside losses for children expected to stay at home. We address this further in Section III.F.

As noted in the introduction, there are several reasons other than income why parents may not want children to migrate. For example, children may provide services for which market substitutes are imperfect or effectively non-existent, such as physical care, attention, affection or protection from crime or violence. Alternatively, parents may place greater value on maintaining traditional ties to ancestral land than children do, worry more about the "corrupting influences" of cities or place less value on their social amenities. In any of these cases, children are more likely to migrate to the city than parents would prefer. If parents do not directly control the migration decision but do control the education decision, and if lower levels of education reduce the child's reward from moving to the city, similar results would arise under these alternative motives. Distinguishing among motives will not be possible with our data. Our primary interest is whether parents engage in strategic behavior to influence their child's migration decision, so our analysis will focus simply on how education responds based on whether parents want a given child to migrate, regardless of the underlying reason.

We made several other assumptions in setting up the model. First, we assumed there were no land markets. If the parent could simply sell their land for the discounted stream of future output, they would not need to have a child stay to work the land. Alternatively, they could lease the land to someone else to farm (either for rent or as part of a share cropping arrangement). However, land markets are often imperfect in many rural areas, and there are not many transactions in practice, so that this assumption remains a crude but fair approximation for many households. There are a few reasons that these markets are limited. In rental markets, for example, there are problems in contract enforcement, and differing incentives between landlord and renter with respect to the short vs. long term health and productivity of the land (i.e., some agricultural techniques result in higher short-term yields at the expense of longer-term yields). With respect to land sales, one limitation is imperfect titling and tenure security. In addition, it would typically be difficult to store wealth from a sale, since there is little access to banks or other formal savings instruments, particular in rural areas, and less formal means of wealth accumulation may not be sufficiently safe, or protected from the demands of relatives. Further, individuals may attach a psychic value to land that has been in their family for generations (which the market will not compensate), and want their sons to keep it in the family. Additionally, in some areas of the developing world, households may have only usufructury rights to land, meaning they have rights to the exclusive use of a given parcel of land, and can bequeath those rights to their children, but they cannot sell the land or rent it to others. Under such arrangements, if the land is unused, village authorities may reassign it to other households, without compensation. The inability to sell the land means that the only way for the parent to extract the future value of that land is if their child remains at home on the farm (or, if they can hire in labor, as discussed below). Although in practice land markets in rural areas are often not very robust for these reasons, we of course would not argue that there is no land market at all. However, there are strong factors that favor retaining owned land, which creates an additional wedge that the higher expected contributions of migrating children must overcome. And it is also worth noting that even with perfect land markets, our results would still hold if parents don't want children to migrate primarily because there are no market substitutes for the other benefits of coresidence or because of an aversion to children living in the city, since then what matters to the parent is just whether the child physically stays or migrates, not whether the parent can maintain income by selling their land.

We also assumed that there were no labor markets. With perfect labor markets where parents can hire-in workers to replace migrating children, there would be again be less financial reason to prefer a child remain at home. However, labor markets are often imperfect as well. Hired labor may not yield as a high a return to the parent, such as due to greater monitoring and enforcement costs. Foster and Rosenzweig (2011) estimate that using hired-in labor rather than family labor as much as doubles the shadow price of labor, such as due to higher supervisory costs. Additionally, a temporary worker who may change from season to season will also not have the farm-specific human capital or "specific knowledge" that a child growing up and working on that farm over many years will have. Rosenzweig and Wolpin (1985) use specific knowledge to jointly explain the predominance of extended families, the predominant use of family labor on farms, and the relative scarcity of land transactions in rural India. Finally, there may also be an unwillingness to hire-in labor that may expose women in the household to men outside of the family (restrictions such as *purdah* are practiced by about 10 percent of households in our study area). Again, we would not argue that agricultural labor markets don't exist, but rather there are strong factors that favor the use of family labor, as has been documented by others, and which is frequently observed in practice. And again, even with perfect labor markets, children who migrate are unable to provide the non-financial benefits of coresidence for which there are no market substitutes, so parents may still prefer a child remain at home.

III. DATA AND EMPIRICAL STRATEGY

III. A. Study Area and Survey Information

We focus on rural areas outside of Delhi, one of the major centers of the Indian BPO sector. Because we wanted to test our model where awareness of BPO jobs was low, we used experienced BPO recruiters from Delhi to define the areas outside of the city where recruiters were not visiting, due solely to distance or population size, i.e., the time and cost per potential recruit was high enough that it was not worthwhile to search for potential recruits there.[12] This primarily meant focusing on areas approximately 50 to 150km outside of the city, in the states of Haryana, Punjab, Rajasthan and Uttar Pradesh. Within this area, we drew 160 villages at random from a list of all villages. In each village, we worked with local officials to draw up a list of all households, then randomly selected 20 households per village.

We conducted a baseline survey from September to October of 2003. The survey consisted of a household questionnaire, an adult questionnaire and a survey of village characteristics conducted with knowledgeable local officials. We also gathered information on all household members, or children of members, who were temporarily or permanently living away from home. Thus, for example we know about school enrollment for children who have migrated.

A follow-up survey with the same households was conducted from September to October of 2006. We also tracked, and where possible interviewed, all individuals who left home between rounds, such as for work or marriage. Means and standard deviations of key variables are provided in Table I.

III. B. Testing Predictions of the Model

The key testable predictions of the model from Proposition 3 are that for rural areas, an increase in the urban returns to schooling should lead to:

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[12] At this range, due to poor road quality and high congestion around Delhi, a Delhi-based recruiter might need to spend a whole day, and considerable travel expenses, just to reach one village. And any given village may have only a few individuals with enough education for a BPO job. Since recruiters typically earn a fee per recruit they find, it is far more profitable to focus on Delhi than on outlying rural areas.

Prediction 1: An increase in schooling for children whose parents want them to migrate;
Prediction 2: A decrease in schooling for children whose parents do not want them to migrate;
Prediction 3: An increase in the number of children parents want to migrate.

The two biggest challenges in testing these predictions are, 1) classifying children based on their parents' preferences towards migration, and 2) a source of exogenous variation in the urban returns to schooling. We discuss each of these in detail below.

III. C. Classifying Children by Parent's Migration Preferences

A number of factors may affect whether a parent wants a given child to migrate, including birth order, sex, the amount of land owned, the quality of labor and land markets, beliefs about the child's altruism or their ability in both rural and urban occupations, expectations about health and life expectancy, preferences over factors like keeping land in one's family or the corrupting influence of city life, etc. Our survey cannot provide a complete accounting of all the determinants of migration intentions. Instead, we use a direct elicitation of intentions or preferences. Respondents were asked, for each of their living children, "When you are older and your child is an adult, do you want or hope [*child's name*] will live: 1. in this dwelling or in another dwelling on this land or compound; 2. in a separate household or dwelling in this village; 3. in a different village, nearby; 4. in a different village, far away; 5. in a city in India; 6. in a country other than India."[13] We take the response to this question as a summary, reduced-form measure of parents' migration preferences.

There are of course concerns in using self-reported preferences or expectations.[14] However, an increasing number of studies have shown that such measures can be good predictors of actual

[13] Since some migration may be temporary, additional follow-up questions were asked. For the first four responses, a follow-up asked: "Do you hope [*child's name*] will go live and work in a city at any time in the future for at least 6 months, even if they return after that?" For responses other than 1 or 2, a follow-up was also asked: "Do you hope [*child's name*] will eventually return and live with you in the same dwelling or in another dwelling on this land or compound, or in a separate household or dwelling in the same village?"
[14] Classifications based on more objective variables have limitations. For example, in some areas, by custom only the oldest son inherits land or is expected to remain home with his parents. However, this norm is not universal, so birth order is not a useful classifying measure. Another alternative is land holdings, since those with little or land would not expect their children to stay to work their land. However land is also wealth, which might affect education. And parents without land might still want their children to remain nearby to provide care or assistance or to run a family non-farm business.

future outcomes, as well useful indicators of underlying beliefs that can be used for testing theories in the way we wish to here.[15] In addition, any concerns about whether subjective measures accurately capture the underlying factor of interest should cause the variable to contain less true signal about migration preferences and thereby weaken our test of the model, which will rely on differences in parental migration intentions across children. One concern is whether this measure simply proxies for other factors that influence schooling (e.g., parents want more intelligent children to migrate and less intelligent children to remain home). However, the key distinguishing prediction of our model is that an increase in the urban returns will have a *negative* impact on schooling for children that parents want to stay at home; though many factors may cause parents to not increase their children's schooling in response to these new opportunities, it is difficult to think of factors that would cause a decrease, unless it is directly tied to not wanting children to take advantage of the new opportunities, as in our model. Thus for example, parents may understandably not give their less intelligent children more education following our intervention because they don't think those children can get BPO jobs, but it is unclear why they would give them *less* education in response to the treatment, other than to keep them from trying to migrate for the job. Though below, we will consider the possible effects of credit constraints (investing less in one child so you can invest more in another), changes in local labor market conditions or changes in household time allocation.

We also note that if parents simply report what they believe is *fait accompli*, i.e., the child has already made it clear whether they will migrate, rather than what the parents themselves prefer, this should not generate our results; there is no reason to expect that parents who have resigned themselves to the child having decided to stay home would respond to the increased urban opportunities by giving them less schooling.

Table II shows baseline responses to the questions about migration preferences for children aged 6 to 18 at baseline. Parental preferences for boys show considerable variation. Parents want about 44 percent of boys to live with them in the same physical dwelling or compound when they

[15] For example, Finkelstein and McGarry (2006) find that subjective beliefs of the likelihood of entering a nursing home predict the decision to purchase long-term care insurance and actual future nursing home entry. They also use this variable to distinguish risk aversion from adverse selection. Similarly, Jayachandran and Kuziemko (2010) test a model of breastfeeding duration based on how close a respondent is to self-reported "ideal family size." Manski (2004), Hurd (2009) and Deavande, Giné and McKenzie (2011) provide discussions of measures of subjective expectations and their limitations.

are older, and want another 24 percent to live in the same village. The desire to have a son stay nearby is even stronger than this implies, since many couples have more than one son; over 80 percent of parents want at least one of their sons to live with them when they are older. Parents want 15 percent of boys to migrate to a city. However, there is very little desired rural-to-rural migration (either to nearby or distant villages) or migration outside of India. Finally, about 5 percent of responses were "don't know," "whatever the child wants," or "up to god."

Preferences for girls differ notably. Parents want very few girls to live in the same dwelling or village as them, instead wanting about 48 percent to live in another rural area (either nearby or further away). These preferences are consistent with the common practice of patrilocal exogamy, where marriages take place across rather than within villages, with girls leaving their birth household to join their husband's family. Parents want 23 percent of girls to migrate to a city, but want very few to leave India. There were also more instances in which parents reported don't know/whatever the child wants/up to god (16 percent). Because parents report wanting so few girls to remain home or in the same village, there is little need for strategic underinvestment to keep them from leaving. Thus, we will not be able to test Prediction 3 for girls.

We note that because these preferences predict that boys may experience the strategic reductions in schooling but girls will not, our model shares a common prediction with Munshi and Rosenzweig (2006). They find that increases in the returns to English language education in Bombay driven by the financial sector and other white collar industries caused increased enrollment in English language schools for girls but not boys. They attribute the difference to caste-based job networks, which women were not a part of and that appear to limit men's occupational mobility. Our studies share the prediction of how a cultural practice or institution can cause a seemingly gender neutral increase in the returns to schooling to have heterogeneous effects on children by sex, and in particular predicting that the gains may be greater for girls.

For testing our predictions for boys, we will use the fifth response, wanting the child to live in a city, as our indicator of parents wanting them to migrate, and the first two responses, wanting the child to live in the same dwelling or compound, or in the same village, as not wanting the child to migrate. In terms of the latter, many of the roles that sons (and/or their wives) play in the lives of their elderly parents, such as working on their land or providing care around the home can best be provided, or are most likely to be provided, when they coreside.[16] However, much of the same can also be accomplished without living in the same physical dwelling, provided children are nearby, such as in the same village, as noted for example by Bian, Logan and Bian (1998) for China.[17] And, for some motives, such as simply not wanting a child to live in a city because of perceived dangers, the parent should be indifferent between living together or having the child in the same village. The key issue for our analysis is that when there are new opportunities available in the city, some parents will want their children to take advantage of those opportunities, and some will want their children not to, and in particular will want them to remain nearby. The first and second responses seem the most appropriate way to capture this latter category. We do not include the other responses (wanting the child to live in another village, nearby or far away, or to live outside of India) in our analysis.[18]

III. D. Variation in the Returns to Schooling: The Recruiting Experiment[19]

Testing the model also requires variation in the urban returns to schooling. We make use of an experimental intervention that in effect assigned greater urban opportunities to randomly selected rural villages by using recruiters for the BPO industry. The BPO industry covers a range of activities such as call centers, data entry and management, claims processing, secretarial services, voice-to-text transcription and online technical support. The sector has grown rapidly over the past two decades in India due to technological changes in telecommunications and networking infrastructure, such as the deployment of fiber optic cable networks, and regulatory

[16] A son's wife may remain behind even if the son migrates, and provide labor, care and support to her in-laws. Though this certainly happens, there is in total less help provided when the son migrates, and additionally, many men who migrate will bring their wives and children with them.

[17] Living in a city also does not preclude visiting parents, providing seasonal labor or occasional care around the home. However, it is likely that the amount of such activity will be greater on average when the child lives nearby. The same holds for responses 3 and 4, wanting the child to live in a nearby or distant village. Though if parents' primary concern about migration relates simply to not wanting their child to live in a city, we might expect parents to reduce education for this group as well.

[18] For our tests, wanting the child to live outside of India should not be included as wanting the child to migrate. The experiment increased the returns to schooling in urban India. If a parent wanted their child to live and work outside of India, we would not expect them to alter their education investments based on these new opportunities (unless it changed whether parents want them to stay in India, and the amount of education for the desired overseas work differs from what is required for BPO jobs).

[19] As noted in the introduction, the experiment we use to test our model was originally designed to examine the effects of labor market opportunities on human capital and work/family outcomes for women, as explored in Jensen (2012). We later independently developed the model presented in the current paper, and subsequently realized that a set of villages from the original experiment could be used to test this model.

changes, such as allowing foreign investment in the telecommunications sector. This growth created a sharp and sudden increase in the demand for educated workers. To help BPO firms meet this demand, a specialized recruiting sector grew, which included small and medium sized firms that would seek out and screen potential employees, either freelance or under contract (some larger BPO firms also developed their own in-house recruiting divisions).

The BPO sector is well-suited for testing our predictions. First, BPO jobs require at least a high school degree, and offer much higher salaries on average than other jobs with similar educational requirements. Entry-level salaries typically ranged from 5,000−10,000 Rupees ($U.S. 110−220) per month in 2003, which was about twice the average salary for workers with a high school degree working in other sectors. Therefore, the growth of the BPO sector represents an increase in the returns to schooling. Oster and Millett (2013) similarly treat the BPO sector as a shock to the returns to schooling and Shastry (2012) uses the information technology sector in India more broadly in a similar way.

Second, at the time of our study, BPO jobs were located almost exclusively in urban areas, thus there was specifically an increase in urban returns to schooling, as in our model, leaving the rural returns largely unchanged (we test this in more detail below). Third, because the sector was so new at the time we began our study, there was very limited awareness of the BPO sector itself or how to get a BPO job, particularly in rural areas, which we will focus on. In our 2003 baseline survey, discussed below, less than five percent of respondents reported they had ever heard of call center jobs.[20] And no household had a member, including those living temporarily or permanently away from home, working in this sector. This allows us to in effect increase the urban returns to schooling from the perspective of rural parents by increasing awareness of these jobs and making it easier for qualified individuals to get them, as detailed below.

Finally, the high education requirements of BPO jobs (typically a minimum of 10 or 12 years of schooling) will help us treat our intervention as increasing the future urban returns to schooling for currently young children, while largely leaving the employment opportunities for older adults in their household unchanged. One concern in analyzing the effects of labor market conditions on contemporaneous changes in schooling is that the labor market affects both children in the future as well as adults in the current period. It can therefore be difficult to determine how

[20] Oster and Millett (2013) find that perceptions of the higher returns to schooling created by the presence of a call center in a town does not spread more than a few kilometers from the actual call center.

much of any associated change in education is driven by the anticipated future benefits of schooling, as opposed to changes in their parents' or older siblings' current employment or earnings (and thus changes in household income, time allocation or the bargaining power of one parent relative to the other). Not only are few adults with school aged children in our sample qualified for a BPO job, but we can exclude any direct effects of getting a BPO job on children's schooling by restricting the sample to households where no member could get a BPO job because they all have too little education. We discuss this in more detail below.

For our intervention, we hired eight experienced BPO recruiters working in Delhi. Each of the recruiters was randomly assigned to one of 80 randomly selected treatment villages. Between December 2003 and February 2004, recruiters visited the treatment villages. After first making contacts and introductions, the recruiters would return a few weeks later and conduct information and recruiting sessions, open to all members of the community.[21]

The sessions followed a fixed format, including: an overview of the BPO sector and the types of jobs and level of compensation available; information on the names of employers currently or frequently looking for workers; strategies for how to apply for jobs (creating and submitting resumes, lists of websites and phone numbers); interview skills lessons and tips; mock interviews; assessment of English language skills; and a question and answer session. The recruiters also emphasized that the jobs were very competitive, and that employment was not guaranteed. The sessions were well-attended and drew a great deal of interest.

The recruiters provided "booster shots" one and two years after the initial treatment, visiting the same villages and conducting the same sessions. Recruiters also left their contact information for free follow-up, additional information or assistance. The recruiters were contracted to provide support for anyone from the designated villages. Thus, the intervention consisted of three in-depth sessions plus three years of continuous, free placement support.

The last three columns of Tables I and II report summary statistics separately by treatment status, as well as tests of treatment-control covariate balance at baseline. The variables overall appear balanced between the control and treatment groups. Formal tests suggest that randomization was successful: the *p*-value for the *F*–test that baseline characteristics jointly predict treatment is

[21] In a second set of treatment villages, we provided recruiting services for women only. Jensen (2012) uses these villages to test whether labor market opportunities for women affect human capital, marriage and fertility. Since parents want few girls to stay home, and since the women-only intervention did not directly alter the opportunities for boys, we do not use these villages for the present study.

0.63 and variable-by-variable individual t-tests in the final column cannot reject equality of means for the treatment and control groups for almost all variables.

III.E. Empirical Specification

Our test of Predictions 1 and 2 (gains in enrolment for children that parents want to migrate and declines for those they want to stay home) consists of regressing Round 2 school enrolment for children 6−18 on an indicator for residing in a treatment village, separately for subsamples based on baseline parental preferences regarding the child's future residential location (remain at or near home vs. migrate),[22] $Enrolled_i = \beta_0 + \beta_1 Treatment_i + \varepsilon_i$, where *Treatment* equals one if child *i* lives in a village that was exposed to the recruiting intervention. Though randomization should result in treatment-control covariate balance in expectation, in any particular sample there can be small differences. Therefore, in additional specifications we also add baseline controls, *Z*, that are predictors of enrolment (parent's education, log of food expenditure per capita, family size and child age), and, separately, a fixed effects specification using changes between Rounds 1 and 2. For girls, we present the overall effect of the treatment for the full sample, since Table II showed that parents want few girls to stay at home or nearby.

Although we did not stratify our randomization by parental baseline preferences, the bottom panels of Table I show that baseline variables are still balanced between the treatment and control groups within these subsamples.

For testing Prediction 2, we use the same specifications, but with the parent's migration preferences for each child as the dependent variable. All regressions are estimated using linear probability models, but the results are robust to alternative limited dependent variable specifications. Standard errors are clustered at the village level.

III.F. Distinguishing Down on the Farm Effects from Credit Constraints

As noted above, credit constraints or household production in the presence of multiple children could yield similar predictions to the down on the farm model. Without ruling out that such effects may cause reductions in schooling for some boys in our treatment villages, we can test our model in a setting where such are unlikely to explain our results. For example, if we see

[22] We use baseline values to avoid stratifying by an endogenous variable. Since the treatment may cause parents to want more children to migrate, this likely biases us against finding the effect we predict.

schooling declines for boys expected to remain home in families with just one child, it cannot be because parents are instead investing more in another child. However, single child families are rare in our sample. As an alternative, we consider households where there is currently only one school-eligible child; for example, they are the last born child and as of Round 1 all of their earlier born siblings are past schooling age or have already permanently dropped out of school.[23] In such cases, credit constraints may cause parents to not provide more schooling to the child in response to the treatment, but they should not cause a reduction, since there is no other child to invest in. And even if parents always intended for these children to get less education than their siblings, there is no reason to decrease their education in response to an increase in the urban returns. If anything, having older siblings who work (either away from home or at home) rather than attend school should reduce credit constraints or household production labor needs.

IV. RESULTS

IV. A. Tests of the Predictions

We begin by first discussing the net effects of the treatment, before turning to the test of our hypothesis of interest. The results are presented in Table III. The first two sets of columns show results for the full sample of boys and girls. For girls, the treatment increased the likelihood of enrollment by about 5−6 percentage points. The coefficient is robust across the three specifications, and statistically significant at the 1 percent level in all cases. These results are consistent with those found in Jensen (2012).

By contrast, the treatment had little to no net effect on education for boys. The coefficients across all three specifications are negative, but they are small and not statistically significant. Again, on its own, the finding of no net effect for boys is consistent with many possible explanations beyond the offsetting effects predicted by our model; for example, there may have already been high returns for boys even without the BPO sector.[24]

The last two sets of columns in Table IIII split boys based on parents' baseline migration preferences for children. For the group of boys that parents want to stay at or near home, the

[23] Even children who report having permanently left school could in principle return to school. However, in our sample, we only observe four cases where such a child at baseline is enrolled in Round 2.

[24] Oster and Millett (2013) find that call centers lead to enrollment gains for boys and girls in India. However, they examine the effect of the local presence of a call center; with call centers nearby, boys could get a BPO job without migrating, reducing the need to strategically reduce their education. We focus on more remote rural areas where there were no call centers, thus requiring migration.

treatment had a negative effect on enrolment. Across the three specifications, the treatment reduced enrolment by about 4−5 percentage points, with results statistically significant at the 5 percent level or better. This result indicates that there is a clear set of youths who lose when urban returns increase, consistent with our model of strategic investment.

By contrast, for the group of boys that parents want to migrate, the treatment had a positive impact on schooling. School enrolment increased by about 6 percentage points, though the effects are less precisely estimated (perhaps in part due to the smaller sample sizes, since parents want fewer boys to migrate). Though consistent with more standard models of investment in schooling, this result, as well as the schooling gains for girls, is of interest in its own right because it suggests that for some children, poverty and credit constraints or supply-side limitations may not be as important as demand-side constraints in limiting investment, i.e., parents may be providing little education to some children not because they can't afford to or because schools are too far away, but because they don't find it optimal to, due to low expected returns. Our experiment did not change credit constraints, wealth, school quality, distance to schools or any other factor; the anticipated higher return to schooling was sufficient, for some children, to induce greater schooling, as in Foster and Rosenzweig (1996), Heath and Mobarak (2015), Munshi and Rosenzweig (2006), Jensen (2010, 2012) and Abramitzky and Lavy (2014).

Table IV shows the results for the sample of last remaining children, which enables us to test our hypothesis more cleanly by effectively eliminating cross-sibling effects (i.e., they cannot be reducing one child's education in order to give another child more education, since there are no other children in the household to give schooling to).[25] This restriction also reduces our sample size considerably. The results are less precisely estimated than before, but we again see the same patterns as for the full sample of children. The point estimates of the effects of the treatment are still positive for girls and negative for boys, though in neither case are they statistically significant. For boys expected to migrate, the effect of the treatment is positive in all specifications, and moderately sized, but no longer statistically significant, perhaps in part due to the sample size being reduced to just 119. With regards to the strategic investment motive however, education again declines for those boys that parents want to remain at home. The magnitude is in fact slightly

[25] Though we can't rule out that some parents reduce their children's education to finance the education of children outside of the household (e.g, nieces or nephews). However, the treatment was not associated with an increase in transfers or payments made on behalf of people outside the household.

larger than for the full sample of boys,[26] and statistically significant at the five percent level for the specifications with controls or fixed effects (for the specification with no additional controls, the effect is only significant at the 10 percent level). Thus, we find evidence supporting our model, in a setting where the results cannot be due to credit constraints. And as noted above, while there may be a concern that wanting a child to stay home is proxying for some other omitted child or household attribute that causes parents to give those children lower levels of schooling on average, or that may make them not want to increase their child's schooling in response to the new opportunities (e.g., the feel the child is not intelligent enough to get one of the jobs), there is no obvious such factor that would cause households to respond to an increase in returns by decreasing schooling, unless it has to do with wanting to prevent that child from migrating in response to the new opportunities. We discuss some alternatives more fully below.

Finally, we can test the prediction that parents should want more children to migrate in response to an increase in the urban returns to schooling. Table V shows that in response to the treatment, parents do indeed want more children to migrate. For boys, there is a 7 percentage point increase, which is very large relative to a baseline of 15 percent. For girls, there is a 6 percentage point increase, from a baseline of 23 percent. The new set of high paying urban jobs clearly changes the migration vs. home calculus from the perspective of parents.

IV.B. Alternative Explanations for Declines in Schooling

As noted, the key prediction that differentiates our model from more standard models of human capital investment or migration is that for the identifiable subgroup of children that parents want to stay at home, increases in urban returns lead to decreases in schooling. We argue that this is due to parents responding to the increased likelihood their children will want to migrate by trying to make migration a less attractive option for them. However, a few alternative mechanisms could also generate a decline in schooling for some children, even alongside gains for others, in the face of increased urban employment opportunities or returns to schooling.

First, even though the BPO sector was specifically chosen for the experiment because it targeted the employment opportunities of younger adults (or future opportunities for current

[26] We might expect bigger effects for last remaining children. If parents want an earlier birth order child to remain home but they migrate anyway, there are other children left to try to keep home. If the parent wants the last child to remain home but they leave, there are no more options. Therefore, parents should employ even greater strategic reductions in schooling for later born or last remaining children.

children) while leaving opportunities for current parents largely unchanged (since few have enough education, speak English or have computer experience), it is still possible that a few parents did get jobs. If so, the education of children 6−18 in our regression samples could have been affected through other channels. For example, schooling declines could be the result of children taking over the household production activities of parents who migrate for a BPO job, or the lost parental time input into the child's human capital (as suggested by McKenzie and Rapoport 2010).[27] Similar effects could be arise through BPO employment of older siblings or other adults in the household.[28]

We cannot completely rule out that such effects take place in our treatment villages. Instead, we can test our model in a setting where these effects are unlikely to apply. Building on Jensen (2012), we focus on the subset of households where no member could get a BPO job because they all have too little education. As noted above, BPO jobs typically require a minimum of 10 years of schooling. The labor market opportunities for individuals with less education were unchanged by our experiment (unless the migration of some individuals for BPO jobs opened up more jobs locally or increased local wages, which we explore below). It is important to keep in mind for this analysis that we have information on all household members, whether living home or away from home, as well as all children of household members, whether they have temporarily or permanently left home. Therefore, we can also exclude households where older siblings of the children in our sample may have gotten a BPO job and are no longer at home. We note that this restriction does not change our sample dramatically, since education levels are quite low in this rural sample (over 75 percent of households with children aged 6 to 18 in our sample do not have any members with 10 or more years of schooling).[29]

Table VI shows that the same results continue to hold for this subsample. The treatment was again associated with declines for boys expected to stay home; the results are similar in magnitude to those in Table III, and remain significant at the 5 percent level in the first two specifications and at the 10 percent level in the third. For boys expected to migrate, the results are

[27] Employment of adults could lead to other changes affecting child's schooling, such as greater income. It is likely that any such effects would increase schooling, not decrease it, but regardless, excluding education-qualified households as we do next would rule out such effects.

[28] In fact, we can already to an extent largely rule out effects coming through parental employment, since no adult with a child aged 6-18 in our sample had a BPO job in Round 2.

[29] Though we did not stratify our intervention by whether households had qualified members, we find that treatment-control balance still holds for almost all variables at baseline (results available upon request).

still positive, but slightly smaller in magnitude than in Table III, and now only 1 of the three is significant at the 10 percent level. For girls, the results are very similar to the full sample, and remain significant at the 5 percent level or better. Again, these results do not rule out that some children's schooling in treatment villages was affected by a parent, older sibling or other household adult getting a BPO job; but such effects are unlikely to explain the results for this subsample of households.

A second mechanism that could lead to schooling reductions for some children is that of many young adults get BPO jobs, the reduced supply of labor might increase the local wage rate and thus the opportunity cost of schooling, as suggested by de Brauw and Giles (forthcoming). Though there is no test to completely rule this out, we believe it is unlikely to explain our results. The number of people in any given village that was induced to leave due to the treatment is small relative to the size of the village (about 3 people per year on average, compared to an average village size of over 1,200), so any wage effects are likely to be very small. As a more direct test, if we regress the average wage of workers on an indicator for being in a treatment village, the coefficient is small, negative and not statistically significant (results available upon request).[30]

V. DISCUSSION AND CONCLUSION

We find that rural children that parents do not want to migrate receive less education in response to an increase in the urban returns to schooling. By contrast, there is an increase in education for children who parents want to migrate, and parents want more children to migrate. Because of the offsetting educational effects, there are no net gains for boys. We believe that the general conditions under which our model predicts these outcomes (i.e., a large rural population with few options for old age support, along with increasing urban employment opportunities) are common in the developing world.

One implication of these results is that overall or aggregate education may adjust more slowly to increases in the returns to schooling, and could even decline (if the population is sufficiently rural and most children are expected to stay home). And the net gain for girls alongside

[30] It is possible that for children expected to remain in the village, the future migration of other children will decrease the future expected local returns to schooling, providing less reason to stay in school. However, this too seems unlikely. Since it is mostly higher skilled or educated workers who will migrate for BPO opportunities, the local returns to education might actually increase.

the net zero for boys may help explain why girls' education in many countries (though not India) is now outpacing boys', as urban opportunities have increased.

However, by showing that education for some children does increase in response to increases in returns, the results also show that there is some demand side limitation to schooling. For these children, the limiting factor in education may not be poverty, access, cost, distance or quality of schools. Though these other factors are certainly important, at least part of low educational attainment may be that parents feel the returns are low and see little value to giving their children much schooling. Our experiment shows that clear and salient evidence of greater returns can lead to gains even without changes in any of these other factors.

Another key aspect of our findings is in highlighting a potentially important secondary consequence of increasing returns to education, namely that the incentive cost of education may reduce the welfare of children who do not take advantage of urban opportunities. Such welfare declines are by no means certain, since the reduction in education is accompanied by a greater claim on household assets. However, our findings suggest that special attention should be paid to these children and that policies may need to be designed or adjusted to protect their interests.

Along these lines, the results suggest a rationale for compulsory schooling laws, since parents may not achieve the solution that is in the child's best interest. If compulsory schooling laws prevent parents from reducing education in response to increasing returns to education in the urban sector, then the greater claim on household assets of children who remain at home will result in unambiguous gains for the children (although the parents will do correspondingly worse). They also suggest that policies and programs outside of the education sector may have effects on schooling. This could include factors that act on parents' desire to have children stay with them in rural areas, such as improving the functioning of rural land markets (more secure and transparent tenure and titling, so parents can sell their land to finance old age consumption, rather than needing a son to stay and generate income from the land) or labor markets (so they can hire in workers, rather than using their own children). Similarly, public or private pension systems, greater access to financial services and savings instruments, improved health care access or the market for home care or nursing homes, may have effects on schooling.

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TABLE I. MEANS, STANDARD DEVIATIONS AND TESTS OF TREATMENT-CONTROL COVARIATE BALANCE AT BASELINE

A. FULL SAMPLE	(1) All	(2) Control	(3) Treatment	(4) Difference (3) − (2)
In school: boys 6-18	0.79	0.78	0.79	0.008
	[0.41]	[0.41]	[0.40]	(0.016)
In school: girls 6-18	0.70	0.69	0.71	0.014
	[0.46]	[0.46]	[0.45]	(0.019)
Log (expenditure per capita)	6.35	6.36	6.35	-0.012
	[0.64]	[0.65]	[0.63]	(0.032)
Head's years of schooling	3.75	3.67	3.83	0.16
	[3.72]	[3.71]	[3.73]	(0.16)
Spouse's years of schooling	1.83	1.80	1.85	0.062
	[2.66]	[2.62]	[2.69]	(0.12)
Family Size	5.52	5.53	5.52	-0.002
	[2.38]	[2.48]	[2.29]	(0.10)

B. BOYS EXPECTED TO STAY HOME	All	Control	Treatment	Difference (3) − (2)
In school: boys 6-18	0.74	0.74	0.75	0.012
	[0.41]	[0.42]	[0.41]	(0.018)
Log (expenditure per capita)	6.40	6.40	6.40	0.004
	[0.59]	[0.61]	[0.59]	(0.041)
Head's years of schooling	3.92	3.95	3.89	-0.063
	[3.73]	[3.78]	[3.70]	(0.23)
Spouse's years of schooling	1.85	1.76	1.94	0.18
	[2.61]	[2.57]	[2.65]	(0.15)
Family Size	6.60	6.65	6.56	-0.09
	[2.35]	[2.51]	[2.18]	(0.15)

C. BOYS EXPECTED TO MIGRATE	All	Control	Treatment	Difference (3) − (2)
In school: boys 6-18	0.84	0.84	0.85	0.012
	[0.41]	[0.42]	[0.41]	(0.018)
Log (expenditure per capita)	6.35	6.36	6.35	-0.003
	[0.59]	[0.61]	[0.59]	(0.064)
Head's years of schooling	3.96	3.81	4.09	0.27
	[3.73]	[3.78]	[3.70]	(0.37)
Spouse's years of schooling	2.04	2.19	1.87	-0.32
	[2.61]	[2.57]	[2.65]	(0.25)
Family Size	6.71	6.71	6.71	-0.001
	[2.35]	[2.51]	[2.18]	(0.24)

Notes: Baseline values for key variables. Standard deviations in brackets in columns 1-3; heteroskedasticity-consistent standard errors accounting for clustering in parentheses in column 4. The last column contains *t*-tests of the difference in means between the control and the treatment samples.

TABLE II. BASELINE PREFERENCES FOR CHILD'S FUTURE MIGRATION

	(1) All	(2) Control	(3) Treatment	(4) Difference (3) − (2)
BOYS (6-18 at baseline)				
Same dwelling	0.44	0.44	0.44	0.01
	[0.49]	[0.50]	[0.50]	(0.02)
Same village	0.24	0.24	0.24	-0.00
	[0.43]	[0.43]	[0.43]	(0.02)
Nearby rural area	0.05	0.05	0.05	-0.00
	[0.21]	[0.22]	[0.21]	(0.01)
More distant rural area	0.04	0.04	0.04	-0.00
	[0.19]	[0.20]	[0.19]	(0.02)
City in India	0.15	0.15	0.15	0.00
	[0.36]	[0.36]	[0.36]	(0.01)
Outside India	0.03	0.02	0.03	0.01
	[0.17]	[0.15]	[0.18]	(0.01)
Don't know/Whatever Child wants/Up to God	0.05	0.06	0.05	-0.01
	[0.22]	[0.23]	[0.21]	(0.01)
GIRLS (6-18 at baseline)				
Same dwelling	0.04	0.03	0.05	0.02*
	[0.20]	[0.17]	[0.22]	(0.01)
Same village	0.06	0.06	0.06	0.00
	[0.24]	[0.24]	[0.24]	(0.01)
Nearby rural area	0.14	0.13	0.14	0.01
	[0.34]	[0.33]	[0.34]	(0.02)
More distant rural area	0.34	0.33	0.34	0.00
	[0.48]	[0.49]	[0.48]	(0.01)
City in India	0.23	0.24	0.22	-0.02
	[0.42]	[0.43]	[0.41]	(0.02)
Outside India	0.03	0.04	0.03	-0.00
	[0.18]	[0.19]	[0.17]	(0.00)
Don't know/Whatever Child wants/Up to God	0.16	0.16	0.16	-0.01
	[0.37]	[0.37]	[0.37]	(0.01)

Notes: Data from baseline survey (September−October, 2003). Standard deviations in brackets in columns 1-3; heteroskedasticity-consistent standard errors accounting for clustering in parentheses in column 4. The last column contains *t*-tests of the difference in means between the control and the treatment samples. *Significant at 10%; **Significant at 5%; ***Significant at 1%.

TABLE III. EFFECT OF THE INTERVENTION ON ENROLLMENT, BY BASELINE MIGRATION PREFERENCES

	GIRLS FULL SAMPLE			BOYS FULL SAMPLE			BOYS EXPECTED TO STAY HOME			BOYS EXPECTED TO MIGRATE		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Treatment	0.057***	0.055***	0.054***	-0.018	-0.017	-0.021	-0.040**	-0.045***	-0.048**	0.062*	0.065*	0.067*
	(0.017)	(0.016)	(0.019)	(0.016)	(0.015)	(0.018)	(0.019)	(0.017)	(0.020)	(0.033)	(0.035)	(0.039)
log (expend per cap)		0.035**			0.047**			0.062***			-0.012	
		(0.015)			(0.023)			(0.016)			(0.030)	
Head's Education		0.003			0.002			0.000			0.001	
		(0.002)			(0.002)			(0.000)			(0.001)	
Spouse's Education		0.007*			0.006*			0.008*			0.006	
		(0.004)			(0.003)			(0.004)			(0.009)	
R^2	0.005	0.068	0.004	0.001	0.10	0.003	0.002	0.17	0.003	0.008	0.065	0.02
Observations	2,227	2,224	1,719	2,603	2,593	2,007	1,911	1,905	1,463	380	379	289

Notes: Heteroskedasticity-consistent standard errors accounting for clustering at the village level in parentheses. The first column in each set of three simply regresses enrolment for children aged 6-18 on a treatment indicator. The second column in each set adds the specified additional covariates. The third column in each set uses the change in enrollment as the dependent variable. All control variables are measured in Round 1. All regressions also include family size, a full set of dummy variables for child's age and indicators for whether expenditure or mother's or father's education data was unavailable (these household are assigned median values for these variables). *Significant at 10 percent level. **Significant at 5 percent level. ***Significant at 1 percent level.

TABLE IV. EFFECT OF THE INTERVENTION ON ENROLLMENT, BY BASELINE MIGRATION PREFERENCES: LAST REMAINING CHILD

	GIRLS FULL SAMPLE			BOYS FULL SAMPLE			BOYS EXPECTED TO STAY HOME			BOYS EXPECTED TO MIGRATE		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Treatment	0.019	0.027	0.058	-0.032	-0.027	-0.039	-0.065*	-0.069**	-0.087**	0.035	0.050	0.071
	(0.042)	(0.038)	(0.045)	(0.034)	(0.032)	(0.038)	(0.037)	(0.035)	(0.043)	(0.066)	(0.065)	(0.104)
log (expend per cap)		0.015			0.085***			0.087**			0.053	
		(0.033)			(0.031)			(0.037)			(0.064)	
Head's Education		0.004			-0.000			-0.001			-0.005	
		(0.005)			(0.006)			(0.001)			(0.012)	
Spouse's Education		0.011			0.000			-0.0001			0.008	
		(0.008)			(0.006)			(0.003)			(0.013)	
R^2	0.001	0.148	0.004	0.001	0.18	0.002	0.006	0.241		0.003	0.100	0.006
Observations	497	497	382	598	596	462	413	411	343	119	119	72

Notes: Heteroskedasticity-consistent standard errors accounting for clustering at the village level in parentheses. The first column in each set of three regresses enrolment for children aged 6-18 on just a treatment indicator. The second column in each set adds the specified additional covariates. The third column in each set uses the change in enrollment as the dependent variable. All control variables are measured in Round 1. All regressions also include family size, a full set of dummy variables for child's age and indicators for whether expenditure or mother's or father's education data was unavailable (these household are assigned median values for these variables). *Significant at 10 percent level. **Significant at 5 percent level. ***Significant at 1 percent level.

TABLE V. EFFECT OF THE INTERVENTION ON MIGRATION PREFERENCES

	GIRLS			BOYS		
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.061***	0.059***	0.062***	0.071***	0.076***	0.067***
	(0.020)	(0.020)	(0.010)	(0.014)	(0.014)	(0.010)
log (expend per cap)		0.020			-0.021	
		(0.017)			(0.014)	
Head's Education		-0.001			-0.000	
		(0.003)			(0.002)	
Spouse's Education		-0.006			0.007*	
		(0.004)			(0.003)	
R^2	0.005	0.010	0.021	0.016	0.021	0.029
Observations	2,366	2,363	1,829	2,765	2,758	2,132

Notes: Heteroskedasticity-consistent standard errors accounting for clustering at the village level in parentheses. The first column in each set of three regresses whether the parent wants or hopes the child will migrate when they are older on just a treatment indicator. The second column in each set adds the specified additional covariates. The third column in each set uses the change in migration intentions as the dependent variable. All control variables are measured in Round 1. All regressions also include family size, a full set of dummy variables for child's age and indicators for whether expenditure or mother's or father's education data was unavailable (these household are assigned median values for these variables). *Significant at 10 percent level. **Significant at 5 percent level. ***Significant at 1 percent level.

TABLE VI. EFFECT OF THE INTERVENTION ON ENROLLMENT, HOUSEHOLDS WITH NO QUALIFIED MEMBERS

	GIRLS FULL SAMPLE			BOYS FULL SAMPLE			BOYS EXPECTED TO STAY HOME			BOYS EXPECTED TO MIGRATE		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Treatment	0.059***	0.055***	0.051**	-0.024	-0.023	-0.017	-0.045**	-0.046**	-0.043*	0.044	0.052*	0.063
	(0.018)	(0.018)	(0.021)	(0.019)	(0.018)	(0.021)	(0.022)	(0.019)	(0.023)	(0.036)	(0.038)	(0.042)
log (expend per cap)		0.040**			0.053**			0.059***			0.036	
		(0.017)			(0.014)			(0.016)			(0.030)	
Head's Education		0.004			0.004			0.002			0.001	
		(0.005)			(0.003)			(0.003)			(0.006)	
Spouse's Education		0.006			0.006			0.008*			0.005	
		(0.004)			(0.004)			(0.004)			(0.008)	
R^2	0.005	0.092	0.004	0.001	0.12	0.004	0.003	0.17	0.002	0.008	0.061	0.008
Observations	1,914	1,912	1,485	2,224	2217	1,708	1,641	1,635	1,245	323	322	254

Notes: Heteroskedasticity-consistent standard errors accounting for clustering at the village level in parentheses. The first column in each set of three regresses enrolment for children aged 6-18 on just a treatment indicator. The second column in each set adds the specified additional covariates. The third column in each set uses the change in enrollment as the dependent variable. All control variables are measured in Round 1. All regressions also include family size, a full set of dummy variables for child's age and indicators for whether expenditure or mother's or father's education data was unavailable (these household are assigned median values for these variables). *Significant at 10 percent level. **Significant at 5 percent level. ***Significant at 1 percent level.

ONLINE APPENDIX:
NOT TO BE PUBLISHED

APPENDIX A: STRATEGIC INVESTMENT IN SCHOOLING UNDER BILATERAL ALTRUISM

In this Appendix, we show that the paper's main comparative static of interest – that parents may respond to increases in the returns to education in the city by reducing their children's education – continues to hold in models in which both the parent and child exhibit altruistic preferences. In addition, once we allow parents and children to have different preferences over the division of household resources should be split between the parent and child, we also endogenize the child's remittances in the sense that the child chooses how to split household wealth between parent and child in the event that the child chooses to migrate.

We present two different versions of the result. In the first, the parent and child have Leontief preferences over own- and other-consumption. In the context of the Leontief model we are able to derive a closed-form solution to the game between the parent and child. While the intuition carries over to more general utility functions, it becomes more difficult to compute the solution in closed form. In the second version of the problem, both the parent and child exhibit Cobb-Douglas preferences over own- and other-consumption. Under the slightly stronger assumption that the relative return to education in the city is convex in the level of education, we are able to implicitly characterize the solution and show that some parents will respond to an increase in the returns to education in the city by reducing education.

A.I: Bilateral Altruism Model with Leontief Utility

The parent chooses the child's education level, e, and the child chooses whether to migrate to the city or stay at home. If the child migrates, he controls the division of household net income. If the child stays at home, then the parent decides how to split income.

If the child stays home, household net income is $h(e) = f(e) - c(e)$, where $f(e)$ is output on the family farm and $c(e)$ is the cost of education. If the child migrates, household net income is $m(e) = \theta\, w(e) - c(e) - t$, where t once again represents the cost of migration.

Assume that $f(e)$ is strictly concave, $c(e)$ is strictly convex, and $m(e)$ is strictly concave. Further, assume that the income advantage to living in the city increases with education. For simplicity, we operationalize this by assuming that $h(e)/g(e)$ is strictly decreasing in e and $h(0) > g(0)$. Other specifications, e.g., $h(e) - g(e)$ is strictly decreasing in e, and $g(e) > h(e)$ for e sufficiently large, would yield similar results.

Both the parent and child are altruistic with preferences given by the Leontief utility function. Let the parent's utility be $u\left(x_k, x_p\right) = \min\left\{\frac{x_k}{1-s}, \frac{x_p}{s}\right\}$. Given this utility function, if the parent maximizes the distribution of household income w, he will choose to consume share s himself and give share $(1-s)$ to the child. In this case, the parent's utility is $\min\left\{\frac{1-s}{1-s}h(e),\frac{s}{s}h(e)\right\}=h(e)$ if the child stays home.

The child's utility is given by $v(x_k,x_p)=\min\left\{\frac{x_k}{1-r},\frac{x_p}{r}\right\}$. Given these preferences, if the child maximizes the distribution of household income w, he will choose to consume share $(1-r)$ himself and give share r to the parent.

We assume that $1 > s > ½ > r > 0$. Thus, both parent and child are altruistic. But, each party prefers to keep more than half of household income for himself.

To examine education choices, consider the case where if the child stays home, the parent keeps income share s for himself, but if the child migrates the child decides how to split household assets, and the parent receives income share r.

	Parent	Child
Consumption (home)	$s\,h(e)$	$(1-s)\,h(e)$
Utility (home)	$\min\left\{\frac{sh(e)}{s},\frac{(1-s)h(e)}{(1-s)}\right\}=h(e)$	$\min\left\{\frac{sh(e)}{r},\frac{(1-s)h(e)}{(1-r)}\right\}=\frac{(1-s)}{(1-r)}h(e)$
Consumption (migrate)	$r\,m(e)$	$(1-r)\,m(e)$
Utility (migrate)	$\min\left\{\frac{rm(e)}{s},\frac{(1-r)m(e)}{(1-s)}\right\}=\frac{r}{s}m(e)$	$\min\left\{\frac{rm(e)}{r},\frac{(1-r)m(e)}{(1-r)}\right\}=m(e)$

The parent prefers that the child remain home whenever $h(e) > (r/s)\,m(e)$, or $h(e)/m(e) > r/s$. The child prefers to remain home whenever $((1-s)/(1-r))\,h(e) > m(e)$, or $h(e)/m(e) > (1-r)/(1-s)$. Due to the assumption that $1 > s > r > 0$, $(1-r)/(1-s)>r/s$. Hence, we have for sufficiently low levels of education, both the parent and child prefer that the child stay home. However, there is a cut off level of education e_1 such that $h(e_1)/m(e_1) = (1-r)/(1-s)$, where for higher levels of education the child would prefer to migrate if he were only given share $(1-s)$ of household resources if he chose not to migrate.

Figure A.1 illustrates the situation where $e < e_1$. For low levels of education, the income advantage from staying home is large relative to migrating (i.e., $h(e)/m(e)$ is large). If the child does not migrate, household income is given by $h(e)$, to be divided between parent and child. The "budget line" this implies is the downward sloping line $h(e)$. If the parent chooses his preferred point along this line, he chooses point X, where he keeps fraction s of income for himself. Since, absent other constraints, the parent always prefers to keep fraction s, the expansion path of the parent's choice has slope $s/(1-s)$. Indifference curves for the parent (green) and child (red) through point X are depicted by solid lines.

If the child chooses to migrate, then household income is $m(e)$ and the child can choose to split income as he wishes. Given the child's preferences, absent other constraints he prefers to give fraction r to the parent. The expansion path for the child's choice is a ray with slope $r/(1-r)$. Given income $m(e)$, the child's preferred point is labeled Y. Indifference curves for the parent (green) and child (red) through point Y are depicted by dashed lines.

In the case where $h(e)$ is much larger than $m(e)$, both the parent and child prefer that the child remain at home. In particular, although the child could gain a larger share of income by migrating, income from migrating is small enough relative to income at home that even the child does not find it worthwhile to gain a larger share of a smaller income.

As education increases, relative income in the city increases and the (proportional) gap between the $h(e)$ budget line and the $m(e)$ budget line shrinks. Eventually, at education level e_1, the child is indifferent about migrating, though the parent still prefers that the child stay home. See Figure A.2.

Since point Z is located directly above Y, we know that the child consumes the same amount at Y and Z. Thus, $x_k = (1-r)\, m(e)$. This leaves income $h(e) - (1-r)m(e) = x_P$ for the parent to consume.

	Parent	Child
Consumption (home)	$h(e) - (1-r)\, m(e)$	$r\, m(e)$
Utility (home)	$\min\left\{\frac{h(e)-(1-r)m(e)}{s}, \frac{rm(e)}{(1-s)}\right\} = \frac{h(e)-(1-r)m(e)}{s}$	$\min\left\{\frac{(1-r)m(e)}{1-r}, \frac{h(e)-(1-r)m(e)}{r}\right\} = m(e)$
Consumption (migrate)	$r\, m(e)$	$(1-r)\, m(e)$
Utility (migrate)	$\min\left\{\frac{rm(e)}{s}, \frac{(1-r)m(e)}{(1-s)}\right\} = \frac{r}{s}m(e)$	$\min\left\{\frac{rm(e)}{r}, \frac{(1-r)m(e)}{(1-r)}\right\} = m(e)$

The child is indifferent between migrating and not by construction. The parent prefers to divert extra resources to the child rather than have the child migrate whenever $h(e) - (1-r)m(e) > rm(e)$, or $h(e) > m(e)$. Let e_2 satisfy $h(e_2)/m(e_2) = 1$. For education levels between e_1 and e_2, the parent prefers the 'distorted' solution of offering Z rather than allowing the child to migrate.

Finally, consider education levels above e_2. At this level of education, income from migrating is greater than income from staying at home. Because when the child migrates income is higher and the child gets his most preferred split of income, there is no way that the parent can divide income $h(e)$ to induce the child to remain at home. Thus, for education levels above e_2, the child always migrates.

The preceding analysis shows that there are three relevant ranges of education the parent must consider. We summarize the parent's utility as a function of education, conditional on the child's migration decision as:

Relative Income	Education Level	Parent's Utility	Child's Migration Decision
$h(\mathrm{e})/m(\mathrm{e}) \geq (1-r)/(1-s)$	$0 \leq \mathrm{e} \leq \mathrm{e}_1$	$h(e)$	Home
$(1-r)/(1-s) \leq h(\mathrm{e})/m(\mathrm{e}) \leq 1$	$\mathrm{e}_1 \leq \mathrm{e} \leq \mathrm{e}_2$	$\frac{h(e)-(1-r)m(e)}{s}$	Home
$h(\mathrm{e})/m(\mathrm{e}) < 1$	$\mathrm{e} > \mathrm{e}_2$	$\frac{r}{s}m(e)$	Migrate

Next, we turn to the parent's choice of education. Depending on which segment of the parent's utility function is relevant, the optimal choice of education will be to set $h'(e^*) = 0$, $h'(e^*) - (1-r)m'(e^*) = 0$, or $m'(e^*) = 0$. It is straightforward to verify that the parent's utility as described above is continuous, and therefore that a solution the parent's problem of choosing an optimal education level exists (provided education is bounded above). Assuming concavity of $h'(e) - (1-r)m'(e)$ over the middle range is sufficient to prevent a boundary solution where education is equal to e_1 or e_2.

The comparative static we are interested in is the response of e^* to an increase in θ. For $e^* < e_1$, it is clear that $e'(\theta) = 0$ since θ does not affect $h(e)$. At the other end of the education scale, it is clear that for $e^* > e_2$, $e'(\theta) > 0$, since an increase in θ induces an upward shift in $m'(e)$, leading to an increase in e^*. The remaining case, where $e_1 < e^* < e_2$ is more complicated. The first-order condition is:

$$h'(e^*)-(1-r)m'(e^*)= f'(e^*)-c'(e^*)-(1-r)\left(\theta w'(e^*)-c'(e^*)\right)=0$$

Consider e^* as a function of θ, and consider the impact of an increase in returns to education in the city.

$$\left[f''(e^*)-c'(e^*)\right]e'(\theta)-(1-r)\left[\theta w''(e^*)-c''(e^*)\right]e'(\theta)-(1-r)w'(e^*)=0$$

$$e'(\theta)=\frac{(1-r)w'(e^*)}{\left[f''(e^*)-c'(e^*)\right]-(1-r)\left[\theta w''(e^*)-c''(e^*)\right]}<0$$

Where the last expression can be signed by the second-order condition and the fact that $w'(e) > 0$.

Hence we have for education levels in the range where the parent must divert additional resources to the child in order to keep him from choosing to migrate, and increase in the returns to education in the city induces the parent to reduce the child's education. The intuition is straightforward. When the parent chooses education levels over this range, he weighs the marginal benefit from increasing income against the marginal cost of education and the fact that at higher education levels migration becomes more attractive, and the parent must give the child additional resources because of this. Thus, this additional transfer behaves as an additional marginal cost of education – the marginal incentive cost of education. An increase in θ increases the rate at which the attractiveness of migration increases for the child, and thus increases the parent's marginal incentive cost of increasing the child's education. The result is that the parent chooses to lower the education given to the child in order to reduce their temptation to migrate.

Note that an increase in θ will decrease the cut-off values e_1 and e_2.

For given functions $h(e)$ and $m(e)$, the optimal education choice will be in one of the regions described above. Which region the solution lies in will depend on $h(e)$ and $m(e)$. Thus, one needs to check for possible solutions in each of the regions and compare the parent's utility in each case. Note, however, that if there is a level of education e such that $h'(e) = 0$ and $e \leq e_1$, then there cannot be an e with $e_1 \leq e \leq e_2$ and $h'(e) - (1-r)m'(e)$. Similarly, existence of a solution to $h'(e) - (1-r)\, m'(e) = 0$ with $e_1 \leq e \leq e_2$ precludes a solution to $h'(e) = 0$ with $e \leq e_1$. Hence, there can be a candidate solution with $e \leq e_1$ or $e_1 \leq e \leq e_2$, but not both. If there exists an education level with $m'(e) = 0$ and $e \geq e_2$, then the optimal educational choice is given by comparing the parent's utility under the (at most) two candidate optimal solutions.

For simplicity, assume that $h'(e_1) > 0$, so that solutions with $e \leq e_1$ are not relevant. Suppose there exists education level e* such that $h'(e^*) - (1-r)m'(e^*) = 0$ and $e_1 \leq e \leq e_2$ and education level e^{**} such that $m'(e^{**}) = 0$. The parent's utility in the two cases are proportional to $h(e^*) - (1-r)m(e^*)$ and $r\ m(e^{**})$, respectively. It is better to choose e^* than e^{**} whenever $h(e^*) - (1-r)\, m(e^*) >$ r $m(e^{**})$, or $h(e^*\ ) > r\ m(e^{**}) + (1-r)\ m(e^*)$.

The above condition holds for any particular household. To get a sense of which households will choose to have children migrate, we introduce heterogeneity into the households. In particular, recall that $m(e) = \theta\, w(e) - c(e) - t$, where t captures the (optimized) cost of migration. The term t can be heterogeneous across households and capture idiosyncratic differences the cost of replacing the child's household inputs and contributions to home produced goods as well as any transition costs the child may have from moving to the city. When t is high, it corresponds to situations where the idiosyncratic cost of losing the child to the city is low, while when t is low, this corresponds to situations where the idiosyncratic cost of losing the child to the city is high.

Since t does not affect the marginal returns to education, e^* and e^{**} are unaffected by changed in t. On the other hand, an increase in f_0 decreases e_2 and increases $m(e)$. Both of these factors make it more likely that households with high f_0 will find it optimal to allow their children to migrate. In particular, there exists a cut-off level of t, t^*, such that if $t < t^*$, it is optimal for the household to choose $e = e^*$ and keep the child at home, while if $t > t^*$, it is optimal for the household to choose $e = e^{**}$ and have the child choose to migrate.

Now, consider a household with $t = t^*$. Such a household has $h(e^*) - (1-r)\ m(e^*) = r\ m(e^{**})$. By the envelope theorem, an increase in θ decreases the left-hand side of the equation and increases the right-hand side. Thus, a household that is indifferent between migrating and not before the increase in θ strictly prefers migration after. This is because the increase in θ both increases income in the city and increases the incentive cost of keeping the child home.

Overall, the above establishes the basic predictions of the simple model in the paper: in response to an increase in the city returns to education:

1. Parents who prefer their children to migrate will give their children more education,
2. Parents who prefer their children to stay home will either leave education unchanged or decrease it,
3. More parents will prefer their children to migrate.

A.II: Cobb-Douglas Preferences

As in the previous versions, the parent chooses the child's education level, *e*, and the child chooses whether to migrate to the city or stay at home. If the child migrates, he controls the division of household net income. If the stays at home, then the parent decides how to split income.

If the child stays home, household net income is $h(e) = f(e) - c(e)$, where $f(e)$ is output on the family farm and $c(e)$ is the cost of education. If the child migrates, household net income is $m(e) = \theta\, w(e) - c(e) - t$.

Assume that $f(e)$ is strictly concave, $c(e)$ is strictly convex, that $m(e)$ is strictly concave. Further, assume that the income advantage to living in the city increases with education. For simplicity, we operationalize this assumption by assuming that $h(e)/g(e)$ is strictly decreasing in e and $h(0) > g(0)$. Other specifications, e.g., $h(e) - g(e)$ is strictly decreasing in *e*, and $g(e) > h(e)$ for *e* sufficiently large, would yield similar results.

Child's Utility**:** $v(x_k,x_p) = x_k^{1-r}\, x_p^r$ where x_k and x_p are the child's consumption expenditure and the parent's, respectively.

Parent's Utility**:** $u(x_p,x_k) = x_k^{1-s}x_p^s$, where x_k and x_p are the child's consumption expenditure and the parent's, respectively.

We assume that $r < s$, so that the child places more value on the child's consumption than the parent does. A stronger assumption, $r < ½ < s$, would imply that each party is altruistic but places greater weight on own consumption than the other party's. However, the less restrictive assumption is sufficient for the results.

Child's Problem. Suppose the child chooses x_k and x_p to solve:

$$\max_{x_k,x_p} v(x_k,x_p)$$
$$s.t. \quad x_k + x_p \le w$$

The solution to this problem is:

$$x_k(w) = (1-r)w \quad and \quad x_p(w) = rw,$$

and the corresponding indirect utility function is $v(w)$ = A w, where A = $r^r(1-r)^{1-r}$.

<u>Parent's Problem</u>**.** Suppose the parent chooses x_k and x_p to solve:

$$\max_{x_k, x_p} u(x_k, x_p)$$
$$s.t. \quad x_k + x_p \leq w$$

The solution to this problem is:

$$x_k(w) = (1-s)w \quad and \quad x_p(w) = sw,$$

and the corresponding indirect utility function is $u(w) = b\,w$, where $b = s^s(1-s)^{1-s}$.

Finally, it will be useful to define two quantities. Suppose that the parent chooses to split income giving share s to himself and share $(1-s)$ to the child. The child's utility from this is given by:

$$v((1-s)w, sw) = (1-s)^{1-r} s^r w = aw \cdot$$

Since the child's preferred split of income earns higher utility when income is w, we have that A > a. Similarly, when the child chooses to split income keeping share $(1-r)$ for himself and giving share r to the parent, the parent's utility is

$$u((1-r)w, rw) = (1-r)^{1-s} r^s w = bw,$$

where by the same argument B > b.

To examine education choices, consider the case where, if the child stays home, the parent keeps income share s for himself, but if the child migrates, the child decides how to split household assets and the parent receives income share r.

	Parent	Child
Consumption (home)	$s\,h$(e)	$(1-s)\,h$(e)
Utility (home)	B h(e)	$a\,h$(e)
Consumption (migrate)	$r\,m$(e)	$(1-r)\,m$(e)
Utility (migrate)	$b\,m$(e)	A m(e)

The parent prefers that the child stay home whenever B $h(e) > b\,m(e)$, or $h(e)/m(e) > b$/B. The child prefers to remain home whenever $ah(e)$ > A $m(e)$, or $h(e)/m(e)$ > A/a. Since A > a and b < B, we have that there is a range of education levels, b/B < $h(e)/m(e)$ < A/a where the parent prefers that the child stay home but the child prefers to migrate.

Education can therefore be divided into three regions. For $e < e_1$, where $h(e_1)/m(e_1)$ = A/a, both the parent and child prefer that the child remain home. For $e_1 \leq e \leq e_2$, where $h(e_2)/m(e_2) = b$/B, the parent prefers the child to remain home but the child prefers to migrate. For $e > e_2$, both the parent and child prefer that the child migrate.

Let us focus for the moment on the case where $e_1 \leq e \leq e_2$. In this case, if the parent chooses to give the child share $(1-s)$ of income, the child will choose to migrate to the city. However, the parent can induce the child to remain at home by giving him a greater share of household resources. Although the parent is worse off relative to the case where the parent can keep share s of household wealth for himself, the parent may find this preferable to allowing the child to migrate and receiving share r.

Holding fixed the choice of e, the parent's problem can be written as:

$$\begin{aligned}
&\max_{x_k, x_p} \ x_k^{1-s} x_p^{s} \\
&s.t. \quad x_k + x_p \leq h(e) \\
&x_k^{1-r} x_p^{r} \geq Bm(e)
\end{aligned}$$

The solution to this problem satisfies the two constraints.

We can simplify the problem as follows. First, let $x_k = (1-t)\,h(e)$ and $x_p = t\,h(e)$. In this case, the first constraint can be eliminated, and we rewrite the problem as:

$$\begin{aligned}
&\max \left((1-t)h(e)\right)^{1-r} \left(th(e)\right)^{r} \\
&s.t. \quad \left((1-t)h(e)\right)^{1-s} \left(th(e)\right)^{s} \geq Bm(e)
\end{aligned}$$

This in turn becomes:

$$\begin{aligned}
&\max h(e)(1-t)^{1-r}\, t^{r} \\
&s.t. \quad h(e)(1-t)^{1-s}\, t^{s} \geq Bm(e)
\end{aligned}$$

And one more small step gives:

$$\begin{aligned}
&\max h(e)(1-t)^{1-r}\, t^{r} \\
&s.t. \quad \frac{h(e)}{m(e)}(1-t)^{1-s}\, t^{s} \geq B
\end{aligned}$$

Next, let $h(e)/m(e) = g(e,\theta)$. We will assume that $g(e,\theta)$ is decreasing and concave in e. It is easy to show that $g(e,\theta)$ is decreasing and convex in θ, and that the cross-partial derivative $\partial^2 g/\partial e \partial\theta < 0$ for the relevant range of e (i.e., where $\theta m'(e) - c'(e) > 0$). Take logs of the objective function and the constraint.

$$\begin{aligned}
&\max \ln\left(h(e)\right) + (1-r)\ln(1-t) + r\ln(t) \\
&s.t. \quad \ln\left(g(e,\theta)\right) + (1-s)\ln(1-t) + s\ln(t) \geq \ln B
\end{aligned}$$

Next, let: $H(\mathrm{e}) = \ln(h(e))$, $G(e,\theta) = \ln(g(e,\theta))$, $C(t) = (1-r)\ln(1-t)+r\ln(t)$, and $F(t) = (1-s)\ln(1-t)+s\ln(t)$. We know A is increasing and concave in e; B is decreasing and concave; C is concave and F is concave.

The Lagrangian for the above problem is:

$$L = H(e) + C(t) + \lambda(G(e,\theta) + F(t) - \ln(B)).$$

The first order conditions for this problem are:

$$\begin{aligned} &H'(e^*) + \lambda^* G'(e^*,\theta) = 0 \\ &C'(t^*) + \lambda^* F'(t^*) = 0 \\ &G(e^*,\theta) + F(t^*) - \ln(B) = 0 \end{aligned}$$

Implicitly differentiating the above with respect to θ and solving the resulting system of equations yields the following expression (arguments on the functions suppressed to improve legibility) for $e'(\theta)$:

$$e'(\theta) \to -\frac{(C'' + \lambda F'')G_\theta G_e + \lambda (F')^2 G_{e\theta}}{(C'' + \lambda F'')(G_e)^2 + (F')^2 (H'' + \lambda G_{ee})}$$

The denominator is clearly negative since C, F and H are concave and G is concave in its first argument. The numerator is negative as well.[31] Hence $e'(\theta) < 0$.

Note: the full solution to the comparative statics equations is:

$$e'(\theta) \to -\frac{G^{(0,1)}(e(\theta),\theta)G^{(1,0)}(e(\theta),\theta)(C''(t(\theta)) + \lambda(\theta)F''(t(\theta))) + \lambda(\theta)G^{(1,1)}(e(\theta),\theta)F'(t(\theta))^2}{G^{(1,0)}(e(\theta),\theta)^2(C''(t(\theta)) + \lambda(\theta)F''(t(\theta))) + F'(t(\theta))^2(\lambda(\theta)G^{(2,0)}(e(\theta),\theta) + H''(e(\theta)))}$$

$$t'(\theta) \to -\frac{F'(t(\theta))(\lambda(\theta)(G^{(0,1)}(e(\theta),\theta)G^{(2,0)}(e(\theta),\theta) - G^{(1,0)}(e(\theta),\theta)G^{(1,1)}(e(\theta),\theta)) + G^{(0,1)}(e(\theta),\theta)H''(e(\theta)))}{G^{(1,0)}(e(\theta),\theta)^2(C''(t(\theta)) + \lambda(\theta)F''(t(\theta))) + F'(t(\theta))^2(\lambda(\theta)G^{(2,0)}(e(\theta),\theta) + H''(e(\theta)))}$$

$$\lambda'(\theta) \to \frac{(C''(t(\theta)) + \lambda(\theta)F''(t(\theta)))(\lambda(\theta)(G^{(0,1)}(e(\theta),\theta)G^{(2,0)}(e(\theta),\theta) - G^{(1,0)}(e(\theta),\theta)G^{(1,1)}(e(\theta),\theta)) + G^{(0,1)}(e(\theta),\theta)H''(e(\theta)))}{G^{(1,0)}(e(\theta),\theta)^2(C''(t(\theta)) + \lambda(\theta)F''(t(\theta))) + F'(t(\theta))^2(\lambda(\theta)G^{(2,0)}(e(\theta),\theta) + H''(e(\theta)))}$$

[31] The first term in the numerator is negative since all three factors are negative. The second term in the numerator is negative as well, since the cross-partial derivative of B is negative.

APPENDIX A: FIGURES

FIGURE A.1. CHILD'S AND PARENT'S CONSUMPTION

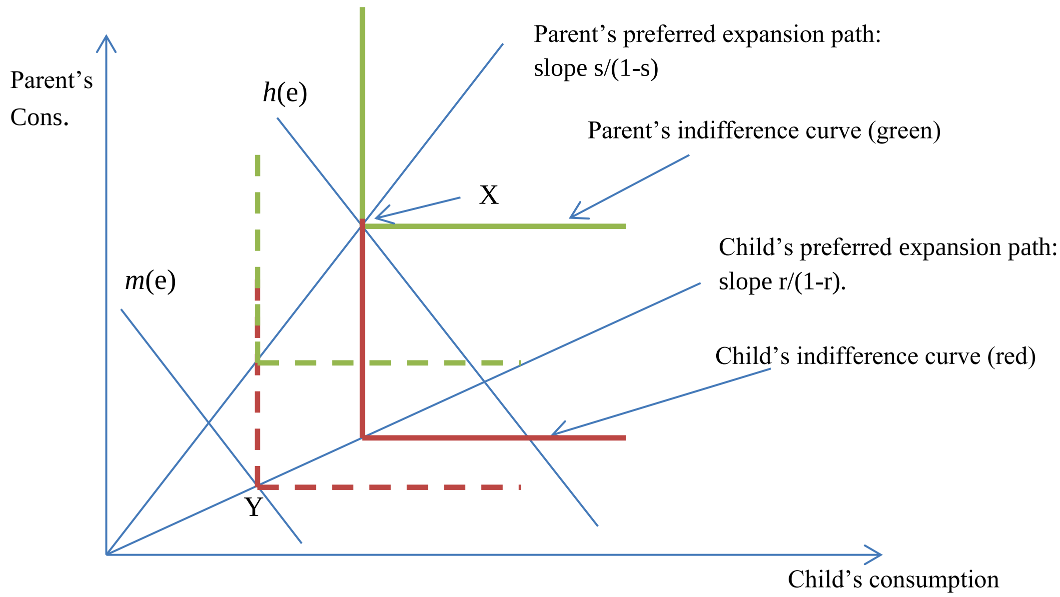


FIGURE A.2. CHILD'S AND PARENT'S CONSUMPTION

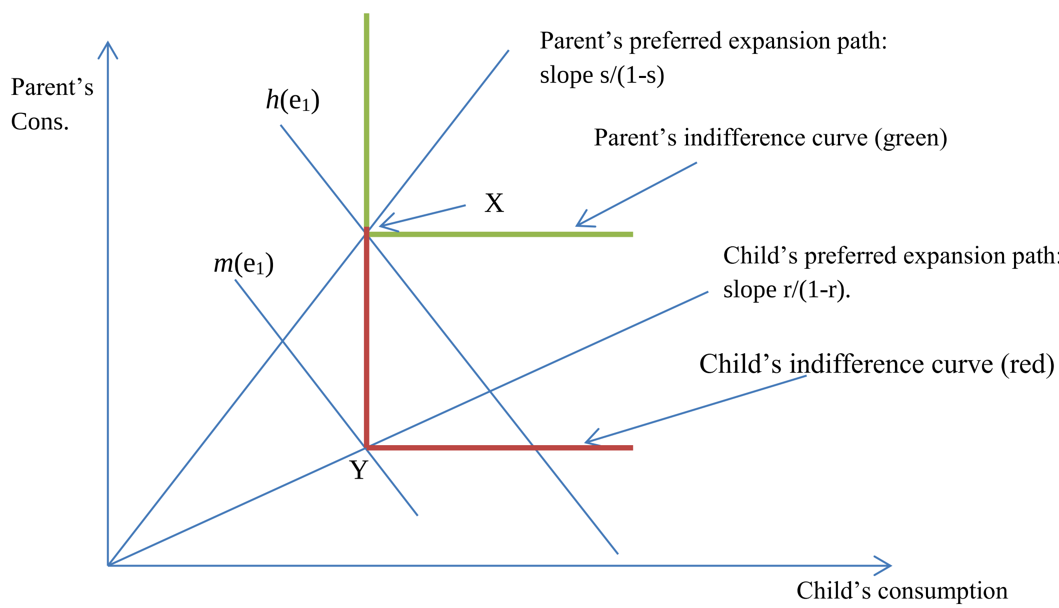
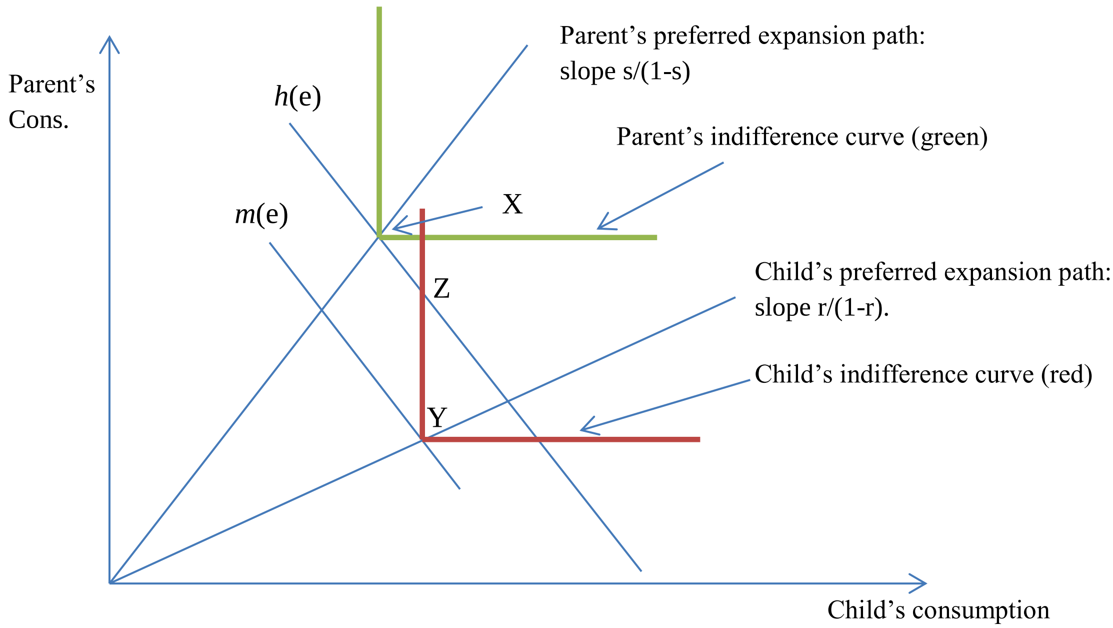


FIGURE A.3. CHILD'S AND PARENT'S CONSUMPTION



APPENDIX B: THE CASE OF MULTIPLE CHILDREN

Suppose the parent has N children, numbered 1, …, N with generic element n. The parent chooses education level e_i for each child. The cost of education is c(e), where c' > 0 and c'' ≥ 0. Let H be the set of children the parent wishes to stay home and M be the set of children that the parent wishes to migrate. With slight abuse of notation, we will use H and M to denote the number of children in each set when it can be done without confusion.

Let $F_H(e_1,\dots,e_H)$ denote the household production function when set H of children remain at home. Children who migrate to the city earn wage w(e) and remit fraction r home to the parent, where $0 \le r \le 1$. The cost of migrating to the city is $t > 0$. We assume it is the same for all children, but that can be relaxed. We can also include a child-specific value u_i that the parent assigns to keeping the child at home.

For a child the parent wishes to keep at home, the parent must offer that child as much net income as the child would receive if the child were to migrate. If the child remits fraction r of income home to the parent, his net income is $v_i = (1-r)\, w(e_i) - t$.

The parent chooses household income subject to the constraint that children who remain at home are willing to do so:

$$\begin{aligned}
&\max_{H,M,e_i} F_H\left(e_1,\dots,e_H\right)+\sum\nolimits_{m\in M} rw\left(e_m\right)-\sum\nolimits_{n=1}^{N} c\left(e_n\right)-\sum\nolimits_{h\in H} x_h \\
&s.t. \\
&x_h \ge \left(1-r\right)w\left(e_h\right)-t \ \ for\ all\ h\in H
\end{aligned}$$

Substituting the constraints into the objective function yields:

$$\max_{H,M,e_i} F_H\left(e_1,\dots,e_H\right)+\sum\nolimits_{m\in M} rw\left(e_m\right)-\sum\nolimits_{n=1}^{N} c\left(e_n\right)-\sum\nolimits_{h\in H}\left[\left(1-r\right)w\left(e_h\right)-t\right]$$

An optimal (interior) solution to this problem satisfies:

$$\begin{aligned}
&rw'\left(e_m^*\right)=c'\left(e_m^*\right) \quad for \quad m\in M^* \\
&\frac{\partial F}{\partial e_h}\left(e_1^*,\dots,e_H^*\right)=c'\left(e_h^*\right)+\left(1-r\right)w'\left(e_h^*\right) \quad for \quad h\in H^*
\end{aligned}$$

The comparative static we are interested in is how the optimal choice of education changes when there is a change in the marginal returns to education in the city. To illustrate this, rewrite the wage function as z w(e). We will analyze the impact of an increase in z on the solution to the parent's problem, now characterized by:

$$\begin{aligned}
&rzw'\left(e_m^*\right)=c'\left(e_m^*\right) \quad for \quad m\in M^* \\
&\frac{\partial F}{\partial e_h}\left(e_1^*,\dots,e_H^*\right)=c'\left(e_h^*\right)+\left(1-r\right)zw'\left(e_h^*\right) \quad for \quad h\in H^*
\end{aligned}$$

Clearly, for $m \in M^*$, an increase in the marginal returns to education increase education whenever r w(e) – c(e) is concave.

Before stating the result for children who remain at home, recall how an increase in the returns to education in the city impact's the parent's decision in the single-child case. In order for the parent to keep the child from migrating, he must give the child a share of household resources equal to his net wage in the city. This becomes an "incentive cost" for keeping the child at home. When the marginal returns to education in the city increase, the marginal incentive cost of keeping the child from migrating increases. The parent responds to this increase in the marginal cost of education by decreasing education.

While the above intuition is correct for the case of a single child at home, when there are multiple children at home there are interaction effects that are potentially important. In particular, changing the education for one child who remains at home affects the marginal productivity of all children who remain at home. So, if increasing the marginal incentive cost to child 1 leads the parent to reduce education to child 1, this impacts the marginal product of the other children. Without further restrictions, it is possible that reducing the education to one child increases the marginal product of education for the other children. In this case, it is possible that, although the direct effect of increasing the incentive cost of keeping the child at home would induce the parent to reduce education, the indirect effect of the parent's adjustment in the other children's education choices leads the parent to prefer to increase, rather than decrease, education.

The additional assumption needed to rule out this case is that the production function is supermodular in its arguments, which in this case is equivalent to assuming that it exhibits positive cross-partial derivatives.[32] In this case, decreasing education to one child decreases the incentive to educate other children, ruling out the type of effect discussed in the previous paragraph.

Proposition**:** If $F_H(e_1,\ldots,e_H)$ is supermodular in $(e_1,\ldots,e_H)$, then $\frac{\partial e_h}{\partial z} < 0$ for all $h \in H$.

*Proof***:** The objective function for the parent's problem is:

$$OBJ = F_H\left(e_1,...,e_H\right) + \sum_{m\in M} rw\left(e_m\right) - \sum_{n=1}^{N} c\left(e_n\right) - \sum_{h\in H}\left[\left(1-r\right)zw\left(e_h\right)-t\right]$$

The cross partial derivative of OBJ, $\frac{\partial^2 OBJ}{\partial e_h \partial z} = -w'\left(e_h\right) < 0$. Hence OBJ exhibits strictly decreasing differences. By Theorem 2.3 in Vives (1999), e_i are strictly decreasing functions of z.■

Many natural production functions, including the Cobb-Douglas and CES, are supermodular. Although somewhat less intuitive, the supermodularity condition can be further relaxed to requiring quasi-

[32] See Milgrom and Shannon (1994), Edlin and Shannon (1998), and Vives (1999).

supermodularity (see Vives 1999). A function is F quasisupermodular if there is a strictly increasing function G such that G(F( )) is supermodular. The family of quasisupermodular functions is quite broad and includes, for example, the case of perfect substitutes with decreasing returns.[33]

Finally, we argue that increasing returns to education in the city make migration more attractive. Since the argument is straightforward, we do so informally. Suppose the parent chooses to keep set H of children at home and allow set M of children to migrate. Consider a particular child, h, who stays home. When the returns to education go up, this increases the value to the parent of letting that child migrate, since for any education level the child now earns a higher wage if he migrates and consequently remits more to the parent. At the same time, since increasing the returns to education in the city makes it more costly for the parent to keep the child at home, since the parent must now match the higher incentive cost, this makes the parent less willing to spend money to keep the child at home. Both factors make it more attractive for the parent to allow the child to migrate, and therefore an increase in the returns to education in the city is expected to lead to more migration.

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Vives, Xavier (1999). *Oligopoly Pricing: Old Ideas and New Tools*. MIT Press. Cambridge, Massachusetts.

[33] Although $F(x,y) = (x+y)^{1/2}$ exhibits negative cross-partial derivatives, $G(F) = F^3$ exhibits positive cross-partial derivatives, and hence F(x,y) is quasisupermodular.

APPENDIX C:
RESPONSE TO AN INCREASE IN URBAN RETURNS UNDER CREDIT CONSTRAINTS

Let $f(e)$ be the return to a child who has education e and works at home, and $w(e)$ be the return to a child with education e who migrates and works in the city. As before, assume $f(0) > w(0)$, $f'(e) > w'(e)$, $w''(e) < 0$, $f''(e) < 0$, and $w(e) > f(e)$ for e sufficiently large.

Assume that the family has two children, 1 and 2, and that the total value to the family is additive. Thus, if both children work at home or migrate, the total return is $f(e_1) + f(e_2)$ or $w(e_1) + w(e_2)$, respectively. If child 1 migrates and child 2 stays home, the total return is $w(e_1) + f(e_2)$. Parents have a fixed total budget to spend on education, $2y$, and the cost of a year of education is normalized to 1. Thus, parents face the budget constraint $e_1 + e_2 \leq 2y$, and we assume that y is small enough that this constraint always binds.

Figure C.1 illustrates a typical home production function (f) and wage function (w). Let e^* denote the point where wages and farm revenue are equal, $w(e^*) = f(e^*)$.

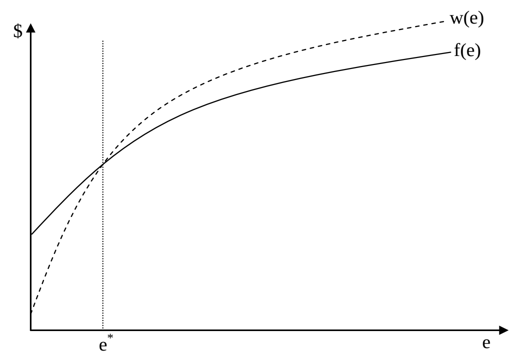

FIGURE C.1 HOME AND MARKET OUTPUT AS A FUNCTION OF EDUCATION

When the budget is extremely tight, $2y \leq e^*$, the optimal solution for the parents, since we have assumed the absence of incentive issues, is to choose $e_1 = e_2 = y$, and both children remain at home. On the other hand, when the family is sufficiently wealthy, $y \geq e^*$, the optimal solution is to once again choose $e_1 = e_2 = y$, but now both children choose to migrate.

For an intermediate range of y, it is possible that the parents choose to have one child migrate and one child stay at home. In this case, it will be optimal to give the child who migrates more education than the child who stays home. Since the total education constraint binds, the parents' problem can be written as:

$$\max_{\Delta} f(y - \Delta) + w(y + \Delta).$$

Taking the derivative with respect to Δ and setting it equal to zero, we have:

$$f'(y - \Delta^*) = w'(y + \Delta^*).$$

The optimal solution is illustrated in Figure C.2.

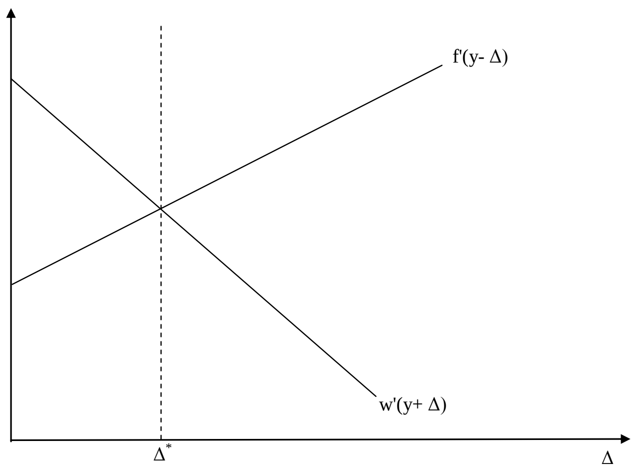

FIGURE C.2. OPTIMAL EDUCATION DIFFERENCE BETWEEN SIBLINGS

Suppose the return to return to education in the city increases, shifting up from $w'(e)$ to $W'(e)$. For a small shift, the result will be an increase in Δ^*, as illustrated in Figure C.3.

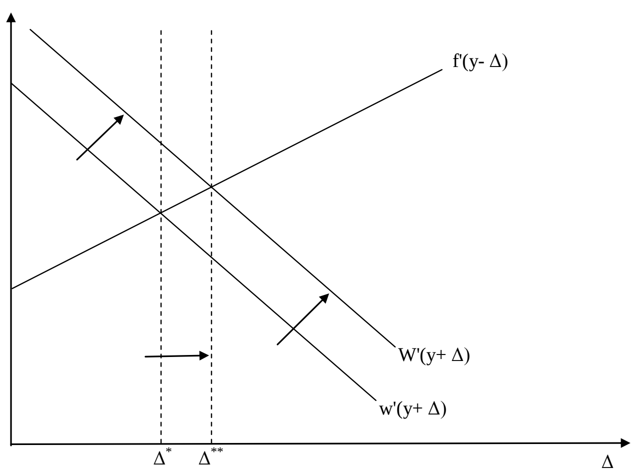

FIGURE C.3. CHANGES IN RETURNS AND OPTIMAL EDUCATION DIFFERENCE

Empirically, an increase in Δ^* corresponds to an increase in education for children who migrate and a decrease in education for children who do not migrate. Thus, it is possible that credit constraints would generate similar behavior to our model, with gains for some children alongside reductions for others. Though we note that it is not guaranteed; it will depend in general on the shape of the cost and production functions.[34]

[34] As drawn, the change in the city returns does not result in more children migrating, and in general there is no clean empirical prediction corresponding to Prediction 2 of our model. It is possible that an increase in the returns in the city could lead more children to migrate (if it moves households from wanting to keep both children at home to letting one migrate or from wanting to keep one at home to letting both migrate).