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Migrating for children's better future: Intergenerational mobility of internal migrants' children in Indonesia

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ABSTRACT

Internal migration dominates population mobility in Indonesia; according to the 2010 census, there were almost 30 million permanent migrants, around 12.5 percent of the population. The effects of this internal migration on the second generation continue to be under-explored. This paper investigates the long-term impact of parents' migration on their children's intergenerational per capita expenditure when adults. We argue that parental migration affects the human capital investment on their children, which has a direct impact on the children's outcomes when adults and on their deviation from the parents' economic status, hence their intergenerational mobility. We pooled the five waves of data from the Indonesian Family Life Survey (IFLS), and we tackled the self-selection of parents' migration using an endogenous treatment regression. Our findings show that despite the fact that parental migration increases the education level of children and their per capita expenditure, it increases intergenerational mobility of the children as adults compared with non-migrants' children when they live in urban areas as adults, come from the poorest parents, or had migrated during childhood. The left-behind children have more intergenerational mobility only if their father migrated, while there is no significant impact on intergenerational mobility if their mother migrated. The results are consistent with the persistence of Indonesian individual inequality.

1. Introduction

Internal migration represents a significant share of population mobility in Indonesia, involving almost 30 million lifetime migrants (Handiyatmo, 2012). In comparison, international out-migration from Indonesia is relatively small as it involved around only 349 thousand people in 2017 (UNDESA, 2017). Approximately 3.3 million of these internal lifetime migrants are children aged 0–14 years old (Handiyatmo, 2012). The children are affected by this migration both in the short and long run and have little say in household choices (Suwandinata, 2012).

What is the impact of parents' internal migration in Indonesia during childhood on the intergenerational mobility of their children when they grow up? Does human capital accumulation explain this impact? These questions have been scarcely explored in the current literature. In economics, intergenerational mobility is defined as the transmission of earnings from one generation to the next (Borjas, 1992; Peters, 1992). In addition, occupation (Borjas, 2006; Long & Ferrie, 2013) and consumption (Beegle, De Weerd, & Dercon, 2011) can also be used to measure intergenerational mobility. Becker and Tomes (1979) explain how the mechanism of the transmission of parental income to the earned income of children is through human capital investment. The literature on whether parental migration has a net positive or negative effect on children's intergenerational mobility focuses mostly on international

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migration rather than on migration within a country because of better data availability. This literature finds mixed results depending on whether: (i) children were left behind in the home country or the whole family migrated; (ii) the decision to migrate with the family was motivated by an investment in the children's human capital development or not. The literature looking at the effects of internal migration on intergenerational mobility is instead scarce and shows mixed evidence.

This paper inquires whether past parental migration during the children's childhood benefits those children when they reach adulthood and whether there is less intergenerational per capita expenditure persistence among the children of the migrants (both those left behind and those who left with their parents) in the long run. We examine how parents' migration affects their children's per capita expenditure as an indicator of intergenerational mobility. We also explore one of the mechanisms that might explain this relationship: education. In this article, 'children' refers to children of migrants and non-migrants at the time of their adulthood.

This study contributes to two streams of literature: (i) the scarce evidence of the impact of internal parental migration on children's future outcomes, inquiring whether past parental migration (either with or without children) during childhood reduced intergenerational per capita expenditure persistence among the children of the migrants in the long-run, exploring education as a potential mechanism; (ii) the studies exploring the long-term impacts of internal migration on the second generation using as a control group those whose parents never migrated and controlling for self-selection. This article differs from earlier studies that compared the migrants' socio-economic status with their non-migrant parents (Long & Ferrie, 2013) and with those who stayed in the origin community (Beegle et al., 2011).

The current literature suggests that the effects of parental international migration on children's outcomes are negative when children are left behind by parents (see Amuedo-Dorantes and Pozo 2010, Antman 2012, Bucheli, Bohara, and Fontenla 2018, Fellmeth et al. 2018, Lu 2014, Zhou, Murphy, and Tao 2014 among others) as children whose parents both migrated have lower education attainment (Lu, 2014; Zhou et al., 2014); lower school attendance (Amuedo-Dorantes & Pozo, 2010) and enrolment levels (Antman, 2012) despite being positively influenced by receiving remittances (Amuedo-Dorantes & Pozo, 2010; Antman, 2012), even if there are some exceptions (Bucheli et al., 2018). Left behind children have also been found to have poorer health outcomes (Fellmeth et al., 2018).

The literature which explore the effects of family migration on intergenerational mobility instead focuses mainly on international migration and it provides mixed results. Some studies find a persistence or a decrease in intergenerational mobility (Borjas, 2006; Dribe, Helgertz, & van de Putte, 2015; Dustmann, 2008) while others find an increase (Hammarstedt & Palme, 2012). The impact of family migration on children depends predominantly on how migrant and non-migrant parents invest in their children's human capital. If parents aspire to move for better investment in their children's education, then parental migration may have a positive impact on children's welfare when adults (Hammarstedt & Palme, 2012; Klein, 2011; Long & Ferrie, 2013), but not if they made the decision for other reasons (see Dustmann 2008, Kim 2006 among others). Kim (2006) looked at the children of Korean immigrants in the US and found that being a child of Korean immigrant entrepreneurs limits education and occupational choices, leading to downward intergenerational mobility. Similarly, in Europe, using German socio-economic panel data, Dustmann (2008) found that children in immigrants' communities have lower intergenerational mobility than native children. The direction of intergenerational and social mobility for international migrants can also depend on structural economic changes in the destination country (Borjas, 2006; Dribe et al., 2015), the investment in skills and education of the migrants (Heckman and Mosso, 2014), proficiency in the host country language (Nielsen & Rangvid, 2012; Smith, Helgertz, & Scott, 2016) and ethnicity and occupation of the parents (Borjas, 1992).

Few studies have investigated the impact of internal migration on intergenerational mobility, and they suggest that internal migration leads to higher growth in consumption and that migrant parents have more resources and can invest more in their children than those who stay (Beegle et al., 2011; Long & Ferrie, 2013; Nguyen, Raabe, & Grote, 2013). These studies also show that investment in human capital can be a mechanism through which migration has an impact on intergenerational mobility. Long and Ferrie (2013) examined 19th-century rural-urban migration in Great Britain, during which the industrial revolution saw labour from agricultural jobs in rural areas move to manufacturing jobs in cities. The study found that there was upward intergenerational occupational mobility among migrants in 1881, compared with their fathers' occupations in their place of origin in 1851. The improvement in socio-economic status was greater for those who moved to urban areas from rural areas, and they were more likely to experience upward intergenerational occupational mobility. Beegle et al. (2011) evaluated the impact of rural to urban migration in Tanzania, using siblings and relatives as counterfactuals for measuring the effects of people's decision to migrate. They found that per capita consumption increased 36% for migrants in comparison with rural stayers, implying the upward social mobility of the migrants. They also found that the destination mattered; migrants who moved to a more connected area had higher returns than those in less connected areas. However, even moving to the less connected areas resulted in higher growth in consumption. A study of rural-urban migration in Vietnam confirms a similar positive relationship between migration and social mobility. Nguyen et al. (2013) found that the resulting higher income growth not only helps the migrants out of poverty, but also improves the poverty situation of rural stayers. However, intergenerational persistence can occur when migrants are poor. Krishna (2013) found that children in Bangalore slums (with mainly migrant residents) experienced intergenerational persistence as they followed their fathers' occupations, suggesting that the migration of poor parents may result in intergenerational persistence instead of upward intergenerational mobility.

Some empirical studies, even if not addressing directly our research question, can help us to build an initial hypothesis of the relationship between migration and intergenerational mobility in Indonesia (Levine & Jellema, 2007; McCulloch, Weisbrod, & Timmer, 2007; Pakpahan, Suryadarma, & Suryahadi, 2009; Resosudarmo & Suryadarma, 2014; Resosudarmo, Suryahadi, Purnagunawan, Yumna, & Yusrina, 2009; Sumner, Yusuf, & made Suara, 2014). These suggest that intergenerational persistence is higher for poorer households (Pakpahan et al., 2009) or for Indonesians living in agricultural areas (Sumner et al., 2014) as well

as that migration can play a role in breaking intergenerational persistence reducing the probability of migrant households falling into absolute poverty compared to local urban residents (Resosudarmo & Suryadarma, 2014), especially when migrant households are wealthy (McCulloch et al., 2007). Migrants' children in urban areas are also found to have better human capital as they spend more years at school than children in rural areas, with an exception for those left behind by parents when migrating (Resosudarmo & Suryadarma, 2014).

This study aims to identify the effects of parent's migration on their children's long-term intergenerational mobility using pooled data from five waves of the Indonesian Family Life Survey (1993, 1997, 2000, 2007, and 2014), and tackles the parents' self-selection into migration using an endogenous treatment regression. The results of this study show that parental migration has a positive effect on both the education level of the children and their per capita expenditure, increasing the intergenerational mobility of the children as adults compared with non-migrants' children when they: (i) live in urban areas as adults, (ii) come from the poorest parents, or (iii) had migrated as well during childhood. The left-behind children instead have more intergenerational mobility than the children of non-migrants only if their father migrated, while there is no significant impact if the mother migrated.

This paper is structured as follows. Section 2 provides the background on internal migration patterns in Indonesia; Section 3 describes the theoretical framework and Section 4 the empirical strategy. Section 5 presents the results and heterogeneous effect; Section 6 explores the mechanisms and Section 7 the robustness checks. We then conclude this paper in Section 8.

2. Background: Internal migration in Indonesia

Contemporary migration in Indonesia, whether it is forced or voluntary, has a root in historical forced migration during the colonial era, when the exploitative nature of colonial systems shaped population mobility in Indonesia (Hugo, 2006; Nitisastro, 2006). The population mobility profile further changed due to involuntary migration during the war of independence and post-independence conflicts. Hugo (2006) claims that flows of refugees helped to urbanise Bandung and Makassar and induce out-migration of the Bugis people from Sulawesi to Java and Sumatra. The government of Indonesia also encouraged migration from the high-density population of the island of Java to other islands in the archipelago in what was known as the transmigration programme, which mobilised people in Java to move to less populated areas outside Java with the incentive of land in their destination (Nitisastro, 2006). In addition, Muhidin et al. (2003) suggest some determinants of partial or entire household migration using 1995 inter-census data. The propensity to migrate will be higher for a household that had already experienced migration, has more educated household members, does not own any land, and has unmarried children. The regional differences, however, are not significant in determining family migration.

Using the 2014 National Socio-economic Survey (SUSENAS), Fig. 1 shows migration flows between and within seven major regions in Indonesia. The migrants mainly migrate within a region. When they migrate to other regions, they tend to migrate to neighbouring regions. This is again in line with Ravenstein's law of migration stating that economic and industrial centres are the primary destinations for long-distance migrants (Ravenstein, 1885). Moreover, the inter-regional migrants choose the most developed economies such as Java as their main destination. If we look at inter-region migration, the highest percentage of non-Java migrants migrate out of their island to Java, with Sulawesi and Maluku as exceptions.

The qualitative data gathered by the authors in an exploratory qualitative survey in 2017 explain the determinants of internal migration in Indonesia. Semi-structured interviews were conducted for this purpose in five different districts (*kabupaten*) Muara Enim (South Sumatra), Ciamis (West Java), Selayar (South Sulawesi), Bekasi (West Java), and Bitung (North Sulawesi), two being urban and three rural, with 99 respondents, both migrants and non-migrants. This qualitative data informed the quantitative model specification and the interpretation of our results. We found that the migration network and job guarantees are the most crucial factors determining the decision to migrate, destination and occupation of the migrants. There is also a sign of intergenerational occupational persistence between parents and children, in particular, the migrant father and his son. We also find that the weather in the origin areas is one of the push factors of migration, whereby people from areas with low precipitation are pushed to migrate. This was true of the migrants interviewed in Bitung. Many had come from the Talaud Islands, where drought had often occurred. Hence, later we use out-migration rate and weather shock in the selection of parental migration (see Sections 4.2 and 4.3).

Finally, we find that social norms regarding gender difference still determine that men have fewer social restrictions on migration. Women need to negotiate more than men regarding their decision to migrate. In some places, women are encouraged to stay in their origin place, where there is an institutionalised custom of the eldest child, and in one case the eldest daughter, staying in or returning to their village to take care of their parents and the family assets (Muara Enim). This is also one of the reasons we include maternal migration in our analysis.

3. Theoretical framework

The economic literature studies intergenerational mobility and migration separately. The migration literature discusses the causes of migration, which explain the self-selection of migrants, whilst the literature on intergenerational mobility discusses parents' investment in their children. We combine both theories to answer our research questions.

Intergenerational social mobility consists of the transmission of parents' social status to their children. The classic theory of intergenerational mobility in a simple Markov model (Black & Devereux, 2011) is presented below:

$$\ln(Y_i) = \beta \ln(Y_j) + \epsilon_i \quad (1)$$

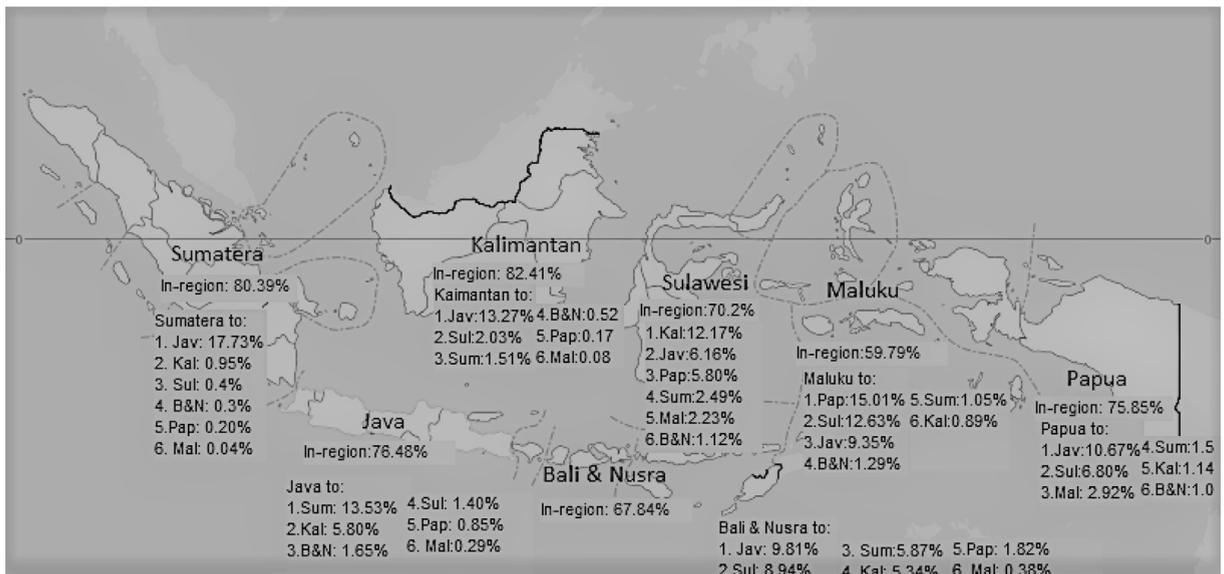


Fig. 1. Migration flows of Indonesian regions, 2014. Notes: the data is within and between regions migration in Indonesia from total migrant population of 45,354,892 people. Nusra refers to West and East Nusa Tenggara. Source: own calculation using SUSENAS 2014. Map from [wikimediacommons](#).

where Y_i is the social status of the children and Y_j is the social status of the parent. Economics literature uses income as a measure of social status; this study uses per capita expenditure as a proxy for income. The coefficient β is the intergenerational elasticity ($0 < \beta < 1$) which indicates higher intergenerational persistence if the coefficient is closer to 1 and higher intergenerational mobility if the coefficient is closer to zero.

The path and mechanism of this transmission is explained by [Becker and Tomes \(1979\)](#) by suggesting that the wealth of the child as an adult (Y_i) is determined by the income of the parents (Y_j), the wage level of the children when adults (w_i), the children's endowment (ϵ_i), and their luck (u_i) in the labour market. Hence, the parents' demand function of children's income shows:

$$\begin{aligned}
 Y_i &= \alpha(1 + r_j)Y_j + \alpha w_i \cdot \epsilon_i + \alpha w_i \cdot u_i \\
 &= \beta Y_j + \alpha w_i \cdot \epsilon_i + \alpha w_i \cdot u_i
 \end{aligned}
 \tag{2}$$

where, $\beta = \alpha(1 + r_j)$, showing the intergenerational elasticity as the proportion of what parents spend on their children (α) and the rate of return per generation ($1 + r_j$).

In this paper, we introduce parents' migration M_j to the intergenerational mobility framework. We propose that past parental migration affects children's income as adults Y_i and the effect of parental income Y_j on their children's income is conditional on their migration:

$$Y_i = \beta Y_j + \gamma M_j + \delta Y_j \cdot M_j + \alpha w_i \cdot \epsilon_i + \alpha w_i \cdot u_i
 \tag{3}$$

The issue is that parents do not migrate randomly. The literature on migration has long discussed the determinants of migration; one of the earliest studies is Ravenstein's law of migration ([Ravenstein, 1885](#)), which acknowledges the determinants of migration such as distance and economic opportunity as pull factors. Later, neo-classical economists emphasised the excess of labour in the agricultural sector ([Lewis, 1954](#)), and wage differences in rural and urban sectors ([Harris & Todaro, 1970](#); [Ranis & Fei, 1961](#)) as the main drivers of rural-urban migration. At the individual level, the non-randomness of the migrants is due to different levels of education ([Chiquiar & Hanson, 2005](#); [Kaestner & Malamud, 2014](#)) and skills ([Borjas, Bronars, & Trejo, 1992](#)). In Section 4.3, we will explain how we deal with the parent's self-selection into migration.

4. Empirical strategy

4.1. Data and definition

The Indonesian Family Life Survey (IFLS) is our primary source of data. The IFLS sampling design is representative both at the national and district level. We also use migration data from census and inter-census surveys of Statistics Indonesia and, in addition, weather data from the National Oceanic and Atmospheric Administration in order to explain some aspects of migrants' self-selection. The IFLS is a longitudinal survey in Indonesia covering 13 out of 27 provinces (in 1993) collecting information at both household and individual level. It has more than 30,000 respondents, and it represents 83% of the population. The IFLS has been conducted

Table 1
Number of parents–children pairs.
Source: Authors' calculation, IFLS 1993–2014.

	All children		Left-behind children	
	Daughter	Son	Daughter	Son
Father	9507	10,176	628	670
Mother	13,436	13,479	892	879

Table 2
Observations attrition.
Source: Author's calculation, IFLS 1993–2014.

Year	Times the observations appeared					Total
	1	2	3	4	5	
1993	703	444	767	878	1100	3892
1997	591	743	1011	1228	1100	4673
2000	890	1032	1691	1467	1100	6180
2007	1200	1960	1222	1452	1100	6934
2014	3130	1647	934	995	1100	7806
Total	6514	5826	5625	6020	5500	29,485

in five waves (1993, 1997, 2000, 2007, and 2014) with 87.6% of original IFLS 1 household being interviewed in all five waves. In our analysis, we use individual information on migration and individual characteristics and household information on household expenditure.

The IFLS data enable us to pair each parent with their children who have been interviewed in the survey rounds. We observe all adults in each wave of the survey and match them with their parents from all five waves. An adult is defined as 15 years old and above, which follows the criteria of the Statistics Bureau of Indonesia. Hence, the 'children' referred to in this paper are adults who matched with at least one of their parents. [Table 1](#) shows the number of parent–children pairs with a smaller proportion of left-behind children. We defined the left-behind children as the children of parents who migrated without any of their children. This is due to limitations of the IFLS, which not specify which child an individual migrated with. In addition, we defined parents' migration as migrating out of the district at least once when their children (our adult observations) were less than 15 years old. The separate analysis of father–child and mother–child pairs is because we cannot be sure when and if they migrated together. This is another limitation of IFLS data as well as our approach to define the parental migration. We realised migration can be a complex event, and this paper try to simplify it. We also do not take into account the length, frequency, circularity, and the distance of parental migration.

Retrospective data on individual migration enable us to trace these past parental migrations so that we are able to obtain more observations than if we used migration information between survey waves. Due to the time-invariant of this past parental migration in the survey, we pooled the data using a repeated cross-section instead of panel data for longitudinal analysis.

The IFLS has a high contact rate; we have 1100 observations (5500 in total) who were interviewed in all five waves. Weights provided by the IFLS are used to deal with differences in sampling design and attrition. [Table 2](#) shows how many times the observations appeared in the survey waves. However, attrition will have a minimal effect as the method used to predict lifetime per capita expenditure allows a minimal number of data points ([Dustmann, 2008](#)) (see Eq. (5)). We will explain this method more detail in Section 4.3.

Before proceeding to our analysis, we show some empirical evidence on parental migration and children per capita expenditure. [Table 3](#) shows a simple mean difference between the children's inflation-adjusted per capita expenditure and the predicted per capita expenditure at age 40 according to their parents' migration status. The predicted per capita expenditure at age 40 for children and their parents is the main variable to determine intergenerational mobility. The reason why we use of this predicted per capita expenditure is to take into account the life-cycle bias and to be able to compare the children and their parents at the same point in their lives. [Table 3](#) shows that the children and their parents have significantly higher household per capita expenditure (both real and predicted at age 40) if the parents migrated than if the parents stayed. These results suggest that there is self-selection into migration as parents who migrated had more resources than those who stayed. [Table 3](#) also shows possible benefits of parental migration on children's per capita expenditure.

In addition, children who live in districts with a higher share of migrated parents have higher household per capita expenditure at 40 years old (see [Fig. 2](#)). The x-axis in [Fig. 2](#) shows the mean of parental migration at the district level, which represents migrated parents divided by the total number of parents in that district. Meanwhile, the y-axis shows the mean of children's household per capita at the district level. Both [Table 3](#) and [Fig. 2](#) indicate that parents' migration is positively correlated with children's per capita expenditure.

[Table 4](#) shows the difference between parents–children migrant pairs and stayers by regressing the covariates that we use in our regressions to calculate the difference and the associated standard error between the migrants' and non-migrants' children. We find children's characteristics are similar when comparing the sample of those whose parent's migrated with those whose parents did not. Although, children of fathers who migrated are significantly older compared with the children of fathers who stayed. [Table 4](#)

Table 3

Inflation-adjusted weekly per capita expenditure (in Rupiah) by migration status of the parents in all IFLS waves.
 Source: Author's calculation, IFLS 1993–2014.

	Obs	Mean
Child's per capita expenditure when:		
Parents migrated	5798	96,882
Parents stayed	22,880	76,203
t-stat		-17.549***
Child's predicted per capita expenditure at age 40 when:		
Parents migrated	5798	208,513
Parents stayed	22,880	186,901
t-stat		-18.078***
Father's per capita expenditure		
Migrated	5868	59,940
Stayed	23,617	40,414
t-stat		-21.436***
Father's predicted per capita expenditure at age 40		
Migrated	4354	115,697
Stayed	15,296	99,672
t-stat		-14.139***
Mother's per capita expenditure		
Migrated	5868	71,907
Stayed	23,617	54,608
t-stat		-18.735***
Mother's predicted permanent per capita expenditure at age 40		
Migrated	5439	85,711
Stayed	21,433	71,504
t-stat		-14.670***

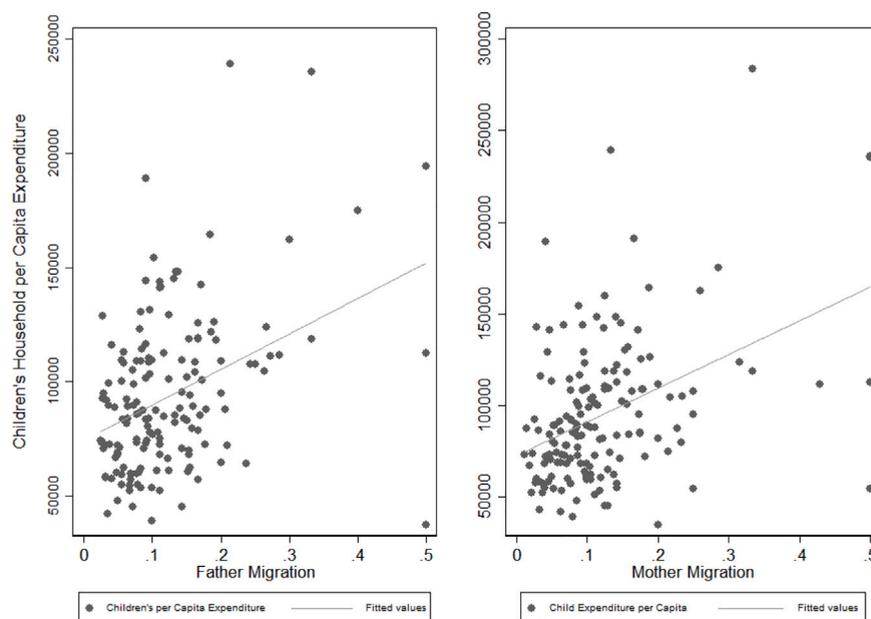


Fig. 2. Parents' migration and children's household per capita expenditure at the age of 40 by district.
 Source: Own calculation using IFLS waves 1–5 data.

also indicates that the parents who migrated are slightly younger than the parents who stayed, from provinces with a higher out-migration rate and with more negative weather shocks, and migrated parents are more often born in urban areas than parents who stayed. We can also see that the children left behind by mothers who migrated come from a bigger household than those whose mothers stayed. Children from migrant parents are currently living more frequently outside Java and in rural areas compared with children from non-migrant parents. This suggests that the effects of parent's migration on their children could be heterogeneous across the locations where children currently live.

Table 4
 Mean differences of covariates from different estimations.
 Source: Authors' calculation, IFLS 1993–2014.

Variables	Father: All samples			Father: The left-behind			Mother: All samples			Mother: The left-behind		
	Stayer	Migrate	Difference	Stayer	Migrate	Difference	Stayer	Migrate	Difference	Stayer	Migrate	Difference
Household size	5.822 (2.713)	5.891 (3.013)	0.068 (0.084)	5.822 (2.713)	6.057 (3.189)	0.235* (0.129)	5.862 (2.761)	5.908 (2.891)	0.046 (0.069)	5.862 (2.761)	6.090 (2.905)	0.228** (0.103)
Children's HH with child age 6–10 y.o	0.429 (0.607)	0.447 (0.638)	0.019 (0.019)	0.429 (0.607)	0.454 (0.652)	0.025 (0.029)	0.434 (0.617)	0.462 (0.652)	0.028* (0.015)	0.434 (0.617)	0.485 (0.652)	0.051** (0.023)
Children's HH with child age 11–14 y.o	0.362 (0.580)	0.400 (0.612)	0.038** (0.018)	0.362 (0.580)	0.413 (0.601)	0.051* (0.027)	0.364 (0.587)	0.384 (0.604)	0.019 (0.015)	0.364 (0.587)	0.430 (0.622)	0.066*** (0.022)
Children being male	0.493 (0.500)	0.531 (0.499)	0.038** (0.015)	0.493 (0.500)	0.472 (0.500)	-0.020 (0.023)	0.483 (0.500)	0.508 (0.500)	0.025** (0.012)	0.483 (0.500)	0.458 (0.499)	-0.025 (0.019)
Children's age	27.047 (8.181)	27.795 (8.417)	0.748*** (0.250)	27.047 (8.181)	27.928 (8.742)	0.881** (0.385)	29.655 (9.972)	29.839 (9.288)	0.184 (0.243)	29.655 (9.972)	29.551 (9.211)	-0.104 (0.367)
Children live in urban areas	0.476 (0.499)	0.571 (0.495)	0.095*** (0.015)	0.476 (0.499)	0.524 (0.500)	0.048** (0.023)	0.483 (0.500)	0.600 (0.490)	0.117*** (0.012)	0.483 (0.500)	0.594 (0.491)	0.110*** (0.018)
Children live in Java	0.607 (0.489)	0.549 (0.498)	-0.058*** (0.015)	0.607 (0.489)	0.601 (0.490)	-0.005 (0.023)	0.614 (0.487)	0.516 (0.500)	-0.098*** (0.012)	0.614 (0.487)	0.578 (0.494)	-0.036** (0.018)
Quintile on children's HH per capita expenditure	3.055 (1.399)	3.323 (1.389)	0.268*** (0.043)	3.055 (1.399)	3.243 (1.411)	0.188*** (0.066)	2.988 (1.394)	3.355 (1.363)	0.367*** (0.034)	2.988 (1.394)	3.290 (1.386)	0.301*** (0.052)
Parent's birthplace, urban areas=1	0.205 (0.403)	0.276 (0.447)	0.071*** (0.012)	0.205 (0.403)	0.241 (0.428)	0.037* (0.019)	0.213 (0.409)	0.288 (0.453)	0.075*** (0.010)	0.213 (0.409)	0.265 (0.441)	0.052*** (0.015)
Parent origin district negative precipitation shock	2.238 (2.289)	2.443 (2.322)	0.206*** (0.070)	2.238 (2.289)	2.350 (2.443)	0.112 (0.108)	2.283 (2.353)	2.518 (2.462)	0.235*** (0.059)	2.283 (2.353)	2.490 (2.466)	0.207** (0.088)
Parents origin province outmigration rate	21.563 (16.823)	23.732 (18.736)	2.169*** (0.521)	21.563 (16.823)	23.260 (16.952)	1.697** (0.788)	21.744 (16.848)	23.950 (19.712)	2.207*** (0.429)	21.744 (16.848)	22.638 (18.233)	0.894 (0.628)
Parents' age	56.936 (11.441)	56.230 (10.770)	-0.706** (0.345)	56.936 (11.441)	55.611 (11.045)	-1.324** (0.534)	54.810 (12.680)	53.067 (11.475)	-1.743*** (0.308)	54.810 (12.680)	51.376 (10.839)	-3.434*** (0.465)
Number of observations	6895	1281	8176	6895	489	7384	9322	1989	11,311	9322	790	10,112

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

4.2. Estimation strategy

In order to estimate the impact of parent's migration on their children's intergenerational mobility, we use an endogenous treatment-regression model. Heckman (1976) introduced the sample selection model, which was expanded by deriving both the maximum likelihood and the control function of the model (Maddala, 1986). The model allows both unobservables affecting the treatment and the potential outcome to have a specific correlation structure. The model is a variant of Heckman's selection model which observed both migrants' and non-migrants' regimes. It addresses self-selection issues and estimates treatment effects as parental migration is non-randomly allocated.

The endogenous treatment-regression model consists of an outcome equation of children per capita expenditure, Y_i , and an endogenous treatment equation M_j , where $M_j = 1$ when parents migrated, where Z_j is a vector of selection variables for parents' migration, j refers to the parents, and i refers to the children. We also add regional fixed effect of $Prov_i$ and time effect of the IFLS survey year of $Year_i$.

$$\begin{aligned}
 Ln(Y_i) &= \beta Ln(Y_j) + \tau M_j + \delta Ln(Y_j) * M_j + \theta X_i + \eta Prov_i + \phi Year_i \epsilon_i \\
 M_j &= \begin{cases} 1, & \text{if } \gamma Z_j + \mu_j < 0. \\ 0, & \text{otherwise.} \end{cases} \tag{4}
 \end{aligned}$$

Y_i is the children's household per capita expenditure and for parents it is Y_j ; the β is the coefficient which captures intergenerational elasticity while δ represents the difference in intergenerational elasticity between the group of children whose parents migrated and those whose parents stayed. We used the standard practice in development economics, as using expenditure as income is noisy and subject to measurement error. X is a vector of control variables which includes household and individual characteristics of children when adults. We use the following variables in the selection equation of parents' migration when children are aged 0–14 years old: rural–urban information on the parents' birthplace; provincial out-migration rate of the place of the parents' origin (defined as the province where parents were living when they were 12 years old); precipitation shock in the district where parents lived when they were 12 years old; parents' age; and children's gender and age. Table 5 shows the definition of the variables we use for our estimations.

4.3. Identification strategy

We use per capita expenditure instead of income as a dependent variable as income data can be affected by both sample selection bias and reporting bias. Sample selection bias in income data happens when we exclude people who do not have income from the sample. Reporting bias also commonly occurs in income data due to job informality and missing data as some respondents do not agree to report their income.

Additionally, as we are interested in studying intergenerational expenditure elasticity, we aim at eliminating the lifecycle bias in household per capita expenditure of both children and their parents. As there are age differences between children and parent pairs, comparing their household per capita expenditure at different points of their life results in bias. In order to make them

Table 5
Variables definition.

Variables	Definition
Log of household per capita expenditure	Log of household weekly total per capita expenditure for children when adults, father and mother. Total household expenditure is the inflation-adjusted (based on year 2010) weekly household expenditure on food and non-food items
Household size	Number of people who live in the household
Male	Dummy variable for gender, male = 1 female = 0
Number of children aged 6–10 years old in the household	Total number of children aged 6–10 years old in the children's household
A household with child aged 11–14 years old	Total number of children aged 11–14 years old in the children's household
Age	Age at the survey year
Migration	Dummy variable migration = 1, when parents migrated across districts at least once when the child was 0–14 years old
Parents' birthplace	Dummy variable urban = 1, using the information on whether the birthplace was rural or urban
Negative precipitation shock	The sum of the event of negative precipitation shock at the parents' origin district when the parents were 12 years old
Out-migration rate	Out-migration rate of the province where the parents lived when they were 12 years old. The data is from Statistics Indonesia (BPS), calculation of provincial out-migration from census and inter-census survey

comparable, we predict permanent household per capita expenditure at age 40 years old, following [Dustmann \(2008\)](#). The method involves averaging per capita expenditure over several years. It also allows the inclusion of individuals with a minimal number of expenditure data points ([Dustmann, 2008](#)).

$$\ln(Y_{i,t}) = \alpha_1 + \alpha_2 \text{Age}_{i,t} + \alpha_3 \text{Age}_{i,t}^2 + v_i + u_{i,t} \quad (5)$$

We then predict Eq. (5) at the age of 40 years old. [Haider and Solon \(2006\)](#) suggest that current income from the early thirties to mid-forties generally provides an unbiased estimate of lifetime income. By fixing the age at a certain point, we can compare the children and their parents at the same point in their lives.

We based the choice of the selection variables on the information from our exploratory qualitative survey that was undertaken in 2017. The main determinant of the decision to migrate is the network in the destination; more people living outside the migrants' districts of origin will pull others to move. This finding is similar to those of [Hare \(1999\)](#) in her work on migration in China. We used the out-migration rate in the province when parents were 12 years old as a proxy for the peer effect as well as the migration network. The weather in the parent's origin areas is also one of the push factors of migration, whereby people from areas with low precipitation are pushed to migrate. This was true of the migrants interviewed in Bitung, many of whom had come from the Talaud Islands, where drought had often occurred. We used the number of negative precipitation shocks in the district when the parents were 12 years old. Precipitation shock is a push factor as the weather shock may push people to migrate. We calculate the precipitation shock by the method used by [Amare, Jensen, Shiferaw, and Cissé \(2018\)](#).

In addition to external factors such as weather and migration network, individual differences affect parents' decisions to migrate, such as age ([Hare, 1999](#)) and birthplace. Being born in an urban or a rural place correlates with propensity to migrate. [Van Lottum and Marks \(2012\)](#) highlight the importance of urban primacy as a determinant of internal migration in Indonesia. We rely on parents' reported information in the survey to distinguish the status of their birthplace as rural or urban at the time of their birth.

We also include the gender of the children and their age in the selection equation as determinants of parental migration. Children's age contributes to the decision to migrate, since parents, where the family has children of school age, are less likely to migrate ([Antman, 2012; Nivalainen, 2004](#)). Having daughters in the household leads to a smaller increase in propensity to return to the origin area, whilst having a son increases the propensity to stay in the destination ([Dustmann, 2003](#)).

The Heckman selection model identifies the effects of parent's migration on intergenerational mobility accounting for sample-induced endogeneity (parental migration choice), only if the exclusion restriction in the selection equation is valid (if the variables we chose to control for in the selection equation do not directly affect the children's household per capita expenditure). It is also important to notice that Heckman selection models account for sample induced endogeneity (parental migration choice), but may not resolve other types of endogeneity, such as persistent unobserved variables that may affect both parental migration and children's outcomes (expenditures). While children's outcomes do not determine parents' past migration, there are other variables that could affect both, such as local conditions. For example, weather shocks may affect both parental migration choice, and be persistent over time and affect future children's welfare/income (as proxied by expenditures) especially if those children stayed behind in the same region where the weather shocks occurred. Negative weather shocks could be migration push factors on parents, but would also have a negative persistent effect on children, leading to downward-biased estimates. Other unobserved non-varying confounders could be regional economic development levels or growth rates.

The variables we chose to control for in our selection equation should not directly or indirectly affect children's future outcomes. These variables are: the parents' birthplace; weather shocks and out-migration rate in the parents' place of origin. The weather shock

is used to model the parental migration and it reflects the origin areas of the parents. The negative precipitation shock we use is defined as the sum of the event of negative precipitation shock in the parents' origin district when the parents were 12 years old. Past weather shocks should not be correlated with children's future outcomes. Additionally, in order to control for weather shock persistence, regional economic development and other sources of spatial variation constant over time were controlled for provincial fixed effects.

Finally, the robustness checks in Section 8, prove that our results are robust to different specifications of the model: excluding those living in Jakarta (the Indonesian capital) and Java (the most populous island); using different measures of per capita expenditure and using individual income; adding parental education and predicted parental expenditure pre-migration to the selection variables; co-living status of the child–parents pairs; using different definitions of migration.

5. Results

5.1. All samples

We find that parents' migration has a significant positive impact on their children's future household per capita expenditure for both child–father and child–mother pairs (see Table 6). However, we find no significant differences in intergenerational mobility across children of the migrants and the non-migrants. As we interact the parents' migration variable with their log of per capita expenditure, we need to calculate marginal effects to understand the average marginal transmission of parents' log of per capita expenditure on their children's log of per capita expenditure (see Table 7).

The intergenerational elasticity coefficient, regardless of the parents' migration status, shows a slightly higher transmission of household expenditure in child–mother pairs than child–father pairs. The average marginal predictions of intergenerational elasticity for the child–father pairs is 0.586 and for child–mother pairs is 0.607 (see Table 7). Our intergenerational expenditure elasticity coefficient is higher compared with intergenerational income elasticity coefficients in other countries (0.29 in Canada (Chen, Ostrovsky, & Piraino, 2017); 0.11 in Germany, 0.68 in the UK, 0.26 in Malaysia (Solon, 1999)), but these may not be comparable because of different measurements of the earnings. In addition, Bruze (2018) suggests that from expenditure data is higher than from income data. Using the Danish Expenditure Survey, he shows that intergenerational expenditure elasticity between parents and their children is at 0.418, higher than intergenerational income elasticity at 0.208.

The Ordinary Least Square (OLS) result also suggests that parent's migration does not affect children's intergenerational mobility, even if it does not account for parents' self-selection into migration (see Table 6). We find that the interaction between the parents' migration and parents' household per capita expenditure is not statistically significant, similar to our model with selection for parental migration.

In order to understand better, Fig. 3 shows, for the children whose parents migrated and stayed, the average marginal differences in children's log of per capita expenditure over the distribution of the average marginal changes in parents' log of per capita expenditure. The graphs show that the children of parents who migrated have higher per capita expenditure than the children of parents who stayed. However, the parallel slopes suggest that parental migration is unable to promote intergenerational mobility. The identical patterns for both child–father and child–mother pairs are because the children of parents who migrated have higher per capita expenditure than those of the parents who stayed.

5.2. Left-behind children

In this section, we use a sub-sample of left-behind children and children of non-migrated parents. The left-behind children are the children whose parents migrated at least once without any of their children and the children whose parents stayed when the children were 0 to 14 years of age. We exclude observations where parents are recorded as having migrated with children. In this case, we compare the left-behind children with the children whose parents did not migrate. Table 8 shows the endogenous treatment regression results of child–father and child–mother pairs.

We find that the fathers' migration has a significant impact on the children left behind but not the mothers' migration. Further, the fathers' migration promotes intergenerational mobility for the children left behind. This is shown by the significant negative coefficient of interaction variable between parents' migration and parents' log of per capita expenditure in child–father pairs. The intergenerational elasticity coefficient is the same in the sub-sample and the full sample for child–father pairs, whilst slightly less in the sub-sample for child–mother pairs.

Fig. 4 shows more clearly the different intergenerational mobility for the children left behind when their father migrated and the children whose father stayed. It also shows that the left-behind children of a father with a lower household per capita expenditure benefited from migration but not the children of a father with a higher household per capita expenditure. Meanwhile, the parallel slopes for child–mother pairs show no significant impact of migration on intergenerational mobility, but they do show that the left-behind child from a migrated mother has higher household per capita expenditure.

We do not include the norm of social pressure to inherit a profession from parents in our quantitative analysis. However, these quantitative findings showing no significant differences in intergenerational mobility between children of migrants and non-migrants suggest what we also found in our qualitative exploratory interview: profession persistence between parents and children. We found a strong persistence regarding fathers' and sons' profession. People in Ciamis express this sentiment in proverbs such as "fruit falls not far from the tree", which demonstrate the intergenerational social persistence in their society. However, for some children of the migrants interviewed, their parents' migration allowed them to escape poverty at their parents' place of origin. One of the migrant's children who is a migrant himself in Bekasi explained that if his parents had stayed, he would be a farmworker as are his uncles, aunts and cousins who remain at their place of origin in Cirebon. Even if the origin is an urban area, the children of stayers will likely to follow their parents' footsteps.

Table 6

Impact of parents' migration on children's per capita expenditure and intergenerational expenditure elasticity: Endogenous treatment estimations on child–father pairs and child–mother pairs.

Dep. var: children's ln household per capita expenditure	(1)		(2)		(3)		(4)	
	OLS				Selection			
	Father		Mother		Father		Mother	
Parents' ln household per capita expenditure (excap)	0.597***	0.613***	0.589***	0.608***	(0.015)	(0.012)	(0.016)	(0.014)
Parents' migration	0.380	–0.028	0.759*	0.722**	(0.366)	(0.299)	(0.404)	(0.337)
Interaction: parents' migration and excap	–0.023	0.014	–0.016	–0.001	(0.031)	(0.026)	(0.035)	(0.029)
Household size	–0.117***	–0.113***	–0.119***	–0.113***	(0.004)	(0.004)	(0.005)	(0.004)
Household with child aged 6–10 years old	0.066***	0.065***	0.068***	0.065***	(0.011)	(0.009)	(0.013)	(0.010)
Household with child aged 11–14 years old	0.073***	0.076***	0.068***	0.071***	(0.011)	(0.009)	(0.012)	(0.010)
Male	0.003	–0.010	–0.011	–0.029*	(0.016)	(0.014)	(0.018)	(0.016)
Age	–0.017***	–0.029***	–0.019***	–0.032***	(0.004)	(0.003)	(0.005)	(0.003)
Age ²	–0.000	0.000*	–0.000	0.000***	(0.000)	(0.000)	(0.000)	(0.000)
Constant	6.079***	6.287***	6.152***	6.312***	(0.189)	(0.149)	(0.214)	(0.175)
Selection to migration								
Parents' birthplace, urban = 1			0.229***	0.279***			(0.058)	(0.046)
Negative weather shocks when parents' 12 y.o			0.023**	0.008			(0.011)	(0.009)
Out-migration rate when parents' 12 y.o			0.002	0.002**			(0.001)	(0.001)
Parents' age			0.037*	–0.012			(0.022)	(0.015)
Parents' age ²			–0.000**	–0.000			(0.000)	(0.000)
Male			0.106**	0.043			(0.054)	(0.046)
Age			–0.007	0.049***			(0.018)	(0.013)
Age ²			0.000	–0.000*			(0.000)	(0.000)
Constant			–2.004***	–1.255***			(0.508)	(0.327)
/athrho			–0.429***	–0.580***			(0.088)	(0.077)
/lnsigma			–0.470***	–0.460***			(0.016)	(0.016)
Year effects	yes	yes	yes	yes				
Province effects	yes	yes	yes	yes				
Observations	10,768	14,900	8211	11,377				
R-squared	0.555	0.581						
F	150.6	383.5	123.9	173.9				
Lambda			–0.253	–0.330				
Converged			1	1				

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. /athrho and /lnsigma are ancillary parameters estimated, whereas lambda is rho times sigma. These parameters indicate outcome and treatment unobservables. Negative signs indicate unobservables that increase observed children per capita expenditure, tending to occur with unobservables that decrease the observed parental migration. All estimation standard errors are clustered at household level and all samples are weighted. Variables definition refer to Table 5.

5.3. Heterogenous effects

We introduce some heterogeneous effects by interacting parents' migration and parents' per capita expenditure (in logarithm) with children as adults' location, position in per capita expenditure distribution, employment in agriculture and whether they migrated in childhood. Tables 9 and 10 show the regression results of each heterogeneous effect.

Table 7
Intergenerational elasticity coefficient and parental migration.
Source: Author's calculation, IFLS 1993–2014.

Dep.Var: children's ln household per capita expenditure	dy/dx	Std. Err.	[95% Conf. Interval]
Intergenerational elasticity			
Father's log of per capita expenditure	0.586	0.0149	0.557 0.616
Mother's log of per capita expenditure	0.607	0.013	0.581 0.632
Migration			
Father migrated = 1	0.580	0.086	0.411 0.749
Mother migrated = 1	0.709	0.067	0.577 0.841

The table shows average marginal effects of parents' log of per capita expenditure and migration on the children's log of per capita expenditure.

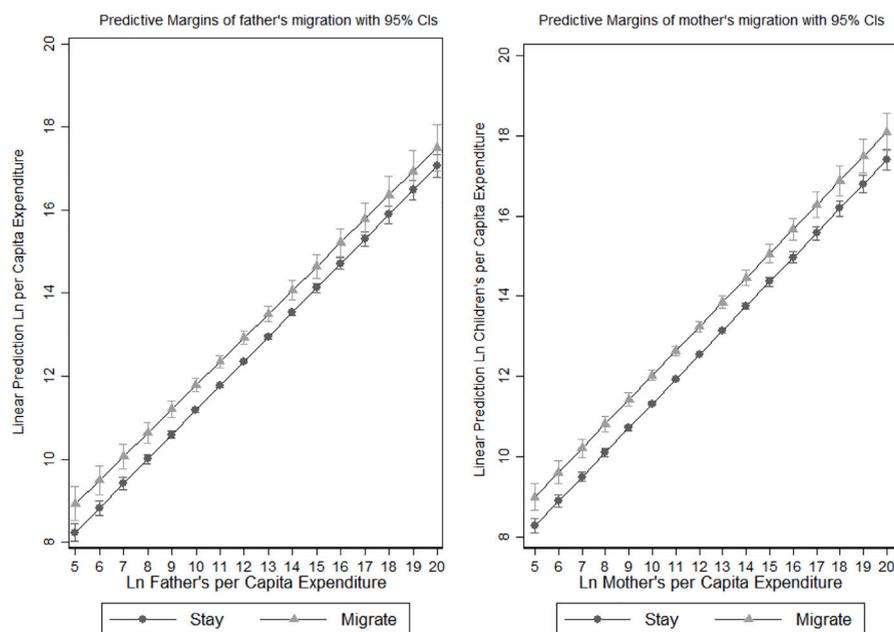


Fig. 3. Intergenerational mobility and migration: all samples.

The figure shows predictive margins of parents' migration on children's log of per capita expenditure, averaged over distribution of parents' log of per capita expenditure.

Source: Own calculation from IFLS 1–5 data.

The results show that being in an urban area benefits children (see Table 9 column (1) and (2) and Fig. 5). In rural areas, we find that both father's and mother's migration benefits children whose parents have lower household per capita expenditure but not children whose parents have higher household per capita expenditure. Conversely, in urban areas, children of parents with lower per capita expenditure benefit less from parent's migration. Being in an urban area instead promotes higher intergenerational mobility for children regardless of parental migration.

Similarly, living in Java leads to the children being more intergenerationally mobile than residing outside Java (see Table 9 columns (3) and (4) of interaction being in Java and parents' household per capita expenditure). However, all the coefficients related to parents' migration are not statistically significant. The figure also shows a parallel line between children from parents who migrated and stayed showing that there is no difference in the impact of migration if we take into account the effect of the children as adults currently living in Java or outside Java (see Fig. 6).

We find that the children as adults currently working in the agricultural sector have lower per capita expenditure and lower intergenerational mobility (see Table 9 columns (5) and (6)), but parental migration does not seem to explain this differential (see Fig. 7). The result, however, is in line with children as adults having higher household income when living in an urban area.

The different effects of parental migration by children's household expenditure quantile status only mattered when the father migrated. The differences in the first quantile mainly determine this heterogeneity. Figs. 8 and 9 show that if the father migrated, the children from the poorest quantile have more intergenerational mobility compared with the children of non-migrant fathers from the same group. In the higher quantile groups, the lower slope shows more intergenerational mobility than the poorest quantile. However, overlay lines show that parental migration does not have any effect on intergenerational mobility and that there is even the same level of children's per capita expenditure regardless of parents' past migration for people from the second to the fourth quantile, the middle class. Children in the first quantile benefited from parental migration if their parents were also poor. The children from the wealthiest quantile benefit slightly from their parents' migration if their parents are also rich.

Table 8

Impact of parents' migration on left-behind children's per capita expenditure and intergenerational expenditure elasticity: Endogenous treatment estimations on child–father pairs and child–mother pairs.

Dep. var: children's ln household per capita expenditure	1	2
	Father	Mother
Parents' ln household per capita expenditure (excap)	0.589*** (0.016)	0.604*** (0.014)
Parents' migration	1.641*** (0.598)	0.767 (0.508)
Interaction: parental migration and excap	−0.105* (0.054)	−0.008 (0.045)
Household size	−0.121*** (0.005)	−0.116*** (0.004)
Household with child aged 6–10 years old	0.071*** (0.014)	0.069*** (0.011)
Household with child aged 11–14 years old	0.070*** (0.013)	0.074*** (0.011)
Male	0.013 (0.019)	−0.015 (0.017)
Age	−0.019*** (0.005)	−0.031*** (0.003)
Age ²	−0.000 (0.000)	0.000*** (0.000)
Constant	6.192*** (0.215)	6.709*** (0.331)
/athrho	−0.489*** (0.016)	−0.492*** (0.014)
/lnsigma	−0.243*** (0.077)	−0.472*** (0.081)
Province effects	Yes	Yes
Year effects	Yes	Yes
Selection equation	Yes	Yes
Observations	7384	10112
F	1547	448.1
Lambda	−0.146	−0.269
Converged	1	1

Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. /athrho and /lnsigma are ancillary parameters estimated, whereas lambda is rho times sigma. These parameters indicate outcome and treatment unobservables. Negative signs indicate unobservables that increase observed children per capita expenditure, tending to occur with unobservables that decrease the observed parental migration. All estimation standard errors are clustered at household level and all samples are weighted. Variables definition refer to [Table 5](#).

We also look at the effect of childhood migration; the children are coded as migrated as child if the birth district is different from the district in which they lived at 12 years of age. However, that children who lived in different districts at birth when they were 12 years old, and their parents were identified as migrated, does not mean that they migrated together with their parents. Similarly, children who stayed during the period and have migrated parents may not be identified as left-behind children in our sample. This is due to our data limitations since the IFLS does not identify which child the parents migrated with if they migrated with children. Use of different migratory periods, when children are 0–14 years old for parental migration, and 0–12 years old for children's migration, is also due to this data limitation. We find that children who migrated at the age of 0–12 years old and had a father who also migrated are more intergenerationally mobile than those whose fathers did not migrate, although the benefit of fathers' migration is similar for children whose fathers have higher per capita expenditure ([Fig. 10](#)). The mother–child pairs showed a similar story when children did not migrate when they were 0–12 years old. However, children who migrated and whose mother also migrated appear to be less mobile than if mothers stayed ([Fig. 11](#)). The reverse is true when looking at father–child pairs.

6. Mechanisms

We test three mechanisms that can explain the impact of migration on children's per capita expenditure and their intergenerational mobility. The three mechanisms are (i) parents' investment in education, (ii) the children's migration when adults, (iii) and the children working in agriculture when adults. We found that children whose fathers migrated have on average four additional years of education than those whose fathers stayed. Similarly, children whose mothers migrated have four additional years of education compared to the children whose mothers stayed (see [Table 11](#)). The educational attainment of children left behind is similar to that of the whole sample with rounding to four years' more schooling than the children of non-migrant parents.

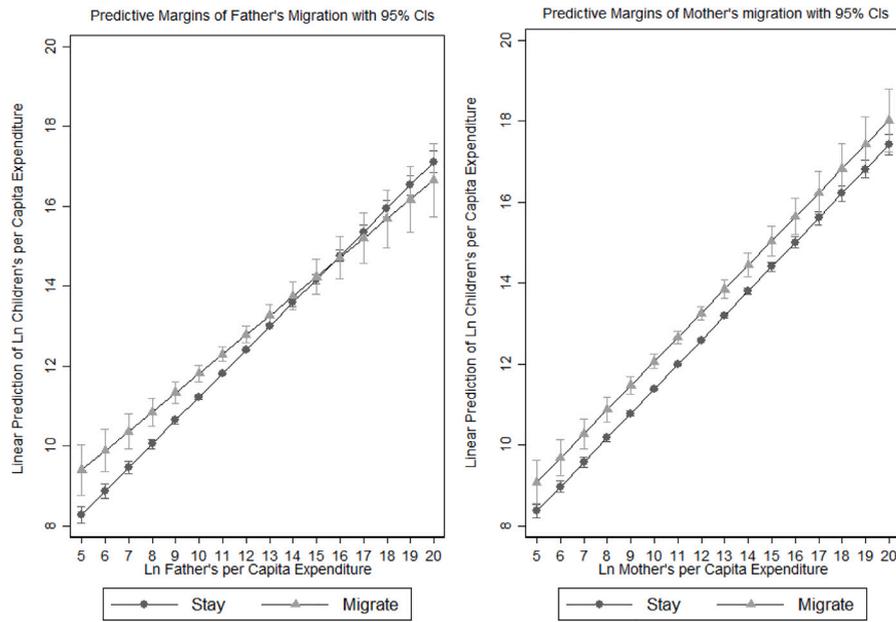


Fig. 4. Intergenerational mobility and migration: left-behind children. The figure shows predictive margins of parents' migration on children's log of per capita expenditure, averaged over distribution of parents' log of per capita expenditure. Source: Own calculation from IFLS 1–5 data.

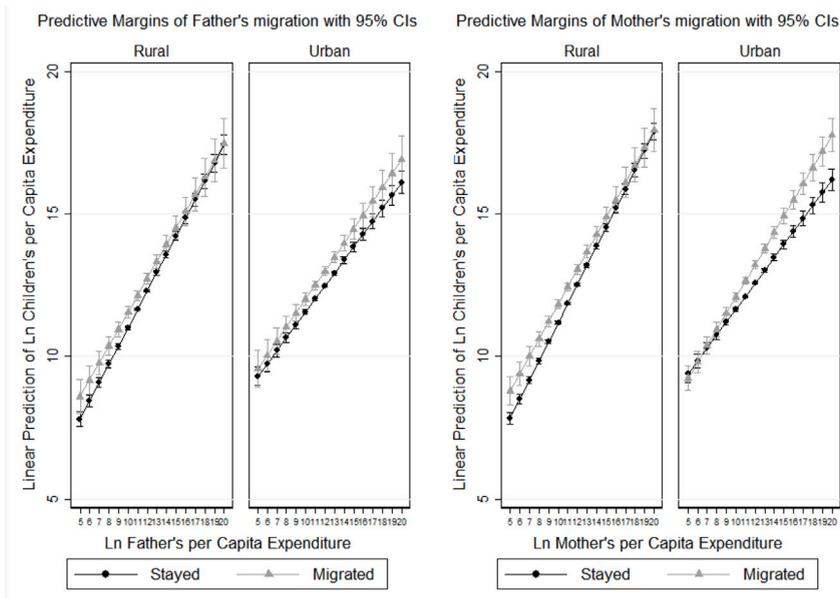


Fig. 5. Heterogeneous effect: living in urban or rural areas as adults. The figure shows predictive margins at CI 95% of parents' migration by children being in urban or rural areas on children's log of per capita expenditure, averaged over distribution of parents' log of per capita expenditure. Source: Own calculation from IFLS 1–5 data.

The finding on education is consistent with the results from previous studies. The magnitude of this finding is similar to the [Resosudarmo and Suryadarma \(2014\)](#) study that uses data from Rural–Urban Migration in China and Indonesia (RuMiCI), which found that permanently migrating as a child adds 4.5 years of schooling. [Antman \(2012\)](#) also found a positive relationship between parental migration and children's educational attainment. She discovered that the fathers' migration to the US from Mexico added a year of educational attainment for the left-behind girls.

Table 9
Effects by children's current residence and agriculture work.

Dep. var: Children' In Household per capita expenditure	(1)	(2)	(3)	(4)	(5)	(6)
	Urban Father	Mother	Java Father	Mother	Agriculture work Father Mother	
Parents' In household per capita expenditure (excapp)	0.643*** (0.020)	0.670*** (0.017)	0.640*** (0.023)	0.644*** (0.022)	0.438*** (0.026)	0.474*** (0.022)
Parents' migration (migration)	1.039* (0.578)	1.256*** (0.483)	0.671 (0.556)	0.714 (0.483)	1.028 (0.658)	0.568 (0.563)
Interaction: parents migration × excapp	-0.050 (0.052)	-0.060 (0.044)	-0.012 (0.048)	-0.001 (0.043)	-0.037 (0.056)	0.001 (0.049)
Variable of interest	2.381*** (0.361)	2.577*** (0.307)	1.002*** (0.364)	0.732** (0.317)	-1.636*** (0.487)	-1.562*** (0.401)
Interaction: var. interest × excapp	-0.189*** (0.031)	-0.215*** (0.028)	-0.070** (0.031)	-0.050* (0.028)	0.119*** (0.043)	0.117*** (0.037)
Interaction: var. interest × migration	-0.959 (0.890)	-1.964*** (0.660)	0.291 (0.782)	0.111 (0.658)	-1.280 (1.149)	0.048 (0.957)
Interaction: var. interest × excapp × migration	0.086 (0.077)	0.173*** (0.059)	-0.019 (0.068)	-0.009 (0.058)	0.100 (0.102)	-0.005 (0.087)
Constant	5.532*** (0.248)	5.626*** (0.192)	5.575*** (0.288)	5.918*** (0.255)	7.981*** (0.341)	7.872*** (0.268)
/athrho	-0.373*** (0.088)	-0.481*** (0.079)	-0.437*** (0.088)	-0.584*** (0.077)	-0.403*** (0.106)	-0.438*** (0.099)
/Insignma	-0.501*** (0.016)	-0.500*** (0.016)	-0.470*** (0.016)	-0.459*** (0.016)	-0.447*** (0.021)	-0.458*** (0.021)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Province effects	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Selection equation	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8175	11,310	8176	11,311	4324	6281
F	127.9	175.0	122.6	162.6	149.4	209.6
lambda	-0.216	-0.271	-0.257	-0.332	-0.245	-0.261
converged	1	1	1	1	1	1

Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Regression on working in agricultural sector is using sub-sample of employed observation, hence the much smaller number in the observations. /athrho and /Insignma are ancillary parameters estimated, whereas lambda is rho times sigma. These parameters indicate outcome and treatment unobservables. Negative signs indicate unobservables that increase observed children per capita expenditure, tending to occur with unobservables that decrease the observed parental migration. All estimation standard errors are clustered at household level and all samples are weighted. Variables definition refer to [Table 5](#).

Looking at the effect of parental migration on the propensity of children to migrate, children of a migrant father migrate twice as often in their adulthood than those whose father stayed. The mother's migration does not affect children's migration movements when adults. These findings can be explained within the context of the patriarchal nature of Indonesian society. Even in adulthood, approval from parents, especially the father, is important. This approval is even institutionalised for aspiring international migrant workers, as they need to provide a parental letter of approval to officials ([Hugo, 1995](#)). Fathers who experienced migration tend to allow their children to migrate as well as to facilitate their children's migration network. Our semi-structured interviews confirm that migrant parents are more lenient regarding their adult children's migration than those who never migrated. Prejudice about destinations and migration risks were the reasons behind parents' negative responses. Hence, children migrated more if their father migrated as well.

Parental migration has also contributed to decreasing the probability that their children work in the agricultural sector compared to the children of the non-migrants. In this respect, the mothers' migration shows less impact than fathers' migration. These results are in line with our results on the children's completed years of education. Migrated parents invest more in their children's education, they are more likely to encourage their children to migrate and, as a result, their children are less likely to work in the agricultural sector.

7. Robustness checks

This section provides robustness checks for our model specification to see whether our main findings hold. We perform robustness checks by excluding observations who live in Jakarta and Java, using different measures for the per capita expenditure, testing different model specifications, and using different definitions of migration. We also provide the robustness check for left-behind children in [Appendix](#).

One concern was that being in the Indonesian capital of Jakarta and Indonesia's most populous island, Java, could influence our results. To check for this, we ran our estimates excluding people who live in Jakarta and Java and found that the results are consistent with our main results, with a higher magnitude in the intergenerational elasticity coefficients (see [Table 12](#)).

Another concern was that setting the predicted permanent per capita expenditure at the age of 40 may not reflect living conditions in Indonesia and may also not capture the life cycle bias. We therefore estimated the same model specification with the log of

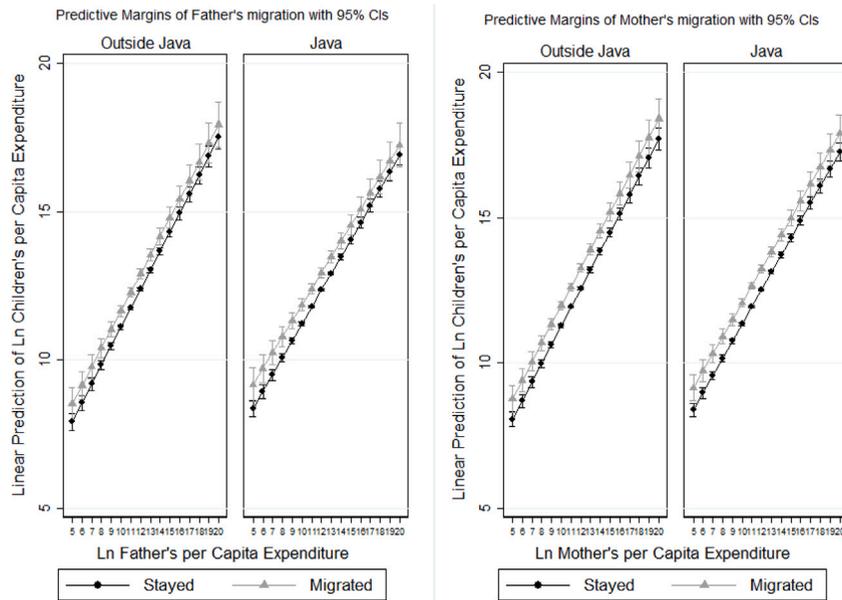


Fig. 6. Heterogeneous effect: living in Java and outside Java as adults. The figure shows predictive margins at CI 95% of parents' migration by children being in Java and outside Java on children's log of per capita expenditure, averaged over distribution of parents' log of per capita expenditure. Source: Own calculation from IFLS 1–5 data.

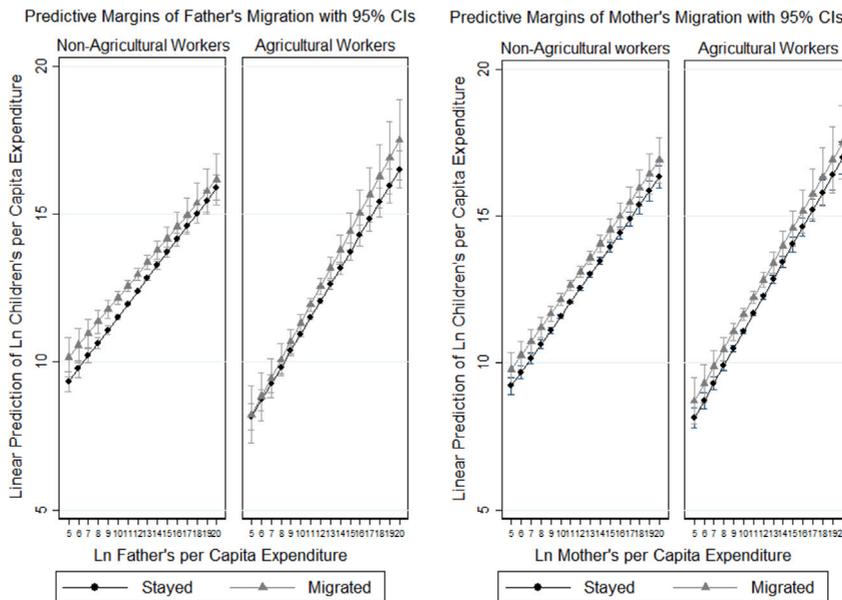


Fig. 7. Heterogeneous effect: working in agricultural sector as adults. The figure shows predictive margins at CI 95% of parents' migration by children working in agricultural and non-agricultural sectors on children's log of per capita expenditure, averaged over distribution of parents' log of per capita expenditure. Source: Own calculation from IFLS 1–5 data.

permanent per capita expenditure at 30 years old and 60 years old. We found consistent results compared with our main result (see Table 13). We also use individual income instead of household per capita expenditure. The number of observations is much smaller than using expenditure data because there is an issue of missing data as well as sample selection. The result is nevertheless consistent, although the intergenerational elasticity coefficients are much smaller than those with expenditure data, and the parental migration coefficients are not statistically significant (see Table 13).

Table 10
Effects by expenditure quantile and individuals who migrated as child.

Dep. var: children's ln household per capita expenditure	(1)	(2)	(3)	(4)
	Quantile of expenditure		Migrated as child	
	Father	Mother	Father	Mother
Parents' ln household per capita expenditure (excap)	0.429*** (0.04)	0.502*** (0.03)	0.609*** (0.02)	0.618*** (0.02)
Parents' migration (migration)	1.620** (0.72)	0.693 (0.78)	0.426 (0.50)	1.134*** (0.41)
Interaction: parents' migration × excap	-0.141** (0.07)	-0.059 (0.08)	0.014 (0.04)	-0.041 (0.04)
Interaction: being in quantile 2 × excap	-0.362*** (0.04)	-0.421*** (0.04)		
Interaction: being in quantile 3 × excap	-0.376*** (0.04)	-0.448*** (0.03)		
Interaction: being in quantile 4 × excap	-0.396*** (0.04)	-0.466*** (0.03)		
Interaction: being in quantile 5 × excap	-0.393*** (0.04)	-0.464*** (0.04)		
Interaction: being in quantile 2 × migration	-1.523* (0.78)	-0.525 (0.83)		
Interaction: being in quantile 3 × migration	-1.782** (0.75)	-0.644 (0.80)		
Interaction: being in quantile 4 × migration	-1.638** (0.74)	-0.679 (0.79)		
Interaction: being in quantile 5 × migration	-1.853** (0.85)	-1.107 (0.85)		
Interaction: being in quantile 2 × excap × migration	0.140* (0.07)	0.051 (0.08)		
Interaction: being in quantile 3 × excap × migration	0.163** (0.07)	0.064 (0.08)		
Interaction: being in quantile 4 × excap × migration	0.149** (0.07)	0.067 (0.08)		
Interaction: being in quantile 5 × excap × migration	0.170** (0.08)	0.104 (0.08)		
Interaction: migaschild × excap			-0.085** (0.04)	-0.044 (0.04)
Interaction: migaschild × parents' migration			1.063 (1.13)	-1.431 (0.93)
Interaction: migaschild × parents' migration × excap			-0.09 (0.098)	0.124 (0.082)
Constant	7.371*** -0.375	6.846*** -0.334	6.026*** -0.572	6.271*** -0.352
/athrho	-0.125*** -0.043	-0.180*** -0.053	-0.432*** -0.093	-0.518*** -0.087
/lnsigma	-1.263*** -0.025	-1.280*** -0.022	-0.477*** -0.017	-0.478*** -0.017
Year effects	yes	yes	yes	yes
Province effects	yes	yes	yes	yes
Control variables	yes	yes	yes	yes
Selection equation	yes	yes	yes	yes
Observations	8211	11,377	6991	9847
F	976	1330	127	138.3
Lambda	-0.0351	-0.0495	-0.252	-0.295
Converged	1	1	1	1

Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The quantile is taken from the whole respondents in the survey for each wave, not only our matched children. Children migrated is our adult observations for whom their birthplace is different to the place they lived in when they were 12 years old. /athrho and /lnsigma are ancillary parameters estimated, whereas lambda is rho times sigma. These parameters indicate outcome and treatment unobservables. Negative signs indicate unobservables that increase observed children per capita expenditure, tending to occur with unobservables that decrease the observed parental migration. All estimation standard errors are clustered at household level and all samples are weighted. Variables definition refer to Table 5.

We have some concerns on the omitted variable bias regarding parental education and parents' per capita expenditure pre-migration. We find similar consistent results for intergenerational elasticity coefficient and parental migration when adding parental education to the selection variables (see Table 14). We define parental education as father's or mother's years of schooling. The addition of parental education in the robustness check shows that excluding some parental variables from the selection to migrate will not affect our results. In our defence, it should be noted that the parental education data that we have is for the number of years of education at the time of the surveys, but there is no information on parental education before migration, especially if the parental

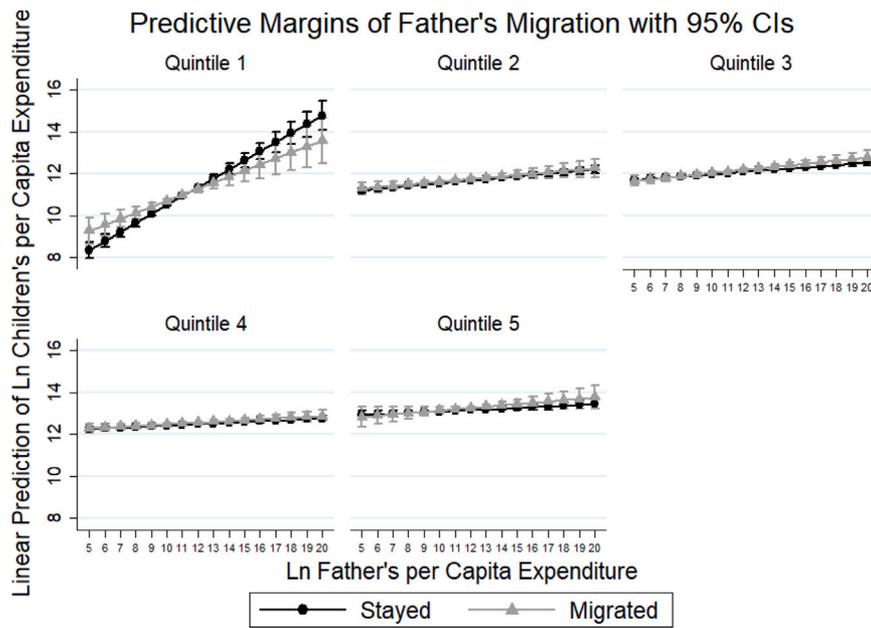


Fig. 8. Heterogeneous effect on father's migration: position in expenditure distribution as adults. The figure shows predictive margins at CI 95% of fathers' migration by children's expenditure distribution on children's log of per capita expenditure, averaged over distribution of fathers' log of per capita expenditure. Source: Own calculation from IFLS 1–5 data.

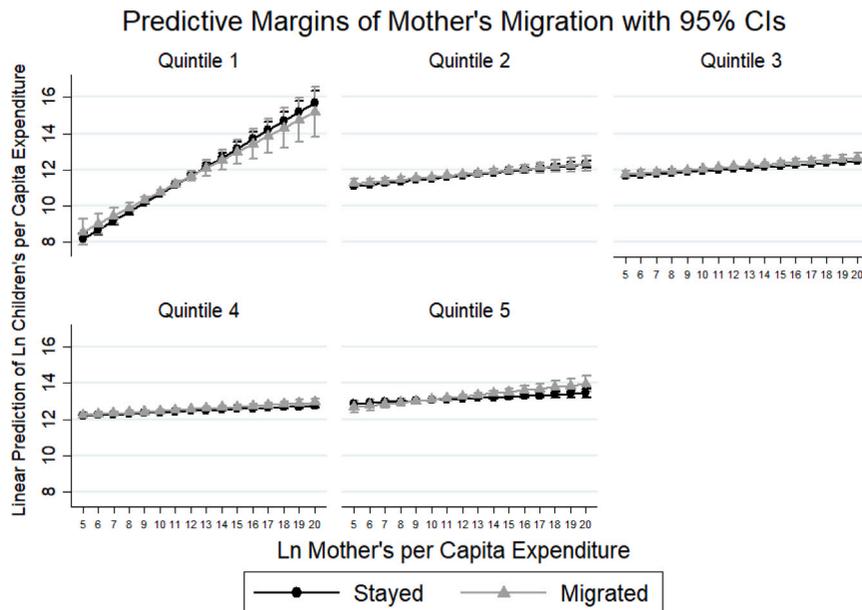


Fig. 9. Heterogeneous effect on mother's migration: position in expenditure distribution as adults. The figure shows predictive margins at CI 95% of mothers' migration by children's expenditure distribution on children's log of per capita expenditure, averaged over distribution of mothers' log of per capita expenditure. Source: Own calculation from IFLS 1–5 data.

migration happened before the survey years, in which case it may not precisely explain the self-selection to migrate. Table 14 also shows that controlling for parental expenditure before migration would not change our main findings.

Another important robustness check is due to the fact that some of our observations are co-living in the same household with their parents. We re-ran a different model specification, adding the co-living variable to predict the per capita expenditure and adding

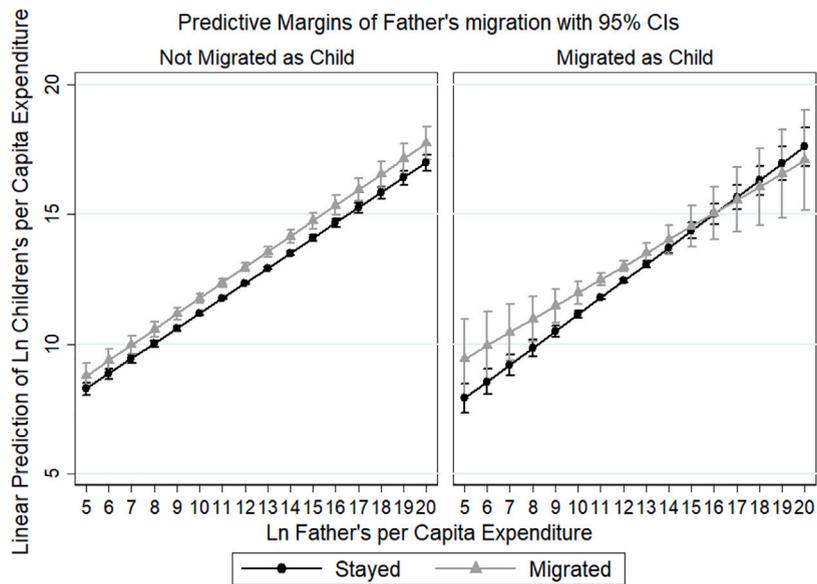


Fig. 10. Heterogeneous effect on father's migration: children's migration status at age 0–12 y.o. The figure shows predictive margins at CI 95% of fathers' migration across children's migration status at age 0–12 y.o. on children's log of per capita expenditure, averaged over distribution of fathers' log of per capita expenditure. Source: Own calculation from IFLS 1–5 data.

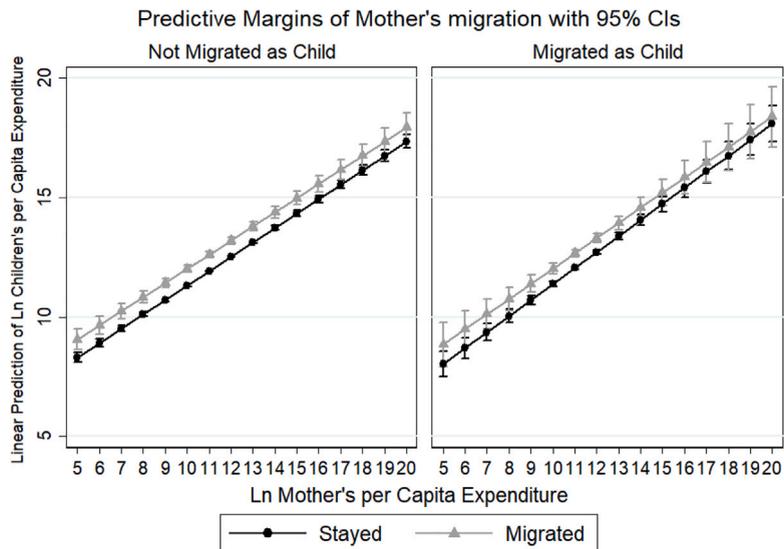


Fig. 11. Heterogeneous effect on mother's migration: children's migration status at age 0–12 y.o. The figure shows predictive margins at CI 95% of mothers' migration by children's migration at age between 0–12 y.o. on children's log of per capita expenditure, averaged over distribution of mothers' log of per capita expenditure. Source: Own calculation from IFLS 1–5 data.

both co-living and being head of household or spouse as control variables in our main regression for all samples and left-behind children. Table 15 shows that our findings still hold which suggests that the co-residency status does not affect our results.

We also use, as a robustness check, different definitions of migration. Instead of migration across districts, we check on migration across regions. We also redefine the across-districts migration by the type of origin and destination. We have the following combinations of across-districts migration: rural to urban, rural to rural, urban to rural and urban to urban. We use the information

Table 11
Mechanisms.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Education				Migration as adult				Working in agriculture			
	Father	Father LBC	Mother	Mother LBC	Father	Father LBC	Mother	Mother LBC	Father	Father LBC	Mother	Mother LBC
Parents' migration	4.296*** (0.431)	3.914*** (0.664)	4.547*** (0.378)	4.335*** (0.613)	1.705*** (0.056)	1.858*** (0.061)	0.037 (0.074)	0.090 (0.345)	-1.268*** (0.286)	-1.058* (0.547)	-1.174*** (0.162)	-0.992*** (0.345)
/lnathrho	-0.624*** (0.074)	-0.547*** (0.108)	-0.662*** (0.069)	-0.589*** (0.106)	-1.081*** (0.074)	-1.199*** (0.075)	0.031 (0.036)	-0.009 (0.173)	0.947** (0.421)	0.569 (0.417)	0.804*** (0.186)	0.570** (0.257)
/lnsigma	1.275*** (0.016)	1.234*** (0.016)	1.277*** (0.018)	1.239*** (0.017)	0.125*** (0.020)	0.067*** (0.019)	0.005 (0.018)	0.001 (0.019)				
Province effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls on outcome equation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Selection equation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8039	7255	11,035	9855	8241	7441	11,410	10,194	8241	7441	11,410	10,194
F	50.33	137.9	77.26	165.7	72.48	141.4	35.03	134.9	223.3	115.0	244.1	163.5
Lambda	-1.984	-1.710	-2.079	-1.826	-0.900	-0.891	0.0307	-0.00884				
Converged	1	1	1	1	1	1	1	1	1	1	1	1

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. LBC is left-behind children. Column (9)-(12) results using seemingly unrelated bivariate probit regression rather than endogenous treatment regression due to its bivariate outcome variable. Dependent Variable for (1)-(4) is children's complete years of schooling, column (5)-(8) is children's number of between district migration as adults, column (9)-(12) is children's working in agriculture as adults. Control variables are born in urban, age, being male, being in urban. Variables on selection equation is the same as the one in the main equation. /athrho and /lnsigma are ancillary parameters estimated, whereas lambda is rho times sigma. These parameters indicate outcome and treatment unobservables. Negative signs indicate unobservables that increase observed children per capita expenditure, tending to occur with unobservables that decrease the observed parental migration. All estimation standard errors are clustered at household level and all samples are weighted. Variables definition refer to Table 5.

Table 12
Robustness check: Excluding Jakarta and Java island.

	(1)	(2)	(3)	(4)
	Excluding Jakarta		Excluding Java	
	Father	Mother	Father	Mother
Ln expenditure per capita (excap)	0.610*** (0.016)	0.626*** (0.014)	0.642*** (0.024)	0.651*** (0.021)
Parents' migration (migration)	0.852** (0.403)	0.886*** (0.333)	0.924 (0.566)	1.087** (0.473)
Interaction: migration × excap	-0.022 (0.036)	-0.012 (0.030)	-0.018 (0.049)	-0.015 (0.043)
Constant	5.874*** (0.211)	6.075*** (0.171)	5.335*** (0.317)	5.639*** (0.265)
/athrho	-0.461*** (0.084)	-0.624*** (0.060)	-0.597*** (0.156)	-0.816*** (0.071)
/lnsigma	-0.474*** (0.018)	-0.458*** (0.017)	-0.372*** (0.030)	-0.330*** (0.026)
Province effects		Yes	Yes	Yes
Year effects		Yes	Yes	Yes
Controls on outcome equation		Yes	Yes	Yes
Selection equation		Yes	Yes	Yes
Observations		7582	10,520	4599
F		127.7	180.8	101.3
Lambda		-0.268	-0.350	-0.484
Converged		1	1	1

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. /athrho and /lnsigma are ancillary parameters estimated, whereas lambda is rho times sigma. These parameters indicate outcome and treatment unobservables. Negative signs indicate unobservables that increase observed children per capita expenditure, tending to occur with unobservables that decrease the observed parental migration. All estimation standard errors are clustered at household level and all samples are weighted. Variables definition refer to Table 5.

on urban and rural status at the place where the parents lived at age 12 as the place of origin, and the information on the place they migrated to as the destination.

The intergenerational elasticity coefficients in all estimations are still consistent with the main estimation (see Table 16). However, we find that if we redefine the migration dummy as between-regions migration, the migration coefficient switches to negative, and the interaction of fathers' migration and fathers' per capita expenditure is positive and significant. This shows that fathers' migration out of their island (across regions) leads to lower per capita expenditure for their children compared with the children from fathers who migrate in-island or stay. This also suggests that long-distance parental migration may not benefit the

Table 13
Robustness check: Different age benchmark and income.

	(1)	(2)	(3)	(4)	(5)	(6)
	Excap at 30 y.o		Excap at 60 y.o		Income	
	Father	Mother	Father	Mother	Father	Mother
Ln expenditure per capita (excap)	0.589*** (0.016)	0.722** (0.338)	0.602*** (0.016)	0.628*** (0.014)		
Parents' migration (migration)	0.754* (0.394)	0.608*** (0.014)	0.641 (0.421)	0.574* (0.338)	0.093 (0.624)	0.452 (0.686)
Interaction: migration × excap	-0.016 (0.035)	-0.001 (0.029)	-0.015 (0.035)	-0.002 (0.029)		
Ln income					0.112*** (0.020)	0.130*** (0.020)
Interaction: migration × income					0.024 (0.041)	0.014 (0.049)
Constant	5.781*** (0.209)	5.750*** (0.175)	6.632*** (0.225)	6.970*** (0.175)	13.721*** (0.467)	14.004*** (0.440)
/athrho	-0.429*** (0.088)	-0.580*** (0.077)	-0.330*** (0.089)	-0.440*** (0.098)	-0.162* (0.098)	-0.199*** (0.066)
/lnsigma	-0.470*** (0.016)	-0.460*** (0.016)	-0.498*** (0.017)	-0.506*** (0.018)	-0.089*** (0.020)	-0.010 (0.022)
Province effects	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Controls on outcome equation	Yes	Yes	Yes	Yes	Yes	Yes
Selection equation	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8211	11,377	8176	11,311	2902	2600
F	123.9	173.9	132.7	191.8	75.49	402.5
Lambda	-0.253	-0.330	-0.194	-0.250	-0.147	-0.194
Converged	1	1	1	1	1	1

Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. /athrho and /lnsigma are ancillary parameters estimated, whereas lambda is rho times sigma. These parameters indicate outcome and treatment unobservables. Negative signs indicate unobservables that increase observed children per capita expenditure, tending to occur with unobservables that decrease the observed parental migration. All estimation standard errors are clustered at household level and all samples are weighted. Variables definition refer to Table 5.

children. The interaction variable is positive and statistically significant, suggesting that migration out of an island leads to more intergenerational persistence. However, we have to be careful with this result as only three percent of the total sample of the child–father pairs comprises fathers who migrated across regions. This shows one of the limitation of this paper as we are not able to include the distance of parental migration.

According to other across-districts definitions of migration, the interaction variables are also consistently non-significant as in our main estimations, although the signs are mixed. This also shows that regardless of whether the origin or destination is urban or rural, across-district parental migration does not promote intergenerational mobility.

8. Conclusions

In this paper, we try to understand whether parental past migration at the time when the children were aged 0–14 years has a long-term impact on the children's per capita expenditure as adults and therefore their intergenerational mobility. Our findings show that parental migration increase the education level of the children and their per capita expenditure; it increases intergenerational mobility of the children as adults compared with non-migrants' children when they live in urban areas as adults, come from the poorest parents, or had migrated as a child. The left-behind children have more intergenerational mobility than the children of non-migrants only when their father migrated, and there is no significant impact when the mother migrated. The results are robust when we exclude the children living in Java, living in Jakarta, use individual income and use a different definition of migration, although migration across regions leads to intergenerational persistence.

There are some limitations in our paper due to limited information from the data. We are not able to identify if father and mother move together with their children as family, hence the separate analysis of father–child and mother–child pairs. We are also unable to capture the complexity of migration and to include the length, frequency, circularity, and the distance of parental migration.

Future research may want to look more into the reasons why parental migration failed to break intergenerational persistence and investigate the impact of professional persistence from parents to children. Also, it might be appropriate to explore the heterogeneous effects across migration locations. Our robustness checks suggest that changing the parental migration from between districts to between islands, which implies a costlier migration, results in negative impacts on the children when adults.

Table 14
Robustness check: Parental education and earnings pre-migration.

	(1)	(2)	(3)	(4)
	Parental education		Parental expenditure	
	Father	Mother	Father	Mother
Ln expenditure per capita (excap)	0.599*** (0.017)	0.630*** (0.015)	0.871** (0.418)	0.929** (0.363)
Parents' migration (migration)	1.310*** (0.436)	0.964*** (0.369)	0.583*** (0.016)	0.595*** (0.014)
Interaction: migration × excap	-0.060 (0.037)	-0.025 (0.032)	-0.027 (0.035)	-0.019 (0.030)
Constant	5.969*** (0.222)	6.002*** (0.189)	6.221*** (0.212)	6.447*** (0.171)
/athrho	-0.503*** (0.071)	-0.598*** (0.079)	-0.420*** (0.099)	-0.593*** (0.083)
/Insigma	-0.479*** (0.017)	-0.484*** (0.018)	-0.471*** (0.016)	-0.458*** (0.017)
Province effects	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes
Controls on outcome equation	Yes	Yes	Yes	Yes
Selection equation	Yes	Yes	Yes	Yes
Observations	7202	8935	8176	11,311
F	114.3	159.3	125.2	174.0
Lambda	-0.288	-0.330	-0.248	-0.337
Converged	1	1	1	1

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. /athrho and /Insigma are ancillary parameters estimated, whereas lambda is rho times sigma. These parameters indicate outcome and treatment unobservables. Negative signs indicate unobservables that increase observed children per capita expenditure, tending to occur with unobservables that decrease the observed parental migration. All estimation standard errors are clustered at household level and all samples are weighted. Variables definition refer to Table 5.

Table 15
Robustness check: Co-living.

Dep. var: children's ln household per capita expenditure	(1)	(2)	(3)	(4)
	All Samples		Left-behind	
	Father	Mother	Father	Mother
Parents' ln household per capita expenditure (excap)	0.609*** (0.016)	0.640*** (0.014)	0.610*** (0.016)	0.640*** (0.014)
Parents' migration	0.403 (0.389)	0.329 (0.300)	1.414** (0.596)	0.557 (0.468)
Interaction: parents' migration and excap	-0.005 (0.035)	-0.000 (0.027)	-0.102* (0.053)	-0.025 (0.042)
Co-living with father	-0.175*** (0.040)	0.179*** (0.017)	-0.173*** (0.043)	0.174*** (0.018)
Co-living with mother	0.454*** (0.036)	0.085*** (0.025)	0.448*** (0.039)	0.083*** (0.026)
Head of household or spouse	-0.028 (0.027)	-0.024 (0.020)	-0.028 (0.028)	-0.019 (0.021)
Constant	4.085*** (0.206)	4.028*** (0.163)	4.107*** (0.210)	4.052*** (0.166)
/athrho	-0.243*** (0.060)	-0.241*** (0.065)	-0.123*** (0.047)	-0.167*** (0.061)
/Insigma	-0.520*** (0.017)	-0.554*** (0.016)	-0.522*** (0.019)	-0.562*** (0.017)
Year effects	yes	yes	yes	yes
Province effects	yes	yes	yes	yes
control variables (female, age, age-squared)	yes	yes	yes	yes
Selection equation	yes	yes	yes	yes
Observations	8211	11,311	7384	10,112
F	114.4	159.8	3149	386.7
lambda	-0.142	-0.136	-0.0726	-0.0946
converged	1	1	1	1

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. /athrho and /Insigma are ancillary parameters estimated, whereas lambda is rho times sigma. These parameters indicate outcome and treatment unobservables. Negative signs indicate unobservables that increase observed children per capita expenditure, tending to occur with unobservables that decrease the observed parental migration. All estimation standard errors are clustered at household level and all samples are weighted. Variables definition refer to Table 5.

Table 16
Robustness check: Different Definition of Migration.

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
	Across regions migration				Across districts: rural-urban				Across districts: urban-rural				Across districts: urban-urban			
	Father		Mother		Father		Mother		Father		Mother		Father		Mother	
Parents' ln per capita expenditure (excap)	0.587*** (0.015)	0.604*** (0.013)	0.588*** (0.015)	0.611*** (0.014)	0.588*** (0.015)	0.620*** (0.015)	0.586*** (0.015)	0.612*** (0.015)	0.587*** (0.015)	0.620*** (0.015)	0.586*** (0.015)	0.612*** (0.015)	0.586*** (0.015)	0.612*** (0.015)	0.586*** (0.015)	0.612*** (0.015)
Parents' migration (migration)	-1.536** (0.698)	-0.878 (0.578)	0.874 (0.746)	0.424 (0.629)	-0.297 (0.992)	0.913 (1.136)	1.127 (0.798)	0.503 (0.566)	-0.297 (0.992)	0.913 (1.136)	1.127 (0.798)	0.503 (0.566)	1.127 (0.798)	0.503 (0.566)	1.127 (0.798)	0.503 (0.566)
Interaction: migration × excap	0.166*** (0.057)	0.056 (0.045)	-0.043 (0.065)	0.033 (0.057)	0.062 (0.085)	-0.036 (0.100)	-0.056 (0.068)	0.007 (0.049)	0.062 (0.085)	-0.036 (0.100)	-0.056 (0.068)	0.007 (0.049)	-0.056 (0.068)	0.007 (0.049)	-0.056 (0.068)	0.007 (0.049)
Constant	6.245*** (0.198)	6.402*** (0.164)	6.212*** (0.199)	6.277*** (0.166)	6.222*** (0.198)	6.296*** (0.181)	6.232*** (0.200)	6.393*** (0.185)	6.222*** (0.198)	6.296*** (0.181)	6.232*** (0.200)	6.393*** (0.185)	6.232*** (0.200)	6.393*** (0.185)	6.232*** (0.200)	6.393*** (0.185)
/athrho	-0.222** (0.098)	0.249** (0.112)	-0.164** (0.071)	-0.523*** (0.066)	-0.306*** (0.064)	-0.349*** (0.077)	-0.293*** (0.085)	-0.399*** (0.072)	-0.306*** (0.064)	-0.349*** (0.077)	-0.293*** (0.085)	-0.399*** (0.072)	-0.293*** (0.085)	-0.399*** (0.072)	-0.293*** (0.085)	-0.399*** (0.072)
/lnsigma	-0.500*** (0.015)	-0.509*** (0.017)	-0.501*** (0.016)	-0.497*** (0.014)	-0.499*** (0.016)	-0.537*** (0.016)	-0.499*** (0.016)	-0.535*** (0.016)	-0.499*** (0.016)	-0.537*** (0.016)	-0.499*** (0.016)	-0.535*** (0.016)	-0.499*** (0.016)	-0.535*** (0.016)	-0.499*** (0.016)	-0.535*** (0.016)
Province effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls on outcome equation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Selection equation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8211	11,377	8211	10,045	8211	8344	8211	8344	8211	8344	8211	8344	8211	8344	8211	8344
N	8211	11377	8211	10045	8211	8344	8211	8344	8211	8344	8211	8344	8211	8344	8211	8344
F	126.5	169.1	122.0	164.3	122.6	1063	122.3	762.2	122.6	1063	122.3	762.2	122.3	762.2	122.3	762.2
Lambda	-0.132	0.147	-0.0987	-0.292	-0.180	-0.196	-0.173	-0.222	-0.180	-0.196	-0.173	-0.222	-0.173	-0.222	-0.173	-0.222
Converged	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. /athrho and /lnsigma are ancillary parameters estimated, whereas lambda is rho times sigma. These parameters indicate outcome and treatment unobservables. Negative signs indicate unobservables that increase observed children per capita expenditure, tending to occur with unobservables that decrease the observed parental migration. All estimation standard errors are clustered at household level and all samples are weighted. Variables definition refer to Table 5.

Table A.1
Robustness check: Excluding Jakarta and Java for left-behind children.

	(1)		(2)		(3)		(4)	
	Left-behind children				Excluding Jakarta			
	Excluding Jakarta		Excluding Java		Excluding Jakarta		Excluding Java	
	Father	Mother	Father	Mother	Father	Mother	Father	Mother
Ln expenditure per capita (excap)	0.611*** (0.016)	0.624*** (0.014)	0.637*** (0.024)	0.645*** (0.022)	0.611*** (0.016)	0.624*** (0.014)	0.637*** (0.024)	0.645*** (0.022)
Parents' migration (migration)	1.761*** (0.606)	0.811 (0.524)	1.379* (0.761)	0.472 (0.745)	1.761*** (0.606)	0.811 (0.524)	1.379* (0.761)	0.472 (0.745)
Interaction: migration × excap	-0.113** (0.055)	-0.006 (0.047)	-0.079 (0.073)	0.030 (0.069)	-0.113** (0.055)	-0.006 (0.047)	-0.079 (0.073)	0.030 (0.069)
Constant	5.902*** (0.214)	6.146*** (0.173)	5.404*** (0.319)	5.716*** (0.275)	5.902*** (0.214)	6.146*** (0.173)	5.404*** (0.319)	5.716*** (0.275)
/athrho	-0.291*** (0.086)	-0.540*** (0.061)	-0.282 (0.235)	-0.634*** (0.101)	-0.291*** (0.086)	-0.540*** (0.061)	-0.282 (0.235)	-0.634*** (0.101)
/lnsigma	-0.496*** (0.016)	-0.494*** (0.015)	-0.416*** (0.026)	-0.396*** (0.024)	-0.496*** (0.016)	-0.494*** (0.015)	-0.416*** (0.026)	-0.396*** (0.024)
Province effects	Yes							
Year effects	Yes							
Controls on outcome equation	Yes							
Selection equation	Yes							
Observations	6882	9384	2908	3929	6882	9384	2908	3929
F	1206	449.7	560.8	191.7	1206	449.7	560.8	191.7
Lambda	-0.172	-0.301	-0.181	-0.377	-0.172	-0.301	-0.181	-0.377
Converged	1	1	1	1	1	1	1	1

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. /athrho and /lnsigma are ancillary parameters estimated, whereas lambda is rho times sigma. These parameters indicate outcome and treatment unobservables. Negative signs indicate unobservables that increase observed children per capita expenditure, tending to occur with unobservables that decrease the observed parental migration. All estimation standard errors are clustered at household level and all samples are weighted. Variables definition refer to Table 5.

Table A.2

Robustness check: Different age benchmark and income for left-behind children.

	(1)	(2)	(3)	(4)	(5)	(6)
	Left-behind children					
	Excap at 30 y.o		Excap at 60 y.o		Income	
	Father	Mother	Father	Mother	Father	Mother
Ln expenditure per capita (excap)	0.589*** (0.016)	0.604*** (0.014)	0.603*** (0.016)	0.627*** (0.014)		
Parents' migration (migration)	1.631** (0.637)	0.767 (0.509)	1.631** (0.637)	0.663 (0.508)	-0.237 (0.815)	0.026 (0.997)
Interaction: migration × excap	-0.105* (0.054)	-0.008 (0.045)	-0.107** (0.054)	-0.016 (0.044)		
Ln income					0.114*** (0.020)	0.129*** (0.020)
Interaction: migration × income					0.050 (0.056)	0.034 (0.076)
Constant	5.821*** (0.210)	5.828*** (0.174)	6.661*** (0.228)	7.018*** (0.175)	13.866*** (0.482)	14.351*** (0.427)
/athrho	-0.243*** (0.077)	-0.472*** (0.081)	-0.160** (0.066)	-0.326*** (0.091)	-0.152** (0.062)	-0.137 (0.087)
/lnsigma	-0.489*** (0.016)	-0.492*** (0.014)	-0.507*** (0.017)	-0.529*** (0.015)	-0.090*** (0.020)	-0.016 (0.023)
Province effects	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Controls on outcome equation	Yes	Yes	Yes	Yes	Yes	Yes
Selection equation	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7384	10,112	7384	10,112	2615	2336
F	1547	448.1	2936	529.7	1317	1168
Lambda	-0.146	-0.269	-0.0955	-0.186	-0.138	-0.134
Converged	1	1	1	1	1	1

Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. /athrho and /lnsigma are ancillary parameters estimated, whereas lambda is rho times sigma. These parameters indicate outcome and treatment unobservables. Negative signs indicate unobservables that increase observed children per capita expenditure, tending to occur with unobservables that decrease the observed parental migration. All estimation standard errors are clustered at household level and all samples are weighted. Variables definition refer to Table 5.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request

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Appendix. Robustness check for left-behind children

The results of robustness check on the sub-sample of left-behind children and children from non-migrated parents show similar pattern with the result from main model specification for left-behind children (see Tables A.1–A.4). As the full-sample, there is an exception if we use definition of migration as migrating inter-region. The explanation will be similar as the full-sample because

Table A.3Robustness check: Parental education and earnings pre-migration for left-behind children.
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	(1)	(2)	(3)	(4)
	Parental education		Parental expenditure	
	Father	Mother	Father	Mother
Ln expenditure per capita (excap)	0.572*** (0.018)	0.630*** (0.015)	0.588*** (0.016)	0.597*** (0.014)
Parents' migration (migration)	2.142*** (0.667)	1.255** (0.541)	1.681*** (0.590)	1.055** (0.535)
Interaction: migration × excap	-0.162*** (0.059)	-0.059 (0.048)	-0.108** (0.053)	-0.031 (0.046)
Constant	6.176*** (0.227)	6.027*** (0.190)	6.201*** (0.215)	6.468*** (0.171)
/athrho	-0.169*** (0.058)	-0.435*** (0.084)	-0.252*** (0.085)	-0.518*** (0.087)
/Insigma	-0.524*** (0.019)	-0.521*** (0.017)	-0.488*** (0.016)	-0.488*** (0.014)
Province effects	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes
Controls on outcome equation	Yes	Yes	Yes	Yes
Selection equation	Yes	Yes	Yes	Yes
Observations	6460	7900	7384	10,112
F	154.1	141.0	1173	449.3
Lambda	-0.0993	-0.243	-0.152	-0.292
Converged	1	1	1	1

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. /athrho and /Insigma are ancillary parameters estimated, whereas lambda is rho times sigma. These parameters indicate outcome and treatment unobservables. Negative signs indicate unobservables that increase observed children per capita expenditure, tending to occur with unobservables that decrease the observed parental migration. All estimation standard errors are clustered at household level and all samples are weighted. Variables definition refer to Table 5.

Table A.4

Robustness check: Different definition of migration for left-behind children.

	Across regions migration		Across districts: rural-urban		Across districts: urban-rural		Across districts: urban-urban	
	Father	Mother	Father	Mother	Father	Mother	Father	Mother
Parents' ln per capita expenditure (excap)	0.589*** (0.017)	0.602*** (0.014)	0.576*** (0.018)	0.603*** (0.014)	0.589*** (0.016)	0.601*** (0.014)	0.589*** (0.016)	0.601*** (0.014)
Parents' migration (migration)	-1.941 (1.323)	-0.444 (0.952)	0.221 (1.094)	0.552 (0.956)	-1.707 (1.342)	1.293 (1.204)	2.642* (1.478)	0.885 (0.806)
Interaction: migration × excap	0.148** (0.073)	0.096 (0.085)	-0.006 (0.099)	0.006 (0.085)	0.190* (0.113)	-0.062 (0.109)	-0.184 (0.128)	-0.021 (0.069)
Constant	6.203*** (0.220)	6.427*** (0.173)	5.810*** (0.235)	6.424*** (0.173)	6.189*** (0.216)	6.428*** (0.172)	6.196*** (0.216)	6.454*** (0.171)
/athrho	0.266 (0.451)	-0.402*** (0.104)	-0.077 (0.160)	-0.350*** (0.101)	-0.316*** (0.062)	-0.333*** (0.074)	-0.244*** (0.079)	-0.398*** (0.066)
/Insigma	-0.499*** (0.021)	-0.511*** (0.014)	-0.390*** (0.016)	-0.512*** (0.014)	-0.500*** (0.017)	-0.513*** (0.015)	-0.499*** (0.017)	-0.514*** (0.015)
Province effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls on outcome equation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Selection equation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6971	9517	7045	9513	6947	9449	6988	9526
F	53456	590.7	10102	468.5	5709	1005	7413	862.9
Lambda	0.158	-0.229	-0.0521	-0.201	-0.185	-0.192	-0.145	-0.226
Converged	1	1	1	1	1	1	1	1

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. /athrho and /Insigma are ancillary parameters estimated, whereas lambda is rho times sigma. These parameters indicate outcome and treatment unobservables. Negative signs indicate unobservables that increase observed children per capita expenditure, tending to occur with unobservables that decrease the observed parental migration. All estimation standard errors are clustered at household level and all samples are weighted. Variables definition refer to Table 5.

this inter-region migration is a more risky and costly. Another exception is if we use income instead of per capita expenditure, the interaction coefficient's sign is changing to positive and it become insignificant for the child–father pairs. Again, we have to be cautious using income as in this case we lose 66% of the left-behind-child–fathers pairs compare to using per capita expenditure due to missing data on income .

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