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## ► To cite this version:

Simone Bertoli, Elsa Gautrain, Elie Murard. Left behind, but not immobile: Living arrangements of Mexican transnational households. *Economic Development and Cultural Change*, 2023, 71 (4), pp.1359-1395. 10.1086/717282 . hal-03343558

**HAL Id: hal-03343558**

**<https://uca.hal.science/hal-03343558v1>**

Submitted on 14 Sep 2021

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# Left behind, but not immobile: Living arrangements of Mexican transnational households\*

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## Abstract

We provide evidence that most Mexican children exposed to the international migration of their fathers experience further variations in their living arrangements, or the dissolution of the marital union of their parents. Children left behind typically join the household of their maternal grandparents. These changes have relevant implications for the analysis of the effects of migration and remittances: they interfere with the identification of instances of paternal migration in standard cross-sectional or longitudinal surveys, and they can give rise to heterogeneity in the effects of interest making some key household-level variables endogenous with respect to the treatment.

**Keywords:** migration; remittances; children; household structure; living arrangements; extended family.

**JEL classification codes:** D10; F22; C83.

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\*The Authors are grateful to the Editor-in-Chief Marcel Fafchamps, to the Guest Editor David McKenzie, to two anonymous referees, and to Nancy Chau, Isabelle Chort, Maëlys de la Rupelle, Flore Gubert and to the participants to various conferences and seminars for their comments, as well as to the INEGI for providing additional data derived from the survey connected to the 2010 Census; Simone Bertoli and Elsa Gautrain acknowledge the support received from the *Agence Nationale de la Recherche* of the French government through the program “*Investissements d’avenir*” (ANR-10-LABX-14-01); an earlier version of this paper was circulated under the title “Left behind, but not alone: Changes in living arrangements and the effects of migration and remittances in Mexico”. Data and codes for replication are provided through Dataverse at <https://doi.org/10.7910/DVN/LEG8B9>; the usual disclaimers apply.

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“When her husband went to New Mexico just after their wedding, Jazmín decided to stay with her parents rather than following the tradition of moving to her husband’s community. Jazmín said that her mother is a great help with her toddler son.”

Deborah Boehm (2012), *Intimate migrations*.

“Grandparents are the most common caregivers when mothers migrate [...] The prevalence of the practice of leaving children with maternal grandparents is curious given [...] the predominance of patrilocal residential patterns.”

Joanna Dreby (2010), *Divided by Borders*.

## 1 Introduction

The decision to cross a border can give rise to prolonged periods of physical separation for individuals who used to live together, and paternal migration can produce wide-ranging implications for the children who are left behind. The use of the expression “transnational household” (see, for instance, [Abarcar et al., 2020](#); [Ambler, 2015](#); [Ashraf et al., 2015](#); [Clemens and Tiongson, 2017](#)) to jointly refer to the individuals who belonged to the household of origin of the migrant, even though they are no longer co-residing, is meant to reflect the strength of the interactions between the migrant and the left behind. However, paternal migration might expose the children to a heightened risk of separation of their parents, and it could also induce additional changes in the composition of the household of origin of the migrants. The effects of migration on the left behind are generally analyzed in the economic literature without taking into account the associated changes within the ensuing transnational household,<sup>1</sup> and this mostly reflects binding data constraints.<sup>2</sup> The occurrence of an international migration episode can entail that the resulting household structure is no longer optimal,<sup>3</sup> and this can induce the left behind to move in with previously non co-residing relatives. Interestingly, concerns about the influence of parental migration on the living arrangements of the children left behind motivated the choice of the World Bank to include retrospective questions on

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<sup>1</sup>[Gibson et al. \(2011\)](#) and [Cortés \(2015\)](#) represent two exceptions, as they discuss the influence of international migration on the living arrangements of the left behind.

<sup>2</sup>The limited evidence about the structure of the household of origin of the migrants contrasts with the scholarly interest around the living arrangements of the immigrants (see [Adserà and Ferrer, 2015](#), for a review), which are typically considered as a yardstick of their integration in the country of destination.

<sup>3</sup>“Changes in household structure can be explained as the result of many of the same forces as those driving marriage formation and dissolution.” ([Fafchamps and Quisumbing, 2008](#), p. 3235).

migration in its Living Standard Measurement Surveys (Bilsborrow, 2016).<sup>4</sup>

Does the occurrence of an international migration episode change the living arrangements of those left behind? In particular, does paternal migration induce the children left behind to join another household within the extended family network? If this is the case, what are the ensuing analytical challenges for data collection and for the analysis of the effects of migration and remittances on children, and how these can be addressed?

We analyze these research questions in the case of the Mexican migration. More precisely, we focus on Mexican children exposed to paternal (and possibly also to maternal) international migration. This choice has three main motivations: First, we know that migration from Mexico to the United States typically occurs in stages, with men living behind their partners and children (Cerrutti and Massey, 2001),<sup>5</sup> and with paternal migration being the main cause of non co-residence of Mexican children with their fathers (Nobles, 2013). Second, Bertoli and Murard (2020) have provided evidence that the occurrence of an international migration episode is associated with further variations in the composition of the households of origin of Mexican migrants.<sup>6</sup> Third, this country represents a focal point in the literature analyzing the effects of international migration on the left behind, and notably on the children (see, for instance, Alcaraz et al., 2012; Antman, 2011, 2012, 2015; McKenzie and Rapoport, 2011).

Mexico is a traditionally patrilocal country (see Angelucci et al., 2010, on this) where newly married couples co-reside, typically for a few years, with the parents of the husband before becoming neolocal, i.e., setting up an independent household, while matrilocality, i.e., co-residence with the parents of the wife, is rather infrequent. The effect of the paternal

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<sup>4</sup>“[T]he LSMS survey of Ecuador in 2005–2006 [...] included a module on emigrants from the household, recording their current age, sex, relationship, education, and whether the emigrant left minor children under age 18 behind (there being special concern at the time, following the surge of emigrants to Spain in 1997–2003, about who was taking care of them following the emigration of a parent, often the mother).” (Bilsborrow, 2016, p. 125).

<sup>5</sup>McKenzie and Rapoport (2010) provide evidence that almost two thirds of the Mexican male immigrants recently arrived to the United States are married but not co-residing with their wives, which are likely to have been left behind in Mexico.

<sup>6</sup>More precisely, Bertoli and Murard (2020) provide evidence using longitudinal data that the households of origin of Mexican migrants are significantly more likely to experience the arrival of a new member, or to drop out of the sample, but they are unable to characterize how these changes modify the living arrangements of the individuals left behind.

migration on the living arrangements of the children is *prima facie* ambiguous, as remittances could represent the resources needed to set up an independent household. However, the prolonged physical separation from the father, with the economic and emotional uncertainty it implies, and a heightened risk of dissolution of the relationship of the two parents, could also push the children and their mothers, who previously formed a nuclear household, to move in the household of maternal grandparents, thus forming a new three-generation household. The initial quote from Dreby (2010) suggests that this is the case when the mother eventually joins the father in the United States. Co-residence with grandparents could, in turn, be associated with various outcomes for the children left behind (see, for instance, Arenas, 2017; Schmeer, 2013), and possibly mediate the effects of migration and remittances.

We address the proposed research questions by using three main data sources, notably the large-scale survey connected to the 2010 Census of the Mexican population,<sup>7</sup> the 2016 wave of the *Encuesta Nacional sobre la Dinámica de las Relaciones en los Hogares* (ENDIREH), a data source that had remained untapped in the migration literature, and all the waves between 2005Q1 and 2018Q4 of the *Encuesta Nacional de Ocupación y Empleo* (ENOE), a rotating panel survey following households for five consecutive quarters. These three surveys conducted by the INEGI, the Mexican National Statistical Institute, allow us to observe the living arrangements of the children left behind after or just before paternal migration.<sup>8</sup> Two additional data sources collected in the United States are also used in the analysis. Notably, various waves of the American Community Survey and of the Biannual June supplement of the Current Population Survey conducted by the Census Bureau allow us to document that a large share of Mexican couples that live together in the United States have left one or more children in Mexico. The use of data from five distinct surveys conducted at origin and at destination reflects the difficulty of overcoming the data constraints that had, so far, hindered the analysis of the frequency of changes in the living arrangements of the children left behind, and of their ensuing implications. Each data source taken separately gives valuable but just partial elements to answer our proposed research questions, but their joint use allows us to quantify the frequency of changes in living arrangements within Mexican transnational households.

The analysis of the data from the 2010 Census reveals that 45.3 percent of the Mexican

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<sup>7</sup>We will be referring to this data source as the 2010 Census for short.

<sup>8</sup>We also draw on the Mexican Family Life Survey (see Teruel et al., 2012) to describe the analytical challenges that are related to the variations in the living arrangements of the children left behind.

children aged 0 to 16 who are exposed to paternal international migration (henceforth the treated) co-reside with their grandparents.<sup>9</sup> For the children left behind who live with their mothers, we are able to further characterize their living arrangements: four out of five of them co-reside with maternal grandparents (while co-residence with paternal grandparents largely prevails among untreated children), and 36.3 percent of these children have their co-resident mothers who are *not* in a relationship at the time of the survey, something that magnifies the incidence of co-residence with maternal grandparents, from 18.7 to 45.0 percent.<sup>10</sup>

In comparison, only 11.8 percent of (untreated) children living with their fathers (and with or without their mothers) in Mexico co-reside with their grandparents. The analysis of ENOE data reveals that these major differences in living arrangements between treated and untreated children do not simply reflect self-selection into migration, as just 10.2 percent of the children were co-residing with their grandparents before the migration of their father.<sup>11</sup>

Thus, the share of treated children who co-reside with grandparents after the migration of their fathers is roughly four times larger than the corresponding share for both the untreated children and treated children right *before* the migration of their fathers. Furthermore, the data collected at destination reveal that a substantial fraction of the children left behind are also exposed to the migration of their mother. In this case, the incidence of co-residence with grandparents is as high as 78.9 percent. Co-residence with the grandparents still stands at 36.1 percent for the children left behind who live with their mothers.

We also provide evidence from the ENOE that children exposed to paternal migration live in households that are significantly (and substantially) more likely to drop out of the sample, while they are not more likely to see their grandparents moving in in later interviews. This, in turn, suggests that co-residence with maternal grandparents is associated with children left behind moving to a different housing unit.

Our paper makes three important contributions to the migration literature: first, we pro-

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<sup>9</sup>We define a child as being treated if (*i*) she does not co-reside with their father, and if (*ii*) she belongs to a remittance-recipient household; the 2010 Census does not provide a direct way to identify these children, e.g., the questionnaire does not include a follow-up question about where the non co-resident father is living.

<sup>10</sup>Co-residence with paternal grandparents stands respectively at 10.3 and 5.0 percent for the children left behind respectively with partnered and not partnered mothers; 54.7 percent of the children that we identify as being exposed to paternal migration in the 2010 Census co-reside with grandparents or have a separated mother (or both), and our analysis of the data strongly suggests that this share represents a lower bound.

<sup>11</sup>Among these children, co-residence with paternal rather than maternal grandparents is predominant, as it is the case among untreated children.

vide novel evidence on the prevalence of changes in the living arrangements of the children left behind. We find that the latter typically join their grandparents' household following paternal migration, which is a simple stylized fact that is consistent with sociological and ethnographic accounts of Mexican migration (Boehm, 2012; Dreby, 2010, 2015). This suggests that the distinction between the international migrant and the left behind should not be interpreted as an opposition between movement and immobility, and that it is not infrequent that Mexican transnational households are either deeply reshaped or fall apart. Furthermore, the evidence that we provide could extend to other migrant-sending countries, in particular those characterized by a higher incidence of independent maternal migration, such as the Philippines, and the empirical evidence in Cortés (2015) is consistent with this conjecture.

Second, we show that these changes give rise to important analytical challenges that are related to (i) the fact that a substantial portion of the children left behind might drop out of the sample (in longitudinal surveys) or not be identified as such (in cross-sectional surveys), and to (ii) the endogeneity of some household-level characteristics that are commonly used as controls in regressions aimed at estimating the effect of migration or remittances on the children left behind. Analyses of the short-run effects of paternal migration on the children left behind using data from panel surveys, such as in Antman (2011), do not include in the analysis the treated children who move in to a different housing unit, and thus drop out of the sample. Changes in living arrangements or the separation of the parents also interfere with standard retrospective questions on the occurrence of migration episodes. These typically embed an objective co-residence condition at the time of migration, following the recommendations of UNDESA (2017),<sup>12</sup> or a subjective condition about whether migrants are still perceived by the respondents as being members of the surveyed household (as in the census of the Filipino population; see National Statistics Office of the Philippines, 2007). Similarly, questions on relatives residing abroad, which are included in the Mexican Family Life Survey, do not allow identifying children exposed to paternal migration when either the parents are no longer in a relationship, or the grandparents are the main caregivers of the

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<sup>12</sup>These questions are employed in Mexico by the INEGI in the Census (including in 2020) and in the various waves *Encuesta Nacional de la Dinámica Demográfica* (ENADID); a change in the living arrangements of the left behind leads to the violation of the co-residence condition (Bertoli and Murard, 2020; Wong Luna et al., 2006), as the migrant was not living with all the members of the surveyed household at the time of migration.

child, irrespective of whether the living arrangements changed after the father moved out of Mexico. The reliance on the answers to these questions can fail to capture an important share of children left behind, which might represent a selected sample with respect to the outcomes of interest.

The change in household composition implies that a number of household-level variables, and notably a measure of the average education of adult household members, become bad controls, as they are affected by endogenous adjustments in household composition following migration. The reliance of a measure of the level of education of the mother (McKenzie and Rapoport, 2011), or of the highest level of education rather than of the average level within the household (Yang, 2008) is not sensitive to the formation of larger three-generation households. Conversely, the use of variables related to the household head is, as already observed by Cox-Edwards and Rodríguez-Oreggia (2009), certainly problematic, and the same applies to variables relating to all adult members (Bertoli and Marchetta, 2014).

Third, our paper illustrates the new insights that can be gained by treating household structure as endogenous or fluid (Foster and Rosenzweig, 2002; Halliday, 2010), and by intertwining more closely the migration literature with the economics of the household, and with the economic analyses of inter-household relationships (see Cox and Fafchamps, 2008, for a review). Variations in the living arrangements of the left behind can possibly reduce expenditures (notably related to housing), which helps mitigate the “temporary financial hardship” (Antman, 2011) induced by the monetary investment into migration.

The rest of the paper is structured as follows: Section 2 draws on various data sources to analyze the living arrangements of children left behind, and compare them with those of other Mexican children. Section 3 discusses the observed and unobserved factors that are likely to jointly determine migration decisions and the occurring of changes within transnational households. Section 4 explores the two main analytical challenges arising from the observed change in living arrangements, and it sketches possible approaches to tackle them in analyses on the effects of migration and remittances on the left behind. Finally, Section 5 draws the main conclusions.



## 2 A simple stylized fact

We draw on five different surveys (three collected in Mexico, and two collected in the United States) to document and quantify a simple stylized fact: a large share of Mexican children that are exposed to the international migration of their fathers co-reside with their grandparents (mostly with their maternal grandparents). This share is significantly higher than the corresponding share for children that co-reside with their fathers in Mexico, and also higher than the share that we observe for the children left behind shortly before their fathers move to the United States. The frequency of variations in the living arrangements of the children left behind is magnified when the mother also migrates, or when she is no longer in a marital relationship with the migrant father.

### 2.1 Evidence from the 2010 Census

The first data source that we employ in the analysis is the large-scale survey connected to the Census of the Mexican population conducted by the INEGI in June 2010, to which we will be referring as the 2010 Census for short. An extended version of the questionnaire was administered to around 2.9 million households, which represented 10 percent of Mexican households. The questionnaire provides information on whether each household member co-resides with each of the two parents. In case of co-residence, the 2010 Census provides the individual identifier of the co-residing parent, while no follow-up question is asked in case of non co-residence, so we do not have information on whether the parent lives abroad. This prevents a direct identification of children exposed to paternal migration, but this data source offers two alternative ways of identifying them.

#### 2.1.1 Identifying children left behind

The first, and seemingly straightforward, way is to rely on the following retrospective question on the occurrence of migration episodes:

(Question IV.1) “During the last five years, that is, from June 2005 to today, has any person who lives or lived with you (in this housing unit) gone to live in another country?”

The use of the answer to this question is exposed to several problems: (*i*) the relationship of the migrant with the head of the surveyed household (or his marital status) is not recorded,

so we cannot unambiguously identify the father of the child among the enumerated migrants; (ii) migration episodes occurring more than five years before the Census are not recorded; (iii) surveyed household could deliberately misreport the information (Hamilton and Savinar, 2015), especially when the migrant is undocumented, and (iv) migrants are enumerated only if they co-resided with all the members of the surveyed household when they left Mexico, in line with UNDESA (2017). Point (iv) is particularly problematic to analyze variations in co-residence choices, as the movement of the child of a migrant father to a different household should automatically lead to a violation of the co-residence condition,<sup>13</sup> and thus the migration episode of their father would remain not enumerated.<sup>14</sup>

An alternative is to rely, for the children that do not co-reside with their fathers, on the question on the receipt of remittances from abroad,<sup>15</sup> relying on it as an (admittedly noisy) signal that the non co-resident father of the child has migrated to the United States.<sup>16,17</sup> The measurement error in this approach to identify the children left behind arises from the fact a migrant father might not be sending remittances back to Mexico (exclusion error), and that a child whose non co-resident father is not an international migrant might still belong to a remittance-recipient household (inclusion error). We provide evidence on the limited incidence of these two types of measurement error in Section 2.3 below.

We restrict the sample to children aged 0 to 16, who are not married or in a free union, and who are not parents. This sample selection criterion is motivated by the fact that older children (and especially girls) might not be co-residing with their fathers as they get

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<sup>13</sup>For each migrant listed in response to Question IV.1, the questionnaire includes this follow-up: (Question IV.5): “When [name] left for the last time, was [s]he living with you?”, with no information that is recorded in case of a negative answer; the INEGI clarifies that these two questions refer to individuals who “lived with the group of individuals who reside in the housing unit” that is surveyed (INEGI, 2010, p. 118).

<sup>14</sup>Bertoli and Murard (2020) provide econometric evidence that variations in household composition lead to the non enumeration of migration episodes in the 2000 Census of the Mexican population.

<sup>15</sup>The question on the receipt of remittances (over an unspecified recall period) is asked separately to all household members aged 12 and above, and information on the amount that is received is not provided.

<sup>16</sup>It is worth noting that this approach is less exposed to the concerns related to deliberate misreporting (Hamilton and Savinar, 2015), as the 2010 Census does not include any question related to the migrant who is sending back remittances.

<sup>17</sup>The 2010 Census also contains a question on the receipt of domestic transfers; this would, in principle, allow us to employ a similar definition of children exposed to the domestic migration of their fathers; however, such a definition would not allow differentiating migration from a simple non co-residence with the father, e.g., because of a *de jure* or *de facto* separation, who makes transfer to his former partner and to his children.

married or enter in a stable partnership, as Mexico is characterized by patrilocality, i.e., newly formed couples initially live together or close by the family of the male partner. This, in turn, would increase the likelihood that the child does not live with the father, and the receipt of remittances in the household to which the child belongs to is *uninformative* about the occurrence of paternal migration. No restriction is introduced with respect to the co-residence of the mother, so that children left behind might be co-residing with neither of the two parents. Similarly, we do not restrict the sample with respect to the marital status of the mother of the child;<sup>18</sup> this analytical choice, which is also related to the previous one (as the marital status of the mother is not observed when she does not co-reside with her child), is coherent with the possibility that the maternal marital status could be endogenous with respect to paternal migration.

The 2010 Census includes 103,076 children left behind, i.e., not co-residing with their fathers and living in a remittance-recipient household, aged 0 to 16. We will be comparing their living arrangements and the marital status of their parents with those of either (i) 4,040,873 untreated children, i.e., children whose fathers is not identified as an international migrant, aged 0 to 16 or (ii) 3,338,629 untreated children who co-reside with their fathers. With few exceptions, Mexican children who co-reside with their fathers also co-reside with their mothers, so that the sample at point (ii) includes almost only children who co-reside with both parents, who are either married or in an informal union, while the (larger) sample at point (i) also includes children whose parents are not in a relationship. Thus, these two samples correspond to two different assumptions about the living arrangements of the children left behind in the absence of the treatment, with their (counterfactual) living arrangements lying somewhere in between those that we observe for the children in these two samples.

Table 1 presents some basic descriptive statistics for the children left behind and for untreated children in the samples at point (i) and (ii) above. There are two noteworthy differences: a larger share of children left behind resides in rural areas (41.2 versus 26.4-27.8 percent), consistently with the substantially larger incidence of male migration out of rural areas (Fernández-Huertas Moraga, 2013), and the non co-residence with the mother is substantially more frequent for the children left behind (20.3 versus 2.4-6.3 percent).

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<sup>18</sup>The only minor exception is that we exclude from the analysis the children whose co-resident mother is widowed, as this strongly suggests that the father of the child is no longer alive.

The 2010 Census includes just 2,681 children aged 0 to 16 in remittance-recipient households that co-reside with their fathers but not with their mothers, compared to 80,385 children left behind that co-reside with their mothers (see Table 2), consistently with the sequential character of international migration evidenced by [Cerrutti and Massey \(2001\)](#). Thus, Mexican children are very rarely exposed to the migration of their mother while the father stays in Mexico, while they can be exposed to the migration of both parents. In this respect, Section A.1 in the Appendix provides evidence from the American Community Survey and the Current Population Survey that confirms that a substantial share of women who join their Mexican partners in the United States leave one or more of their children behind, rather than necessarily corresponding to instances of whole household migration ([McKenzie and Rapoport, 2010](#)).

## 2.2 Living arrangements

We can identify the children (both left behind and untreated) who co-reside with their grandparents using their relationship (and the ones of other household members) with the household head. The 2010 Census provides a very detailed description of the relationship with the household head, with 26 distinct entries.<sup>19</sup> When the child co-resides with the mother, we can also rely on her answers concerning co-residence with her own parents to differentiate between co-residence with maternal and paternal grandparents. These answers are not used to identify instances of co-residence with grandparents, as this would introduce an asymmetry in the definition for the children left behind, which could potentially inflate the share of these children co-residing with maternal grandparents.<sup>20</sup> Table 2 compares the living arrangements of the children left behind with those of the untreated children who co-reside with their fathers. 45.3 percent of the children left behind co-reside with their grandparents, while the corresponding share for the untreated children stands at 11.8

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<sup>19</sup>Almost invariably, instances of co-residence with the grandparents correspond to cases in which one of the grandparents is the household head (85.0 percent of the cases), or the parent of the household head (13.2 percent of the cases).

<sup>20</sup>This follows from the fact that children left behind do not, by construction, co-reside with their fathers; our symmetrical definition induces a measurement error, which appears to be modest in size: we have 321 children left behind that are not identified as co-residing with their grandparents, but whose mothers reports to be living with her own parent(s), compared to 28,393 children that are identified as co-residing with grandparents on the basis of the relationships with the household head.

percent. The absence of the mother is associated with a major increase in the incidence of co-residence with grandparents for both groups of children (33.6 percent for the untreated, 78.9 percent for the left behind).<sup>21</sup>

The difference in the incidence of co-residence with grandparents (or with maternal grandparents) is not driven by the differences in observables between untreated and left behind that emerge in Table 1. This can be seen from the last two data columns in Table 2, where we report the estimates of a regression where we include dummies for the age and gender of the child, and for residence in rural areas and in each of the 32 Mexican states to control for possible spatial differences in living arrangements that might be correlated with the incidence of international migration. The coefficients obtained from these regressions are almost identical to the differences in the raw data, e.g., the difference between Column (4) and Column (1) stands at  $0.453 - 0.118 = 0.335$ , while the coefficient of the corresponding regression stands at 0.344.

For the children left behind with their mothers (79.7 percent of the sample), 28.3 percent co-reside with maternal and 8.5 percent co-reside with paternal grandparents, while for untreated children we observe the opposite pattern, as 4.0 and 7.3 percent of them co-reside respectively with maternal and paternal grandparents. For these children, we also have information on the marital status of their mothers:<sup>22</sup> 63.5 percent of the children left behind have their mothers who is partnered (45.6 percent married, and 17.9 percent in a free union), while 36.5 percent of them are not partnered (24.2 percent separated or divorced, 12.3 percent single), as reported in last row of Table 3. If we consider the 3,783,632 untreated children aged 0 to 16 who co-reside with their mothers, 87.4 percent of them have a mother who is partnered, while 12.6 percent of them not in a relationship at the time of the survey. Thus, the share of co-resident mothers who are not in a relationship is almost three times larger

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<sup>21</sup>For the children left behind that do not co-reside neither with their parents nor with their grandparents, the main caregiver is typically either an aunt (50.1 percent), or an older sibling (27.8 percent).

<sup>22</sup>Interestingly, 3.4 percent of the 57,372 children left behind in our sample from the 2010 Census with partnered mothers live with the partner of their mothers (who are *not* their fathers); this figure is substantially below the corresponding share (39.6 percent) of children who co-reside with a step-father in a non-recipient household.; this pattern in the data is consistent with the plausible conjecture that the migrant father might stop sending remittances back when his former partner enters into a new stable relationship; if this is the case, then our approach to the identification of children left behind would also end up missing children that co-reside with a step father, leading to an underestimation of the extent to which Mexican transnational households reshape themselves, or fall apart.

among children left behind than among other Mexican children.<sup>23</sup> This pattern might reflect a higher propensity of the parents who are still in a relationship to reunite on either side of the border (i.e., a higher risk of marital dissolution for the Mexican couples that experience a prolonged period of physical separation) or a higher propensity to migrate for men who are separated or divorced. Our data do not allow to tease out these alternative but not mutually exclusive explanations.

Table 3 reveals that 29.0 percent and 50.2 percent of the children left behind whose mothers are respectively partnered and non-partnered co-reside with grandparents, and nine out of ten children left behind of non-partnered mothers co-reside with maternal grandparents. The corresponding figures for other Mexican children stand at 12.5 percent and 45.8 percent respectively.<sup>24</sup> Thus, children left behind are always more likely than other Mexican children to co-reside with their grandparents, but the difference is (both in absolute and in relative terms) higher for children whose mother is in a relationship. Table 3 can also be used to compute the share of children left behind (living with their mothers) who co-reside with grandparents (see Table 2) that we obtain assuming that they had the same propensity to co-reside with their grandparents as other Mexican children. This hypothetical share stands at  $0.635 \times 0.125 + 0.365 \times 0.458 = 24.7$  percent. Thus, the difference in co-residence with grandparents between the children left behind and other Mexican children (36.8 percent and 16.7 percent respectively) reflects both the higher share of children with non-partnered mothers, and the higher propensity to co-reside with grandparents for each marital status of the mother. In total, 54.7 percent of the children left behind have a non-partnered mother or co-reside with grandparents, revealing that a large fraction of so-called Mexican transnational households either reshape their composition, or simply fall apart.

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<sup>23</sup>A similar pattern emerges from the ENDIREH 2016, as Mexican women that report to have their current or former partner in the United States are three times more likely to be separated or divorced compared to the women that report to have their current or former partner in Mexico.

<sup>24</sup>The average for this group is equal to 16.7 percent, and the difference with respect to Table 2 is related to the fact that the sample used here also includes children in non-recipient households that do not co-reside with their fathers.

## 2.3 Concerns about measurement error

### 2.3.1 Exclusion and inclusion error

The indirect approach to the identification of the children exposed to paternal migration in the 2010 Census described in Section 2.1.1 above is exposed to the risk of both exclusion and inclusion error. The frequency of these two types of error is likely to vary with the marital status of the mother of children left behind. A solid relationship between the two parents is likely to be positively correlated with the receipt of remittances (lower exclusion error). A woman with a strained relationship may be more likely to receive transfers from a relative, e.g., a sibling, who has moved to the United States (higher inclusion error). The 2010 Census does allow to assess the relevance of measurement error, as it does not contain any information on the relationship between the recipients and the migrant who is sending back remittances. We thus need to draw on a different data source to address the concerns related to measurement error.

The ENDIREH 2016 is a survey focusing on the relationship among household members, with in-depth interviews for a sub-sample of the women belonging to survey households.<sup>25,26</sup> The INEGI interviewed 111,256 Mexican women in 2016, randomly selecting one woman among all women aged 15 and above from each one of the housing units that had been included in the sample. 40,754 partnered (married or in a free union) women aged 18 to 55 with at least one co-resident child aged from 0 to 16 went through the in-depth interview, and the survey contains a question on the co-residence with the partner, which allows identifying 1,313 partnered women that do not co-reside with their partner, with 554 of them reporting that their partner lives in the United States. For these 554 women left behind by a migrant partner, 522 report to be receiving remittances from abroad (94.2 percent), and only 8 (out of 759) women that do not co-reside with their partner who resides in Mexico report to be receiving remittances from abroad. This, in turn, is reassuring with respect to the limited incidence of the two types of measurement error: the exclusion error stands at  $32/554=5.8$  percent, and the inclusion error stands at  $8/554=1.4$  percent.

The ENDIREH 2016 also allows identifying 4,431 women that are currently separated or

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<sup>25</sup>Previous waves of this survey have been used in papers analyzing domestic or intimate partner violence (e.g., [Angelucci, 2008](#)), but not, to the best of our knowledge, to analyze Mexican migration.

<sup>26</sup>The ENDIREH 2016 is clearly uninformative about the incidence of measurement error for children who do not live with either of their parents.

divorced and who co-reside with a child aged 0 to 16, and it allows identifying the place of residence of their former partner. 280 of them report that their former partner resides in the United States at the time of the survey.<sup>27</sup> Here, both types of errors are substantially more relevant: only 125 out of these 280 women report to be receiving remittances (44.6 percent), while 84 women whose former partner is not an international migrant belong to a remittance-recipient household. Thus, the exclusion error stands at 55.4 percent, and the inclusion error is lower but still substantial, as it stands at  $84/280=30.0$  percent.<sup>28</sup> The high share of children left behind whose mother is not in a relationship is potentially a source of concern as, in this case, the measurement error is more substantial, and the children are more likely to co-reside with the grandparents (see Table 3).

This evidence entails that we need to assess the implication of an incorrect identification of the sample of children left behind for the evidence provided in Section 2.2 above about their living arrangements.

### 2.3.2 Measurement error in living arrangements

One can reasonably conceive explanations of the higher incidence of co-residence with grandparents for the children left behind in Table 2 that are centered around a differential incidence of measurement error in the identification of the children left behind across various living arrangements. For instance, a woman that is *de facto* or *de jure* separated from the father of her children who lives in Mexico is more likely to co-reside with her own parents, and to receive support from a relative who has migrated to the United States. Her children would clearly meet the two conditions that are used to identify exposure to paternal migration, and would be then incorrectly classified as children left behind, thus unduly inflating the share of children left behind co-residing with grandparents. The empirical relevance of this legitimate concern can be assessed relying on the ENDIREH 2016, a survey that, on substantially smaller sample, allows for a more direct identification of the exposure to the treatment.

If we go back to the sample of separated or divorced women with at least one co-resident child in the ENDIREH 2016, we have that 28.1 percent of the 125 women who report to both

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<sup>27</sup>No information is provided on the relative timing of migration and of the dissolution of the relationship with the partner.

<sup>28</sup>Mothers of children whose father is a migrant to the United States can also enter into a new stable relationship (marriage or free union), but the ENDIREH 2016 does not, in this case, provide any information about her former partners.



have their former partner in the United States and to receive remittances live with their own parents. The influence of the inclusion error seems negligible, as the share of co-residence with one's own parents for the 84 women that we incorrectly identify as left behind stands at 28.2 percent. Conversely, the exclusion error reduces the incidence of co-residence with their own parents, as this share stands at 36.7 percent among the women whose former partner is in the United States, but who do not receive remittances from abroad. In total, the combination of the two types of measurement error results in an underestimation of the incidence of co-residence with grandparents for children left behind. This is confirmed by Table A.1 in the Appendix A.2, where we draw on the ENDIREH 2016 to define (among the women that do not co-reside with a partner) the women left behind by an international migrant either on the basis of the direct questions on the place of residence of the current or of the former partner, or on the question on the receipt of remittances from abroad, in line with what we do to identify children left behind in the 2010 Census.

Table A.1 also shows that our inability to include in the treatment group (exposure to paternal migration) children who live in non-recipient households lowers the share of those with a separated or divorced mother (37.0 percent using the direct question versus 29.2 percent using the receipt of remittances). Similarly, using the data from the 2010 Census, Table A.2 in the Appendix A.2 reveals that 74.3 percent of the children not co-residing with their fathers and belonging to non-recipient households have a non-partnered mother, which is more than twice as large as the corresponding share for children left behind. It also shows that, conditional on the marital status of the mother, the two groups of children have a similar propensity to co-reside with maternal and paternal grandparents. Thus, Tables A.1-A.2 in the Appendix A.2 strengthen the argument that the measurement error in the definition of the children exposed to paternal migration due to the non-receipt of remittances is likely to lead to an underestimation of both the incidence of the dissolution in the relationship of the parents, and of the incidence of co-residence with (maternal) grandparents.

## 2.4 Variations in living arrangements

The stylized fact that we put forward in Section 2.2 might reflect either a differential self-selection into paternal migration across different living arrangements, or variations in living

arrangements after the exposure to the treatment,<sup>29</sup> or both. Notably, children belonging to a three-generation household might be more likely to be exposed to the migration of their fathers. The ENOE allows us to observe the living arrangements of the children left behind before paternal migration. This survey follows a household for (up to) five consecutive quarters, and around 20,000 Mexican households are included in the sample in each wave of the survey, and we draw on the waves conducted between 2005Q1 and 2018Q4. The ENOE (and its predecessors, such as the ENET and the ENEU) has been traditionally used in the economic literature on Mexican migration (e.g., [Alcaraz et al., 2012](#); [Antman, 2011](#); [Bertoli and Murard, 2020](#); [Fernández-Huertas Moraga, 2011, 2013](#)). This survey allows identifying the occurrence of international migration episodes from variations in the household roster across interviews (so, from the second interview), and its questionnaire includes a question on the current place of residence of the former household members who left the household. Thus, the ENOE allows us identifying all instances in which a child is exposed to the migration of his or her father, provided that the household of origin of the migrant does not drop out of the sample because of household dissolution occurring at the same time (more precisely, between two consecutive interviews) as the international migration episode ([Bertoli and Murard, 2020](#)).<sup>30</sup> The ENOE survey does not provide the identifier of the co-resident parents. This, in turn, obliges us to identify parents using information on the very detailed relationship of the child and of all household members with the household head. Similarly, as we did with the 2010 Census, the relationships with the household head of the child and of other household members can also be relied upon to define the living arrangements of the child at the time of the first interview.

Table 4 is based on 773,878 children aged 0 to 16 in non-attriter households who co-reside with both parents at the time of the first interview. For 8,202 of them, their father is reported to migrate to the United States in a later interview. For the (future) children left behind, only 10.6 percent co-resides with grandparents, and co-residence with paternal grandparents is predominant (6.7 and 3.9 percent respectively). As far as the stayers are concerned, their living arrangements are almost identical to the ones that emerge from Table

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<sup>29</sup>Unfortunately, none of the data sources that we employ allows us understanding the timing of the observed changes in living arrangements.

<sup>30</sup>Clearly, we also miss instances of whole household migration ([Ibarraran and Lubotsky, 2007](#)), as this would also lead to attrition, and instances in which the household members left behind deliberately misreport the current place of residence of a household member who moved out of Mexico ([Hamilton and Savinar, 2015](#)).

2: 5.1 percent co-reside with maternal and 6.4 percent with paternal grandparents.

It is important to notice that Table 4 misses the children left behind that are exposed to paternal migration if (i) they were not co-residing with their father when he left Mexico, or if (ii) they moved in a different housing unit shortly after the migration of their father. Point (i) is likely to lead to an underestimation in the incidence of co-residence with grandparents before the treatment, as children whose parents are separated or divorced are more likely to co-reside with (maternal) grandparents, as shown in Table 3 above. Reassuringly, McKenzie and Rapoport (2010) provide evidence that just a small fraction of ever-married recently arrived male Mexican immigrants to the United States is separated or divorced, among those who have ever been in a relationship ( $3.3/44.6=7.4$  percent, see Table 1 at p. 814).

Conversely, point (ii) would lead to an overestimation of the incidence of co-residence with grandparents for the children left behind before they get exposed to the treatment, both in absolute and relative to the stayers. This follows from the fact that, in Table 4, households in which paternal migration and the relocation of the household members left behind to a different housing unit occur simultaneously, i.e., both before the following interview, are not identified as instances of paternal migration (as no one is left to report the migration episode in the subsequent interview), and nuclear households are more likely to drop out of the sample than larger, three-generation households.

## 2.5 Children left behind are moving

The implications of Table 4 is that the stylized fact described in Section 2.1 reflects variations in the living arrangements of the children left behind that intervene after their exposure to the treatment. Table 5 still draws on the 2005Q1-2018Q4 waves of the ENOE to understand whether these variations reflect the fact that the children left behind move to a different housing unit, joining the household of their grandparents, or if rather the grandparents move in with the children. We use the longitudinal dimension of the data, defining a dummy variable Paternal migration $_{js}^q$  equal to 1 if the father of child  $j$  is reported to have migrated out of Mexico in quarter preceding the interview  $s = 2, \dots, 5$ , and where  $q = 2005Q1, \dots, 2018Q1$  represents the quarter in which the household of child  $j$  entered into the sample. Similarly, we define a dummy variable  $a_{js+1}^q$  equal to 1 if the household of child  $j$  drops out of the sample in any quarter following the interview  $s$ , with  $s = 2, 3, 4$ , and a dummy variable  $G_{js}^q$  equal to 1 if one grandparent joins the household of child  $j$  in the interview  $s$ , with

$s = 2, \dots, 5$ , or in a later interview. We run a regression of either  $a_{js+1}^q$  (Panel A) or  $G_{js}^q$  (Panel B) on Paternal migration  $a_{js}^q$  and on a progressively richer structure of fixed effects, which is described in Table 5. The units of observation are child-wave pairs, and standard errors are clustered at the household level.

The estimates reveal that paternal migration is significantly associated with a higher probability of attrition, while it is not associated with a higher probability that a grandparent moves in. In particular, the estimates in the third data column of Panel A imply that paternal migration is associated with a  $0.017/0.064=26.6$  percent higher probability of attrition. These results are consistent with the idea that the variation in the living arrangements of the children left behind correspond to their own movement to a different housing unit, with the ensuing dissolution the household of origin of the migrant leading to attrition, rather than to a movement of the grandparents. Two remarks are necessary here: First, the estimated differential in probability of attrition is insufficient to account for the differences in living arrangements for children left behind and for stayers observed in Table 2. This might reflect a high incidence of the dissolution of the household of origin of the migrant shortly after the migration episode, so that the episode of paternal migration remains unrecorded. Second, the ENOE covers (at most) a period of nine months following paternal migration, so it does not allow ruling out a possible opposite pattern intervening later on in time.<sup>31</sup> However, Bertoli and Murard (2020) provide evidence that elderly individuals are *underrepresented* among the individuals that move in our out Mexican households, thus confirming that the observed variation in living arrangements of the children left behind in Mexico is unlikely to correspond to instances in which their grandparents move.

### 3 Joint determination of migration and living arrangements

The exposure of Mexican children to the migration of their fathers, which represents the single most important cause of non co-residence with them (Nobles, 2013), appears to

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<sup>31</sup>We also considered using the MxFLS, as this longitudinal survey allows covering a longer time period since paternal migration; however, we have just 71 instances of the international migration of a father of children aged 0 to 16 between the first and the second wave, and 29.7 percent of the children exposed to paternal migration are attriters, i.e., they are not included in the sample of the second wave of the MxFLS.

be strongly associated with further major changes occurring within so-called transnational households. Co-residence with (maternal) grandparents for the children left behind can correspond to two opposite cases. A strained relationship between the migrant father and the mother left behind, which can induce a *de facto* or a *de jure* separation, can increase the chances that the children co-reside with maternal grandparents. But co-residence with maternal grandparents can also occur when the relationship between the parents remains solid, as this increases the chances that the mother joins her partner in the United States, leaving the children with her own parents (Dreby, 2010, 2015). Even though changes in living arrangements can intervene shortly after the migration of the father, as shown in Section 2.5, both cases become more likely as the time elapsed since paternal migration increases (see also Figure A.1 in the Appendix A on the propensity of Mexican women to join their partners in the United States).

Furthermore, the (lumpy) investment into migration out of Mexico can be subject to binding liquidity constraints (Angelucci, 2015), and pooling resources beyond the household of origin of the migrant can be a way to overcome them.<sup>32</sup> Co-residence with either parents or in-laws for a woman left behind and her children can be more likely when other non co-resident family members have contributed to finance the investment into migration, and be correlated with the importance of inter-household transfers within the extended family of the migrant. The formation of a larger three-generation households can be a way for the formerly non co-residing relatives to secure their access to the remittances, which can represent the repayment of the loan that the migrant has obtained to move to the United States (Poirine, 1997). This, in turn, suggests that co-residence with the previous generation could be more likely when the migrant comes from a household of low socioeconomic status. Co-residence with grandparents could also represent a way to soften the otherwise negative short-run consequences of paternal migration for the children left behind, as evidenced by Antman (2011) because of the monetary investment into migration. This, in turn, also implies that the health conditions of grandparents, their willingness and ability to take on additional responsibilities with respect to child care, and the number of siblings of the mother that already co-reside with them could influence the decisions concerning paternal migration.

The living arrangements of the children left behind are also likely to be correlated with the legal status of the migrant father. Undocumented migration exposes the migrant to

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<sup>32</sup>See Angelucci et al. (2010, 2018) on the extent of resource pooling within family networks in Mexico.

a possible wage penalty (Borjas and Cassidy, 2019), and it makes the ensuing remittance income for the left behind lower and more unstable.

Unobservables that are correlated with some key children outcomes such as schooling and child work are also likely to vary across children left behind with different living arrangements. For instance, children whose mothers have also moved to the United States are more likely to co-reside with grandparents (see Section 2.2) and also more likely to migrate themselves in the future, and this could depress the expected return from their investment in education (McKenzie and Rapoport, 2011). These arguments imply that paternal migration could produce heterogeneous effects on children left behind in Mexico across various living arrangements. We do not explore the data from the 2010 Census in this respect. This choice, which is also constrained by the paucity of information on children’s outcomes in the long form of the questionnaire, is motivated by the differential incidence of measurement error across various living arrangements. Measurement error is, in turn, likely to be correlated with unobserved variables, as those outlined above, that can also influence the observed outcomes for the children left behind.

## 4 Analytical challenges and tentative solutions

The changes in the Mexican transnational households following paternal migration that we have outlined in Section 2 above give rise to major analytical challenges for the analysis of the effects of migration and remittances on the children left behind. These challenges are related to the sheer possibility to identify the children left behind that moved to a different housing unit in standard cross-sectional or longitudinal surveys, and to the ensuing endogeneity of a number of relevant household-level variables. Reassuringly, some solutions can be deployed to tackle (at least partly) these challenges.

### 4.1 Missing children left behind in cross-sectional surveys

Asking questions about the occurrence of migration episodes in surveys conducted at origin is tricky, as current international migrants are *not* members of the surveyed household on the basis of its statistical definition, and the enumerators thus have to determine which migration episodes should be reported. Both a co-residence condition at the time of migration, recommended by UNDESA (2017) and used by the INEGI, or the subjective perception

that the migrant is still part of the household (see, for instance, [National Statistics Office of the Philippines, 2007, 2010](#)) run into problems when the household of origin of the migrant dissolves, or the migrant dissolves his union with the spouse or partner left behind (before or after migrating). Problems also arise when the survey lists, as done with the Mexican Family Life Survey, the relatives of the members of the surveyed household who are international migrants, if these questions do not relate directly to children.

#### 4.1.1 Retrospective questions with an objective or subjective condition

The 2010 Census employs retrospective questions on migration that embed the typical co-residence condition, as recalled in Section 2.1.1 above. If this condition fails, the record related to the migrant is deleted from the publicly available data. When the children left behind move in with their maternal grandparents, this violates the co-residence condition.<sup>33</sup> The same retrospective questions have also been employed by the INEGI in the 2000 and 2020 Census, and in the various rounds of the *Encuesta Nacional de la Dinámica Demográfica* (ENADID).<sup>34</sup>

Do the children that are identified as exposed to paternal migration by the retrospective questions on migration episodes have different living arrangements from those that we identify using the approach described in Section 2 above? Table 6 reproduces the structure of Table 2, comparing the living arrangements of the children left behind, as defined in Section

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<sup>33</sup>Following our request, the INEGI informed us that a negative answer to Question IV.5, which evaluates the respect of this condition, was given in 12,667 cases (compared to 152,344 cases with a positive answer). The 12,667 cases reported by the INEGI do not cover all instances of failure of the co-residence condition. This follows from the fact that, as observed by [Bertoli and Murard \(2020\)](#) for the 2000 Census, the key difference between Question IV.1 and Question IV.5 is that only the latter specifies that the co-residence condition has to be evaluated at the time of migration. Thus, if the migrant was a member of the surveyed household at some point in the past but not when he left Mexico, the respondent would give a positive answer to Question IV.1 but a negative one to Question IV.5. Conversely, if the migrant was never a member of the surveyed household, then the respondent can give a negative answer already to Question IV.1, and the latter appears to be the relevant case if the child moves in with his maternal grandparents, as Mexico is a patrilocal country and the migrant father is thus likely to have never co-resided with his in-laws.

<sup>34</sup>Interestingly, the LSMS conducted in Ecuador in 2005-2006 also gathered information on the migration of former members of the surveyed households ([INEC, 2005](#), p. 210). This implies that this survey potentially missed instances of parental migration that were followed by a change in the living arrangements of the children left behind, even though the concern about their living conditions had motivated this data collection effort ([Bilsborrow, 2016](#)).

2.1.1 with those of the 63,640 children aged 0 to 16 that do not co-reside with the father, and who live in a household that enumerates a current international male migrant who is between 17 and 69 years older than the child, and who might thus be the migrant father.<sup>35,36</sup>

The enumeration of this migrant represents an alternative (noisy) signal of the exposure of the child to paternal migration. Table 6 reveals that 31.2 percent of the children in this second group co-reside with grandparents (compared to 45.3 percent for the children left behind). When the mother is present, co-residence with grandparents stands at 25.9 percent (compared to 36.8 percent for children left behind), and the difference between the two groups is driven by a significantly lower incidence of co-residence with maternal grandparents (16.3 and 28.3 percent respectively). Thus, relying on the answers to the retrospective questions on migration included in the 2010 Census lowers the share of children co-residing with grandparents by  $(0.453-0.312)/0.453=32.1$  percent.<sup>37</sup> A higher share (89.4 percent) of children living in a household with an enumerated male migrant co-reside with their mothers (compared to 79.7 percent for children left behind).

The differences in living arrangements that emerge from Table 6 are remarkable, as the two signals (enumeration of a migrant, and receipt of remittances from abroad) are clearly correlated, and 35,937 children are identified as exposed to paternal migration on the basis of both signals. Moreover, the inclusion error with this second signal is certainly higher for children living in larger, three-generation household, who are more likely to enumerate as a migrant a former household member who is *not* the father of the child, and this inflates the share of co-residence with grandparents for children in households with an enumerated migrant. Thus, Table 6 confirms that the reliance on retrospective questions subject to a co-residence condition can indeed give a distorted picture of the living arrangements of the children exposed to paternal migration.

The dissolution of the marital relationship between the migrant and the partner left

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<sup>35</sup>Allowing for a very large (and unusual) difference between the age of the migrant and of the child is a conservative approach, that reduces (as discussed below) the chances of finding major differences in living arrangements in Table 6 between the two groups of children.

<sup>36</sup>Fewer children are identified as exposed to parental migration with this second signal; this could be due to various and not mutually exclusive explanations: (i) the father left Mexico before the five-year recall period covered by the retrospectively, (ii) deliberate non reporting, and (iii) the violation of the co-residence condition at the time of migration.

<sup>37</sup>Similarly, 17.5 percent of the children in households with an enumerated male migrant have a co-resident mother who is non-partnered (compared to 36.5 percent for children left behind).



behind, which should be immaterial for the co-residence condition described above, creates problems to identify the children exposed to parental migration when surveys employ a subjective condition. For instance, the Enumerator’s Manual of the 2007 Census of the Filipino Population specifies that “undocumented [migrants] are included if *the household still considers them as members* and if they mention their names when you ask about the names of household members” (National Statistics Office of the Philippines, 2007, p. 86, emphasis added). The difficulty arises from the fact that marital dissolution is likely to be associated to the perception that the migrant is no longer a member of the surveyed household, and hence her migration episode could remain unrecorded. Thus, children left behind whose parents dissolved their union (before or after the migration episode) are less likely to be correctly identified on the basis of surveys that employ a subjective condition to define the migrants that should be enumerated.

#### 4.1.2 Listing relatives residing abroad

A similar problem arises with the Mexican Family Life Survey; the questionnaire of the 2002 wave of this survey provides information on whether various relatives of the respondents reside in the United States. More precisely, questionnaire asks to each respondent:

(Question RE01) “Do you have any relatives in the United States?”

In case of a positive answer, the name(s) of the relative(s) are listed, and for each of them the enumerator records the relationship with the respondent (Question RE03): partner, father, mother, sibling, son or daughter, parent-in-law, grandparent, grandchild, cousin, uncle or aunt, niece or nephew, and other relative (specify). These questions, which are meant to facilitate the tracking of (future) international migrants, are only asked to household members aged 15 and above, and the only option for younger children is to rely on the answers provided by other household members to (indirectly) infer whether the non co-resident father is an international migrant. This is problematic in the presence of the living arrangements of Mexican transnational households that we have described in Section 2.

Let us consider the answers provided by the mother, or by the maternal grandparents of the children (when the mother does not belong to the same household). From the viewpoint of the mother, the migrant father is (or could be) her partner, but this piece of information is missing when the mother is either not partnered at the time of the survey, or when the mother co-resides with her partner who is not the father of the child. For maternal grandparents, the

questionnaire does not include questions related their son-in-laws.<sup>38</sup> Thus, the questionnaire does not allow identifying instances of paternal migration for children aged 0 to 14 who (i) have a non-partnered mother, (ii) co-reside with a step father, or (iii) live with maternal grandparents without their mothers. Our analysis of the sample of children left behind in the 2010 Census reveals that one of condition (i) is met for  $0.797 \times 0.365=29.1$  percent of the children left behind, while conditions (ii) and (iii) hold respectively for  $0.797 \times 0.034=2.7$  percent and  $0.789 \times 0.203=16.0$  percent (see Tables 2 and 3). As these three conditions are mutually exclusive, the indirect identification of children exposed to paternal migration is impossible using the questions in the 2002 wave of the MxFLS for 47.8 percent of the children that we identify as being left behind, irrespective of whether their living arrangements changed after their exposure to paternal migration.

#### 4.1.3 Alternative approaches to data collection and analysis

The ideal solution would be to detach the identification of the children exposed to paternal (or maternal) migration from the retrospective questions on the occurrence of migration episodes. Ideally, direct questions should be asked on where, in case of non co-residence, the parents of the child are living. However, this approach is not immune to concerns related to deliberate misreporting (Hamilton and Savinar, 2015), and it cannot be deployed with existing surveys. A pragmatic approach would be to rely on variables (notably, the receipt of remittances) that are likely to convey information on the (unknown) place of residence of non co-resident parent(s). If this is not possible, and the analysis has to be based on a data source that is likely to miss a substantial portion of children left behind that moved to a different housing unit or whose parents dissolved their union, then a re-weighting approach as the one used by McKenzie and Rapoport (2010) to deal with whole household migration could be considered, inflating the weight of the children left behind that are underrepresented in the sample. This approach rests on the assumption that the identification of the children left behind is, for a given living arrangement, orthogonal with respect to unobservables influencing the outcome of interest, and the empirical plausibility of this assumption should be adequately defended. In our case, we miss children exposed to paternal migration who belong to non-recipient households; as the absence of remittances is likely to be correlated

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<sup>38</sup>The detail for the last residual category (other relative) for the answers to Question RE03 are not included in the publicly available data.

with a strained relationship or with a separation of the parents, and with co-residence with grandparents, inflating the weights of children co-residing with grandparents in remittance-recipient households would be a questionable approach.

## 4.2 Missing children left behind in longitudinal surveys

Longitudinal surveys are also exposed to problems, as the changes in living arrangements of the left behind are associated with the dissolution of the household of origin of the migrant, and hence with attrition.<sup>39</sup> This leads to a selected sample of children left behind, compounding the problems that arise when a sample selection criterion is (indirectly) based on the living arrangements of the children. For instance, [Antman \(2011\)](#) uses longitudinal data for Mexico that have the same structure as the ENOE, and she only includes in her sample children of the household head;<sup>40</sup> this implies that the evidence that [Antman \(2011\)](#) provides is uninformative about the short-run effects of migration on the Mexican children co-residing with grandparents, as almost none of them is included in the sample (as they are either grandchildren of the head, or attriters),<sup>41</sup>

Tracking of individuals who move to a different housing unit, as in the Mexican Family Life Survey, could in principle represent a solution. However, the major efforts related to tracking typically result in relatively small size of the sample, which, in turn, hinders the possibility of using the data to analyze the implications of relative rare events such as the occurrence of an international migration episode.

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<sup>39</sup>[Bertoli and Murard \(2020\)](#) propose an approach to identify new members in surveyed households that are likely to come from a dissolved household of origin of an international migrant, which rests on the fact that the new members report to be personally receiving remittances from abroad; this approach does not allow to have information on the characteristics of the migrant, including on the time elapsed since migration.

<sup>40</sup>This choice is related to the need to avoid ambiguity in the identification of the parents of the child (and hence of the exposure to paternal migration); this sample selection criterion also entails that children that were not co-residing with their fathers, e.g., because of the separation of their parents, are not included in the analysis.

<sup>41</sup>The only (minor) exception would be represented by a three-generation household in which the household head is the parent of the child.

### 4.3 Household-level variables

Observational studies often employ household-level measures of adult education as controls, and household composition is observed after the exposure to the treatment. This is problematic when the data refer to the household head, as household headship can be endogenous to migration (Cox-Edwards and Rodríguez-Oreggia, 2009), or when the data on the migrant members are unavailable (Bertoli and Marchetta, 2014) and within-household selection into migration is not random. However, even the availability of data on the migrant members does not solve the problem in the presence of post-treatment variations in household composition. These do not give rise to biases only as long as they just introduce a non-systematic measurement error in the variables that are measured after the exposure to the treatment (Lechner, 2008). However, the pattern that we uncover in the Mexican data suggests that the influence is likely to be systematic. The formation of larger, three-generation households would certainly depress any measure of the average level of education of adult household members, as grandparents are less educated of the mother of the children left behind.<sup>42</sup> The reliance of a measure of the level of education of the mother (McKenzie and Rapoport, 2011), or of the highest rather than of the average within the household (Yang, 2008) would represent two pragmatic approaches that clearly reduce the sensitivity to changes in household composition, as the mother is likely to have the highest level of education within the household. The problem remains when the child is exposed to the migration of both parents, whose characteristics are usually not recorded in the survey.

## 5 Concluding remarks

International migration can lead to prolonged periods of physical separation for individuals that used to co-reside. We provide evidence that paternal migration exposes Mexican children to a variety of further changes in their living arrangements. They are significantly more likely to start co-residing with their (mostly maternal) grandparents, and this pattern is magnified when the mother also moves to the United States, or when their parents dissolve

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<sup>42</sup>The data from the 2010 Census reveals that the children left behind co-residing with grandparents belong to households that have a significantly lower level of adult education than the households of the other children left behind, but their mothers are significantly more educated than the mothers of the other children left behind; results are available from the Authors upon request.

their relationship.

Our analysis draws exclusively on Mexican data, but we can plausibly conjecture that variations in the living arrangements of the individuals left behind could even be more frequent in origin countries where women represent a larger share of international migrants. As [Fafchamps and Quisumbing \(2008\)](#) notice, “essential tasks often can only be performed by certain categories of people because of acquired skills or social norms—for instance, women for food preparation [...]. This implies that in order for a household to be an effective production unit, all these categories of people must be present” (p. 3202). Indeed, [Cortés \(2015\)](#) observes that, in the Philippines, “the children of migrant mothers are more likely to live in extended households” (p. 66), with 20 percent of the children left behind by a migrant mother co-residing with their grandparents, as opposed to 8 percent in case of paternal migration.

The changes in living arrangements that we uncover in the data have two major implications for the analysis of the consequences of migration on the left behind. First, when they join a different housing unit, the left behind drop out of longitudinal surveys that have been used to analyze the effects of migration or of the receipt of remittances (see, for instance, [Antman, 2011](#); [Murard, 2020](#)), so that the resulting econometric evidence is uninformative about the left behind who adjusted their living arrangements. Second, the left behind that are either excluded from longitudinal analyses or not identified as such in cross-sectional surveys are likely to be a selected sample of the left behind with respect to the outcomes of interest. This, in turn, implies that variations in living arrangements associated to migration can mediate the effects that scholars aim at estimating. These important implications of variations in the living arrangements of the left behind further add to the challenges related to whole household migration ([Steinmayr, 2020](#)), intra-household selection into migration ([Gibson et al., 2011](#)), deliberate misreporting ([Hamilton and Savinar, 2015](#)), and to the violation of the co-residence condition embedded in retrospective questions ([Bertoli and Murard, 2020](#)). Econometric analyses should rely on definitions of the treatment and of relevant control variables that are least sensitive to the changes in living arrangements that are associated to paternal migration.

As [Massey et al. \(1993\)](#) observe, “migration decisions are not made by isolated individual actors, but by larger units of related people—typically families or households” (p. 436). Thus, a fuller understanding of the implications of migration for the left behind requires taking

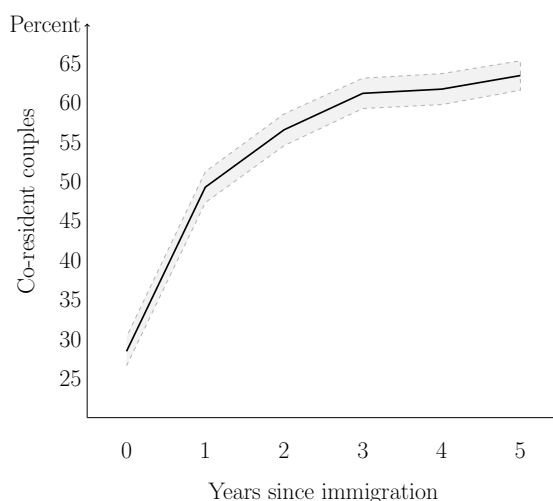
into account that each “household is actually embedded within an extended family network” (Angelucci et al., 2010, p. 197), and that the partition of family members into separate households can be impacted by the occurrence of an international migration episode.

## A Appendix

### A.1 Migrant Mexican women with children left behind

The American Community Survey (ACS) provides us with information on the year of immigration of Mexican (more precisely, Mexico-born) male immigrants, on their marital status (and year of marriage), and about their co-residence with a female Mexican partner. Using the 2000 to 2018 rounds of the ACS, we identify 14,502 Mexican male immigrants aged 25 to 64 who got married before migrating and are still currently married, and who arrived to the United States by no more than five years ago.

Figure A.1: Co-residence with a Mexican wife for Mexican male immigrants in the United States



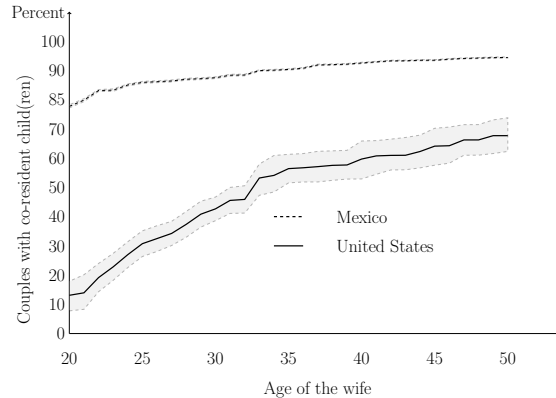
Notes: mean values and the 95 percent confidence intervals have been computed using individual sampling weights; the sample includes 14,502 Mexican men aged 25 to 64 who migrated to the United States in the five years before the survey, who were married before migrating and who are still married at the time of the survey.

Source: Authors' elaboration on data from the American Community Survey 2000-2018.

The share of these Mexican men who co-reside with a Mexico-born wife rises sharply with the time elapsed since migration, as shown in Figure A.1. This pattern suggests that children exposed to paternal migration could also be exposed to maternal migration; as the ACS does not provide information about fertility, we are not able to identify the Mexican

migrant couples that have left behind one or more of their children.

Figure A.2: Co-residence with a child for married Mexican couples in Mexico and in the United States



Notes: mean values and 95 percent confidence intervals computed using the individual sampling weights; the two samples include respectively 10,692 Mexican co-resident couples in the United States (who migrated less than five years before the survey and who got married before migrating), and more than 2 million non-migrant couples in Mexico where the age of the wife ranges from 20 to 49 years.

Source: Authors' elaboration on data from the Biannual June Supplement of the Current Population Survey 1998-2018 and the survey connected to the 2010 Census of the Mexican Population.

The ACS allows us to compute the share of co-resident Mexican couples in the United States for which we observe at least one co-resident child in the data. Figure A.2 plots this share as a function of the age (from 20 to 49) of the woman, using data from 10,692 Mexican co-resident couples in the United States (who migrated less than five years before the survey and who got married before migrating), and using the corresponding share for more than 2 million non-migrant couples from the survey connected to the 2010 Census of the Mexican Population. Figure A.2 reveals that share of migrant couples with co-resident children is between 20 and 60 percentage points below the corresponding share for non-migrant couples. This major difference could reflect non-random self-selection into joint couple migration rather than the fact that some children have been left behind in Mexico.

The Current Population Survey (CPS) provides information on fertility in the June round of even years (see <https://www2.census.gov/programs-surveys/cps/techdocs/cpsjun18.pdf>). We use 11 Biannual June Supplements conducted between 1998 and 2018,



which contain information on the number of live births for each woman aged 15 to 50, and either the year of birth of the last-born child (from 1998 to 2010), or the year of birth of the first-born child (from 2012 to 2018). For each woman aged 15 to 50, we also know the total number of children.

We identify 1,657 Mexican-born women who migrated to the United States at most five years before the survey, and who report to have at least one child no older than 16 at the time of the survey. Among those, we can identify 734 wives (44 percent) with at least one child born before the year in which they migrated to the United States, and therefore who should be born in Mexico,<sup>43</sup> 491 wives whose children are all born after they migrated to the United States, and 432 for whom we cannot determine whether they have one (or more) child born before they migrated, as they have at least two children and we do not have the years of birth for the children other than the last-born (in the 1998 to 2012 surveys). This is because a child might be born (at an earlier parity) in Mexico before the migration of her mother.

For these 734 wives, we search the household roster for an individual who could be her Mexico-born child, on the basis of the country and of the year of birth (to be conservative, we allow for a difference of up to two years) and of the relationship of the wife and of the child with the household head (the CPS does not provide identifiers of the co-residing parents). We find that in 46 percent of the cases (335 wives) the household includes a member who respects these conditions. Given that virtually all children aged below 16 normally live with their mothers (both in Mexico and in the United States),<sup>44</sup> this suggests that 54 percent of the wives who move with or join their husbands at destination leave at least one child behind in Mexico. Notice again that this is a lower bound, as we do not have information on all the children of a woman, but only on the year of birth of the last-born child (from 1998 to 2010), or the year of birth of the first-born child (from 2012 to 2018); thus, we are not able to detect instances in which a Mexico-born son or daughter born at a different parity and aged less than 16 at the time of the survey is not co-residing with his or her mother in the United States. For the 432 wives with children with undetermined place of birth

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<sup>43</sup>We have information on the country of birth of the children only if they co-reside with their mothers in the United States.

<sup>44</sup>In the CPS, 92.6 percent of children below 16 live with their mothers (376,000 observations); in the 2010 Census of the Mexican population, 91.5 percent of the children below 16 live with their mothers (4.4 million observations).

(ambiguous relationship between the year of birth of the child and the mother's immigration year), there is a (unknown) fraction of those that are born in Mexico and for whom we cannot know whether they joined their parent in the United States or were left behind in Mexico. However there is no reason to believe that this unobserved group is a selected sample with respect to the migration decision, and we thus assume that the share of children left behind (54 percent) observed in the identified group of 734 wives prevails among the overall population. This is a conservative choice: if we focus on the CPS rounds after 2012 for which there is no ambiguity about the relative timing of children's birth and mother's migration (because the year of birth of the firstborn child is reported), we find that 61 percent leaves behind at least one child—compared with 54 percent in the entire sample.

Thus, the data from the ACS and the Biannual June Supplements of the CPS are consistent with the pattern that emerges from data collected at origin: a non-negligible share of children exposed to paternal migration are also exposed to maternal migration.

## A.2 Additional results

Table A.1: Co-residence patterns with two different definitions of women left behind

Definition of the treatment:	Married or in free union		Separated or divorced	
	Direct question	Remittances	Direct question	Remittances
Co-residence with parents	0.257 (0.019)	0.243 (0.019)	0.333 (0.028)	0.282 (0.031)
Co-residence with in-laws	0.091 (0.012)	0.093 (0.013)	0.000 (0.000)	0.000 (0.000)
Observations	554	530	280	209
Share	0.630 (0.017)	0.708 (0.017)	0.370 (0.017)	0.292 (0.017)

Notes: average and standard deviation (in parentheses) have been computed using individual sampling weights; the sample includes women aged 18 to 55 who have at least one co-residing child between 0 and 16, who do not co-reside with a partner and who are either married or in free union (*union libre*), or declare to be divorced or separated (single women are not in the sample as no question about potential former partners is asked); we define a woman as having a former or current partner in the United States using either the direct question on this, or information on the receipt of remittances from abroad.

Source: Authors' elaboration on data from the ENDIREH 2016.

Table A.2: Living arrangements of Mexican children not co-residing with their fathers in recipient and non-recipient households

	Partnered mother			Non-partnered mother		
	Left Behind	Non recipient	Difference with controls	Left Behind	Non recipient	Difference with controls
	(1)	(2)	(1)-(2)	(3)	(4)	(3)-(4)
Live with maternal grandparents	0.187 (0.002)	0.247 (0.001)	-0.026*** (0.002)	0.450 (0.003)	0.415 (0.001)	0.037*** (0.004)
Live with paternal grandparents	0.103 (0.001)	0.110 (0.001)	-0.005*** (0.002)	0.052 (0.001)	0.052 (0.000)	0.001 (0.002)
Observations	57,337	162,501	219,838	22,932	355,306	378,238
Share	0.635	0.257		0.365	0.743	

Notes: average and standard deviation (in parentheses) have been computed using individual sampling weights; the sample include children aged 0 to 16 unmarried, not parent and who co-reside with their mother (not widowed) but not with their father; the left behind are children who live in households that receive remittances from abroad; the other children are those living in non-recipient households; the last row reports the share of left behind and other children whose mother is partnered (or not partnered); the third and the sixth data column report respectively regression estimates of the differences (1)-(2) and (3)-(4) that include in the controls a set of dummies for the gender and age of the child, rural areas, and state of residence; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Source: Authors' elaboration on the survey connected to the 2010 Census.

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# Tables

Table 1: Descriptive statistics, children aged 0 to 16

	Left behind	Untreated		Difference	
		All	Co-resident father	(1)-(2)	(1)-(3)
	(1)	(2)	(3)	(1)-(2)	(1)-(3)
Age	8.490 (0.015)	7.981 (0.002)	7.930 (0.003)	0.509*** (0.017)	0.559*** (0.017)
Male	0.504 (0.002)	0.509 (0.000)	0.510 (0.000)	-0.005** (0.002)	-0.006*** (0.002)
Remittances-recipient household	1.000 (0.000)	0.015 (0.000)	0.019 (0.000)	0.985*** (0.000)	0.981*** (0.000)
Household size	5.517 (0.008)	5.504 (0.001)	5.507 (0.001)	0.014* (0.008)	0.011 (0.007)
Rural	0.412 (0.002)	0.264 (0.000)	0.278 (0.000)	0.148*** (0.002)	0.134*** (0.002)
Mother is not co-resident	0.203 (0.001)	0.063 (0.000)	0.024 (0.000)	0.140*** (0.001)	0.179*** (0.001)
Father is not co-resident	1.000 (0.000)	0.198 (0.000)	0.000 (0.000)	0.802*** (0.001)	1.000 (0.000)
Live with grandparents	0.453 (0.002)	0.195 (0.000)	0.118 (0.000)	0.258*** (0.001)	0.335*** (0.001)
Observations	103,076	4,040,873	3,338,629	4,143,949	3,441,705

Notes: average and standard errors (in parentheses) have been computed using individual sampling weights; the sample includes children aged 0 to 16 who are unmarried, not parent and whose mother, if present, is not widowed; the left behind are children not co-residing with their father and who belong to households that receive remittances from abroad; the untreated are children who either co-reside with their father, or those belonging to a non-recipient household and not co-residing with their father \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Source: Authors' elaboration on the survey connected to the 2010 Census.

Table 2: Living arrangements of left behind and untreated children

	Untreated			Left behind			Difference	
	Co-resident mother			Co-resident mother			with controls	
	All	Yes	No	All	Yes	No	(4)-(1)	(5)-(2)
	(1)	(2)	(3)	(4)	(5)	(6)		
Live with grandparents	0.118 (0.000)	0.113 (0.000)	0.336 (0.002)	0.453 (0.002)	0.368 (0.002)	0.789 (0.003)	0.344*** (0.001)	0.259*** (0.001)
Live with maternal grandparents		0.040 (0.000)			0.283 (0.002)			0.249*** (0.001)
Live with paternal grandparents		0.073 (0.000)			0.085 (0.001)			0.011*** (0.001)
Observations	3,338,629	3,267,303	71,326	103,076	80,385	22,691	3,441,705	3,347,688
Share	1.000	0.976	0.024	1.000	0.797	0.203		

Notes: average and standard errors (in parentheses) have been computed using individual sampling weights; the sample includes children aged 0 to 16 who are unmarried, not parent and whose mother, if present, is not widowed; the left behind are children not co-residing with their father and who belong to households that receive remittances from abroad; the untreated children are children co-residing with their fathers; the last row reports the share of untreated and left behind that co-reside (do not co-reside) with their mother; the last two data columns report regression estimates of the differences (4)-(1) and (5)-(2) that include in the controls a set of dummies for the gender and age of the child, rural areas, and state of residence; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Source: Authors' elaboration on the survey connected to the 2010 Census.

Table 3: Marital status of the mother and living arrangements of Mexican children

	Partnered mother		Non partnered mother	
	Left behind	Untreated	Left behind	Untreated
Live with maternal grandparents	0.187 (0.002)	0.050 (0.000)	0.450 (0.003)	0.406 (0.001)
Live with paternal grandparents	0.103 (0.001)	0.075 (0.000)	0.052 (0.001)	0.052 (0.000)
Observations	57,337	3,418,337	22,932	365,295
Share	0.635 (0.002)	0.874 (0.000)	0.365 (0.002)	0.126 (0.000)

Notes: average and standard errors (in parentheses) have been computed using individual sampling weights; the sample include children aged 0 to 16 unmarried, not parent and and who co-reside with their mother (not widowed); the left behind are children not co-residing with their father and who belong to households that receive remittances from abroad, and the untreated are all children who are not left behind; partnered mothers are either married or in a free union, non partnered mothers are separated, divorced.

Source: Authors' elaboration on data from the survey connected to the 2010 Census.

Table 4: Living arrangements for stayers and left behind before paternal migration

	Future status of the father		Difference	
	Stayer	Migrant	raw	with controls
	(1)	(2)	(2)-(1)	(2)-(1)
Live with grandparents	0.114 (0.000)	0.106 (0.003)	-0.008** (0.003)	0.000 (0.003)
Live with maternal grandparents	0.051 (0.000)	0.039 (0.002)	-0.011*** (0.002)	-0.001 (0.002)
Live with paternal grandparents	0.064 (0.000)	0.067 (0.003)	0.003 (0.003)	0.002 (0.003)
Observations	765,676	8,202	773,878	773,878

Notes: average and standard errors (in parentheses) have been computed using individual sampling weights; the sample includes children aged 0 to 16 who live with both their father and mother (married or in free union) at the time of the first interview in a non-atrriter household; the sample is split on the basis of the migration status living arrangements are defined at the first interview; the sample is split depending on whether the father is observed to have migrated to the United States between the second and the fifth interview; the last two data column report respectively the difference (2)-(1) between in the raw data and from a regression that includes controls a set of dummies for the age and gender of the child, rural areas, and state of residence; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Source: Authors' elaboration on data from the ENOE 2005Q1-2018Q4.

Table 5: Children moving out or grandparents moving in?

<i>Panel A</i>			
	<u>Dep. var. <math>a_{js+1}^q</math>: Household attrition</u>		
Paternal migration $_{js}^q$	0.021***	0.019**	0.017**
	(0.008)	(0.008)	(0.008)
Adjusted- $R^2$	0.018	0.027	0.036
Observations (household-wave pairs)	2,173,181	2,173,181	2,173,181
Average outcome (stayers)	0.064	0.064	0.064
<i>Panel B</i>			
	<u>Dep. var. <math>G_{js}^q</math>: Grandparents joining</u>		
Paternal migration $_{js}^q$	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)
Adjusted- $R^2$	0.003	0.003	0.004
Observations (household-wave pairs)	2,644,204	2,644,204	2,644,204
Average outcome (stayers)	0.002	0.002	0.002
<i>Dummies</i>			
Rural FE, $q \times s$ FE and state FE	Yes	Yes	Yes
Child's age, gender and number of children	No	Yes	Yes
Household size, parents' age and years of schooling	No	No	Yes

Notes: standard errors are clustered at the household level; individual sampling weights used in the estimation; the sample consists of children aged 0 to 16 who co-reside with both of their parents, and do not co-reside with any of their grandparents at the time of the first interview; regressions in Panel A are estimated on up to three waves per household (from the third to the fifth interview), while regressions in Panel B are estimated on up to four waves per household (from the second to the fifth interview); all household and individual controls are measured at the time of the first interview; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ ;

Source: Authors' elaboration on ENOE 2005Q1-2018Q4.

Table 6: Children (not co-residing with their fathers) in households with an enumerated male migrant

	Enumerated migrant			Left behind		
	Co-resident mother			Co-resident mother		
	All	Yes	No	All	Yes	No
	(1)	(2)	(3)	(4)	(5)	(6)
Live with grandparents	0.312 (0.002)	0.259 (0.002)	0.757 (0.005)	0.453 (0.002)	0.368 (0.002)	0.789 (0.003)
Live with maternal grandparents		0.163 (0.002)			0.283 (0.002)	
Live with paternal grandparents		0.095 (0.001)			0.085 (0.001)	
Observations	63,640	56,616	7,024	103,076	80,385	22,691
Share	1.000	0.894	0.106	1.000	0.797	0.203

Notes: average and standard errors (in parentheses) have been computed using individual sampling weights; the sample includes children aged 0 to 16 who are unmarried, not parent and whose mother, if present, is not widowed; the left behind are children not co-residing with their father and who belong to households that receive remittances from abroad; children with an enumerated father are children living in a household that reports through the retrospective questions a male migrant currently living in the United States and whose age difference with the child is between 17 and 69 years; the last row reports the share of stayers and left behind that co-reside (do not co-reside) with their mother.

Source: Authors' elaboration on the survey connected to the 2010 Census.