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Effects of internal migration on labour market behaviour of families left-behind in Vietnam

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The Thailand Vietnam Socio Economic Panel (TVSEP) is a long-term research project for data collection and scientific analysis funded by the Deutsche Forschungsgemeinschaft (DFG). The high quality panel data sets have been collected in rural areas of Thailand and Vietnam since 2007. The panels cover many important aspects of living standard measures, demography, geography, shocks, risks, expectations and behavioural traits of individuals. TVSEP data is available for scientific research purposes free of charge.

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Effects of internal migration on labour market behaviour of families left-behind in Vietnam

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Abstract

This document explores the implications of a migratory shock (in the form of household member(s) leaving) on the labour market behaviour of individuals left-behind in Vietnam. In addition, various coping mechanisms exhibited by each age group and their implications regarding sectoral labour allocation are further explored.

Using panel data of 2,200 households in six waves and a DiD specification, the results suggest an increase in the likelihood of working for the elderly in agriculture that is most likely associated with higher labour invested in livestock activities. The results are robust to different specifications. Moreover, this coping mechanism of increased work is exhibited by those families that do not receive remittances and seems to last (even increase) for up to three periods after the migratory shock occurs. Interestingly, there is also evidence of diminishing returns on working probability when the share of migrants in the household increase.

Keywords: Migration, Left-Behind, Labour Market, Agriculture.

JEL: J61, O15, P25, R23

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1 Introduction

Internal migration is a notable characteristic of developing countries all around the world. According to the (World Bank, 2016), 763 million people migrated to newer regions within their countries. This unprecedented domestic rate appears to be around three times higher than that displayed by international migrants. The phenomenon typically obeys the search for better labour opportunities and people's interest in improving their quality of life as well as that of the following generation. Moreover, lower cultural barriers and distances reduce migration costs and make internal migration preferable to improve the inhabitant's well-being (Sugiyarto, Deshingkar, & McKay, 2019).

These migration patterns are significant in Vietnam, where sizeable internal migration flows have occurred. Despite Vietnam having around 40% of their labour force working in agriculture (D. L. Nguyen, Grote, & Nguyen, 2019), the productivity of the sector and its share in the GDP has decreased in recent years. The contrary has happened in the service sector, mainly in the big cities of Hanoi and Ho Chi Minh City, and the industrial areas of Binh Duong and Dong Nai provinces (Amare & Hohfeld, 2016). The market liberalization measures at the beginning of the '90s, (known as "Doi Moi" reforms) can partially explain this phenomenon, which led to significant industrial investments and foreign direct investment growth. Therefore, labour demand in the country for off-farm activities increased (Gröger, 2021). According to Coxhead, Vu, and Nguyen (2016), by the 2009 census, around 6.6 million people migrated internally in Vietnam, which constituted almost 8% of the total population. Furthermore, by 2015, internal migrants represented 13.4% of the total population, representing an increase of 67% in the share of migrants compared to the previous census (UNESCO, 2019).

In this sense, internal migration can be considered as a livelihood strategy for rural house- holds, which serves as a coping mechanism for different economic and social shocks andrisks that households may face (Damon, 2010). Remittances that migration generates can be beneficial for consumption and increased expenditure for rural households on the one hand. On the other, it could also help alleviate liquidity constraints that hinder individuals from investing in productive assets, therefore increasing farm productivity (D. L. Nguyen et al., 2019).

Nevertheless, the absence of a member in the family can be understood as a shock that has implications that go beyond a simple reduction in labour force availability. In addition to worsening social indicators, rural's capital accumulation and total factor productivity can also potentially see a reduction (Peri, 2009). Therefore, in the net effect, it is still unclear whether families left-behind are better off once a member of the family leaves.

This research seeks to contribute to the existing literature about the effects of internal migration on families left-behind. Specifically, the main research question investigates the effect of internal migration on rural households' labour decisions in Vietnam. I

analyse the heterogeneity in effects exhibited by different age groups: Children, Working-age, and the Elderly. I also analyse differences between female and male individuals. In order to do this, I rely on a panel data set of about 2,200 households from three provinces in Vietnam. These households have been followed since 2007, thus allowing me to examine the individual behaviour after facing a migratory shock. To identify the effect of the migration of a family member on the households' labour market outcomes, I follow a
differences-in-differences (DiD) strategy with a fixed-effects estimation. Consequently, I compare wave changes in individuals' working probability for households that faced a member leaving with respect to the changes in the labour supply for those who do not experience migratory shocks.

Potential endogeneity issues, such as omitted variable bias and self-selection, could arise in the estimation. For instance, variables such as economic and educational conditions are likely to be correlated with the probability of migrating, making treatment and control groups not comparable and biasing the effect observed on the outcome variable. In order to rule out these concerns I choose to restrict my sample under two conditions. First, only those households that have had migrants at some point are included in the analysis. Second, within each of these households, I exclude all those individuals who migrated at some point in the analysis. It helps avoid self-selection under unobservable and makes both treatment and control groups more comparable. Further, I rely on an event-study analysis, estimating leads and lags of the treatment variable, to examine the existence of pre-trends in the outcomes before a household's member(s) migrate.(Gagliarducci & Manacorda, 2020). This exercise helps explore whether the effect is caused due to migration itself or latent differences in the outcomes between families. According to this exercise, the effect is also likely to last three waves later.

Additionally, a dummy variable for returning migrants is appended to this specification to isolate the coefficients of those individuals who return to the household. Next, the interactions between villages and time fixed effects (to control for potential time-variant unobservables at the village level), and individual fixed effects (to eliminate potential individual time-invariant omitted variables) are explored. Finally, the independent variable is changed to the number of migrants and the share of migrants in the household. The results of this last specification show diminishing returns in the share of migrants in the family.

The results suggest that a household's member's migration increases the probability of working for the elderly by around eight percentage points, mainly driven by increased labour in the agricultural sector. The results are robust to the specifications delineated above. Furthermore, the increase in labour in agriculture appears to occur in those households that carry the right to property over the land and those who do not receive remittances. This is highly indicative of increased labour (in their own farms) as a coping

mechanism exhibited by those left-behind who do not obtain income benefits in the formof remittances.

Moreover, the results show that migration leads to an increase in income from livestock, specifically driven by an increase in the sales of products from this sector, such as eggs, milk, etc. As these activities are less strenuous, the elderly are more likely to take on these tasks to offset the absence of a member in the household. While remittances appear to positively affect total household income, for those families that do not perceive these benefits, livestock production mitigates the adverse income effects produced by a member leaving. Furthermore, for those who do not have the chance to partake in livestock activities, the impact of migration on income is negative. Nevertheless, the results for the gender specifications do not show remarkable differences between male and female in the labour supply.

The novelty of this research is threefold. First, I analyse the effect on working probability for those individuals left-behind in Vietnam. Most related literature in the country has analysed the phenomena from the household's perspective on outcomes related to productivity and income. This leaves a niche of individual behaviour in the labour marketto be explored. Second, exploiting the panel data structure, this research explores the dynamics and the persistence of the effect periods later from when the migratory shock happens.

Third, it goes beyond the conceptualization of agriculture purely as an activity reliant on crops and brings the importance of livestock production to light, particularly for older adults. Typically, the increase in livestock activities is associated with a reduction in liquidity constraints through remittances -income effect. However, my findings are in line with the substitution effect, where individuals are seen to make a shift towards livestock activities despite receiving no benefits in the form of income from migration.

This study is structured as follows: This introductory section is followed by the literature review that contains a brief discussion about the theoretical and empirical insights regarding the effects of migration among families left-behind. The third section containsthe description of the data and explicates the databases used, the unit of analysis, the regions involved, the time structure, and how the main variables were constructed. In the fourth section, I present the methodology, where the DiD identification strategy is explained. This is followed by a section detailing the results, robustness checks and channels of transmission. Lastly, there is a discussion and conclusion section exploring the caveats present in this research project along with some potential extensions.

2 Literature review

When analysing the main features of rural markets in developing economies, de Janvry,

Fafchamps, and Sadoulet (1991) suggested that most households' economies are characterised by labour-self-sufficiency due to the precariousness in market access. Moreover, complementary to this approach, Ilahi and Grimard (2000) argue that it is difficult for households to access essential goods and services, making them very dependent on family labour to fulfil their necessities. Under this scenario, the effect of migration on left-behind members in rural settings can be analysed through an assorted set of lenses. For instance, the dominant strand of literature investigates the impact of remittance flows on economic outcomes of the left-behind members (Chang, Dong, & MacPhail, 2011). Research on the impact of migration on income, production levels, and investments for international migrant-sending areas include J. E. Taylor and Wyatt (1996) and J. E. Taylor and Lopez- Feldman (2010) on Mexico, Wouterse and Taylor (2008) on Burkina Faso and Atamanov and Van den Berg (2012) on the Kyrgyz Republic.

Nevertheless, a member leaving the household could also affect the behaviour and well-being of rural individuals left-behind, particularly in terms of their labour supply. New Economics of Labour Migration (NELM)[2] (E. J. Taylor, 1999), shows three main theoretical channels for rural households: (1) an increase in the activities undertaken by the left-behind rural households to offset the loss in household labour force caused by migration, under the scenario of imperfect markets and lack of access to credit (that ultimately hinders efforts to hire external labour) (D. L. Nguyen et al., 2019); (2) remittances in- crease the reservation wage of individuals left-behind, increasing the opportunity cost of leisure, and therefore decreasing the labour supply (Amuedo-Dorantes & Pozo, 2006; Atamanov & Van den Berg, 2012; Lokshin & Glinskaya, 2009); and (3) remittances relieve liquidity and credit constraints, that allow individuals to partake in more risky activities with a higher expected returns, such as an investment in livestock or self-entrepreneurial activities (Wouterse & Taylor, 2008).

Thus, the net impact of migration on non-migrating individuals' rural employment is unclear and might be heterogeneous across households. For instance, the effects could be different in terms of employment sectors (Atamanov & Van den Berg, 2012), left-behind individuals' socioeconomic status, and variegated periods of migration (Wouterse & Taylor, 2008). Furthermore, diversification of activities within the household could arise in order to cope with the absence of one member (Chang et al., 2011).

The labour and time allocation logic within households ultimately depends on household composition and characteristics. According to the multi-person agricultural household model (Jacoby, 1993), labour decisions are positive functions of individual wages/shadow wages relative to other household members' performance. These household characteristics, particularly regarding the wages commanded by the various individuals

[2] NELM understands migration as a decision made by the whole household as an effort to overcome market failure, cope with shocks, and to maximize joint utility (J. E. Taylor & Martin, 2001)

present, are highly susceptible to social norms and market discrimination shaped by different contexts.

These context-specific conditions could bring about (shadow) wage differences across categories of gender or age that further determines individual labour allocation. For instance, wages in off-farm activities are expected to be larger than those in other sectors. Additionally, multi-person theory (Jacoby, 1993) is also seen to predict that males in the working-age category command higher wages than any other gender/age group category in off-farm activities. However, the situation is the opposite when farm and domestic activities are considered - males in the working-age group are seen to receive lower wages when compared to any other gender/age groups.

Under the assumption that an off-farm male worker, in the working-age, chooses to migrate (as is the case in several developing countries), there are spillover effects created due to this absence in terms of a rising relative shadow wage of the left-behind individuals inother sectors such as agriculture and domestic work (Chang et al., 2011). These changesin relative prices may induce a change from off-farm work to agriculture and domestic activities for those gender/age groups with a comparative advantage. There are two contradictory forces regarding the income and substitution effect for farm activities. The income effect is reflected through a decrease in labour supply, and the substitution effectis seen through the increase in labour supply.

Thus, both NELM and the multi-person agricultural household theory predict an uncertain net effect of migration on the labour supply of the left-behind. The typical channelof a decrease in labour supply, i.e., the income effect, is seen to run through the channel of remittances. This channel of remittances helps offset the loss in household income. However, since most households in developing countries are characterised by low income and high poverty settings, the expected result is a more substantial substitution effect. The expected larger substitution effect thus leads to an increase in labour in agricultureand domestic activities. In addition, the effects may vary in terms of gender and age status, as described by the multi-person agricultural household model, depending on the valuation of different labour skills attributed in the presence of different settings.

Most empirical literature that analyses the effects of migration on families left-behind focuses mainly on the impacts on income and productivity of households. For instance, Gibson, McKenzie, and Stillman (2011), using a natural experiment of a lottery in Tonga, find a negative impact of international migration to New Zealand on the income of the left- behind, even after accounting for the channel of remittances. Moreover, migration was also seen to harm durable assets and livestock, wherein selling assets as a coping mechanism is more detrimental to households than if used for productive purposes. In the same line, Wouterse and Taylor (2008) test the effects of continental and intercontinental migration on income diversification for rural households in Burkina Faso, using the instrumental variables approach. Their findings suggest that

intercontinental migration, which tends to be long-term and generates more significant remittances for the family left-behind, directly impacts livestock productivity. Thus, it is likely that remittances could have been invested in high-risk activities that were previously not possible due to liquidity restrictions that usually cripple rural families.

J. E. Taylor and Lopez-Feldman (2010) analyse the effect of migration from Mexico tothe United States on income and productivity of households left-behind. The authors find, as expected, a positive effect on income due to remittances and land productivity in rural Mexico. However, this improvement seems to occur only two years later, aligning with the theory of alleviation of liquidity and credit constraints. D. L. Nguyen et al. (2019), analyse the effect of internal migration, both with remittances and without, on land productivity, crop diversification, and labour productivity in Vietnam. Using the FE approach for the first three waves of the panel data, they find that migration that does not generate remittances increases labour productivity and reduces crop diversification, leading to a specialisation in crops other than rice. Moreover, diversification and labour productivity decreases for those families that do not receive remittances.

Regarding labour market behaviour, Démurger and Li (2013) analyse the effect of internal migration in China on the labour supply of the individuals left-behind. The authors show that migration is associated with a higher probability of working in agriculture and decreased off-farm activities for non-migrating individuals. Moreover, they suggest that returning migrants tend to take up off-farm activities, which also enhances the likelihood of other individuals working in the same sector. Following the same line, Murakami, Yamada, and Sioson (2021) for Tajikistan find that migration and remittances reduce the labour supply of individuals left-behind. Specifically, they use a control function to rule out simultaneity and find that sending migrants and receiving remittances reduces labour supply by 5.4 and 10.2 percentage points, respectively.

Since migrants in developing countries are usually men, literature has focused on the impact of their absence on women left-behind labour's supply. Thus, Amuedo-Dorantes and Pozo (2006) have investigated the direct effect of remittances on the working hoursof men and women left-behind in Mexico. Their findings suggest that the net effect of the hours spent in the labour market for women tends to decline, particularly in the informal sector and the non-paid agriculture sector. Lokshin and Glinskaya (2009) examine the impact of male migration on non-migrating females who were left-behind in Nepal and note a negative effect on labour market participation, mainly through an increase in the reservation wage. Mu and van de Walle (2011) conduct the same analysis in China for women's work supply, exploring the impact on health and time use. Despite not finding effects on health, the authors argue that women left-behind tend to undertake more farm work due to migration, both in the short and long run. The previous is predominantly the case since housework can be undertaken in conjunction with farm

work.

Xu (2017)'s research focuses on the labour supply and time use of individuals left-behind in China and primarily looks at children and individuals in the working-age. On average, the author finds no net effect on either time use or labour supply, arguing that both income and substitution effects cancel each other out. On the other hand, Chang et al. (2011) analyse the effect of time-use specifically for children and older adults in rural China. Their research highlights an increase in the time dedicated to farm activities and domestic work for both age groups. Unfortunately, literature for Vietnam, analysing the effects disaggregated by age groups, as is done in this research, is still relatively scarce.

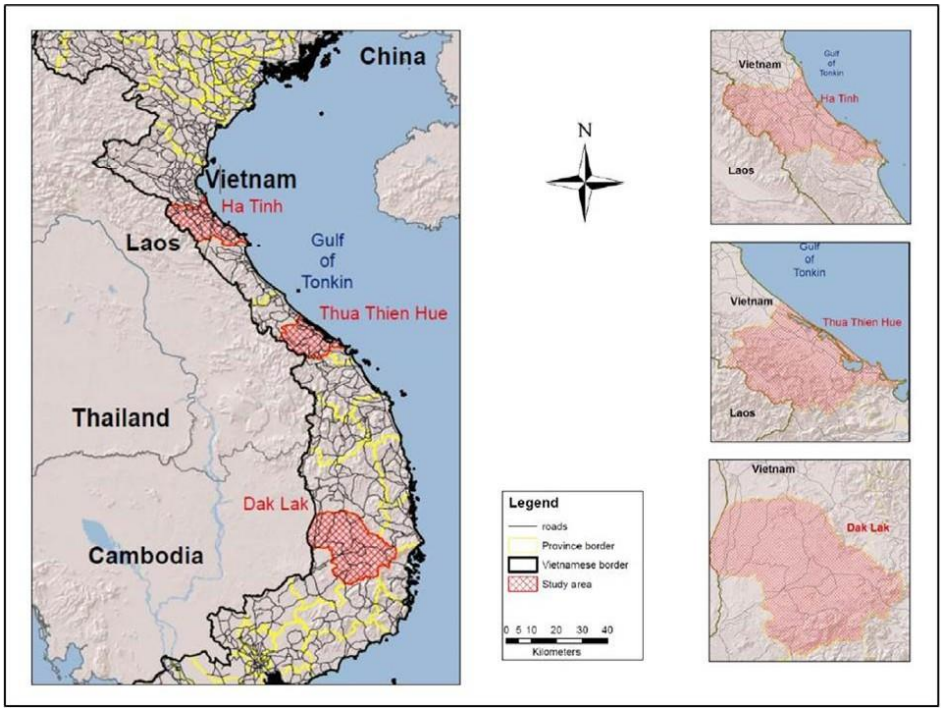
3 Data

This study uses the data collected under the project titled "Poverty dynamics and sustain-able development: A long-term panel project in Thailand and Vietnam," which allowed for the construction of the Thailand - Vietnam Socioeconomic Panel (TVSEP from now on). This information aims to analyse the long-term development dynamics of rural households in these two economies (Klasen & Waibel, 2015). The study area comprises three provinces, namely Ha Tinh, Thua Thien Hue, and Dak Lak (Figure 1). According to L. D. Nguyen, Raabe, and Grote (2015), these areas have faced a significant increase in rural-urban migration, primarily due to harsh weather conditions, making them suit- able for the current research project. Moreover, they are also characterised by a high dependence on agriculture and high poverty rates (Do, Nguyen, & Grote, 2019).

The data contains a household questionnaire that tracks information at the household and individual level about the demographic, economic, and social situation. The survey was undertaken in six waves: 2007,2008, 2010, 2013, 2016 and 2017. Two hundred and twenty villages were chosen from the three regions, with ten households per surveyed village. The latter implies that there are around 2,200 households per wave. Despite having an attrition rate of around 14%[3] from the first to the last wave in the number of households surveyed, I was able to construct a balanced panel that consists of 6,534 individuals per wave (including both migrants and non-migrants). The TVSEP household survey includes information regarding individuals, household conditions, shocks, income from farming, livestock production, wage employment, remittances and self-employment(T. T. Nguyen, Tran, Nguyen, & Grote, 2021).

[3] The number of households in the sample for 2007 was 2,200 and in 2017 was 1,898

Figure 1: Map of Vietnam and three provinces Ha Tinh, Thua Thien Hue, and Dak Lak.



Source: Do et al. (2019).

I use the individual module to construct the working indicators and the migration variable. First, I construct a dummy variable to represent whether an individual is working. Then, I build a set of dummy variables to represent the various sectors in which an individual chooses to work. To be more precise, these variables measure if the individual partakes in agriculture, off-farm work, self-employment, or housework, or not. This module also contains information about whether the individual has migrated in a particular period, the reasons for migration, and the number of streams of remittances that they send. The primary dummy variable is constructed following the definition given by Gröger and Zylberberg (2016). They classify a household member as an internal migrant if the person declares that they belong to the household, are older than 16 years and spend more than half the year in another location in Vietnam. The main variable takes the value of one for all individuals of the household in the period where they reported having a migrant. Due to the rural composition of the data, this variable also captures rural-urban migration dynamics.

According to Table 1, 45% (810 over 1,788) households surveyed had at least one migrant for the sixth wave. Moreover, this table shows the share of income of each sector for households with migrants and without migrants. Households without migrants (Column 2) predominantly rely on income from off-farm activities (32.68% of total income) and agriculture (29.56% from crops and 19.86% from Livestock). On the other hand, for families with migrants, despite relying on agriculture and off-farm activities, remittances seem to be the channel that allows them to diversify income sources, thus granting them the opportunity to be less dependent on traditional

activities.

Table 1: Income of HH by sector and HH migration

Characteristic	Overall, N = 1,788	Family w/o migrants, N = 978	Family with migrants, N = 810
% Income land	0.84	1.31	0.27
% Income Crops	26.80	29.56	23.51
% Income Livestock	18.28	19.86	16.38
% Income Labour	29.68	32.68	26.10
% Income Self. Emp.	15.46	15.59	15.30
% Income Remmit.	8.95	1.00	18.43

[1] Descriptive statistics only for the 6th wave

Table 2 shows individual labour behaviour for the whole population, disaggregated by age. First, the share of the elderly in the sample corresponds to 11.5% while the share of people in the working-age is seen to be 80.4%. On average, 61% of individuals report are working. Surprisingly, the share of older adults working (63%) seems to be just as high as the share of people in the working-age report being employed (66%). Remarkably, these older individuals report being working mainly on activities in agriculture (50%) and related to the home (9.6%), whereas individuals in the working-age are primarily seen to be enrolled in agriculture (45%) and off-farm activities (12%). Table 2 also broadly shows the share of individuals who have decided to migrate. Overall, an average of 17% are seen to be migrants, predominantly driven by the share of working-age migrants (21%).

Table 3 categorizes the main reasons for individuals who have decided to migrate. About 90% of the individuals are seen to leave the rural home for job opportunities and schooling. However, it must be recognized that 25% of those who migrate for educational purposes are likely to be unable to support the family left-behind and may still need monetary help.

Table 2: Labour supply whole population

Characteristic	Overall, N = 6,498	Kid, N = 519	Old, N = 749	Work age, N = 5,230
Dummy working	3,952 (61%)	18 (3.5%)	475 (63%)	3,459 (66%)
Occupation				
Agriculture	2,751 (42%)	9 (1.7%)	374 (50%)	2,368 (45%)
House	174 (2.7%)	2 (0.4%)	72 (9.6%)	100 (1.9%)
Not working	2,545 (39%)	500 (97%)	274 (37%)	1,771 (34%)
Off Farm	630 (9.7%)	7 (1.4%)	9 (1.2%)	614 (12%)
Self empl	397 (6.1%)	0 (0%)	20 (2.7%)	377 (7.2%)
Ind. Migrate Dummy	1,120 (17%)	0 (0%)	10 (1.3%)	1,110 (21%)

[1] Descriptive statistics only for the 6th wave

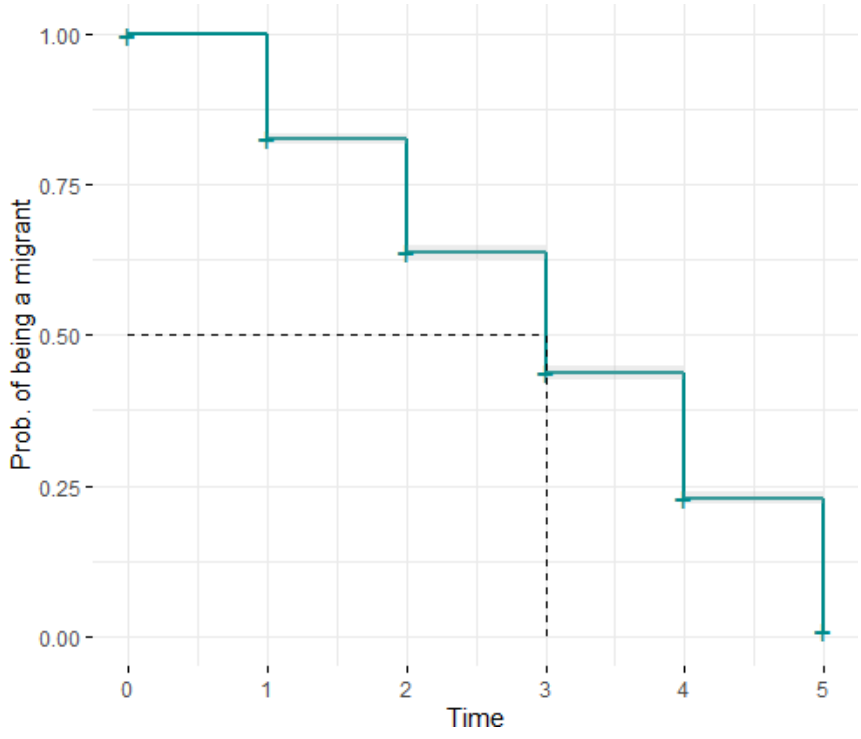
Table 3: Reasons migrating- Working age population

Characteristic	N = 1,110
Reason away	
Job opportunity	708 (64%)
Marriage	29 (2.6%)
Other	93 (8.4%)
Schooling	280 (25%)

[1] Descriptive statistics only for the 6th wave

Apart from the insights derived from the above table regarding the various reasons for migrating for an individual, it is also equally essential to classify whether this shift is to be viewed as long-term or short-term migration. According to Wouterse and Taylor (2008), long term migration could lead to more stable amounts of remittances received, which could therefore impact the labour supply behaviour of the affected individuals. For this reason, in Figure 2, I proceed with a survival analysis for individuals categorized as migrants in the first wave. The basic idea behind this is to check whether those individuals survive as "migrants" in the following periods or decide to return to their households. For simplicity, I assume that individuals would not migrate once they have chosen to return. Thus, the figure shows that approximately 20% of the individuals who left the household returned each period. Eventually, it is seen to transform into around 50% of individuals who choose to stay away three periods later.

Figure 2: Probability of migrants in t being migrant later



Note: Survival estimations using Kaplan Meier Analysis. Migrants in first wave as baseline

Despite individuals having a high probability of staying away from home after a few periods, the structure of the migration variable has considerable variation across time. Figure 8 (Appendix) shows the change of the dummy variable for a representative household over time. Therefore, it can be inferred that it is likely that the migrant will leave and return home multiple times during the period of analysis. Therefore, it is essential to distinguish the two effects in the estimation.

Table 4 displays a few descriptive statistics regarding the left-behind sector in terms ofthe composition of employment. First, the share of people working in the sample is 73%, which is around 12 percentage points larger than the share of the whole population. This is driven by 84% of working-age individuals who are left-behind who choose to work. The primary sectors of involvement for these individuals remain to be agriculture and off-farm activities, with the former having a higher relevance (57% vs 45%) than in Table 2. For the elderly, the participation in each economic sector does not differ much from the whole population, since the share of people working remains similar (64%) and the main employment sectors are still agriculture and household activities. Moreover, the last row of the table shows the number of individuals affected by the absence of a member. On average, 42% of left-behind individuals had a household member who chose to migrate, who most likely had to change their behaviour in the labour market as a coping mechanism.

Table 4: Labour supply left-behind

Characteristic	Overall, N = 5,378	Child, N = 519	Old, N = 739	Work age, N = 4,120
Dummy working	3,952 (73%)	18 (3.5%)	475 (64%)	3,459 (84%)
Occupation				
Agriculture and Livestock	2,751 (51%)	9 (1.7%)	374 (51%)	2,368 (57%)
House	174 (3.2%)	2 (0.4%)	72 (9.7%)	100 (2.4%)
Not working	1,425 (27%)	500 (97%)	264 (36%)	661 (16%)
Off Farm	630 (12%)	7 (1.4%)	9 (1.2%)	614 (15%)
Self empl	397 (7.4%)	0 (0%)	20 (2.7%)	377 (9.2%)
HH. Migrate Dummy	2,275 (42%)	182 (35%)	204 (28%)	1,889 (46%)

[1] Descriptive statistics only for the 6th wave. Child < 15 y/o and Old > 64 y/o

Finally, Tables 5 and 6 show the labour supply behaviour for individuals who faced a migratory shock in their household and those who did not, respectively. Overall, households with a member absent had a higher share of people who chose to work. The latter is observed in Table 5, which shows 76% of individuals who choose to work, whereas Table 6 shows 71%. It is likely caused by a higher share of people working in agriculture (53% vs 50%) and self-employment (8.2% vs 6.8%). As shown in previous tables, the main change occurs in the working-age population, where households with a migratory shock have 59% of adults working on agriculture, compared to 56% adults working among those without shock. In this sense, groups in Tables 5 and 6 are the treatment and control groups of my specification, which will be further illustrated in the following section.

Table 5: Labour supply left-behind with migration shock

Characteristic	Overall, N = 2,275	Child, N = 182	Old, N = 204	Work age, N = 1,889
Dummy working	1,740 (76%)	9 (4.9%)	126 (62%)	1,605 (85%)
Occupation				
Agriculture	1,212 (53%)	2 (1.1%)	101 (50%)	1,109 (59%)
House	59 (2.6%)	0 (0%)	18 (8.8%)	41 (2.2%)
Not working	535 (24%)	173 (95%)	78 (38%)	284 (15%)
Off Farm	283 (12%)	7 (3.8%)	3 (1.5%)	273 (14%)
Self empl	186 (8.2%)	0 (0%)	4 (2.0%)	182 (9.6%)
Dummy shocks	1,618 (71%)	121 (66%)	135 (66%)	1,362 (72%)

[1] Descriptive statistics only for the 6th wave

Table 6: Labour supply left-behind without migration shock

Characteristic	Overall, N = 3,103	Child, N = 337	Old, N = 535	Work age, N = 2,231
Dummy working	2,212 (71%)	9 (2.7%)	349 (65%)	1,854 (83%)
Occupation				
Agriculture	1,539 (50%)	7 (2.1%)	273 (51%)	1,259 (56%)
House	115 (3.7%)	2 (0.6%)	54 (10%)	59 (2.6%)
Not working	890 (29%)	327 (97%)	186 (35%)	377 (17%)
Off Farm	347 (11%)	0 (0%)	6 (1.1%)	341 (15%)
Self empl	211 (6.8%)	0 (0%)	16 (3.0%)	195 (8.7%)
Dummy shocks	2,066 (67%)	226 (67%)	345 (64%)	1,495 (67%)

[1] Descriptive statistics only for the 6th wave

4 Methodology

To identify the effect of the migration of a family member on the household's labour market outcomes, a DiD estimation is used at the individual level with a binary dependent variable as follows:

Overall equation:

$$Y_{i,h,t} = \beta_0 + \beta_1 migrate_{h,t} + X'_{h,t}\gamma + \delta_h + \eta_t + \epsilon_{i,h,t} \quad (1)$$

Where $Y_{i,h,t}$ is the outcome variable in period t for the individual i in household h. The primary outcome variable is a dummy variable equal to one whether the individual i is working in the period t. This variable will be disaggregated into various work sectors - agriculture, off-farm activities, self-employment and house employment. The analysis will be conducted using an LPM model since the coefficients on average are similar to other specifications such as Logit or Probit.

The variable $migrate_{h,t}$ measures whether the household has a member absent in a given period/wave. The parameter of interest for (1) is β_1, whose identification is based on a DiD strategy. Thus, I will compare changes in families' behaviour in households that faced a migratory shock after one member leaves with that of changes in behaviour among those families that did not experience any migratory shocks. This methodology allows

me to tackle the initial time-invariant differences between the treatment and control groups.

A secondary question of interest for this research is to analyse whether individuals behave differently within the households depending on their age-status or gender. Therefore, with a second specification, the following is taken into account:

Age-status equation:

$$Y_{i,h,t} = \beta_0 + \beta_1 migrate_{h,t} + \beta_2 age_{i,h,t} + \beta_3 migrate_{h,t} * age_{i,h,t} + X'_{h,t}\gamma + Z'_{i,h,t}\tau + \delta_h + \eta_t + \epsilon_{i,h,t} \quad (2)$$

Gender equation:

$$Y_{i,h,t} = \beta_0 + \beta_1 migrate_{h,t} + \beta_2 female_{i,h,t} + \beta_3 migrate_{h,t} * female_{i,h,t} + X'_{h,t}\gamma + Z'_{i,h,t}\tau + \delta_h + \eta_t + \epsilon_{i,h,t} \quad (3)$$

Where $age_{i,h,t}$ is whether the individual is a child (less than 15 years old), belongs to the working-age (15-64 years old) or is old (more than 64 years old) (Tan, Liu, Sun, & Zeng, 2022). On the other side, $female_{i,h,t}$ is a dummy variable equal to 1 where the individual sex is female and 0 otherwise. The coefficient of interest in (2) and (3) is β_3. This specification will also be done using the LPM model for simplicity in interpreting heterogeneous effects.

For both specifications, household fixed-effects δ_h and time effects η_t are included. Individual FE are not considered in the main specification to avoid overfitting, which reduces the number of observations as well as the variance. $X'_{h,t}\gamma$ is a set of household-level controls that measure socio-demographic characteristics and shocks that the household has faced. $Z'_{i,h,t}\tau$ are the controls at individual level. Specifically, I add individual controls of gender, dependency, age, education, a dummy for the head of the household, and a set of shocks at the household level that include natural, social, economic, crime in addition to other shocks. Moreover, it is likely that the probability of working changes when the age status $age_{i,h,t}$ changes. Therefore, I include an additional control to check whether the individual has changed their status between waves.

However, these models may have certain caveats in the form of incomparability between the treatment and control groups. This could be the case as the DiD model considers time- invariant baseline differences between the treatment and control group but fails to consider the problem of correlated, time-variant factors such as socioeconomic conditions, which could be related to the probability of migration. For instance, households with better socioeconomic conditions are more prompt to migrate than those with less favourable conditions, making treatment and control groups not comparable. Another concern could be omitted variable bias at the individual level, particularly with variation across waves, which is not captured in the specification.

I run a few additional robustness checks to make a comprehensive argument for comparability. First, I restrict the sample to households with migrants at some point of the analysis, and second, to individuals who have never migrated. It helps rule out self-selection under unobservables. Second, I rely on an event-study analysis, estimating leads and lags of the treatment variable, in order to analyse the existence of pre-trends in out- comes before a household's members migrate (Gagliarducci & Manacorda, 2020). The latter aims to check whether the effect is caused due to migration itself or because of thepresence of latent differences in outcomes between families.

Third, since $migrate_{h,t}$ can vary from 0-1 and from 1-0 from wave to wave, the central coefficient is likely to capture both the effect of leaving and returning to the household. Therefore, I include a dummy of returning to isolate this effect. Next, I estimate the interactions of villages and time fixed effects to control for potential time-variant unobservables at the village level and individual fixed effects to eliminate potential individual time-invariant omitted variable effects. Finally, the primary independent variable in equations (1)-(3) is changed to measure the effect on the number of migrants and the share ofmigrants in the family.

5 Results

Table 7 shows the results of the initial linear probability models, where all estimations include controls, time and HH fixed effects. Panel A exhibits the overall probability of working. Column 1 shows the aggregated probability of working, whereas columns 2-5 estimate the probability of working on each sector. It shows that in households where some members leave, the individuals left-behind show a more significant probability of working in activities related to self-employment. Thus, a member leaving the household increases the probability of working in self-employment for the left-behind members by 0.8%. The probability of working in other sectors does not seem to be affected.

Panel B in Table 7 shows the heterogeneity in effects concerning the age status, and Panel C shows the heterogeneous effects for gender. Column 1 of Panel B shows an increase in the probability of working by 7.9%[4] for older adults, 3% for children, and a decrease of1.4% for working-age people (benchmark). Column 2 shows an increase in the probabilityof working in agriculture by 10.4% for the elderly and 2.6% for children. Column 5 shows a negative effect for the elderly in activities in the house (a decrease of 2.5% for probability to work), which may imply that they decide to change their mode of work from household activities to agricultural activities as the predominant coping mechanism for the absenceof a member in the household.

[4] 7.9% is the 9.3% (coefficient of Migration*Old) minus 1.4% (Benchmark)

Table 7: LPM of working supply for left-behind

	Work	Agri. and Livest.	Off-farm	Self Empl.	House
	(1)	(2)	(3)	(4)	(5)
Panel A: Overall effect					
Migration dummy	0.004	0.005	-0.004	0.008***	-0.004*
	(0.005)	(0.005)	(0.004)	(0.003)	(0.002)
Num. Obs.	33064	33109	33109	33064	33064
R2	0.670	0.527	0.289	0.311	0.148
R2 Adj.	0.651	0.500	0.248	0.271	0.099
Panel B: Age					
Migration dummy	-0.014**	-0.010	-0.008*	0.005	-0.001
	(0.006)	(0.007)	(0.005)	(0.004)	(0.003)
Migration*Child	0.044***	0.026**	0.010	0.011	-0.003
	(0.007)	(0.011)	(0.007)	(0.007)	(0.003)
Migration*Old	0.093***	0.104***	0.017*	-0.002	-0.025**
	(0.028)	(0.028)	(0.010)	(0.010)	(0.012)
Num. Obs.	33064	33109	33109	33064	33064
R2	0.671	0.528	0.289	0.311	0.149
R2 Adj.	0.652	0.501	0.248	0.271	0.100
Panel C: Gender					
Migration dummy	0.000	0.006	-0.004	0.001	-0.003
	(0.006)	(0.008)	(0.005)	(0.004)	(0.002)
Migration*Female	0.010	-0.001	0.000	0.013**	-0.002
	(0.008)	(0.010)	(0.007)	(0.006)	(0.003)
Num. Obs.	33064	33109	33109	33064	33064
R2	0.670	0.527	0.289	0.311	0.148
R2 Adj.	0.651	0.500	0.248	0.271	0.099

Notes: LPM estimation. Cluster Std errors at hh level. Controls, HH and Wave FE includedDependent variable: Probability of working on each sector
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel C shows the heterogeneous effects for gender. The results depict a member of the household leaving to be associated with an increase in the probability to work by 1.3% for self-employed women left-behind. Thus, the heterogeneous gendered effects explain the average effect found in Panel A.

6 Robustness Checks

6.1 Subsample Households with migrants

A potential concern about the identification strategy is whether households with migrants are different in terms of unobservables than those without migrants. To rule out this concern, Table 8 shows DiD estimations only for those families who have had a migrant at some point, excluding families who have never had a migrant. The results in Panel A are similar to previous tables. A migratory shock is associated with an increase in the probability of the self-employed working by 0.7% on average.

In that sense, Panel B and C in Table 8 display the results of sub-setting the sample and including heterogeneous effects of age status and gender, respectively. Thus, columns 1 and 2 in panel B show that the effect is 6.2% and 9.1% for the elderly on average and in agriculture respectively. The absence of a member in the household leads to an increase in the probability of working of 2.3% and 2.8% in agriculture for children. Panel C shows similar results in terms of gender, where member absenteeism leads to an increase in the probability of the self-employed working by 1.5% for women left-behind.

6.2 Subsample individuals never migrated

In this setup, the migration variable for each individual can vary from 1 to 0 or from 0 to 1, thus indicating that the individual can return to the household. Since work behaviour is not captured in the survey for those individuals who remain absent, migrants could potentially be included in the dependent variable and considered a worker in a period where they did not migrate and excluded in the period they do. Thus, the coefficient would capture the effect of the change from belonging to the labour force to not be considered a part of the household, thereby underestimating the coefficient.

Table 8: Subset for only families with migrants

	Work	**Agri. and Livest.**	**Off-farm**	**Self Empl.**	**House**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Panel A: Overall effect					
Migration dummy	0.003	0.004	-0.004	0.007**	-0.004*
	(0.005)	(0.006)	(0.004)	(0.003)	(0.002)
Num. Obs.	28678	28717	28717	28678	28678
R2	0.663	0.525	0.285	0.308	0.144
R2 Adj.	0.643	0.498	0.244	0.268	0.094
Panel B: Age					
Migration dummy	-0.011**	-0.010	-0.007	0.007*	-0.002
	(0.006)	(0.007)	(0.005)	(0.004)	(0.003)
Migration*Child	0.034***	0.028***	0.005	0.004	-0.002
	(0.007)	(0.011)	(0.007)	(0.007)	(0.003)
Migration*Old	0.073***	0.091***	0.015	-0.010	-0.023*
	(0.028)	(0.029)	(0.009)	(0.009)	(0.013)
Num. Obs.	28678	28717	28717	28678	28678
R2	0.663	0.526	0.285	0.308	0.144
R2 Adj.	0.643	0.498	0.244	0.268	0.095
Panel C: Gender					
Migration dummy	-0.002	0.001	-0.001	0.000	-0.002
	(0.006)	(0.008)	(0.005)	(0.004)	(0.002)
Migration*Female	0.010	0.006	-0.006	0.015**	-0.004
	(0.008)	(0.010)	(0.007)	(0.006)	(0.004)
Num. Obs.	28678	28717	28717	28678	28678
R2	0.663	0.525	0.285	0.308	0.144

R2 Adj.	0.643	0.498	0.244	0.268	0.094

Notes: LPM estimation. Cluster Std errors at hh level. Controls, HH and Wave FE includedDependent variable: Probability of working on each sector
* p < 0.1, ** p < 0.05, *** p < 0.01

To rule out this concern, I exclude all individuals who have ever migrated in order to isolate the effect in the dependent variable of individual migration. These results are shown in Table 9. Just as seen before, the effect for older adults is positive and significant, establishing an increase of 8.4% in the probability of working (Panel B). For children, the effect of increased probability to work is 2.2%. For Panel B Column 2, the results for agriculture are only stable for the elderly, where member absenteeism leads to an increase of probability of working by 8.1%. Nevertheless, unlike previous estimations, results for children and the elderly in off-farm activities (Column 3) show a positive and significant coefficient of around 2% each.

Panel C shows the results of excluding individuals who have ever migrated in terms of the probability to work at the level of gender. The results show no significant changes in the probability to work for either gender. Since these results exclude individuals who have the necessary features to be migrants, these results (under this sub-sampling strategy) inTable 9 are henceforth considered the benchmark upon which the following estimationsare based.

Table 9: Subset for only non-migrants individuals

	Work	**Agri. and Livest.**	**Off-farm**	**Self Empl.**	**House**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Panel A: Overall effect					
Migration dummy	-0.002	-0.007	0.003	0.006*	-0.003
	(0.006)	(0.007)	(0.004)	(0.004)	(0.003)
Num. Obs.	21679	21701	21701	21679	21679
R2	0.726	0.576	0.312	0.379	0.179
R2 Adj.	0.704	0.543	0.258	0.330	0.115
Panel B: Migration*Age					
Migration dummy	-0.026***	-0.022**	-0.004	0.002	-0.001
	(0.007)	(0.009)	(0.006)	(0.005)	(0.003)
Migration*Child	0.048***	0.019	0.018**	0.012	-0.002
	(0.009)	(0.014)	(0.008)	(0.009)	(0.003)
Migration*Old	0.110***	0.103***	0.021**	0.004	-0.018
	(0.033)	(0.033)	(0.010)	(0.013)	(0.014)
Num. Obs.	21679	21701	21701	21679	21679
R2	0.727	0.577	0.312	0.379	0.179
R2 Adj.	0.705	0.543	0.258	0.330	0.115
Panel C: Migration*Female					
Migration dummy	-0.007	-0.003	0.003	-0.002	-0.003
	(0.007)	(0.010)	(0.006)	(0.005)	(0.002)
Migration*Female	0.009	-0.007	0.000	0.016*	0.001

	(0.009)	(0.013)	(0.009)	(0.008)	(0.004)
Num. Obs.	21679	21701	21701	21679	21679
R2	0.726	0.576	0.312	0.379	0.179
R2 Adj.	0.704	0.543	0.258	0.331	0.115

Notes: LPM estimation. Cluster Std errors at hh level. Controls, HH and Wave FE includedDependent variable: Probability of working on each sector
* p < 0.1, ** p < 0.05, *** p < 0.01

6.3 Isolating effect of return

Due to the construction of the primary independent variable, the migration variable at the household level could potentially capture both the effect of leaving the household and returning. To isolate this effect, I create an index of "return" that is equal to 1 when the household $migration_{t-1}$ is equal to 1 and $migration_t$ is equal to 0, and 0 otherwise. This indicator captures the changes from 1 to 0 in the migration variable, i.e., returning any individual to the household. I interact this index with the corresponding age-status/gender variable to evaluate heterogeneous effects.

Table 10 (Appendix) panels A, B and C show the total, age-status and gender effects, respectively. On average (Panel A), upon controlling for individuals returning, the migration dummy represents a decrease in the probability of working in agriculture (Column 2). The co- efficient for the returning variable is negative both overall and for agriculture. It might imply that once the absent member returns, they take back their productive role in the household, reducing the burden on the left-behind.

Panel B Column 1 shows an average increase in the probability of working for children and older adults. Thus, a migratory shock increases the probability of working for the elderly by 8.6% and 2.3% for children. Moreover, the results in agriculture (Panel B, Column 2) for older adults remains stable, where the migration shock is associated with an increase in the probability of working in this sector of 7.7%. On the other hand, the elderly and children also increase their probability of working off-farm activities by 2.2% and 2.6%, respectively. Additionally, Panel C does not show significant results for genderin any of the sectors.

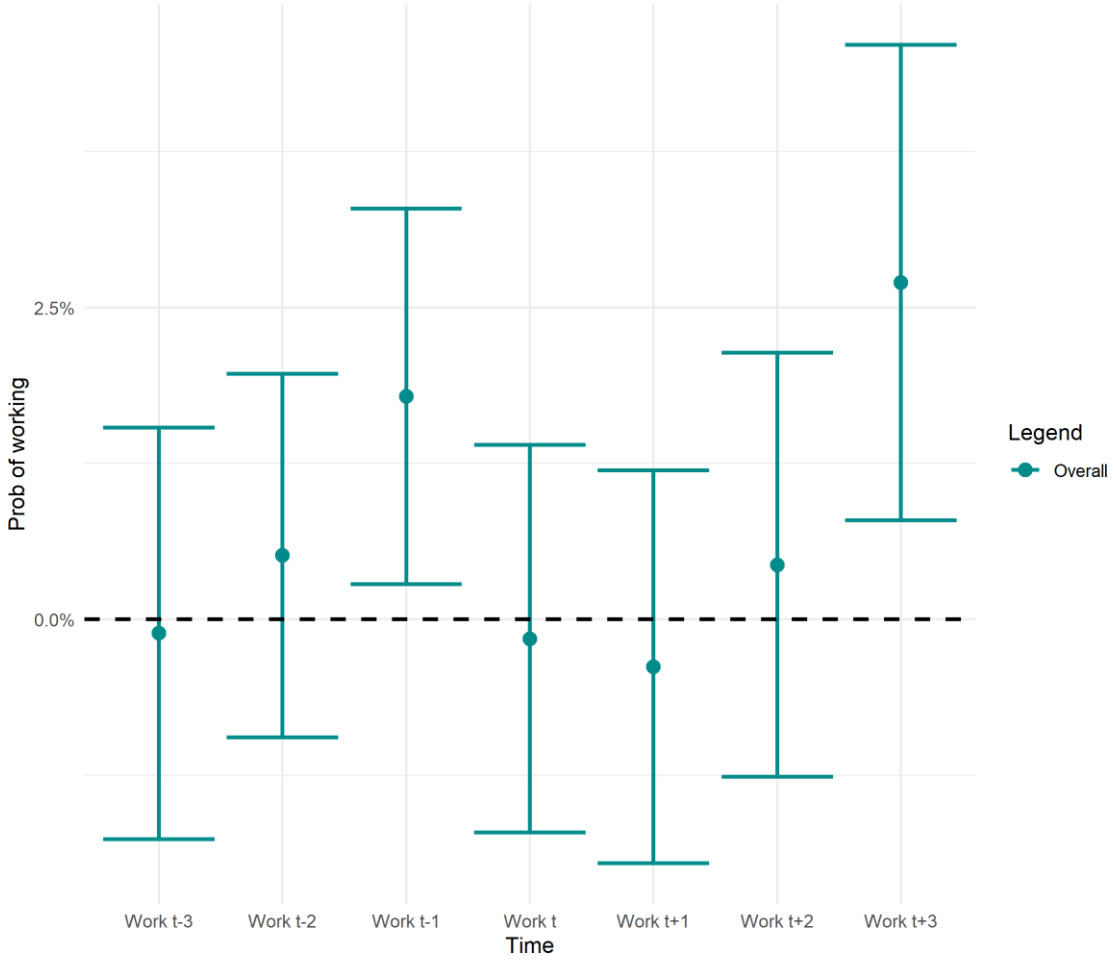
6.4 Event Study design

One of the main assumptions of the DiD specification is that of parallel trends. It implies that the treated group would have followed the same trend as the control group without treatment. To falsify this, I proceed to run an event study to understand the time behaviour of the migration shock in specific periods after and before. This placebo regression aims to understand what would have happened if the migration had occurred after or before it did. For these regressions to be valid, work supply behaviour must not change before the migratory shock. In this setting, three periods after and before are included. The coefficients in t-3, t-2 and t-1 are not expected to be significant and

areonly expected to be significant from t onwards.

Moreover, since I am now interested in understanding the effects for each age group, I interact those lags and leads with the age-status/gender dummy. The overall probability of working in agriculture is shown in Figure 3. In this estimation, the coefficient for t-1 is positive and significant at 5%, implying that individuals in the treatment group changed their behaviour before migration occurred. Thus, I cannot argue for the comparability of individuals under this estimation.

Figure 3: Event study Working in Agriculture



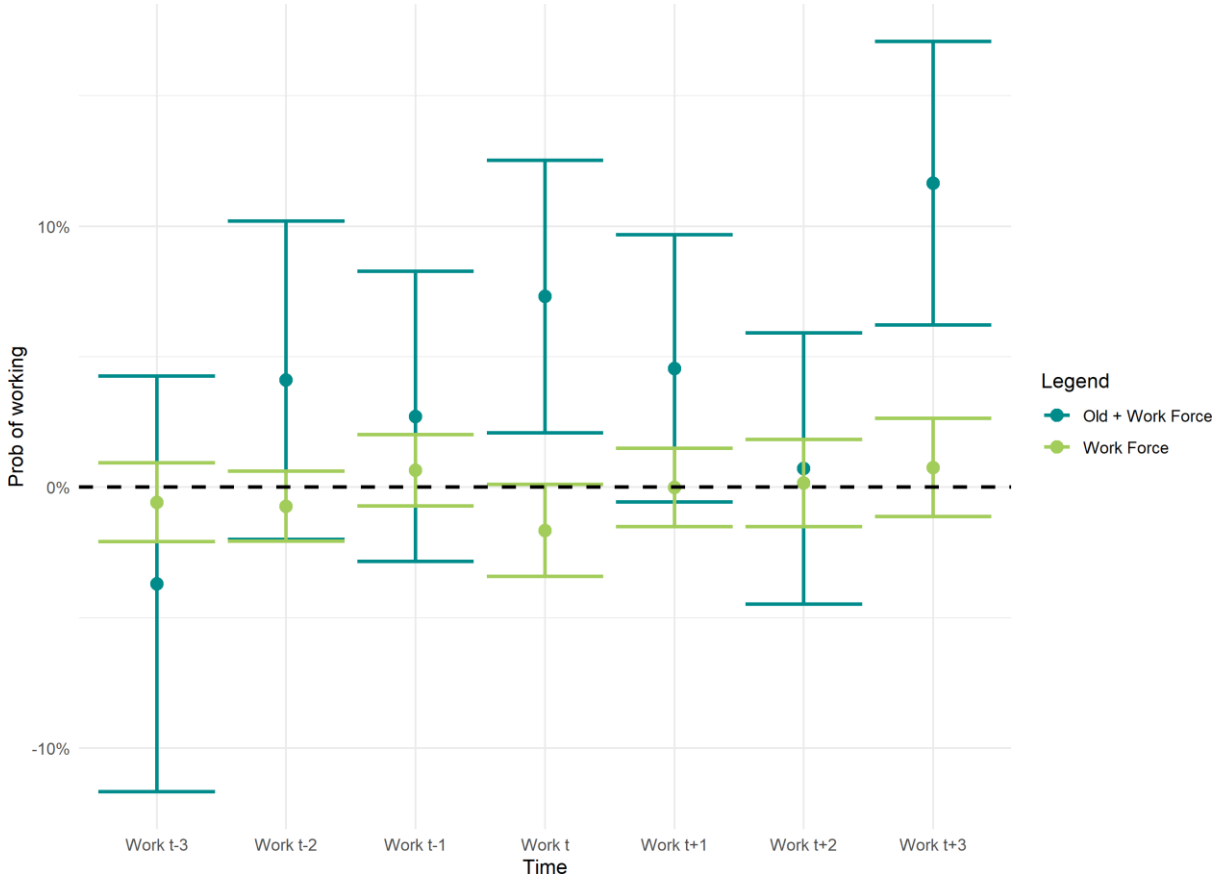
Note: CI at 5% level. Calculations excluding ever migrants

Nevertheless, Figure 4 and Figure 5 show the event study estimation with age status het- erogenous effects, for the overall probability of working and for agriculture, respectively[5]. For both figures, most of the coefficients for the old and working-age individuals remain non-significant, except for the coefficient of older adults in t and t+3. First, this implies that individuals do not change their behaviour in the labour market before a migratory shock occurs. Second, there is an immediate effect of

[5] I compare the behaviour of the elderly vs people of the working age.

migration on the working probability of older adults, with an increase in the probability of around 8%, as shown in previous results. Third, it is possible for a long term effect to exist since the coefficient in t+3 is significant at 5%. Surprisingly, the magnitude in t+3 exceeds that of the previous coeffi- cients by increasing to 15% for the probability to work. This effect could be driven by a decrease in the liquidity constraints that foster investment in agriculture in the long run. In contrast with Figure 3, now that heterogeneous effects of age are included, individuals in treatment and control groups are made comparable, therefore effectively sealing the argument of the non-existence of differential pre-trends.

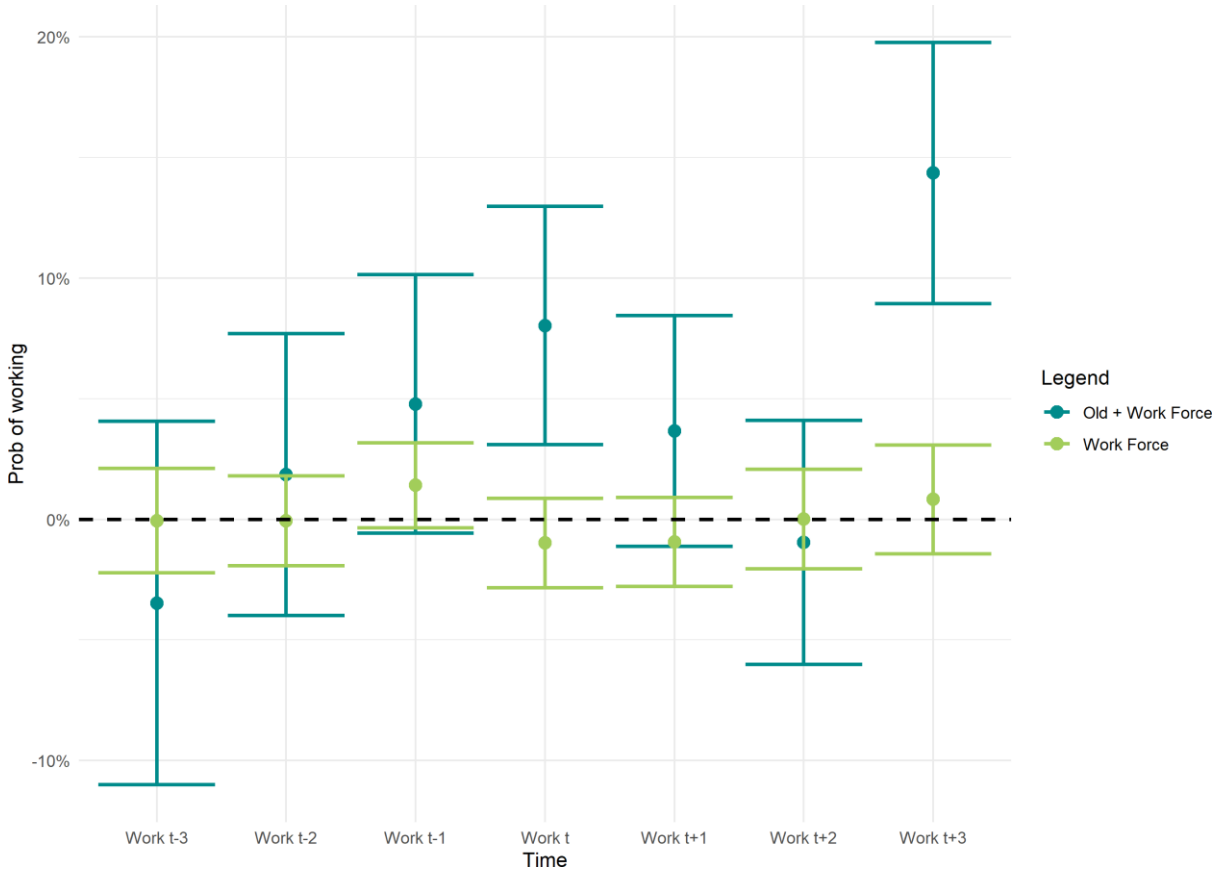
Figure 4: Event study Working Overall vs Age (Old people)



Note: CI at 5% level. Calculations excluding ever migrants

To check whether the increase in the probability of working in off-farm activities is robust for the elderly and children, Figures 6 and 7 show the event study results to analyse the existence of parallel trends. Figure 6 shows the results for older adults, where most of the coefficients of all the leads and lags are non-significant. However, in t+3, the coefficient of the probability of working is negative. Since I do not find a positive coefficient, as was found in previous exercises, I argue that the behaviour of the elderly in off-farm activitiesis not consistent across all these specifications.

Figure 5: Event study Working in Agriculture vs Age (Old people)

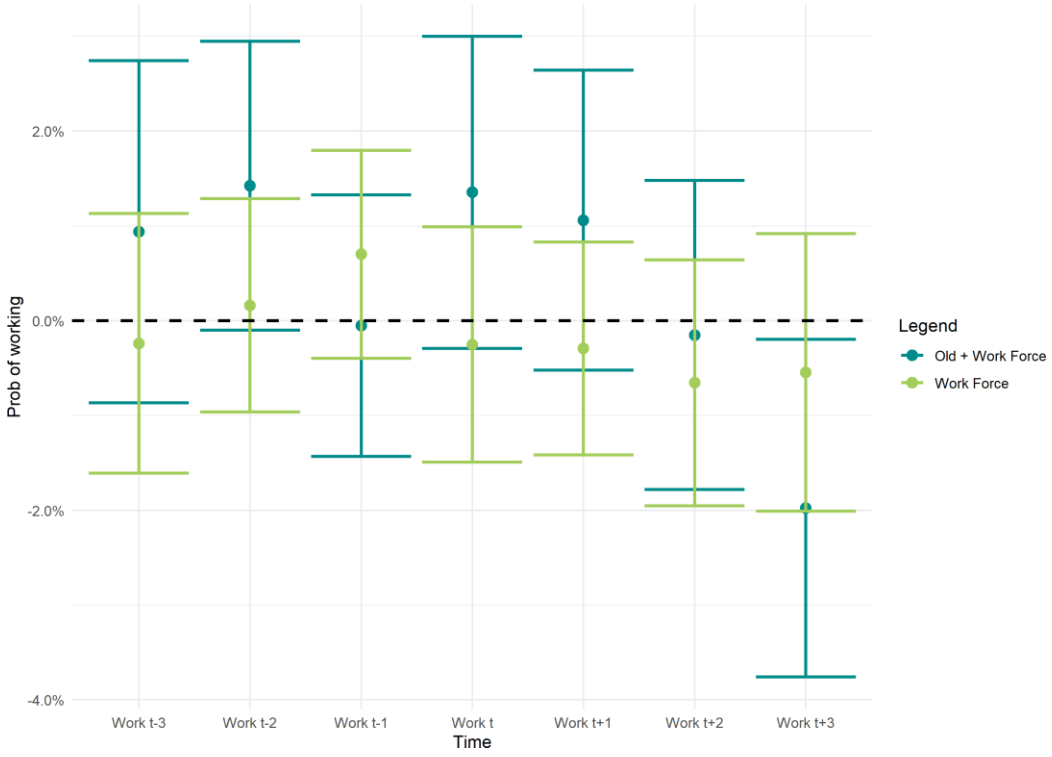


Note: CI at 5% level. Calculations excluding ever migrants

Nevertheless, when analysing the labour supply of children in off-farm activities (Figure 7), I find that the coefficients in t and t+1 are positive and significant, with values of probability of working seen to be around 1%, supporting the hypothesis that the absence of a member affects the children's labour decisions. Moreover, the coefficients of t-3 until t-1 remain non-significant, giving evidence that the children did not change their behaviour before the migratory shock.

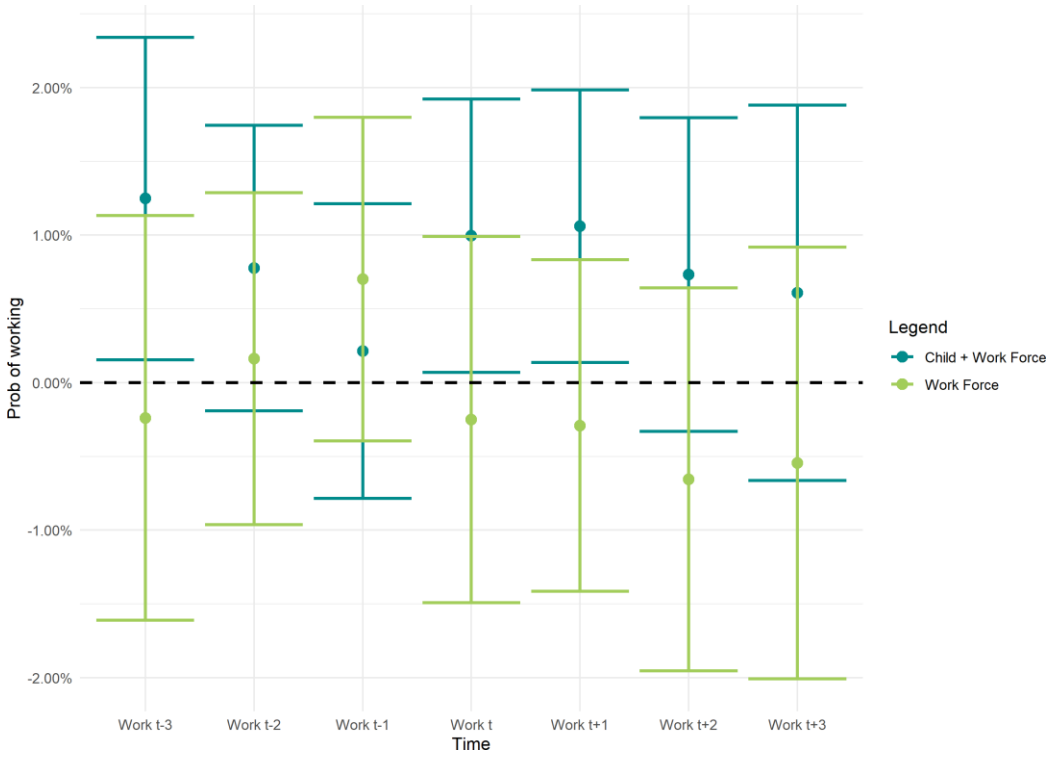
Finally, results for gender in self-employment are shown in Figure 9 (Appendix). It shows a positive coefficient of around 1% for t, and no significant effect for the periods after or before. It implies that females do not change their behaviour before migration, thus validating the parallel trends assumption.

Figure 6: Event study Working in Off-Farm vs Age (Old people)



Note: CI at 5% level. Calculations excluding ever migrants. Includes control of returning

Figure 7: Event study Working in Off-Farm vs Age (Children)



Note: CI at 5% level. Calculations excluding ever migrants. Includes control of returning

6.5 Village*Time and Individual FE

Another potential source of endogeneity is the possible existence of omitted variables correlated with the propensity of migrating. I analyse two potential sources of endogeneity: village time-variant unobserved variables and individual time-invariant unobserved variables.

Table 16 (Appendix) shows the results of village*time FE. Panel B, columns 1 and 2 show that the absence of a member in the family has a positive effect on the working probability in agriculture activities for the elderly and children. Panel C shows an increase in the probability of self-employment for women due to the absence of a member.

Table 11: Estimations with Time-Vill and Ind FE

	Work	**Agri. and Livest.**	**Off-farm**	**Self Empl.**	**House**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Panel A: Overall effect					
Migration dummy	0.004	0.007	0.001	-0.001	-0.003
	(0.005)	(0.006)	(0.004)	(0.004)	(0.003)
Num.Obs.	21679	21701	21701	21679	21679
R2	0.842	0.762	0.597	0.671	0.368
R2 Adj.	0.796	0.694	0.482	0.576	0.187
Panel B: Migration*Age					
Migration dummy	-0.004	-0.004	0.002	0.000	-0.002
	(0.006)	(0.007)	(0.005)	(0.004)	(0.003)
Migration*Child	0.013	0.023*	-0.005	-0.005	-0.001
	(0.010)	(0.013)	(0.008)	(0.008)	(0.006)
Migration*Old	0.047***	0.056***	0.003	-0.006	-0.006
	(0.014)	(0.018)	(0.012)	(0.010)	(0.009)
Num.Obs.	21679	21701	21701	21679	21679
R2	0.842	0.762	0.597	0.671	0.368
R2 Adj.	0.797	0.694	0.482	0.576	0.187
Panel C: Migration*Female					
Migration dummy	0.005	0.017**	0.001	-0.010**	-0.002
	(0.006)	(0.008)	(0.005)	(0.005)	(0.004)
Migration*Female	-0.002	-0.017*	0.001	0.016***	-0.001
	(0.008)	(0.010)	(0.007)	(0.006)	(0.005)
Num.Obs.	21679	21701	21701	21679	21679
R2	0.842	0.762	0.597	0.671	0.368
R2 Adj.	0.796	0.694	0.482	0.577	0.187
Time-Vill FE	Yes	Yes	Yes	Yes	Yes
Ind FE	Yes	Yes	Yes	Yes	Yes

Notes: LPM estimation. Cluster Std errors at hh level. Controls, HH and Wave FE includedDependent variable: Probability of working on each sector
* p < 0.1, ** p < 0.05, *** p < 0.01

However, according to Table 11 when including individual fixed effects, most coefficients turn non-significant, and for agriculture, the coefficient for the elderly

drops by half of what was previously found in the exercises (Panel B). Moreover, specifically for children, the result is no longer significant. Panel C also shows a positive and significant effect on the probability of working on self-employment for women. Nevertheless, the coefficient is 0.6%, which is low compared to other findings and brings up no strong evidence of this channel.

6.6 Number of migrants and share of migrants

Having found stable results for agriculture among the elderly, I change the independent variable to the number of migrants and the share of migrants in each household. Table 12 shows the probability of working in agriculture for the elderly and the benchmark (people of working age). In Column 1, I show the effect of the number of migrants on the probability of working. Thus, an increase in one member migrating leads to an increase in the probability of working for the elderly left-behind by 5.6%. Column 2 includes the number of migrants squared to check for non-linearities. However, both the coefficientsare seen to lose significance. It could happen due to the lack of categories in the number of migrants, where the maximum number of migrants is 8. Thus, it is likely that this variable cannot be treated as a continuous variable. Figure 10 (Appendix) shows the heterogeneous effects for different numbers of migrants, where the increase in the probability occurs for the first two migrants, and then the coefficient decreases subsequently.

Table 12: Estimations with Number of migrants and share of migrants

	Agri. and Livest			
	(1)	(2)	(3)	(4)
Number of migrants	-0.013***	-0.016		
	(0.004)	(0.013)		
N.Migrants*Old	0.056***	0.089*		
	(0.016)	(0.053)		
(Number of migrants)^2		0.001		
		(0.002)		
Share of migrants			-0.098***	-0.198**
			(0.026)	(0.089)
Share Migrants*Old			0.421***	0.968***
			(0.070)	(0.265)
(Share Migrants)^2				0.123
				(0.092)
(Share Migrants)^2*Old				-0.597**
				(0.253)
Num.Obs.	21701	21701	21701	21701
R2	0.577	0.577	0.578	0.578
R2 Adj.	0.544	0.544	0.545	0.545

LPM estimation. Cluster Std errors at hh level. Controls, HH and Wave FE
Dependent variable: Probability of working on each sector
* p < 0.1, ** p < 0.05, *** p < 0.01

Calculating the share of migrants in the family is another good strategy to make the variable linear and control for migration's relative weight on each household. Columns 3 and 4 of Table 12 show the results. In both, the share of migrants positively affects the probability of working. Moreover, in Column 4, I include the squared term of the share of migrants, where the coefficient is negative and significant. Therefore, it indicates diminishing returns in terms of the share of migrants on the probability of working. Thus, if more individuals migrate, they are more likely to support the family left-behind, relieving the burden to work for the elderly.

7 Heterogeneous effects and Channels of transmission

After ascertaining that the elderly are the most prompt to change their labour supply behaviour once a member leaves, particularly in the agriculture sector, the next step is to investigate why. Therefore, the first thing I show in Table 13 is the disaggregation of the probability of working in agriculture. In the Survey, this variable is defined as (1) Self Agriculture and Livestock activities, (2) Fishing, hunting and collecting, (3) Casual agriculture activities, and (4) Permanently employed in agriculture. Therefore, I run the same specification as before for each sub-category.

I argue that the increase in the probability of working in agriculture found in previous tables is due to an increase in the probability of working in Self Agriculture and Livestock (Column 1). Thus, a member leaving leads to older adults increasing the probability of working by 8% in this activity, which indicates that the primary coping mechanism of households might be for the elderly to work in their lands.

Table 13: Agriculture sub-sectors

	Self Agri/Livest. (1)	**Fishing, huting/ collect (2)**	**Casual agri. (3)**	**Perm. employed agri. (4)**
Migration dummy	-0.021**	0.003	-0.001	-0.004**
	(0.009)	(0.003)	(0.002)	(0.002)
Migration*Child	0.025*	-0.006	-0.001	0.002
	(0.014)	(0.005)	(0.002)	(0.002)
Migration*Old	0.103***	-0.005	0.002	0.002
	(0.033)	(0.004)	(0.002)	(0.002)
Num.Obs.	21679	21679	21679	21679
R2	0.566	0.370	0.119	0.111
R2 Adj.	0.532	0.320	0.050	0.041

LPM estimation. Cluster Std errors at hh level. Controls, HH and Wave FE includedDependent variable: Probability of working on each sector
* p < 0.1, ** p < 0.05, *** p < 0.01

In Table 14, I run a range of heterogeneous effects to verify this hypothesis by including different effects for those households who were owners of their land in the first wave. Column 1 shows that for households with property, the increase in the probability of working in agriculture for the elderly increases by 18%, while the effect for those who do not have property is not significant. It validates the idea that they increase their

laboursupply in their lands to offset the absence of a member.

Table 14: Het. effects Income and Assets

	Agri. and Livest				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Migration dummy	0.031	-0.041***	-0.038***	-0.016	-0.037***
	(0.034)	(0.012)	(0.012)	(0.012)	(0.011)
Migration*Old	-0.063	0.130***	0.135***	0.119***	0.129***
	(0.076)	(0.038)	(0.042)	(0.038)	(0.040)
Migration*Old*Property 2007	0.180**				
	(0.082)				
Migration*Old*High income 2007		-0.069			
		(0.067)			
Migration*Old*High assets 2007			-0.079		
			(0.065)		
Migration*Old*High members 2007				-0.018	
				(0.066)	
Num.Obs.	21541	21701	21623	21701	17095
R2	0.581	0.580	0.580	0.577	0.578
R2 Adj.	0.548	0.547	0.547	0.544	0.536
Sample	Full	Full	Full	Full	No Remit.

LPM estimation. Cluster Std errors at hh level. Controls, HH and Wave FE included Dependent variable: Probability of working on each sector
* p < 0.1, ** p < 0.05, *** p < 0.01

Columns 2 and 3 analyse the differentiated effect for those households which are better off economically. The primary migration variable is interacted with values of income and assets in 2007, for the initial wave, to evaluate whether deprived households are more prone to change their behaviour in the labour market. Heterogeneous effects are seen not to change differences among households with high and low initial income/assets.

The analysis then examines whether individuals from large/small households behave differently in terms of members (Column 4). It is likely, for instance, that in small house-holds, since there are only a few individuals who can offset the absence of the migrant, the older individual is forced to enter the labour market to help out the family. Finally, column 4 depicts the heterogeneous effects without showing any significant differences.

Moreover, I make a final estimation subsampling households that do not receive remittances. For instance, given that for the 6th wave, 44% of households that faced a migratory shock did not receive remittances, it is essential to check whether individuals ofthose households changed their behaviour. Table 14, Column 5 analyses the latter by sub-setting the sample to only those households that do not receive remittances. Since coefficients remain positive and significant for older adults, it can be argued that the cop-ing mechanism of turning to agriculture for work occurs for those families with

no benefitin the form of income from migration.

Finally, since it has been observed that individuals from households that do not receive remittances are most likely to change their labour supply, it is essential at this point to analyse the effect of migration on household income. Table 15 shows the effect of the migration dummy on the logarithm of income for a few sectors and the total. Column 1 shows that, as expected, families that have faced a migratory shock experience an increase in income from remittances in the amount of 0.67 log points.

Table 15: Effect of migration on income

	Log of Income by sector						
	Remittances	Livestock	Livestock	Crops	Total 1	Total 2	Total 3
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Migration dummy	0.670***	0.138***	0.210	0.002	0.116***	−0.053	−0.108***
	(0.148)	(0.047)	(0.148)	(0.035)	(0.027)	(0.027)	(0.029)
Log Sells Livest.			0.330***				
			(0.050)				
Observations	2,183	5,939	1,004	7,479	8,841	8,765	8,830
R^2	0.036	0.011	0.173	0.007	0.042	0.030	0.034

Note: *p<0.1; **p<0.05; ***p<0.01
Estimation at household level. Robust standard errors.Controls, HH and Wave FE included
Total 1 refers to Total Income, Total 2 refers to Income without remit.
Total 3 refers to Income w/o remit and livestock

The previous findings exhibit a change in individuals labour behaviour who work in agriculture and livestock activities. Considering that, the impacts of migration on income from those sectors are included. Table 15 Column 2 shows the effect of migration on livestock, and Column 4 shows the effect of migration on income from crops production. The migratory shock increases livestock income by 0.14 log points, while it does not affect income from crops. Therefore, I argue that individuals left-behind increase their labour in livestock activities, leading to an increase in income derived from activities in this sector. Nevertheless, due to data availability issues, this finding cannot be corroborated with that of individual labour likelihood.

In Column 3, additional control of the log of sales of livestock products, such as eggs, milk, etc, is included. Once this control is added, the migration dummy is no longer significant, and the sales log takes on all the statistical power. The previous might imply that the effect of migration on livestock income predominantly acts through an increase in the sales of livestock products, most likely as a coping mechanism. Therefore, as these activities are less strenuous, the elderly are more likely to take on these tasks to offset theabsence of a member in the household.

Furthermore, Column 5 shows the effect on total income, Column 6 shows Total income excluding remittances, and Column 7 shows Total income excluding both remittances and income from livestock. Migration of a household member increases the total income by 0.116 log points, which implies that, on average, households left-behind are better off in terms of income once migration occurs (Column 5). Nevertheless, there is no significant change in the income found for households without remittances (Column 6).

In Column 7, I find that without taking remittances and livestock income into account, total income decreases by 0.1 log points. Thus, just as before, this implies that for households without remittances, the primary coping mechanism is to increase their labour and sales in livestock activities, which helps them offset the absence to not to change their income. Nevertheless, households that cannot cope with livestock activities decrease their totalincome.

Together with the labour supply results, these findings indicate that it is likely that the elderly increase their work in terms of selling products from livestock to offset the absence of a member. For those families without remittances, this help to mitigate the negative income effect produced by a member leaving. However, income decreases after the migratory shock occur for those who do not have the chance to cope with livestock activities. This result aligns with Do et al. (2019), who argue for the importance of livestock production in reducing poverty and income inequality in Vietnam, particularly given the recent importance of the sector to the national GDP.

Additionally, as discussed in the data description, it would have been rather interesting to analyse the different facets of the behaviour observed in terms of work for households facing long-term migration versus those facing short-term migration. However, this estimation is not feasible in this setup since the variable would have needed to be constructed at the household level and would not have had time variation. Therefore, the household fixed effects would have captured this effect. On the other hand, this estimation usually is feasible in cross-sectional setups, such as in Wouterse and Taylor (2008).

Furthermore, different reasons for migrating would also affect labour supply behaviour. Nevertheless, due to data quality, only the reasons for leaving the household for the last two waves can be captured. Thus, the estimation of heterogeneous effects would not have considered the same time variation as the other estimations, and it is likely, that the results would differ consistently.

8 Conclusion and Discussion

Rural-Urban migration and the urbanisation process has been hailed as a pivotal element in the developmental pathway. (UN, 2016). According to development models (Harris & Todaro, 1970), structural change is primarily seen to be the driving force for the shift from agriculture to industry and the modern service sector, thus fostering urbanisation. In that sense, urban spaces incentivise the incoming population to accumulate human capital. In fact, endogenous growth theory Romer (1994) establishes the importance of gains in human capital accumulation, thus firmly entrenching cities to be the engines of modern economic growth.

Despite all the benefits that this process could bring, there is still a large set of research

that looks at the other side of urbanisation, i.e., in terms of aggravating poverty conditions, raising a debate about the net associated costs. Among these costs, there is a rather drastic restructuring of the home dynamics and the labour and leisure associated with the remaining individuals within each of the rural households. The present research has this focus which has chosen to make the left-behind family its prime area of inquiry.

In particular, the implication for the left-behind in Vietnam regarding their labour market behaviour once faced with a migratory shock from a member leaving is examined. The various coping mechanisms exhibited for each age group and implications for the sectoral allocation of labour have been explored. The nodal channel of this analysis is whether there are different effects observed for each age group: Children, Working-age, and the elderly. To identify the effect of migration of a family member on the household's labour market outcomes, this investigation follows a DiD approach with a fixed-effects estimation using TVSEP data.

After several robustness checks, this research concludes that the primary coping mechanism for the family left behind when faced with a migratory shock is for the elderly to take up agricultural activities. In concrete terms, migration leads to an increase in livestock income, specifically driven by an increase in the sale of products obtained from this sector, such as eggs, milk, etc. Since this is an activity that older adults can easily partake in, they are likely to increase their effort in selling to offset the absence of a member. For families without remittances, this helps mitigate the negative income effect produced by a member leaving. However, for those that do not have the chance to cope with livestock activities, the effect of member absenteeism on income is seen to be negative.

The central novelty of this investigation is the finding of the increased probability of working in livestock activities as a coping mechanism by the left-behind under scenarios of no income benefits from migration. This result strongly aligns with Do et al. (2019), who argue for the importance of livestock production in reducing poverty and income inequality in Vietnam, given the recent importance of the sector in the GDP. However, contrary to this finding, typically in literature, an increase in livestock activities results from a reduction in liquidity constraints due to the receipt of remittances.

Despite many robustness checks, the main drawback of this research is the difficulty in arguing for causal effects. In this setup, the effect of unobserved time-varying variables correlated with the migration dummy cannot be isolated, thus leading to a bias in the results. This problem is typically corrected in the literature through Instrumental Variables or an Experimental Design, but this was not feasible due to data availability.

Subaltern migration has interesting policy implications and presents potential extensions to this investigation. For instance, with better information about the

destination of the internal migrants in Vietnam, the variegated effects for migrants who go to larger cities than those who go to secondary towns can be investigated. Despite TVSEP having a migration module that tracks migrants and collects their information, the variability is still relatively scarce to make further claims and estimations.

As discussed before in this document, more disaggregated data about the specific activities in which each individual left behind partakes in would be helpful to have a better understanding of the dynamics of turning to livestock as a coping mechanism. Additional data could help distinguish the extensive vs intensive labour supply mechanism, i.e., whether the increase of the livestock income is only through an increased number of individuals working or whether there is more time dedicated to those activities.

Finally, other dependent variables could have been taken into account in this setting, such as poverty rates or happiness. This research found an increase in working supply from the elderly to offset the member leaving without remittances. However, it is not clear whether this migration had an adverse effect on other welfare measures such as those named above.

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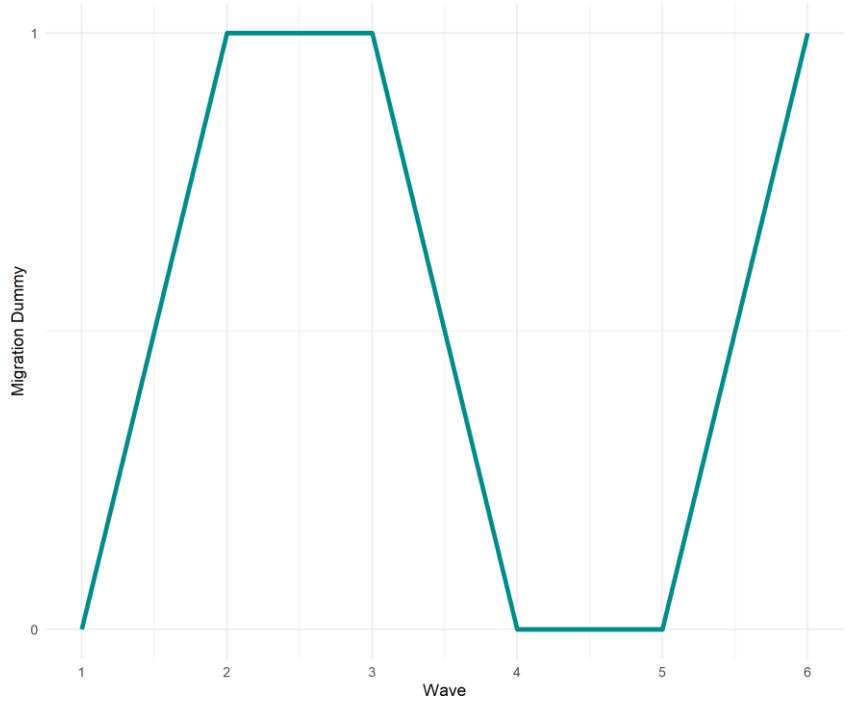
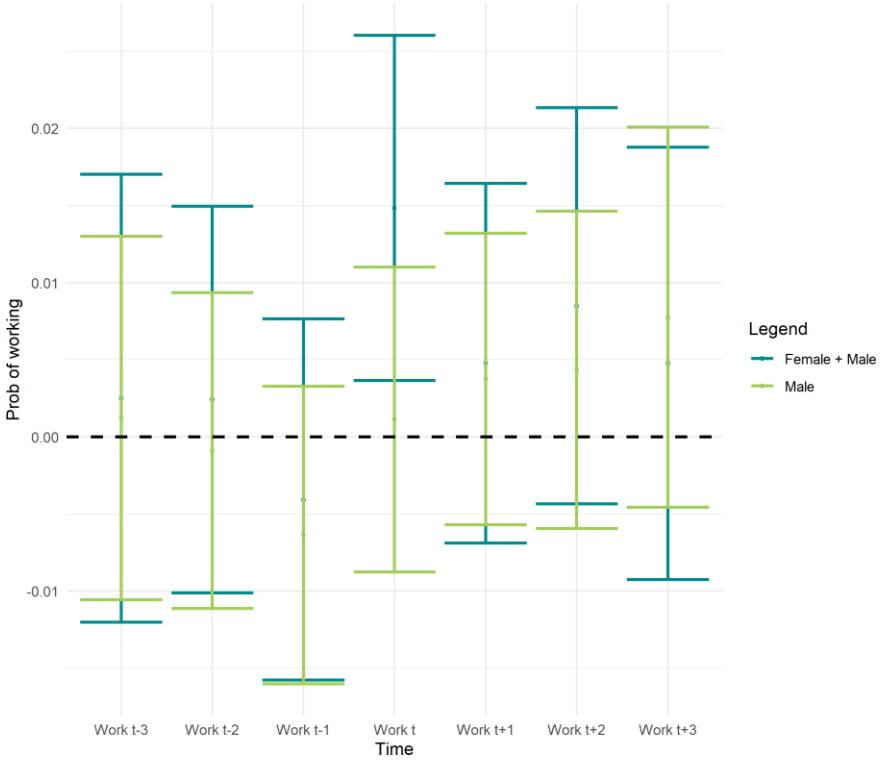
10 Appendix

Figure 8: Description of Migration dummy for a representative household by wave



Note: Household Id 2219

Figure 9: Event study Working in Self Employment vs Gender



Note: CI at 5% level. Calculations excluding ever migrants

Table 10: Isolating effect of return

	Work	Agri. and Livest.	Off-farm	Self Empl.	House
	(1)	(2)	(3)	(4)	(5)
Panel A: Overall effect					
Migration dummy	-0.008	-0.018**	0.005	0.007*	-0.002
	(0.007)	(0.008)	(0.005)	(0.004)	(0.003)
Return dummy	-0.018**	-0.032***	0.006	0.004	0.003
	(0.008)	(0.009)	(0.005)	(0.005)	(0.004)
Num.Obs.	21679	21701	21701	21679	21679
R2	0.726	0.576	0.312	0.379	0.179
R2 Adj.	0.704	0.543	0.258	0.330	0.115
Panel B: Migration*Age					
Migration dummy	-0.039***	-0.037***	-0.004	0.000	0.002
	(0.009)	(0.011)	(0.007)	(0.006)	(0.004)
Migration*Child	0.060***	0.025	0.022**	0.017*	-0.004
	(0.010)	(0.016)	(0.010)	(0.010)	(0.004)
Migration*Old	0.125***	0.114***	0.026**	0.012	-0.027*
	(0.038)	(0.037)	(0.013)	(0.015)	(0.016)
Return*Child	0.062***	0.027	0.021*	0.025**	-0.011*
	(0.014)	(0.018)	(0.011)	(0.010)	(0.006)
Return*Old	0.059	0.045	0.018	0.029*	-0.033*
	(0.038)	(0.036)	(0.015)	(0.015)	(0.019)
Num.Obs.	21679	21701	21701	21679	21679
R2	0.727	0.577	0.312	0.379	0.180
R2 Adj.	0.705	0.544	0.259	0.331	0.115
Panel C: Migration*Female					
Migration dummy	-0.013	-0.011	0.004	-0.001	-0.004
	(0.008)	(0.011)	(0.007)	(0.006)	(0.003)
Migration*Female	0.009	-0.013	0.002	0.016*	0.005
	(0.010)	(0.014)	(0.010)	(0.009)	(0.005)
Return*Female	-0.002	-0.034**	0.012	0.001	0.020***
	(0.014)	(0.016)	(0.012)	(0.009)	(0.008)
Num.Obs.	21679	21701	21701	21679	21679
R2	0.726	0.576	0.312	0.379	0.180
R2 Adj.	0.704	0.543	0.258	0.331	0.115

Notes: LPM estimation. Cluster Std errors at hh level. Controls, HH and Wave FE includedDependent variable: Probability of working on each sector

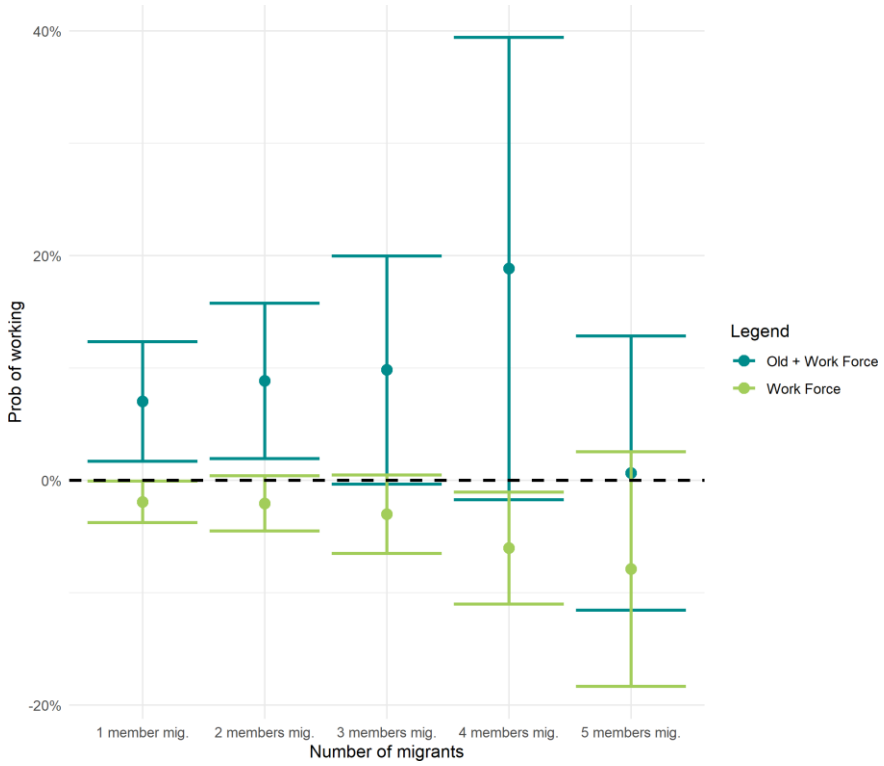
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 16: Estimations with Time-Vill FE

	Work	Agri. and Livest.	Off-farm	Self Empl.	House
	(1)	(2)	(3)	(4)	(5)
Panel A: Overall effect					
Migration dummy	0.011**	0.011*	0.003	0.000	-0.003
	(0.006)	(0.007)	(0.004)	(0.004)	(0.003)
Num.Obs.	21679	21701	21701	21679	21679
R2	0.741	0.599	0.344	0.403	0.224
R2 Adj.	0.705	0.543	0.252	0.319	0.115
Panel B: Migration*Age					
Migration dummy	-0.015**	-0.009	-0.002	-0.002	-0.001
	(0.007)	(0.009)	(0.006)	(0.006)	(0.004)
Migration*Child	0.069***	0.042***	0.015	0.010	0.001
	(0.009)	(0.016)	(0.010)	(0.010)	(0.004)
Migration*Old	0.103***	0.100***	0.016	0.007	-0.018
	(0.033)	(0.032)	(0.011)	(0.013)	(0.014)
Num.Obs.	21679	21701	21701	21679	21679
R2	0.742	0.600	0.344	0.403	0.224
R2 Adj.	0.706	0.543	0.252	0.319	0.115
Panel C: Migration*Female					
Migration dummy	0.008	0.016	0.004	-0.009	-0.003
	(0.007)	(0.010)	(0.007)	(0.006)	(0.003)
Migration*Female	0.007	-0.009	-0.002	0.017**	0.001
	(0.009)	(0.013)	(0.009)	(0.008)	(0.004)
Num.Obs.	21679	21701	21701	21679	21679
R2	0.741	0.599	0.344	0.403	0.224
R2 Adj.	0.705	0.543	0.252	0.319	0.115
Time-Vill FE	Yes	Yes	Yes	Yes	Yes
Ind FE	No	No	No	No	No

Notes: LPM estimation. Cluster Std errors at hh level. Controls, HH and Wave FE included
Dependent variable: Probability of working on each sector
* p < 0.1, ** p < 0.05, *** p < 0.01

Figure 10: Het. Effects by number of migrants



Note: CI at 5% level. Calculations excluding ever migrants