

**Universität Bielefeld**

**Faculty of Business Administration and Economics**

**Working Papers in Economics and Management**

**No. 14-2014  
September 2014**

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**Theory and Empirical Evidence**

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ISSN 2196–2723

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# Migration Experience, Aspirations and the Brain Drain

## Theory and Empirical Evidence

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September 16, 2014

We develop a theoretical model of human skill formation and emigration. We extend the existing brain drain models, by partly endogenizing the heterogeneity of individuals, by introducing aspirations. Emigration of an individual will result in a migration experience, which increases the migrant's aspirations. This will induce her to invest more in the education of her children back home. We find that this *aspirations effect* increases the average skill level in the society for a given migration rate. We show that the optimal migration rate that maximizes the post-migration skill-rate of the population is higher if we allow for the aspirations effect of migration. We use panel data from Indonesia to demonstrate that a migration experience has an aspirations increasing effect and calibrate our model accordingly. Our results suggest that there are potentially more countries than previously thought which could benefit from migration.

**Keywords:** migration, brain gain, aspirations, education

**JEL classification:** D03, F22, I25, J61, O15

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We thank for their comments Mathias Czaika, Frédéric Docquier, Holger Görg, Tobias Stöhr, Rainer Thiele, Gerald Willmann, participants at the NORFACE Conference on “Migration: Global Development, New Frontiers”, London, April 2013, the EBIM Doctoral Workshop, Bielefeld, December 2013, the GEP Postgraduate Conference, Nottingham, May 2014, our discussant Michal Burzynski, and seminar audiences at Aarhus, Bielefeld, Leuven, Louvain-la-Neuve, and IfW Kiel.

Toni Glaser would like to thank the German Research Foundation (DFG) and the KU Leuven for their financial support.

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<sup>†</sup>The opinions expressed and arguments employed in this document are the sole responsibility of the authors and do not necessarily reflect those of the OECD or of the governments of its member countries.

# 1. Introduction

The question of whether or not emigration of skilled citizens is a curse or a blessing for developing countries has been of great concern in the recent past. Whereas previous contributions like Bhagwati and Hamada (1974) identified the brain drain as one of the primary reasons for poverty and lacking growth in countries of the global south, more recent articles show that the picture is not as bleak as previously imagined.<sup>1</sup> Recently various studies such as Mountford (1997), Beine et al. (2001) and Stark (2004) have made the argument that the possibility to migrate to a richer country, where one can earn considerably higher wages, given the necessary skills, will serve as an incentive to invest in education. With this additional stimulus, it can be shown that emigration can actually increase the average skill level of the remaining population.

All the existing work that we are aware of assumes that individuals differ in their inherent ability, and that this one-dimensional variable is the only source of heterogeneity. This ability distribution is typically assumed to be completely exogenous and thus not influenced by the migration prospects. In this paper, we want to establish that it is not only ability, but also psychosocial capacities that shape an individual's education decision. Since these parameters are typically not inherent, but evolve as a result of experience and social interactions, they will not be exogenous but depend on the migration history of a household. More specifically, our research aims at establishing a connection between the more recent brain drain models and the literature on aspirations formation. This literature defines aspirations as a quality of individuals who pursue a certain goal with conviction. This capacity is usually thought to form as a result of interactions with one's immediate social environment.<sup>2</sup>

The concept of aspirations has recently attracted a growing interest in the economic literature. Several articles identify *aspirations failure* as one possible reason for underinvestment in education in developing countries. Ray (2006), Dalton et al. (2011) and Bernard et al. (2011) all stress the importance of raising aspirations in order to fight persisting poverty. We claim that one possible channel to overcome aspirations failure is migration.

New empirical insight on aspirations formation<sup>3</sup> motivates us to augment work by Beine et al. (2008). We introduce an intergenerational externality on the household level to a theoretical model of a brain drain. In our model, it is no longer only the aggregate probability to migrate that determines the education decision of an individual, but also the household's migration history. Since aspirations evolve as a result of social interactions, a migration experience will lead to a revision of the migrant's prior aspirations. The subsequent rise in aspirations will lower the perceived intertemporal discount rate for the migrant and therefore increase the aggregate investment in education. To evaluate the validity of the assumptions made in the model we use panel data from Indonesia to show that a migration experience has a beneficial effect on the aspirations of individuals. In the last section of the paper we use our empirical results to calibrate the model.

We find that introducing aspirations to our model, as a variable that increases the

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<sup>1</sup>For an extensive survey of the literature see Commander et al. (2004)

<sup>2</sup>See Appadurai (2004)

<sup>3</sup>Czaika and Vothknecht (2014) and Böhme (2012) both find that aspirations are higher for migrants.

weight that someone places on future earnings, increases the positive influence that migration has on skill formation. There are two reasons for this. First, the higher aspirations magnify the original incentive effect of migration. The expected skill premium that a higher migration rate implies will be larger for aspiring individuals, since they value future earnings more than non-aspiring people. Second, a higher steady state migration rate means that it is more likely to have a parent who has a migration experience. Thereby, a higher migration rate will increase the average aspirations level in the society, and hence, the average investment in education.

Taken together, these two effects lead to a higher optimal migration rate for every country. Furthermore, they increase the autarky equivalent migration rate. Below this benchmark, allowing for migration will lead to a higher average skill-level than under autarky. This implies that the *aspirations effect* increases the range of migration rates for which a country will have a net brain-gain. Our results suggest that omitting the intergenerational household effect of emigration in empirical studies on the effect of skilled migration on the skill level of sending countries will overstate the negative effect of emigration. Beine et al. (2008) study which countries win and lose from emigration. We show that, depending on the size of the aspirations effect, some countries that were found to be net losers of emigration could potentially be winners.

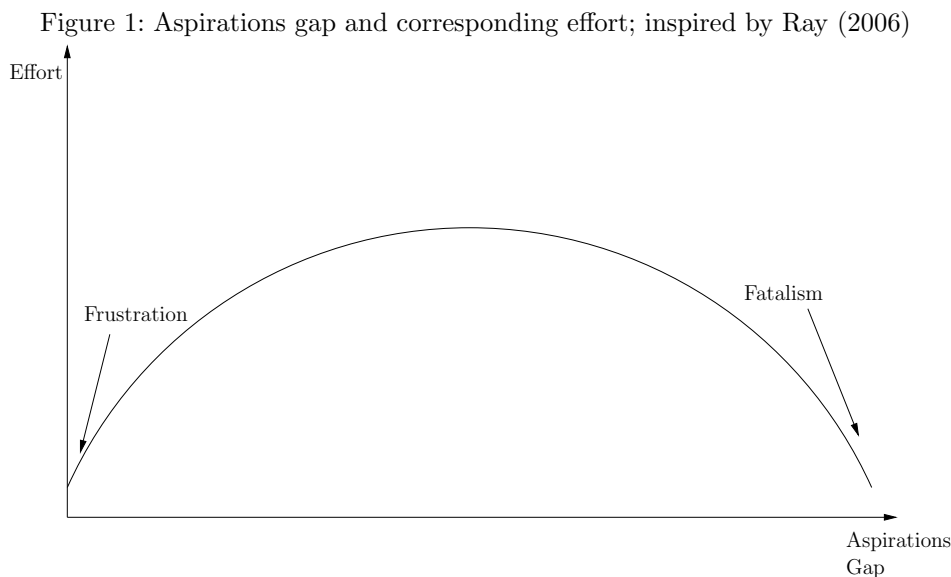
The remainder of this paper is structured as follows. In section 2 we will give a short overview about aspirations and their influence on economic behavior. In section 3 we present a theoretical model that investigates the implications of aspirations for the brain drain. In section 4 we give empirical evidence on the influence that a migration experience has on aspirations and use the estimation results to quantitatively simulate the importance of aspirations in our brain drain model. In section 5 we conclude.

## 2. The aspirations concept

An aspiring individual is someone who has a certain goal or dream that she is pursuing with conviction. The notion of aspirations as a social capacity is still rather new to economics. Appadurai (2004) argues that aspirations do not form in a void, but that the contact and interaction with our peers is essential for the formation of aspirations. An individual will aspire to a level of wealth, education or social norms that she is confronted with in her immediate environment. The more diverse this social environment, the more likely it is that someone will find a desirable and attainable goal to aspire to. Appadurai points out that in cultures of absolute poverty, individuals will lack this *capacity to aspire*. The point he is making is that if all the peers of a poor individual are equally bad off, then she will not form the capacity to imagine herself better off.

Ray (2006) develops this idea further and investigates the economic implications of such a *culture of poverty* in which the poor will accept their destiny. He develops the concept of an *aspirations window*, which is composed of the people that influence an individual's aspirations. Usually these are the closest peers, such as close family members, friends and even neighbors. If this window is solely composed of other economically and socially disadvantaged people, an individual will be unaspiring because of her unawareness of the possibility of social and economic ascension. Ray (2006) proposes that someone who is

aspiring towards a better, attainable life will put a certain amount of effort into the realization of this goal, whereas someone who is unaspiring will not. It is important that the *aspirations gap*, the distance between where an individual sees herself currently and the goal she is aspiring to, must be of a reasonable size, in order to affect her behavior. A gap that is too small, as in poor or segregated societies, will lead to frustration, since there is no goal worth pursuing. A gap that is larger than what is reasonably attainable is also unlikely to affect an individual's behavior, since she will get fatalistic at the prospect of never being able to attain her goal. Figure 1 illustrates this relationship.



Ray (2006) further argues that the *aspirations failure* in poor societies can be the cause for a self-sustaining poverty trap. The poor will not save or invest in education, because the improvement in their lives that this could bring about is not considered as an option. Bernard et al. (2011) state that aspirations in themselves are future-oriented, meaning that they are not about the satisfaction of immediate needs, but rather about the achievement of a long-term goal. Furthermore, they are seen as motivators. If an individual is aspiring to a certain goal, she is willing to spend time and money on the realization of this goal. In poor societies, the aggregate lack of aspirations will then lead to a behavior that is not concerned with the pursuit of a better life, but the fulfillment of instant needs, and can thus for example be associated with a lack of human capital, which in turn will be detrimental to growth. Wilson and Boldizar (1990) and Bernard et al. (2011) find empirical evidence that a lack of aspirations will indeed lead to a less future oriented behavior.

Dalton et al. (2011) formalize Ray's concept and develop a theoretical model for aspirations failure and poverty traps. In their model, aspirations are shaped by one's past successes and failures. Since the poor face greater downside risk, they will be less likely to put effort into the pursuit of a goal than the rich. This results in a situation where the poor achieve less than the rich, which will confirm their initial behavior and lower their aspirations. This will then lead to self-sustaining poverty traps, where poor individuals exert less effort because of their acquired low aspirations. The authors argue that policy needs to tackle the belief and aspirations formation of the poor to be successful in fighting

persisting poverty.

The points made by Ray (2006) and Dalton et al. (2011) have been taken up by a number of recent empirical studies whose focus is to find ways to increase the aspirations of the poor. Exposing poor individuals to successful role models from a similar social background is such a mechanism that is found to have the desired effect. Macours and Vakis (2008) find that the responsiveness to an asset transfer program would increase if the test subjects were exposed to a female leader that also participated in that program. They argue that the proximity to the female leaders increases the aspirations of the test subjects, which in turn increases their investment and human skill accumulation.

Another analysis looking at the importance of role models has been undertaken by Chiapa et al. (2012). The authors studied participants in a Mexican anti-poverty program and reported higher educational aspirations for children that came into personal contact with professional medical staff such as doctors and nurses. This suggests that the children include this highly-trained personnel in their aspirations window.

A different approach that can be found in the literature is the enrollment of individuals in interventions that are designed to raise their self-efficacy. Krishnan and Krutikova (2010) evaluate a program that was specifically designed to foster the psychosocial skills of disadvantaged children in the slums of Bombay. In the course of the program, participating children are enrolled in activities that are meant to boost their non-cognitive abilities. The study finds that aspirations, as well as self-efficacy and self-esteem, grow significantly as a result of the intervention.

Similarly, Wydick et al. (2013) investigate the effects of international child-sponsorship programs on the schooling outcomes and job-prospects of the sponsored individuals. They find that the long-term enrollment and participation in such a program has a significantly positive effect on children's aspirations, by exposing them to an encouraging and optimistic environment. It is then shown that this increase in aspirations improves their educational attainment.

Bernard et al. (2014) run a randomized experiment, in which they show a motivational video to inhabitants of poor villages in Ethiopia. This video shows success stories of previously poor individuals, who have all managed to greatly improve their lives by showing perseverance, reliability and determination. They find that subjects that saw the video experience a significantly higher increase in their aspirations, compared to a control group that watches a placebo video. Six months after the video intervention, they find that actual behavior has also changed for the test subjects. Their children's school enrollment and savings behavior has increased significantly. Furthermore, there seem to be spillover effects on other villagers that haven't seen the video, but have heard about it from their peers.

This literature shows that increasing aspirations is vital in order to help the poor to overcome their condition. We identify an additional channel through which aspirations failure can be overcome: migration. We argue that migration will have a beneficial effect for the aspirations formation of an individual for at least two reasons. First, migration allows an individual to broaden her horizon and to meet new people. This is equivalent

to a widening of the *aspirations window*. The more people an individual knows, the more likely she is to know someone who has a lifestyle that she considers worth aspiring to. Second, migrants usually move to a destination that is wealthier than their place of origin and often differs substantially in culture and norms. This means that the migrant will probably be surrounded by individuals who have a lifestyle that is different from and more luxurious than the one of her domestic peers. The migrant might aspire to these new social and economic norms that she discovers while being abroad.

The fact that migrants, but also their family in the source country, adapt their social and cultural values as a result of migration, has been pointed out in several papers that treat the transfer of norms. Spilimbergo (2009) demonstrates that democratic values are adopted by migrants and then promoted in their home countries upon their return. Beine et al. (2013) show that birthrates of source countries will adapt as a result of migration flows to destinations with different fertility norms. Interestingly, this adaptation does not require return migration, which suggests that strong cultural links between the migrants and their home country persist. Migration is also found to have an impact on political aspirations. Lodigiani and Salomone (2012) find that political participation of women in sending countries increases as a result of migration streams to countries that have a greater female political empowerment. Migrants witness the foreign political norm and transmit it to their home country.

Our finding, that aspirations increase as a result of an exposure to a different economic environment is closely linked to the idea of an international transfer of norms. In the following section we formalize this idea in a theoretical model, and show its implications for the brain drain.

### 3. Theoretical Framework

Consider a small open economy where each household consists of a parent and her child. This economy represents a poor country, where aspirations are initially low and intertemporal discounting is high.<sup>4</sup> Each individual lives for two periods. In the first period, *youth*, an individual will invest in education if her parent decides that she should do so. In the second period, *adulthood*, all youths become parents of one child and make the education decision for the child. At birth, each individual is endowed with one efficiency unit of labor, and can invest in education in order to increase its labor force to  $h > 1$  units. Individuals differ in their ability, which is inversely related to their perceived cost for education  $c_i$ . This perceived cost can be interpreted as the time that is needed in order to achieve a high-school diploma. The more time a child needs to spend on her education in order to achieve a degree, the less time she can spend on work.

$c_i$  follows the cumulative distribution function  $F(c_i)$  and the density function  $f(c_i)$  and is defined on  $\mathbb{R}_+$ . We assume that a child's inherent ability, and therefore the perceived education cost, is independently distributed of her parent's ability.<sup>5</sup>

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<sup>4</sup>The basic setup of this model is inspired by Beine et al. (2008).

<sup>5</sup> This assumption will become important in the course of our analysis, because the parent's ability will indirectly influence the child's education investment through the probability that the parent is

If an individual pursues education, she earns  $w_t - c_i$  in the first period of her life. In the second period, her effective units of labor will have increased to  $h$  and her income will change accordingly to  $w_t h$ . Unskilled individuals will earn  $w_t$  in both periods.

We assume, as in Cunha and Heckman (2007), that parents make the education decisions for their offspring out of altruistic motives. They are assumed to perfectly know the ability of their children, and can therefore judge the cost and benefits of education for their children. We assume that a parent's aim is to maximize the expected discounted lifetime earnings of her child, net of the perceived education cost. If a parent decides that her child should pursue education, this can be seen as an investment of the parent, because during *youth* children only contribute  $w_t - c_i$  to the household's income. The higher the perceived cost, the lower is the effective income in the first period. Without migration, a parent invests in her child's education if

$$w_t - c_i + (1 - \delta)hw_{t+1} \geq w_t + (1 - \delta)w_{t+1} \quad (1)$$

In this setting without migration, the perceived cost benchmark for which parents will just invest in education is then

$$c_i \leq \tilde{c}_t = (1 - \delta)w_{t+1}(h - 1) \quad (2)$$

where  $\delta$  is the perceived intertemporal discount rate for non-aspiring parents.

We include intertemporal discounting in our model, because the perceived discount rate is closely related to aspirations and poverty. The fact that the poor are exposed to a considerably higher amount of risk in their day-to-day lives than the wealthy has gained considerable interest in the recent economic literature. The lack of insurance or savings as well as the insufficient funds to purchase weather resistant crops can be reasons for this. Banerjee and Duflo (2007) and Banerjee et al. (2011) give several striking examples that illustrate the considerable risk-exposure of the poor. Vargas Hill (2009) argues that this high perceived amount of risk of the poor will have a considerable effect on their production decisions. The author shows that poorer households with low risk-preferences are less likely to invest in cash-crops, such as coffee, even if their expected long-run return is higher than that of traditional crops. As argued earlier, individuals in poor societies are also likely to have low aspirations. The lack of aspirations manifests itself in a disregard for long run goals and a higher valuation for the fulfillment of imminent needs.

For these two reasons, future expected earnings should be heavily discounted in our model. At a high  $\delta$ , investments in education become less attractive, because skilled workers earn higher wages only in the second period of their lives, whereas the initial perceived education costs  $c_i$  have to be paid in the first period. The next step is to extend the model and allow for migration.

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aspiring. High-ability parents are more likely to be educated and thus to have a migration experience, since migration is more likely to be possible for the skilled.



### 3.1. Migration

We now assume that in the second period of their lives, after becoming a parent, skilled workers can emigrate to a higher wage destination with an exogenous probability.<sup>6</sup> Foreign wages  $w_t^*$  are assumed to be significantly higher than domestic wages,  $w_t^* > w_t$ . We assume that there are no costs associated with emigration. However, an inclusion of the costs does not alter our results qualitatively. Since foreign wages are significantly higher, an individual will emigrate with certainty if she gets the opportunity to do so. Migration is thus not a choice variable, but can be seen as a random shock to the income of the individual.

As argued in Docquier and Marfouk (2000) and Beine et al. (2008), educated individuals are more likely to emigrate. We adopt this assumption and normalize the probability that an unskilled individual emigrates to  $\underline{p} = 0$ . The emigration probability for skilled individuals is denoted by  $p$  and is the same for all the educated. This is a reasonable assumption in our model, where only one education regime exists. In a world where more than one education level can be achieved, it would be likely that the emigration probability is increasing in the skill level. Our assumption also implicitly indicates that the ability level is unobservable for the visa authority, and that education therefore is the only variable that influences the authority's choice.

A parent will then decide to invest in her child's education, if the expected discounted lifetime earnings of the child, including education costs, are higher if it is skilled.

$$w_t - c_i + (1 - \delta) \left( (1 - p_{t+1})hw_{t+1} + p_{t+1}hw_{t+1}^* \right) \geq w_t + (1 - \delta)w_{t+1} \quad (3)$$

The perceived costs to education for a child have to be below a benchmark value  $\tilde{c}$ , otherwise the parent will not invest in the education of her offspring.

$$c_i \leq \tilde{c}_t = (1 - \delta) \left( w_{t+1}(h - 1) + p_{t+1}h(w_{t+1}^* - w_{t+1}) \right) \quad (4)$$

It can be seen that  $\tilde{c}_t$  is increasing in  $h$ . The higher the increase in effective work units as a result of education, the more attractive it becomes to invest in skills. Furthermore,  $\tilde{c}_t$  is also increasing in  $p_{t+1}$ . Since wages are higher abroad, and migration is only possible for the skilled, a higher migration probability increases the expected skill premium, and leads to a higher education-cost benchmark.

In the previous brain drain models, the only source of heterogeneity were differences in the inherent individual ability and budget constraints. We introduce aspirations as an additional source of heterogeneity. We have suggested earlier, and will show in the empirical section, that migration increases the aspirations of the migrants. Thus, if a parent has emigrated, she is said to have a migration experience and her aspirations will increase by  $\gamma$ , compared to a non-migrant. As mentioned before, empirical evidence suggests that increased aspirations will lead to higher educational attainments. There are at least three possible ways of introducing aspirations to our model, such that the

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<sup>6</sup>We assume that migrants will leave their offspring behind. This might seem strange, given our simplifying assumption of one parent per child, but in reality, children have two parents. Often, the head of the household emigrates to earn money for the family, while the rest of the family stays behind. The education decisions will still be carried out by the head of the household, even if she is abroad.

skill rate of children from aspiring households are higher. First, one could think of an aspirations-induced change of preferences. Second, children of aspiring parents can be assumed to have systematically lower perceived costs for education. Third, aspirations could lead to a higher valuation of future earnings, lowering the inter-temporal discount rate. We choose the last option, because it has been pointed out in the aspirations literature that aspiring individuals have a more future-oriented behavior and are willing to spend time and money in the pursuit of their goals. They believe themselves capable of altering their own destiny, which distinguishes them from other poor individuals who have an *aspirations failure*. Some recent studies such as Wilson and Boldizar (1990) and Bernard et al. (2011) provide empirical evidence that aspirations are fundamental for future-oriented behavior.

The way in which we incorporate this in our model is straightforward. Aspiring individuals will have a lower perceived discount rate, whereas parents who do not have a migration experience are non-aspiring, and will therefore put a high discount rate  $\delta$  on possible future earnings. The aspiring parent will thus be more future oriented, and puts a larger weight on the second period earnings of her child. It becomes more important for the parent that her child will have a better life when it is grown up. Migration thus creates an intergenerational externality, since it influences the future of the child through the increased aspirations of her parent.

The aspiring parent will invest in the education of her child, if the following holds.

$$w_t - c_i + (1 - \delta)(1 + \gamma) \left( (1 - p_{t+1})hw_{t+1} + p_{t+1}hw_{t+1}^* \right) \geq w_t + (1 - \delta)(1 + \gamma)w_{t+1} \quad (5)$$

The higher aspirations  $\gamma$  lead to a change in the perceived cost benchmark.

$$c_i \leq \tilde{c}_{t,\gamma} = (1 - \delta)(1 + \gamma) \left( w_{t+1}(h - 1) + p_{t+1}h(w_{t+1}^* - w_{t+1}) \right) = (1 + \gamma)\tilde{c}_t \quad (6)$$

This benchmark is strictly higher than for non aspiring households. Migrants will thus also invest in education if their children are less able than what would be required for non-migrant families.

What implications does this have for the brain-drain? We assume that a fraction  $\pi$  of the population has a parent who has a migration experience and is therefore aspiring. Imposing that there are no binding budget constraints, which implies that every individual who chooses education over work can do so, the aggregate pre-migration education rate in the economy in period  $t$  can then be calculated as

$$H_{a,t} = (1 - \pi_t)F(\tilde{c}) + \pi_t F((1 + \gamma)\tilde{c}) \quad (7)$$

The probability that one's parent has a migration experience depends on the probability that this parent is educated herself,  $H_{a,t-1}$ , and the current migration rate for skilled individuals  $p_t$ . This probability is then calculated as  $\pi_t = H_{a,t-1}p_t$ .

In order to assess the influence that migration has on the brain drain in the long run, we want to investigate how a change in the exogenous migration probability will influence the steady state education rate. In the steady state, wages, the migration probability

and education rates remain constant over time. The steady state education rate is then

$$\begin{aligned}
H_a^{ss} &= (1 - \pi^{ss})(1 - F(\tilde{c})) + \pi^{ss}F((1 + \gamma)\tilde{c}) \\
&= F(\tilde{c}) + \pi^{ss}(F((1 + \gamma)\tilde{c}) - F(\tilde{c})) \\
&= F(\tilde{c}) + H_a^{ss}p^{ss}(F((1 + \gamma)\tilde{c}) - F(\tilde{c}))
\end{aligned} \tag{8}$$

$$H_a^{ss} = \frac{F(\tilde{c})}{1 - p^{ss}(F((1 + \gamma)\tilde{c}) - F(\tilde{c}))}$$

Remembering that  $\tilde{c}$  depends positively on  $p$ , it is clear that  $H_a^{ss}$  depends positively on  $p^{ss}$ . There are two reasons for this conclusion. First, the possibility to emigrate will increase the expected skill-premium, because skilled work earns considerably higher wages abroad. This is the classical argument for a brain gain, the *incentive effect*, as it has often been identified in the literature. The second channel that drives this positive relationship between the steady state migration rate and investment in education is the *aspirations effect*. If the steady state emigration rate is high, the possibility to have a parent that has a migration experience is higher, and therefore it is more likely that the parent will be aspiring. This effect is visible in the denominator. The bigger the aspirations effect  $\gamma$ , the higher the positive influence of the emigration rate on education will be.

However, we are not only interested in the incentive effect that migration has on education. Our ultimate aim is to assess whether migration will increase or decrease the *post-migration skill ratio*. This rate is calculated as

$$H_{p,t} = \frac{(1 - p_t)H_{a,t-1}}{1 - p_tH_{a,t-1}} \tag{9}$$

which, in the steady state becomes

$$\begin{aligned}
H_p^{ss} &= \frac{(1 - p^{ss})H_a^{ss}}{1 - p^{ss}H_a^{ss}} \\
&= \frac{(1 - p^{ss})F(\tilde{c})}{1 - p^{ss}F((1 + \gamma)\tilde{c})}
\end{aligned} \tag{10}$$

It is evident that this average post-migration skill level is strictly increasing in the aspirations effect.

$$\frac{\partial H_p^{ss}}{\partial \gamma} = \frac{(1 - p^{ss})p^{ss}\tilde{c}f((1 + \gamma)\tilde{c})F(\tilde{c})}{\left(1 - p^{ss}F((1 + \gamma)\tilde{c})\right)^2} \tag{11}$$

Even though the possibility to migrate increases the incentives to invest in education, it also depletes the stock of skilled workers. The subsequent question then becomes under which circumstances skilled emigration leads to a brain drain, and what the role of aspirations in this context is. We will focus on the steady state only.<sup>7</sup> In order to determine whether migration will lead to a net brain drain or gain, and thus whether migration is good or bad for a country, we have to investigate the influence that migration has on this

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<sup>7</sup>From now on we drop the superscript *ss* in our analysis. All variables of interest are now assumed to be in steady state.

post-migration skill rate.<sup>8</sup> Taking the derivative of (10) with respect to  $p$ , we get

$$\begin{aligned} \frac{\partial H_p}{\partial p} = & \\ & \frac{-F(\tilde{c})(1 - F((1 + \gamma)\tilde{c}))}{(1 - pF((1 + \gamma)\tilde{c}))^2} \\ & + \frac{(1 - p)\frac{\partial \tilde{c}}{\partial p}\left(f(\tilde{c}) + p((1 + \gamma)F(\tilde{c})f((1 + \gamma)\tilde{c}) - F((1 + \gamma)\tilde{c})f(\tilde{c}))\right)}{(1 - pF((1 + \gamma)\tilde{c}))^2} \end{aligned} \quad (12)$$

It can easily be shown that the first term is negative, whereas the second term is unambiguously positive. As argued in Beine et al. (2008), the possibility for a beneficial brain drain exists if the derivative above is positive for  $p = 0$ . That means that a transition from a state of autarky to very restricted emigration would increase the post-migration skill level. In this case, there will be a positive emigration rate, which results in the same average post-migration skill-level as autarky. As a first part of our analysis, we focus on the effect that an intergenerational *aspirations effect* has on this autarky-equivalent emigration rate.

**Proposition 1.** *If the aspirations effect increases the weight that aspiring individuals put on the future and assuming that  $c_i \sim U(0, 1)$ , the aspirations effect increases the autarky-equivalent migration rate and thus the range for which migration is considered to be better than autarky.*

$$H_{p,\gamma}(p_{0|\gamma=0}) > H_p(0) \quad (13)$$

where  $p_{0|\gamma=0}$  is the autarky-equivalent emigration rate without aspirations effect, for which the autarky skill-ratio equals the ex-post emigration skill-ratio.

*Proof.* With  $c_i \sim U(0, 1)$  and a model without aspirations, the emigration rate for which the skill ratio is identical under autarky and migration fulfills

$$\frac{(1 - p_{0|\gamma=0})H_a(p_{0|\gamma=0})}{1 - p_{0|\gamma=0}H_a(p_{0|\gamma=0})} = (1 - \delta)w(h - 1) \quad (14)$$

where the RHS is the education rate under autarky. We can then calculate  $p_{0|\gamma=0}$  as

$$p_{0|\gamma=0} = \frac{h(w^* - w) - w(h - 1)(1 - (1 - \delta)w(h - 1))}{h(w^* - w)(1 - (1 - \delta)w(h - 1))} \quad (15)$$

We want to show that at this emigration rate, the skill ratio in the economy will be higher

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<sup>8</sup>We assume that due to productivity spillovers of education and *aspirations failure*, the education rate in the economy is lower than optimal. Therefore, an increase in the education rate will be described as being "better" for the economy.

than under autarky, if we account for the aspirations effect.

$$H_{p,\gamma}(p_{0|\gamma=0}) > H_p(0)$$

$$\frac{(1 - p_{0|\gamma=0})(1 - \delta)(w(h - 1) + p_{0|\gamma=0}h(w^* - w))}{1 - p_{0|\gamma=0}(1 - \delta)(1 + \gamma)(w(h - 1) + p_{0|\gamma=0}h(w^* - w))} > (1 - \delta)w(h - 1) \quad (16)$$

Setting in (15) for  $p_{0|\gamma=0}$  and rewriting<sup>9</sup>, we obtain

$$\gamma h(w^* - w) \frac{(1 - \delta)w(h - 1)}{1 - (1 - \delta)w(h - 1)} > 0 \quad (17)$$

which is fulfilled by the assumption that  $h > 1$  and that  $c_i \sim U(0, 1)$ <sup>10</sup>. Q.E.D.  $\square$

If a country has an effective skilled migration rate that is below the autarky-equivalent, it will benefit from migration. The proposition above states that accounting for the *aspirations effect* increases the range of the migration rate, for which a country can be seen as such a net-winner of migration. The bigger  $\gamma$ , the bigger the magnitude of this effect. Hence, accounting for the aspirations effect when quantifying which country has a net brain drain or gain will potentially<sup>11</sup> increase the number of net winners. If a positive autarky-equivalent emigration rate exists, there must also be an optimal emigration level, which maximizes the average skill level.

We now proceed by showing that this optimal migration rate, which maximizes the post-migration skill ratio, is also increasing in aspirations. We will first calculate the first-order condition to determine the optimal skilled emigration rate. Then we will use the implicit function theorem on the first order condition to show that the optimal skilled emigration rate is increasing in aspirations.

We set equation (12) equal to zero and define this first order condition as a function of the migration rate and the aspirations effect.

$$\begin{aligned} \frac{\partial H_p}{\partial p} &\equiv \eta(p^*, \gamma) \\ &= -F(\tilde{c})(1 - F((1 + \gamma)\tilde{c})) \\ &\quad + (1 - p^*) \frac{\partial \tilde{c}}{\partial p} \left( f(\tilde{c}) + p^* \left( (1 + \gamma)F(\tilde{c})f((1 + \gamma)\tilde{c}) - F((1 + \gamma)\tilde{c})f(\tilde{c}) \right) \right) \\ &\stackrel{!}{=} 0 \end{aligned} \quad (18)$$

where  $p^*$  is the optimal migration rate.

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<sup>9</sup>See Appendix A.

<sup>10</sup> $(1 - \delta)w(h - 1)$  is the autarky education cost benchmark for which investments in education will be made. It has to be smaller than one if  $c_i \sim U(0, 1)$ .

<sup>11</sup>With a continuum of countries, it would definitely increase the number of net-winners at the margin. Since in reality there is a discrete number of countries, it depends on the actual size of the aspirations effect, whether or not it will shift some net-looser countries on the net-winner side.

As argued earlier, the first term of (18) is negative, whereas the second is positive. For small enough migration rates and sufficiently large differences between foreign and domestic wages,  $\partial\tilde{c}/\partial p$  will be large enough to ensure a net brain gain. If an optimal migration rate exists, that is if  $\partial\eta/\partial p < 0$ , then we can show that the optimal skilled migration rate is increasing in aspirations by showing that  $\partial\eta/\partial\gamma > 0$ .

**Proposition 2.** *Assuming that  $c_i \sim U(0, 1)$ , the optimal skilled migration rate is increasing in the aspirations effect.*

$$\frac{\partial p^*}{\partial\gamma} > 0 \quad (19)$$

where  $p^*$  is the migration rate that maximizes the post-emigration skill-ratio.

*Proof.* From the implicit function theorem, we know that  $\partial p^*/\partial\gamma = -\frac{\partial\eta/\partial\gamma}{\partial\eta/\partial p}$ .  $\partial\eta/\partial p < 0$  is a necessary condition for  $p^*$  to be a local maximum. It is thus sufficient to show that  $\partial\eta/\partial\gamma > 0$ .

$$\begin{aligned} \frac{\partial\eta}{\partial\gamma} &= F(\tilde{c})f((1+\gamma)\tilde{c})\tilde{c} \\ &+ (1-p^*)p^*\frac{\partial\tilde{c}}{\partial p} (f((1+\gamma)\tilde{c})(F(\tilde{c}) - f(\tilde{c})\tilde{c}) + f'((1+\gamma)\tilde{c})F(\tilde{c})(1+\gamma)\tilde{c}) \end{aligned} \quad (20)$$

For  $c_i \sim U(0, 1)$  the expression simplifies with  $F(\tilde{c}) = \tilde{c}$  and  $f(\tilde{c}), f((1+\gamma)\tilde{c}) = 1$ . For uniformly distributed perceived education costs, the equation above thus changes to

$$\frac{\partial\eta}{\partial\gamma} = \tilde{c}^2 > 0 \quad (21)$$

□

The proposition above states that for uniformly distributed perceived education costs, the optimal migration rate will be increasing in the *aspirations effect*. The higher the impact of a migration experience on the increase in aspirations  $\gamma$ , the higher the optimal level of emigration.

The *aspirations effect* works through two distinct channels. First, the negative effect of emigration is weakened because a higher steady state migration rate increases the probability that one's parent has a migration experience. This implies that more people will have aspiring parents if migration is higher, which means that a higher fraction of the population has a higher education cost benchmark. Second, aspirations magnify the incentive effect of the skilled emigration rate. A higher skilled emigration rate means that the expected returns of education are higher. This effect is stronger for aspiring individuals, because, compared to the non-aspiring, they give a higher weight to expected future earnings. This means that the higher aspirations are, the bigger the impact of the *incentive effect* will be, and the more pronounced the positive impact of migration on the aggregate educational investment.

### 3.2. Robustness of theoretical results

The proofs we have conducted above required the assumption that the perceived education costs follow a uniform distribution. We made this assumption, because it is very common in the brain drain literature. For example, Beine et al. (2008) and Mountford (1997) have used uniform distributions in their models. Is it realistic to assume that perceived costs are uniformly distributed? Most data suggests that intelligence quotient test scores, as a proxy for unobservable inherent ability, seem to follow a normal distribution.<sup>12</sup> Even if we do not know exactly how different intelligence quotients translate into different magnitudes of perceived education costs, this finding suggests that perceived costs could also be approximated by a normal distribution, rather than by a uniform distribution.

Would our findings concerning the aspirations effect still be valid under an alternative ability distribution? Rewriting (20), we see that the aspirations effect will increase the optimal skilled migration rate, if

$$\frac{\tilde{c}}{(1-p^*)p^* \frac{\partial \tilde{c}}{\partial p}} + \frac{f'((1+\gamma)\tilde{c})}{f((1+\gamma)\tilde{c})}(1+\gamma)\tilde{c} \geq \frac{f(\tilde{c})\tilde{c} - F(\tilde{c})}{F(\tilde{c})} \quad (22)$$

This equation will be fulfilled under some requirements on the distribution function. First, the variance around the benchmark education cost  $\tilde{c}$  must be sufficiently high, such that  $(f(\tilde{c})\tilde{c} - F(\tilde{c}))/F(\tilde{c})$  does not become too big. With a strong concentration around  $\tilde{c}$  the density would otherwise be too high. The aspirations effect thus works better if there is a large variety of different abilities in the society. Second,  $f'((1+\gamma)\tilde{c})$  should be positive or at least not strongly negative. The density of people with higher perceived costs should thus be higher than that of people with low costs. The aspirations effect works on those who would otherwise not choose to invest in education. If the density is increasing, more people will change their education decision as a result of an increase in aspirations.<sup>13</sup> Third, if  $p^*$  is small or close to one the aspirations effect gets stronger. This implies that the aspirations effect will be larger for countries that have otherwise a small *incentive effect*.

## 4. Estimation and Simulation

The simulation of our model requires a numerical approximation of the migration-induced increase in aspirations. However, the empirical literature on this subject remains scarce and does not provide any suggestions with respect to the magnitude or overall importance of the proposed effect. The main problem is the limited data availability since only few data sets include questions on aspirations and migration at the same time. The Indonesian Family Live Survey (IFLS) constitutes an exception. Czaika and Vothknecht (2014) use the IFLS and discover a significant correlation between migration and the aspirations gap. Their analysis offers interesting insights but does not fully exploit the potential of the dataset. We extend their analysis by focusing on the problem of endogeneity to come closer to a causal interpretation of the association between migration and aspirations.

<sup>12</sup>See e.g. Shaywitz et al. (1992)

<sup>13</sup>With  $H_a < 0.5$ , this will be fulfilled for the normal distribution. See graph in Appendix B.

Making full use of the panel structure of the data we overcome time invariant unobservable characteristics of individuals by emphasizing the importance of fixed effects and difference in difference estimations. Our results suggest that the migration experience of an individual is positively associated with an upward shift in aspirations. This empirical exercise and the resulting coefficients provide an indication of how to parameterize the simulation of our model.

#### 4.1. Data and descriptive statistics

The IFLS is a panel household survey that is representative of around 80% of the Indonesian population.<sup>14</sup> Since the questions that are relevant in order to measure aspirations have only been introduced recently to the survey, we limit our analysis to the third and fourth wave (compiled in 2000 and 2007). The survey keeps track of the internal migration of all household members aged 15 years or more. There are only few recorded incidents of international migration. However, this should not pose a problem since internal migration does expose the migrant to a new socioeconomic environment as does international migration. The intensity of the effect will most likely depend on the socio-cultural difference between origin and destination. In both cases the migrant will revise her own goals and ambitions. It is reasonable to assume that the sociocultural gap will be even larger for international migration. Therefore, if we find that internal migration has a significant effect on aspirations, the relation should also hold for international migration and might even be stronger.

The survey captures the migration experience in the last observation period of individuals, only if they had lived in a different village for more than 6 months. In order to be able to identify the impact of migration we also narrowed our analysis down to individuals who did not migrate before 2000. This provides us with a sample of 12,092 individuals present in each wave who were between 15 and 80 years old in 2000 (Table 1). Although there are only few instances where this is relevant, we decided to keep only migrants who moved for reasons related to labor or education, i.e. we exclude marriage induced migration and whole household migration. Based on these adjustments, the national migration prevalence in our sub-sample stands at around 16 % in 2007. Migrants are on average 33 years old compared to non-migrant who were on average 45 years old (not reported in Table 1). About one in five migrants has a higher education degree and 95% of them can write Indonesian. This is quite different from non-migrants where only 78% of all individuals can read and only 7% hold a higher education degree.

Aspirations can be measured in several ways, since the concept can be cultural or socio-economic. A question concerning the desired years of schooling for an individual's offspring is a type of aspirations measure, as is the commitment to a certain saving behavior. The IFLS provides us with a set of questions that allow us to construct a measure for the economic aspirations gap. Participants were asked to assess their subjective current economic well-being, relative to the rest of society, on a 6 step ladder.

*Please imagine a six-step ladder where on the bottom (the first step), stand the poorest people, and on the highest step (the sixth step), stand the richest*

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<sup>14</sup>See Strauss et al. (2009)



people.

*On which step are you today ?*

They were also asked where on this ladder they see themselves in the near future.

*On which step do you expect to be in one/five years from now?*

This forward looking evaluation of the respondents' future is equivalent with what is generally considered as aspirations. The simple difference between the forward looking evaluation and the assessment of her current situation is the aspirations gap our analysis focuses on.<sup>15</sup>

Table 1: Descriptive statistics for both waves

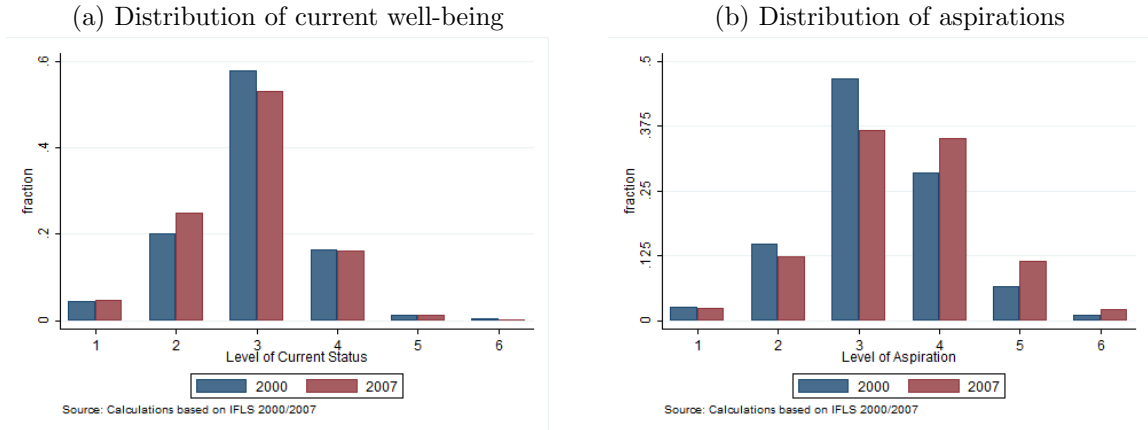
	2000		2007	
	Mean	Std Dev.	Mean	Std Dev.
<i>Individual characteristics</i>				
Age	35.43	14.54	42.75	14.49
Gender (male=1)	0.45	0.50	0.45	0.50
Married (yes=1)	0.67	0.47	0.76	0.42
Household head (yes=1)	0.32	0.46	0.44	0.50
<i>Education &amp; household size</i>				
No education	0.12	0.32	0.11	0.32
Years of education	7.62	3.92	7.82	4.04
Household size	12.01	5.38	11.96	5.37
<i>Migration and aspirations</i>				
Migration prevalence	-	-	0.16	0.37
Current wellbeing	2.91	0.78	2.85	0.80
Aspirations	3.24	0.91	3.47	1
Aspirations gap	0.34	0.61	0.62	0.75
Observations	12,092		12,092	

Table 1 shows the average current well-being, aspirations and aspirations gap for all individuals in both years. In 2007 migrants had a higher aspirations gap (0.79) than non-migrants (0.59). This is not driven by the assessment of current well-being which is 2.91 and 2.84 for migrants and non-migrants respectively (not reported).

It must be noted that between 2000 and 2007 a small adjustment of the aspirations question was undertaken. The authors of the IFLS changed the time horizon of the aspirations from one year to five years. This modification of the question is unfortunate for comparisons in the level of the aspirations gap. It can be seen that there is an increase in the mean aspirations gap for both groups from 2000 to 2007 for which the change in the time horizon is a probable explanation. The change in the question does not affect the distribution of the evaluation of the current economic well-being of individuals (see graph 3a) but does shift the distribution as expected in the forward looking evaluation (see graph 3b). For our purposes this does not pose a problem, since the fixed effects estimation that we perform measures the difference in the change in the aspirations gap,

<sup>15</sup>We also used ratios of aspirations and current situation assessment of individuals as a measure for the aspirations gap and came largely to the same qualitative conclusions.

Figure 2: Distributions



not the level. The adjustment of the question would only be problematic if migrants understood the question differently than non-migrants, i.e. they processed the changed horizon of the question systematically different. There is no reason to believe that such a systematic bias exists.

## 4.2. Empirical Approach

We explore the influence of migration on aspirations both at the individual as well as at the household level. Our standard estimation equation looks as follows:

$$A_{ijt} = \alpha + \beta_1 M_{ijt} + \beta_2 C_{ijt} + \varepsilon_{ijt} \quad (23)$$

where  $A_{ijt}$  is the aspirations gap of individual  $i$ , in household  $j$  at time  $t$ .  $M_{ijt}$  is a binary migration indicator and  $C_{ijt}$  is a vector of observable individual characteristics such as age, gender and education but also the assessment of the current well-being. We include the latter to control for possible level effects. We first approach the data with simple OLS to explore the basic relationship between aspirations and migration. The central problem in this setup is the endogeneity of migration. More precisely, unobserved characteristics of the individual might be driving both her aspirations gap as well as her decision to emigrate. We have the big advantage to be able to control for unobserved fixed characteristics by using fixed effects estimation based on the two waves of the IFLS. The fixed effects estimation helps us to come closer to a causal interpretation of the relation between migration and aspirations. This is important since the correlation between migration and aspirations could go in both directions. More aspiring individuals are forward looking and are ready to act in order to shape their own future. Migration is one way to achieve this. Therefore, migrants are likely to have higher aspirations at the time they decide to emigrate. To be able to isolate the effects of migration we limit our analysis to households that had no migrants before 2000.

In the fixed effects setup the identification of the effect of migration on aspirations is based on the inter-temporal variation of both the aspirations gap and the migration behavior of individuals. Equation (23) is therefore reduced to:

$$\Delta A_{ij} = b + \Delta M_{ij} + \Delta e_{ij} \quad (24)$$

This approach controls for fixed group effects, i.e. effects that are common to all groups between the two periods. The fixed effects approach also nets out fixed individual effects, i.e. time invariant individual characteristics. It is reasonable to expect that in the context of Indonesia the distribution of households with specific characteristics is partly exogenous. This is due to the government initiated Transmigration program that has been in place in Indonesia since 1902.<sup>16</sup> One of the main goals of the program was to populate uninhabited regions of Indonesia and to counterbalance the increasing urbanization. Within the Transmigration program that moved more than a quarter of a million people per year, a random element can be found. The program provided free farm land and housing in the periphery of Indonesia, as well as free transport and free food and fertilizer for the first year. But most importantly, the free farm land was allocated by lot.<sup>17</sup> This implies that the productivity and quality of farmland was independent of the families' characteristics. Households might have opted into the Transmigration program without knowing the economic benefit this decision would provide. Consequently some households could be considered randomly distributed.

This particularity of Indonesia can however not remove the doubt about the causal effect of migration on aspirations since there is still a chance that unobservable variable factors influence both the dependent and the independent variable at the same time. We therefore also employ an instrumented variable strategy and propensity score matching to evaluate our fixed effects results. The instruments we use to identify the effect of migration on aspirations are the gender distribution and birth order of siblings within households. Our identifying assumption is that geographic mobility will strongly depend on the composition of households but the gender composition of siblings and the position in the birth order should not have significant effects on the change in aspirations. Rainer and Siedler (2009), for example, document that due to intergenerational responsibilities at least one adult child will remain geographically close to take care of the elderly. The same pattern has been documented by Abramitzky et al. (2013). They also point out that birth order could be an extremely important factor for individual migration. We build the birth order based on the first period of observation (2000). It is therefore time invariant and will drop in the fixed effects estimation. However, the share of male siblings in the household that have reached working age (+15) varies over time. We keep the effect of being the first born by interacting the share of male siblings and the first born dummy. Hence our identification will run through the change of the share of male siblings in the household and its interaction with the first born dummy for each individual. The validity of our instruments rests on the exclusion restriction that siblings do not differ systematically with regard to their propensity to migrate except with respect to their quasi-random birth order.

The first stage of our instrumented fixed effects estimation shows clearly that an increase in the share of male siblings reaching working age is having a negative impact on the likelihood to migrate. However being the firstborn changes the picture entirely. The oldest sibling is significantly more likely to migrate due to an increase in the share of male siblings. All covariates included in the estimation predict migration in the first-stage as found in other studies. For example, we observe an increased probability to migrate of individuals in larger households and of individuals with a higher education. With respect

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<sup>16</sup>See Hugo (2006)

<sup>17</sup>See Kechsull (1986)

to the statistical strength of the instruments we conduct various tests. First, the first stage F-Test is slightly below the critical value of 19.93 for a 10% bias but above the value of 11.59 for a 15% bias of the instrumented estimator as proposed by Stock and Yogo (2005). This suggests that our instruments are reasonably strong.

Another common approach to evaluate the unconfoundedness of the two comparison groups is propensity score matching. Although we are controlling for a number of covariates in all estimations this does not ensure that the linearity assumption of the comparison is satisfied. More precisely, if migration depends strongly on the covariates and if the average value of the covariates is quite different between the two groups, we should not compare migrants and non-migrants. To address this issue we follow Heckman et al. (1998) and build a comparable synthetic control group based on a nonparametrically derived propensity score estimate.

### 4.3. Estimation Results

In Table 2 we present the benchmark regression results. The standard OLS displayed in rows one and two shows positive but only borderline significant coefficients for the migration dummy. The coefficient size roughly reflects the findings reported by Czaika and Vothknecht (2014). This suggests that in the cross-section there is a significantly positive correlation between the aspirations gap and migration. Looking at the included covariates we observe that the aspirations gap decreases with age and that gender does not seem to play a significant role. We also observe that married individuals display a significantly more positive outlook than unmarried individuals, and that education and skills represented by the years of education and the ability to read are positively correlated with the aspirations gap.

In a second step we look at between effects, random effects, and finally fixed effects regressions, exploiting the full potential of the panel dataset at hand. A Hausman Test suggests a systematic bias in the random effects model and leads to the conclusion that the fixed effects model is suited best to answer our research question. It is interesting to observe that only marital status and education seem to have a statistically significant impact on the aspirations gap independently of the econometric specification. The last row of Table 2 contains our preferred estimation specification. Migrants experience a significantly higher increase in their aspirations gap than non-migrants between 2000 and 2007. Since the mean change in the gap between 2000 and 2007 was 0.2845, the size of the coefficient of our migration indicator is also economically important.

To check concerns about the importance of changes in income vis-a-vis the exposure to a new environment, we also included income and a wealth index based on a principal component analysis (PCA). The results in columns 1 and 2 of Table 3 show only a slight decrease of the strength of the migration effect. As a second robustness check we split the sample into households with a more than median increase and less than median increase in income between 2000 and 2007. The results displayed in columns 3 and 4 do not change the picture. Both these robustness checks suggest that income is not the driver of the observed effects.

We also evaluated the assumption of common trends by using random assignment of

the migration status to non-migrants. Using this randomly assigned dummy we should not observe an effect that is different from zero if our difference in difference estimates are unbiased. Obviously for this estimation true migrants were excluded, which reduces the sample size. We report the results of these tests in columns 5 and 6. Independent of the stratification used for the random assignment we find no effect that suggests any problems with the assumption of parallel trends.

In Table 4 we address the concern of variable unobserved variables that drive the observed effect of migration on the aspirations gap. As outlined before we use the share of male siblings in the household and the interaction of this share with the first born status for each individual. As reported in column 1 of Table 4 the change in the composition of siblings in the household is not able to predict the subsequent migration behavior of individuals. However when interacting the change in the composition of siblings with birth order we find that this combination of variables serves as a good instrumental variable to predict subsequent migration. The results in column 2 repeat the previous finding that migration seems to have a strong causal impact in the aspirations window of individuals. The large size of the instrumented coefficient stems from the fact that the subpopulation which reacts to the exogenous stimulus of our instrument is rather limited: the effect is driven by individuals heading the birth order of the household.

Based on the procedure proposed by Heckman et al. (1998) we also implement a non-parametric propensity score estimation. This method uses the observed characteristics to match members of both the treatment and control group, i.e. migrants and non-migrants, based on a nonparametrically generated weight. These characteristics include current economic well-being, age, gender, marital status, education and ability to read as well as the position of the individual in the household and the household size. We exclude individuals that have propensity scores outside of the region of common support. The result of this approach is reported in columns 3 and 4 of Table 4. It corroborates the effects suggested by our benchmark regressions even though the effect is slightly higher with 0.121.

To assess the spillover effect of migration of an individual on all other household members we also conducted the analysis at the household level. For this purpose we only kept individuals who did not migrate but lived in a migration household. The uninstrumented fixed effects estimation results of this exercise show that it is primarily young household members whose aspirations are positively affected by migration. For migrant household members that are 25 years of age or younger the aspirations gap increases by 0.1029 between between 2000 and 2007 compared to individuals who do not live in migrant households. Although mostly positive this effect is not statistically significant for other age cohorts. Still, this suggests that even if the education decision wasn't taken by the head of the household, as we assume in our model, but by the children themselves, an aspirations effect would probably still lead to an increase in the average skill rate.

Table 2: *Benchmark regressions aspirations gap*

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	BE	RE	FE	FE
	2007	2007			(no trend)	(with trend)
Migration	.0312	.0377*	.0559**	.0808***	.0834***	.0848***
Current wellbeing	-.2062***	-.2181***	-.1540***	-.1892***	-.2355***	-.2350***
Age	-.0094***	-.0084***	-.0058***	-.0058***	.0333***	-.0099
Gender (male=1)	0.259	0.201	-.0030	-.0113	/	/
Married (yes=1)	0.0371**	0.0390**	.0517***	.0644***	.0907***	.0930***
HH head (yes=1)	-.0659***	-.0637***	-.0246*	-.0164	.0061	.0067
Years of education	.0198***	.0239***	.0193***	.0206***	.0160***	.0158***
Reads Indo	.0483***	.0603***	.0432***	.0490***	.0624*	.0626*
HH laborforce size	0.0013	0.0025*	.0020**	.0022***	.0118	.0141
<i>Province fixed effects</i>	No	Yes	Yes	Yes	/	/
Observations	12,092	12,092	24,184	24,184	24,184	24,184

Notes: Authors calculation based IFLS3 and IFLS4; Dependent variable is aspirations gap. Robust standard errors in parentheses; \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ ; Standard errors clustered at the household level.

#### 4.4. Counterfactual simulation

We perform a numerical simulation, assuming a uniform distribution for the perceived education cost, for different magnitudes of the aspirations effect to get an idea of the quantitative implications. The graphs are based on the theoretical model presented in chapter 3 and the empirical results from the previous chapter to calibrate the model. Since the fixed effects estimator represents our preferred estimation, we take the FE point estimate of the aspirations gap as a benchmark value for the aspirations effect. The estimator tells us that the aspirations gap for migrants increased by 0.0848 units compared to non-migrants. This represents  $\gamma$  and will be used as a lower bound to calibrate our counterfactual simulation. Since our survey mainly covers interregional migration, it might be that the migration experience of an actual international migration has a more important impact on aspirations than what we measured. We thus also run the simulation for an *aspirations effect* that is 50% stronger ( $\gamma = 0.127$ ), in order to compare the implications of a possible higher impact of international migration.

Figure 4 depicts the pre- and post-emigration proportion of skilled individuals. As expected, a higher aspirations effect results in more investment in education, which in turn increases the post-emigration human capital. Figure 5 shows the derivative of the post-emigration skill rate with respect to the emigration rate. The intersection of the graphs with the x-axis identifies the optimal emigration rate, which maximizes the *ex-post* skill proportion. It can be seen that an aspirations effect of 0.0848, as we find it in the data, increases the optimal emigration rate considerably, in this example from 16% to almost 20%. Using a more optimistic estimate for the aspirations effect of 0.1272, the optimal migration rate increases to 21%.<sup>18</sup>

<sup>18</sup>We have used a rather cautious guess for the intertemporal discount rate, setting  $\delta = 0.4$ . This was

Table 3: *Fixed Effects - Robustness Tests*

	(1)	(2)	(3)	(4)	(5)	(6)
	Including wealth (PCA)	Including log income	Low change in Income	High change in income	Random placebo assignment (Not stratified)	Random placebo assignment (Stratified)
Migration	.0696***	.0822***	.0891**	.0799**	.0071	.0016
Observations	23,971	23,971	11,766	11,994	20,330	20,330

Note: Authors calculation based IFLS3 and IFLS4. Robust standard errors in parentheses; \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ ; Standard errors clustered at the household level; Estimation setup is the same as in the benchmark. Controls include current economic well-being, age, gender, education, household head dummy and household size.

Table 4: *Fixed Effects - Alternative Approaches*

	(1)	(2)	(3)	(4)
	IV (Change in Ratio of male siblings)	IV (Firstborn interacted with ratio)	Propensity score <sup>‡</sup> (Kernel)	Propensity Score <sup>‡</sup> (Kernel on common support)
Migration	3.9429	1.3351***	.125***	.121***
CDF	.107	12.681	/	/
Observations	24,184	24,184	24,184	24,024

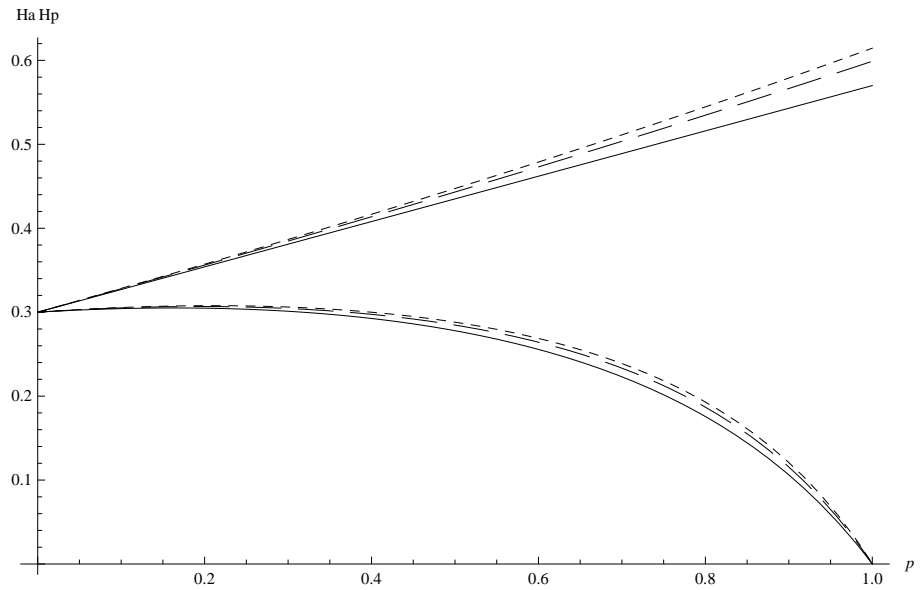
Note: Authors calculation based IFLS3 and IFLS4. Robust standard errors in parentheses; \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ ; <sup>‡</sup> Standard errors for the treatment effect and regression treatment effect are computed using a bootstrap with 500 replications; CDF are Cragg-Donald test statistic of the first stage.

As we have seen in the empirical part, aspirations are a somewhat blurry concept that is hard to quantify. Furthermore, the survey did not provide us with an estimator for the actual influence of aspirations on education decisions. The examples above are therefore only meant to clarify the possible implications that aspirations could have for the brain drain. However, the results suggest that the effect is sizable even for small aspirations increases due to a migration experience.

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done so that we do not get overly optimistic results. Decreasing  $\delta$  to 0.3 almost doubles the *aspirations effect* in our simulation. See Appendix C for an illustration.

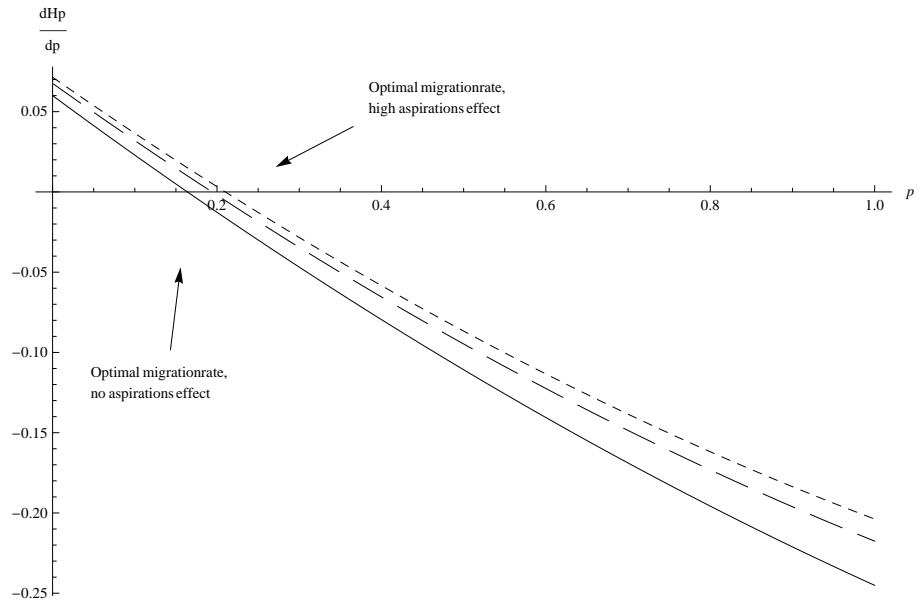
Figure 4: Effect of aspirations on the pre and post-emigration skill proportion



Note: The following values were used for the simulation.  $h = 1.5$ ,  $\delta = 0.4$ ,  $w = 1$ ,  $w^* = 1.3$

$\gamma_1 = 0$  (——),  $\gamma_2 = 0.0848$  ( - - ),  $\gamma_3 = 0.1272$  (.....)

Figure 5: Effect of aspirations on optimal emigration rate



Note: The following values were used for the simulation.  $h = 1.5$ ,  $\delta = 0.4$ ,  $w = 1$ ,  $w^* = 1.3$

$\gamma_1 = 0$  (——),  $\gamma_2 = 0.0848$  ( - - - ),  $\gamma_3 = 0.1272$  (.....)



## 5. Conclusion

The brain drain literature of the recent past has been arguing that a small amount of emigration might actually be beneficial for the sending country, since it increases the incentives to invest in education. However, this literature has only focused on the incentive effect of the aggregate emigration probability.

In this paper we propose that the positive incentive effect of emigration is even stronger than previously assumed, because of an intergenerational externality of a migration experience. We consider the positive *aspirations effect* that emigration has on the migrant. We find that an aspirations effect will increase the autarky-equivalent skilled emigration rate, and thus the range of migration rates, for which a country benefits from skilled emigration. Furthermore, the optimal skilled emigration rate is found to be increasing in aspirations. In the empirical part of this paper, we show that emigrants experience a significantly higher increase in aspirations, compared to non-migrants. Having lived and worked in a different location for a while changes the goals and values that an individual aspires to. Our empirical results suggest that the central assumption of our model is justified and provide a rough estimate of the parameter needed to simulate our model quantitatively. The simulation of the model shows that neglecting aspirations leads to a sizable underestimation of the beneficial effect of migration in the country of origin.

These insights about the relationship between aspirations and the brain drain provide a promising starting point for further research. First and foremost, more panel data on the relationship between migration, aspirations and education is needed in order to quantify the actual impact of the *aspirations effect* on the overall brain drain. Since aspirations are still a somewhat blurry concept that can be measured in several dimensions, it is important to develop reliable survey questions to measure aspirations such that they can be compared quantitatively across cultures and across time. Second, studies which calculate the net brain drain for different countries should incorporate the *aspirations effect*. This would help to gain knowledge about how the brain drain develops in the long run if the intergenerational linkages discussed in this study are taken into account.

# Appendices

## A. Rewriting equation (16)

We rewrite equation (16) by multiplying with the denominator of the left hand side. We then get

$$(1 - p_{0|\gamma=0})(1 - \delta) (w(h - 1) + p_{0|\gamma=0}h(w^* - w)) > (1 - \delta)w(h - 1) - p_{0|\gamma=0}(1 - \delta)^2(1 + \gamma)w(h - 1) (w(h - 1) + p_{0|\gamma=0}h(w^* - w)) \quad (25)$$

We now subtract  $(1 - \delta)w(h - 1)$  and divide both sides by  $p_{0|\gamma=0}$  and  $(1 - \delta)$ . This simplifies the equation to

$$(1 - p_{0|\gamma=0})h(w^* - w) - w(h - 1) > - (1 - \delta)(1 + \gamma)w(h - 1) (w(h - 1) + p_{0|\gamma=0}h(w^* - w)) \quad (26)$$

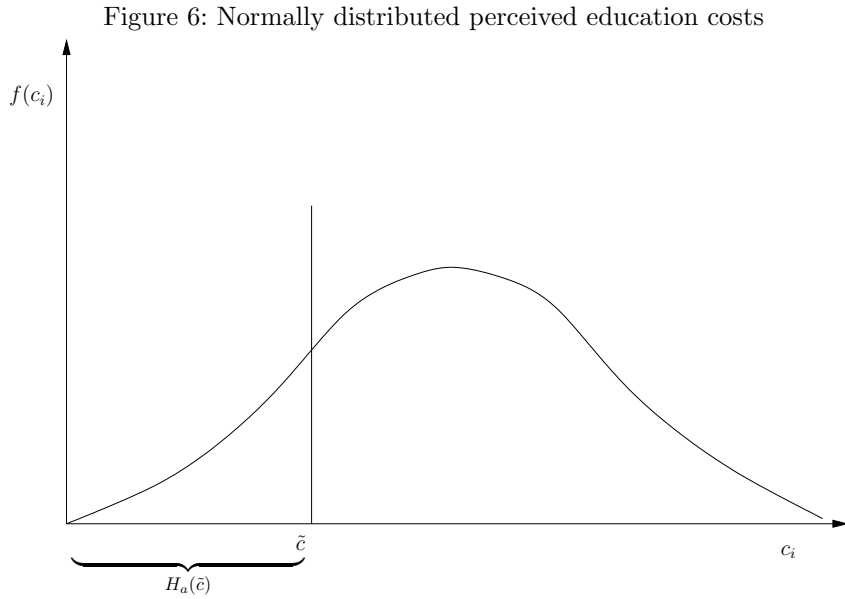
which can be written as

$$h(w^* - w) - (p_{0|\gamma=0}h(w^* - w) + w(h - 1)) (1 - (1 - \delta)(1 + \gamma)w(h - 1)) > 0 \quad (27)$$

Setting in (15), some terms cancel out, and we obtain equation (17).

## B. Normally distributed education costs

With a normal distribution, the density is increasing in  $\tilde{c}$  as long as  $H_a < 0.5$ . Therefore, ceteris paribus, the aspirations effect is likely to be greater in situations where only a minority of the non-aspiring population would invest in the education of their children.

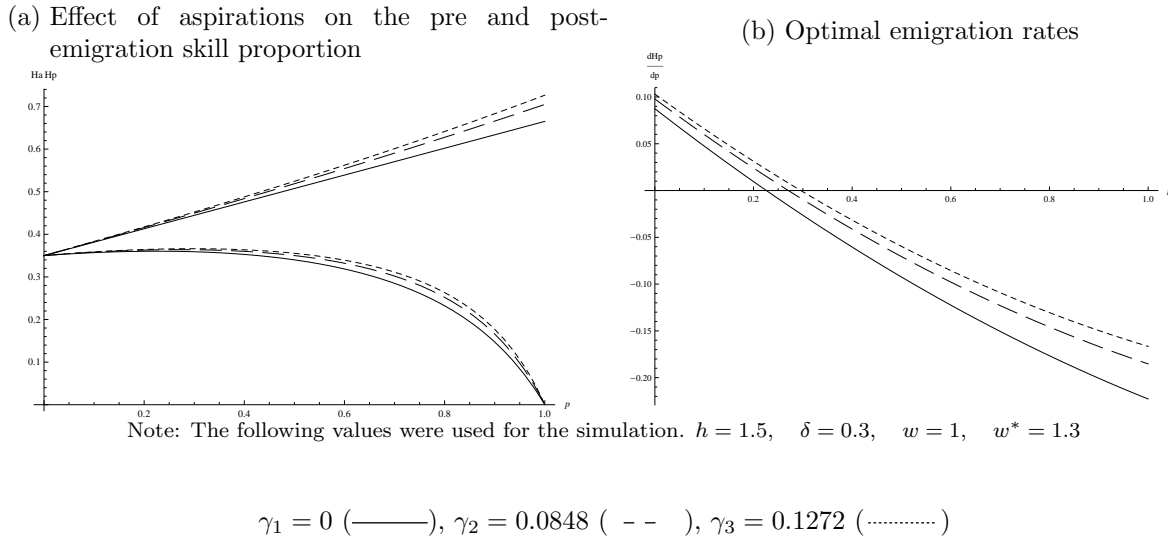


## C. Counterfactual simulation with low delta

Figure (7) shows an example for a counterfactual simulation where we decreased  $\delta$  to 0.3. There are two main effects of this.

- The optimal migration rate increases considerably for all levels of aspirations. When not accounting for the aspirations effect, the optimal migration rate is now 22% compared to 16% for  $\delta = 0.4$ . This is intuitive, because a lower discounting implies weighing future income more. The low discount rate thus leads to a magnification of the *incentive effect* of the possibility to emigrate on the education decision.
- The *aspirations effect* becomes larger and the gaps between a moderate and a high aspirations effect increase. For a  $\gamma$  of 0.848 as we find it in our estimation, the optimal migration rate increases to 26% and for  $\gamma = 0.127$  to 30%. This is due to the multiplicative form of aspirations that we assume. If the initial discount rate is low, the increase in the weighting of future earnings that aspirations imply, is magnified.

Figure 7: Counterfactual for lower discount rate



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