Easy Come, Easy Go? Economic Shocks, Labor Migration and the Family Left Behind

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Abstract

This study investigates how labor market shocks in destination countries affect households at origin through their migrants abroad. The results show that such shocks had large and heterogeneous effects on the demographic composition and labor supply of Vietnamese families left behind during the Great Recession. Poor households were negatively affected and coped by reducing domestic while increasing foreign labor migration. These changes also resulted in a rise in fertility as well as an increase in origin labor supply and of the household nucleus size. In contrast, rich households remained relatively unaffected. I provide a theoretical framework, which rationalizes these heterogeneous responses by the relative magnitudes of income and substitution effects caused by the shock.

JEL classification: D10, F22, J61, O15, P36, R23
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1 Introduction

The magnitude of migration is large and has been growing rapidly over the past decades, both within and across countries (World Bank 2009).[1] International migration typically yields high income gains to migrant workers from developing countries (McKenzie et al. 2010). Countries such as the Philippines and Vietnam are actively promoting temporary labor export schemes with the goal of fostering remittance receipts, which have become a major source of income for families left behind (World Bank 2016a). In this environment of increasing migration and remittances, households at the origin become dependent on overseas incomes and exposed to economic shocks through their migrants abroad. Despite the increasing scale of this phenomenon, there is little evidence about the impact on the family left behind, their coping strategies, and the implications for domestic and foreign migration.

This paper studies the effect of economic shocks to migrant incomes during the Great Recession on their remittance-dependent families left behind in Vietnam. I address three sets of questions: First, with negative income shocks that hit migrant members abroad and transmit to the origin through remittances, how do families left behind cope and which role do domestic and international migration strategies play in this? Second, do they react heterogeneously to the shock and, if yes, for what reason? Third, conditional on their coping strategies, what are the financial consequences for affected households and the implications for a migration-driven development policy?

Vietnam provides an interesting setting for this study as the country has been experiencing a sharp increase in both domestic and foreign migration since the beginning of the economic and political liberalization of the early 1990s (Abella and Ducanes 2011). The number of domestic migrants in Vietnam was estimated to be 6.6 million in 2009 (8.6% of the total population), up from 4.5 million in 1999 (Marx and Fleischer 2010). At the same time, approximately 1 million Vietnamese (1.2% of the total population) were living abroad in a diverse set of destination countries (Dang et al. 2010) and Vietnam ranked among the top 10 net emigration countries (United Nations 2013b). Remittance receipts amounted to approximately 6.2 billion USD in 2007, constituting almost 8% of GDP (World Bank 2016b).[2]

Estimating the effects of migration on the family left behind is typically complicated as selection into migration tends to be correlated with unobserved characteristics. Furthermore, economic shocks abroad might also affect migrant origin areas, thereby preventing

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[1]The total stock of domestic migrants was estimated to be 763 million in 2005 (United Nations 2013a) and 191 million for international migrants, with the latter having increased to 243 million in 2015 (United Nations 2015).

[2]As an open economy in the lower middle-income category with a medium-sized population of approximately 90 million people and no common land borders with any major migrant destination country, the case of Vietnam might also be informative for other developing country contexts sharing similar characteristics.

the identification of household responses. In addition, microeconomic data on migrants and their households at the origin tends to be scarce. Following McKenzie and Yang (2012), this study overcomes these issues by adopting a quasi-experimental approach, relying on unique survey data from a panel of around 500 migrant households in Vietnam. The data includes individual information from 670 absent international migrants across 30 different destination countries and approximately 2,200 household nucleus members and domestic migrants, which was collected in two waves in 2008 and 2013, with the latter implemented by the author. I exploit the fact that families left behind were exposed to differential shocks conditional on the destination choices and skill levels of their international migrants in order to construct a continuous and household-specific measure of employment shocks during the Great Recession. I conduct a difference-in-difference analysis comparing origin households with differential treatment magnitudes, before and after the crisis occurred. The estimation strategy enables me to control for time-invariant household of origin and migrant destination country characteristics as well as for changes in the province of origin over time. This setting allows identifying the causal effects of economic shocks abroad on the outcomes of families left behind.

The results of this paper provide evidence that labor market shocks abroad led to large changes in the demographic composition of origin households in Vietnam and their migration decisions during the aftermath of the crisis. First, I find that affected families left behind coped with the shock by readjusting their labor supply along the extensive margin across different locations in a complementary way: they increased labor supply at home through the number of working members by 10% (compared to baseline levels) in response to the average economic shock. This was mainly driven by former domestic labor migrants returning to the origin household (-50%). Simultaneously, households sent around 10% *more* labor migrants abroad. The key contribution of this paper is to provide the first empirical evidence of a trade-off between domestic and foreign migration strategies among migrant households in developing countries. Furthermore, the positive net inflow of former domestic migrants to the origin led to an increase in fertility as well as in the overall size of the household nucleus.

Second, I find that household responses were strongly heterogeneous along the initial distribution of wealth and that the effects outlined were driven mainly by the subgroup of poor migrant households. Rich migrant households, on the other hand, remained relatively unaffected or responded to a much lower degree, respectively. These heterogeneous effects can be rationalized by a simple household migration model in which households at the origin distribute their labor optimally across home, domestic, and foreign locations in order to maximize their utility. The main intuition behind this framework is that changes in the foreign wage cause income and substitution effects and that the relative magnitudes of each effect determines the elasticity of domestic and foreign labor supply with respect to labor market shocks abroad. For poor households that face relatively low

levels of wages in domestic locations compared to what they can earn abroad, the elasticity of domestic (international) migration with respect to foreign wages can be positive (negative).

Third, the analysis of the financial consequences of families left behind in the aftermath of the crisis provides suggestive evidence consistent with poor migrant families left behind being negatively affected by the crisis while rich ones remained relatively unaffected. For the poor, the allocation of additional labor abroad did not result in an immediate increase in remittances receipts and, together with a strong depletion in household assets, resulted in a significant decrease in household expenditure (-10%), even three years after the peak of the crisis and despite all coping efforts.

I address a number of concerns regarding the robustness of my empirical results. Relying on historic migration data for my household sample, I confirm the validity of my identifying assumption by demonstrating the presence of pretreatment parallel trends for my key outcome variables. Due to the number of destination country-skill clusters being unbalanced in this empirical setting, all estimations are implemented using a wild bootstrap procedure to calculate cluster-robust standard errors. Taking advantage of the availability of a large non-migrant household sample from the same survey, I also conduct a test verifying that my shock measures are exogenous to economic development at the origin. Furthermore, I show that the results are robust to sample attrition as well as a range of modifications of the shock measure and outcome variables.

This study contributes to at least four different strands in the literature in Development, Labor, and Migration: 1) determinants of migration; 2) household risk management; 3) selection into migration; and 4) family left behind. In line with classic theories of domestic (Harris and Todaro 1970, Cole and Sanders 1985, Kennan and Walker 2011) and international migration (Borjas 1999, Clark et al. 2007), the empirical literature on the determinants of migration has identified differences in income opportunities between origin and destination to be the main driver for emigration, both in the domestic (Todaro 1980) and international context (Mayda 2010, Ortega and Peri 2013). While there is a general consensus about this effect, my results document a contradicting phenomenon in which negative economic shocks in a destination country, i.e. a *decrease* of differences in income opportunities, *increase* emigration to that country.

There is a large literature on household risk management strategies which has identified a range of measures that households rely on in order to cope with negative income shocks. A strand of this literature is dedicated to migration related strategies which have been identified to fulfill important insurance functions via remittances when households at the origin are hit by negative shocks, both in the context of domestic (Rosenzweig and Stark 1989) and international migration (de la Brière et al. 2002, Yang and Choi 2007).[3]

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[3]For an overview of the literature on the economics of remittances, see Rapoport and Docquier (2006) for theoretical considerations, and Yang (2011) for a review of evidence.

Gröger and Zylberberg (2016) show that rural households affected by a natural disaster in Vietnam cope predominantly through domestic labor migration to urban areas: those with settled migrants ex-ante receive more remittances while non-migrant households react by sending new members away ex-post. This study adds to that literature by showing that migrant households in developing countries make use of both domestic and international migration strategies flexibly in order to cope with income shocks.

The central question of the literature on migration selection is typically the one about brain drain. Applied work has identified positive skill selection into migration, both in the context of domestic (Fernández-Huertas Moraga 2013) and international migration (Grogger and Hanson 2011).[4] My findings show that this general trend can reverse temporarily in times of crises abroad, when international migration becomes more negatively selected. Since skills tend to be negatively correlated with poverty, another strand of this literature investigates to which extent household wealth constraints constitute barriers to migration. Most empirical studies are indicative of binding financial constraints (Chiquiar and Hanson 2005, McKenzie and Rapoport 2010, Bryan et al. 2014, Angelucci 2015, de Janvry et al. 2015, Bazzi 2017), but there is no consensus so far about whether income growth at origin leads to more or less migration (Dustmann and Okatenko 2014). This article contributes to this question by showing that credit constraints among migrant households are not strongly binding, as they achieve to finance additional international migration in the face of an income shock. This is consistent with their wealth levels being significantly superior to those of the average household in Vietnam and their migration costs lower due to existing migration networks. An understudied area in this literature is the joint investigation of the selection into domestic and international migration as well as the relationship between these strategies.[5] To my knowledge, this study is the first to provide evidence on the trade-off between domestic and foreign migration strategies among migrant households, documenting a partial substitution of domestic with foreign labor supply in order to cope with negative income shocks.

There is a growing literature about the effects of labor migration on the families left behind.[6] In a closely related study, Yang (2006) and Yang (2008) explore how Philippine migrant households responded to positive income shocks during the Asian Financial Crisis and find no effect on households' labor supply at the origin. Using administrative data on international contract workers from the Philippines, McKenzie et al. (2014) investigate how emigration flows were affected by the Great Recession. They find a negative effect on emigration flows driven by a decrease in the demand for migrant labor, but no significant response of overseas earnings because of minimum wage restrictions abroad. Fajardo

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[4]See Docquier and Rapoport (2012) for an overview of this literature.

[5]I only know of one study investigating such questions: for Mexico, Majlesi and Narciso (2015) find that individuals living in municipalities more exposed to Chinese import competition are more likely to migrate domestically, while they are less likely to migrate to the US.

[6]See Antman (2013) for an overview of this literature.

et al. (2015) investigate Mexican-US migration flows during the Great Recession. They find that rich households in Mexico reacted to economic shocks in the US by bringing their members back to Mexico, while poor ones sent more workers to the US. My results confirm the effect for poor migrant households in the general context of a developing country with migrants to a large number of different destinations worldwide. In contrast, I find that rich households remained relatively unaffected. Furthermore, by relying on a unique household dataset covering both domestic and international migration as well as detailed individual demographic and financial outcomes enables me to analyze within household responses directly, thereby providing a complete picture of different impacts and coping mechanisms at the origin.

The remainder of the paper is structured as follows. Section 2 introduces a simple theoretical framework to guide the empirical analysis. Section 3 provides the background for my study, namely the patterns of migration in Vietnam, descriptive statistics, and the construction of the shock measure. Section 4 outlines the identification and estimation strategy. Section 5 presents the main results and section 6 summarizes the findings from a series of robustness checks. I briefly conclude in Section 7.

2   Theoretical Framework

I develop a simple theoretical framework in which migration decisions are determined at the household level (Stark and Bloom 1985) and agents choose to send family members away for work in two competing markets: the domestic and the foreign one. The objective of this exercise is to understand how migrant families left behind who are dependent on remittances revise their migration decisions when they are hit by an economic shock that decreases overseas incomes and, ultimately, leads to a negative income shock at home through remittances. The goal of this section is to provide a framework for guiding the empirical analysis, and not to provide a theoretical contribution as such.

Consider a family consisting of n members. There are three potential locations, the origin area of the household (subscript h for home), the domestic migration destination (subscript d), and the foreign migration destination (subscript f), over which the family can allocate its labor supply. Following Roy (1951) and using the notation of Chiquiar and Hanson (2005), I assume that household members' wage equations are of the following type: $w_i = \mu_i + \delta_i s$, where w_i is the wage in location i ($i \in \{h, d, f\}$), μ_i is the minimum wage for unskilled labor, s is the individual level of schooling, and δ_i is the return to schooling. Because minimum wages tend to be higher in developed compared to developing countries such as Vietnam, I assume $\mu_f > \mu_d$. In contrast, the returns to schooling are typically lower in developed compared to developing countries: $\delta_f < \delta_d$.[7]

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[7]Note that the wage comparison in the context of this study is between Vietnam, a relatively poor developing country, and a range of foreign destination countries as listed in Panel A of Table 1, which

Consequently, the relative wage premium of foreign to domestic migration ($\frac{w_f}{w_d}$) is higher for low- compared to high-skilled migrant workers. For simplicity, I normalize the wage at home to zero. The economic shock is assumed to depress foreign wages uniformly, while the returns to skills remain unchanged. This implies that the deterioration of the relative wage premium is stronger for low-skilled compared to high-skilled migrant workers, both in absolute and relative terms. This is also consistent with the descriptive statistics presented in Panel B of Table 1 that labor market shocks during the Great Recession affected the former stronger than the latter.

Income from the family's labor supply is pooled at the household level[8] and all members have the same skill level. Household utility is determined by a concave function with respect to the number of household members left behind, which has arguments for h, d, and f. Households maximize their utility by keeping as many members as possible at home while allocating labor optimally across domestic and foreign locations in order to secure a minimum level of consumption ($\underline{c}$). The intuition behind this is that securing home production is imperative and requires a minimum number of members at home, but that productivity is marginally decreasing with labor supply (Jayachandran 2006).[9] Migration incurs constant psychic costs to the household which arise when sending their members away and materialize in the form of disutility (Sjaastad 1962). This disutility is assumed to be constant over time and smaller for domestic (α) than for foreign migration (β) due to distance and higher ease of return ($\alpha < \beta$). For simplicity, my framework abstracts from (plausibly heterogeneous) monetary migration costs assuming that wages are net of the respective costs for each location. Consequently, the household maximization problem is:

$$\underset{m_h, m_d, m_f}{\text{Max}} \quad U(m_h, m_d, m_f) = u(m_h) - \alpha m_d - \beta m_f,$$
$$\text{subject to} \quad m_h + m_d + m_f = n,$$
$$\text{and} \quad w_d m_d + w_f m_f \geq \underline{c}.$$

This setup highlights how the migrant household's choice between keeping the family together and sending members away for work is affected by changes in foreign wages. Securing a certain pay-off from migration corresponds qualitatively to a situation in which falling below $\underline{c}$ puts the family's welfare at risk.[10] The main goal of this simple frame-

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mainly belong to the group of developed countries. For empirical evidence supporting these assumptions, see Chiquiar and Hanson (2005) and Montenegro and Patrinos (2014).

[8]This is not restrictive since it suffices for results to hold that only a share of migrant labor income in domestic and foreign destinations is pooled through remittances.

[9]The incentive of keeping family members at home is very prevalent in the Vietnamese context due to the historic household registration system (*Ho Khau*), which conditions property rights and access to social services on the presence of a minimum number of family members in origin areas (Hardy 2001).

[10]An alternative way of interpreting this assumption is that $\underline{c}$ are the minimum returns from migration needed 1) to make the household migration investment profitable over a fixed migration duration when financed through household assets or, 2) to service debt repayments when financed through credit and

work is to illustrate how migrant households with different skills and resulting wage levels respond to income shocks abroad in terms of domestic and foreign migration decisions. Note that abstracting from the adaptation of the minimum consumption level is of analytical convenience and helps focusing the model's comparative statics on the essential effect of labor allocation across different destinations. A modification of this assumption that allows positive decreasing marginal returns to additional consumption does, however, qualitatively yield similar predictions. Solving this model and deriving the elasticities of domestic and foreign migration with respect to foreign wages yields that they are determined by the sign of the following expressions respectively (see Appendix Section B.2 for a step-by-step solution):

$$sgn(\frac{\mathrm{dm}_d^*}{\mathrm{dw}_f}) = sgn(-\frac{w_d}{w_f^2}u'(m_h^*) + \frac{(w_d - w_f)m_d^*}{w_f^2}u''(m_h^*) - \beta\frac{w_d}{w_f^2}), \tag{1}$$

$$sgn(\frac{\mathrm{dm}_f^*}{\mathrm{dw}_f}) = sgn(\frac{1}{w_d}u'(m_h^*) + \frac{(w_f - w_d)m_f^*}{w_d^2}u''(m_h^*) + \alpha\frac{1}{w_d}). \tag{2}$$

Intuitively, changes in the foreign wage cause income and substitution effects to the households at origin. Due to the negative shock at destination, foreign labor markets become relatively less attractive, constituting a substitution effect that pushes all families to reduce the amount of foreign labor supply. Simultaneously, the reduction in foreign migrant wages makes families left behind poorer, which implies an income effect that increases the incentive for greater levels of migration. The difference between these two effects ultimately determines the elasticity of domestic and foreign labor supply with respect to foreign wages. The specific sign of each elasticity depends on the shape of the utility function, the cost parameters, the magnitude of the shock and, most importantly, on households' relative wage premium of foreign to domestic migration. Based on this framework, heterogeneous household responses originate from differences in these premiums. Note, that the comparative statics of this theoretical framework in the general and continuous case are ambiguous and can, theoretically, vary to the extent that the signs of expressions 1 and 2 become positive or negative. Nevertheless, similar to previous work by Fajardo et al. (2015) for the case of a single migration destination, I expect poor households with a high relative wage premium of foreign to domestic migration to experience the strongest income effect that may outweigh the substitution effect and result in increased foreign migration in response to the shock abroad, eventually at the expense of domestic migration. On the other hand, I expect rich household to respond less or remain unaffected.[11]

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that falling below this threshold corresponds to default.

[11]In Appendix Section B.3, I provide a calibration exercise for my theoretical framework which demonstrates that the elasticities of domestic and foreign migration with respect to the foreign wage can, under certain assumptions, be positive and negative for poor households respectively. At the same time, rich households remain unaffected.

Although this framework relies on the change of the foreign wage level as the exogenous parameter, there is evidence that the period of study during the Great Recession was characterized by nominal wage rigidities in several destination countries, especially for low-skilled workers receiving minimum wages (McKenzie et al. 2014, Cadena and Kovak 2016). Therefore, in my empirical strategy, I use changes in the level of unemployment, which is a more suitable proxy for economic shocks in this case. Alternatively, one could also change the definition of w_i to capture the expected wage, which is a weighted average of the effective wage and the probability of being employed at destination. In such a framework, the empirical effects would then capture changes in the probability of being employed given a constant level of wages.

3 Background

3.1 Migration in Vietnam

Since the opening of Vietnam's economy in the wake of the post-Soviet liberalization reforms of the early 1990s (*Doi Moi* - renovation), the country has experienced rapid GDP growth, averaging 7% per year, accompanied by an impressive reduction in the poverty headcount. These economic reforms also triggered a liberalization of the historic household registration system (*Ho Khau*), which closely regulated people's movement and constituted high barriers to migration (Hardy 2001). The result was a sharp increase in both domestic and, subsequently, foreign migration and remittances receipts (Abella and Ducanes 2011). Nowadays, domestic migration is widespread and the number of internal migrants in Vietnam was estimated to be 6.6 million as of 2009 (Marx and Fleischer 2010). This corresponded to 8.6% of the total population, compared to 4.5 million (6.5%) during the previous census round in 1999.

The surge in domestic migration alongside the release of comprehensive panel datasets covering this theme, has led to a growing literature dedicated to the causes and consequences of domestic migration in Vietnam. Similar to patterns found in other developing countries, domestic migrants tend to be relatively young and more educated than the average citizen in Vietnam (Coxhead et al. 2015). The main motive for domestic migration in Vietnam is economic and migrants are predominantly seeking employment opportunities. The industrial sector is the main provider for off-farm employment in Vietnam and its activity is highly concentrated in a small number of urban centers, mainly Ho-Chi-Minh-City (*Saigon*) and surrounding provinces in the South, as well as Hanoi in the North.

Conditional on the sector of employment, wages paid in these urban centers are considerably higher compared to rural areas. Domestic migration tends to be relatively inexpensive in Vietnam and migrants usually find low-skilled jobs rather quickly. Due to

the high concentration of capital investments and off-farm job creation in certain sectors and provinces, domestic labor mobility has been identified as an important mechanism for spreading welfare gains across the country (Phan and Coxhead 2010). Especially for the low-skilled population in rural areas, seasonal migration is an important way of increasing household expenditure and alleviating poverty (de Brauw and Harigaya 2007). Furthermore, domestic labor migration is also used as a shock-coping strategy in rural areas in order to smooth negative shocks to agricultural incomes, both ex-ante, through remittances from existing migrant networks, and ex-post, through additional out-migration (Gröger and Zylberberg 2016).

In contrast to domestic migration, there is a general lack of data and empirical evidence on foreign migration in Vietnam. Nevertheless, existing aggregated data confirms that the stock of foreign migrants from Vietnam has been increasing in recent years, with the result that Vietnam was listed among the top 10 net emigration countries over the 2000 to 2010 period (United Nations 2013b). For 2008, Dang et al. (2010) estimate that 1 million Vietnamese were living abroad, corresponding to 1.2% of the total population.[12] Simultaneously, remittance receipts from international migrants grew rapidly and reached approximately 8.3 billion USD in 2010, constituting 7% of GDP (World Bank 2016b).

Between 2000 and 2010, the single most important channel of international migration was the country's temporary labor export scheme, sending around 70 thousand contract workers per year to a diverse set of countries worldwide (Ministry of Foreign Affairs of Viet Nam 2012).[13] This figure has increased to around 100 thousand departures per year since 2010. Within this program, contract workers from Vietnam migrate on a temporary basis, through employment quotas to certain destination countries, which are usually negotiated in bilateral agreements. Job matching in Vietnam is performed through private recruitment agencies that charge relatively high fees, officially amounting to several months of overseas gross earnings (Abella 2004). However, there is anecdotal evidence of excessive overcharging practices among agencies, such that effective fees tend to be even higher (Wang and Bélanger 2011). In addition to that, foreign migration costs are often debt-financed at high interest rates in Vietnam (Hoang and Yeoh 2015).

A previous study based on the baseline data used in this paper finds that foreign migrants in Vietnam share certain characteristics with domestic ones (Dang et al. 2010): they are relatively young and better educated than the average Vietnamese. Independent of the channel of migration, economic motives are the main driver of foreign migration and migrants typically remit large shares of their overseas income to their families left

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[12]Note that these figures refer to recent flows and stocks of Vietnamese migration after 1998 and exclude the approximately 2 million political refugees who left the country between 1975 and 1995.

[13]See Nguyen (2014) for an institutional description of Vietnam's labor export program. Alternative channels of international migration in Vietnam are non-temporary workers migrating through family reunification policies or other permanent migration channels, irregular labor migration, as well as educational and marriage migration to a minor scale.

behind. There is a wide variation across destinations in wage earning potentials for overseas workers with OECD countries such as Japan offering the highest salaries and the United Arab Emirates or Malaysia the lowest (McKenzie et al. 2014). Apart from descriptive statistics, empirical evidence in this country context is thus far very limited.[14] To the best of my knowledge, the analysis in this study is the first one to rely on a comprehensive panel of foreign and domestic migrants and their households in Vietnam.

3.2 Household and Migrant Data

The analysis in this paper focuses on households with international migrants having left prior to the onset of the Great Recession and who were, therefore, exposed to the deterioration of labor market conditions abroad through their migrants. Data on households and their migrants was collected in two rounds in 2008 and 2013 among a stratified random sample in Vietnam.[15] Households were selected into the sample if they had at least one migrant abroad during the baseline in 2008 who left the household within ten years prior to the baseline survey and had not returned yet.[16] Detailed information on all nucleus member as well as domestic and international migrants was collected through proxy respondents, usually the head of the household. Out of the initial sample of 576 migrant households interviewed in the baseline survey, 546 of them could be successfully tracked in the follow-up survey. Accounting for missing observations, in the empirical analysis I am left with a sample size of 507 households including individual information from 665 foreign migrant individuals and 2,170 household members at the origin in the balanced version. This translates into an attrition rate of 12% over 5 years or 2.4% per year, which is remarkably low compared to similar datasets, particularly those including migrant households in a developing country (Yang 2008). In the robustness checks, I conduct additional tests which show that, in addition to being small, attrition does not bias my estimates.

Panel A of Table 1 shows the geographical distribution of international migrant indi-

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[14]This is mainly due to sample sizes of international migrants in random population surveys being too small for rigorous quantitative analysis. I know of only three studies conducting econometric analyses on the impact of international migration on families left behind in Vietnam: while Nguyen et al. (2011) find that remittances have a positive impact on per capita expenditures, Nguyen and Mont (2012) show that this does not translate into a significant decrease of consumption-based poverty. Binci and Giannelli (2016) find that remittances increase schooling and reduce child labor.

[15]The first round of this survey was commissioned by the Global Development Network and the Institute for Public Policy Research as part of a global project under the name *Development on the Move* (DOTM). See Chappell et al. (2010) for a technical report on the global project and Dang et al. (2010) for details on the survey in Vietnam, including the sampling procedure. The follow-up round in 2013 was organized by the author in collaboration with the Mekong Development Research Institute and the Vietnamese-German University.

[16]Apart from this migrant household sample, the survey also included a strata of non-migrant and returned migrant households. I exclude these observations from the main analysis as, by definition, they did not experience the shock of interest. Nevertheless, in robustness checks, I rely on the non-migrant sample in order to demonstrate the exogeneity of the shocks to household outcomes in Vietnam.

viduals from the sample households across the top 10 destination countries recorded in the baseline survey. Among those, the United States of America stand out as the single most important destination country with 27.7% of the total sample. Taiwan comes in second with 14.9%, followed by Malaysia (9.2%), South Korea (8.7%), Germany (6.6%), and Russia (6.3%). Together, the top 10 destination countries listed account for 87.5% of the total sample of migrants, with the remaining 12.5% spread over 20 other destinations.

Table 2 provides descriptive statistics on foreign migrant individuals. They tend to be relatively young, with a mean age of around 31 years. Due to the stratification strategy, migrants captured in the sample have left the household between 1998 and 2008, with the median migrant having left in 2005. 56% of migrants are female and the majority is reported to be married (62%). Due to positive skill selection into migration, the share of low-skilled migrants with less than secondary educational attainment is relatively low at 22%. The majority of migrants have achieved at least a secondary level of education and 13% a tertiary degree before departure. As for the reasons for migration, economic considerations are by far the most important answer with 55% being reported having left for such motives, followed by family- (43%), and education-related reasons (17%).[17]

Table 3 presents summary statistics on the main outcome variables of migrants' families left behind in Vietnam. In line with the theoretical considerations, the sample is divided into low- and high-skilled households using their level of per capita consumption in 2008 with respect to the median to proxy for their level of education.[18] By construction, low- and high-skilled migrant households are different in many aspects along their observable characteristics. In terms of demography, low-skilled households are considerably larger in size, with almost 5 nucleus members (excluding any migrants) compared to high-skilled ones with only 3.5 in 2008. While low-skilled households are almost equally distributed across rural and urban areas, 63% of high-skilled households live in urban areas.

In line with the subsample selection criteria, domestic income is rather different for the two subgroups with 1,432 USD per capita for low-skilled households versus 2,525 USD for the high-skilled ones respectively.[19] Note that domestic income increases for both subgroups over time, but the increase is more pronounced for low-skilled households (32%) than for high-skilled ones (6%). In 2008, net remittances are larger for the high-skilled in absolute terms but constitute a higher share of domestic income for the low-

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[17]Descriptive statistics indicate that the majority of migrants being reported other than economic motives for migration still send remittances back home. This underlines the fact that economic motives, even if not explicitly reported, ultimately play a key role for any kind of migration decision among my sample households.

[18]This approach is preferable over using categorical education information directly because it provides a smooth and continuous distribution and is highly correlated with household skill levels.

[19]Note that all monetary variables are expressed in real USD (PPP) per capita. Low-skilled migrant households are still considerably richer than the average Vietnamese non-migrant household that earned 1,165 USD per capita in 2008 according to the World Development Indicators.

skilled. The level of net remittances decreases over time for both types of households, but this trend is stronger for rich households whose remittances decrease by more than 50% over 5 years. The wealth gap between the two subgroups is even more extreme when considering total consumption, with the high-skilled household mean being more than three times larger than the low-skilled one.

Given the sample stratification strategy, all households have at least one foreign migrant abroad during baseline, such that: $p(migrant) = 1$, for both subgroups. The mean number of migrants per household is 1.2 for low- and 1.36 for high-skilled households during the baseline, with 84% (78%) of the former (latter) households having just one migrant, while 16% (22%) have two or more. Both the migrant status and the total number of migrants decrease over time for both groups. However, when looking at the number of foreign migrants conditional on having at least one such migrant, we actually observe an increase for both subgroups, which is more pronounced for low-skilled households, who send 20% more migrants. While sample migrants are spread across many different destinations, the number of destinations is rather concentrated within households, with only 4% of the sample having migrants in different destination countries simultaneously. As expected given the subsample selection, the distribution of migrants' educational attainment prior to departure is clearly polarized between the two subgroups: low-skilled households' distribution is concentrated in the lower tail and *vice versa* for high-skilled ones. This shows that the level of household consumption is a good proxy for, and highly correlated with, educational attainment.

Turning to domestic migration patterns, we observe that about 20% report a domestic migrant, with the total number of domestic migrants being twice as high for the high- compared to low-skilled. While the incidence and number of domestic migrants increases for both subgroups over time, the trend is more pronounced for low-skilled households, with 20% of the sample changing status over time and the mean number of domestic migrants increasing threefold. Due to missing data on domestic migrants' occupation in the baseline survey, I am unable to determine the level of domestic labor migration in 2008. Therefore, the numbers reported reflect the flow of former household members who migrated domestically during the 5 years between baseline and follow-up and are reported working in 2013.

3.3 Shock Measure Construction

In order to construct a proxy capturing employment shocks that households in Vietnam were exposed to through their migrants abroad, I rely on Bartik (1991) and combine cross-sectional information about foreign migrants' destinations and skill-levels prior to the Great Recession with time-varying data reflecting the change in unemployment rates by destination and skill-group during the crisis years. Using unemployment rates in-

stead of alternative measures of economic shocks, such as GDP, allows me to exploit migrant-specific dynamics of economic shocks within each destination.[20] Based on foreign migrants' location in 2008, Figure 1 depicts the evolution of unemployment rates in the top 12 destination countries before, during, and after the Great Recession. While unemployment rates started to rise in most countries only in 2008, a few countries experienced a rise in 2007 already (most notably Japan, UK, and the USA). After steep, but highly differential increases in the unemployment rates across countries, levels peaked in 2009. In order to capture the crisis impact, my analysis relies on the changes in unemployment rates from the start of the crisis in late 2007 to its peak in 2009. Consequently, the benchmark shock measure is calculated as follows:

$$Shock_h = \frac{\sum_{d=1}^{D} \sum_{s=1}^{S} (M_{h,d,s,2008} \times \Delta UR_{d,s,2007-2009})}{M_{h,2008}}, \tag{3}$$

with $M_{h,d,s,2008}$ being the number of foreign migrants from household h, at destination d, with skill level s in the baseline year 2008. $UR_{d,s,2007-2009}$ is the destination-skill-specific change in unemployment rates between the crisis years 2007 to 2009. In order to proxy for the level of skills, I use data on migrants' educational attainment prior to departure following the International Standard Classification of Education with 1997 levels (ISCED97). As described in Table 3, there is considerable variation in migrants' educational attainment across households, such that the benchmark shock measure is strongly household-specific. Columns two to four in panel B of Table 1 report this measure for the main destinations.[21] The distribution of migrant skills across all destinations is concentrated in the secondary education cell (65% of the total number of migrants), followed by the primary (22%), and tertiary category (13%). On average, the effective shock measure decreases with the individual levels of educational attainment within destinations, i.e. low-skilled workers experienced stronger economics shocks compared to high-skilled ones during the Great Recession.

In robustness checks, I also use an alternative shock measure which reflects the a simple destination-specific trend in unemployment rates and is calculated as follows:

$$Shock_d = \frac{\sum_{d=1}^{D} (M_{h,d,2008} \times \Delta UR_{d,2007-2009})}{M_{h,2008}}, \tag{4}$$

with $M_{d,2008}$ being the number of foreign migrants from household h at destination d during the baseline. $UR_{d,2007-2009}$ is the destination-specific change in unemployment rates between the crisis years 2007 to 2009. Note that this measure is destination country-

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[20]Due to a lack of data on foreign migrants' sector of employment abroad in the baseline, I am unable to repeat the same exercise for sector-specific GDP trends.

[21]Note that for ease of exposition, the measure reported is collapsed over three education categories. The actual variation is, however, greater and relies on the complete ISCED97 system with seven categories.

specific for the vast majority of sample households (96%) with one destination reported in the baseline. For those households the shock variable turns out to be the simple destination country average, as listed in Panel B of Table 1 (column 1) and depicted in Figure 2. With an increase of 4.67 percentage points, the USA experienced the biggest shock magnitude, followed by Canada (2.33 pp), United Kingdom (2.28 pp), Russia (2.2 pp), and Taiwan (1.94 pp). Note that the shocks were not particularly concentrated within certain continents apart from North America, and that some destinations were hardly affected at all, such as Korea (0.4 pp) and Germany (-0.91 pp), while their direct neighbors were (e.g. Japan with 1.23 pp and France with 1.8 pp). This suggests that the effective magnitude of the shock in each destination was rather unexpected and unlikely to have been anticipated by migrants and their families left behind.

4 Empirical Approach

4.1 Identification Strategy

In order to establish the impact of changes in migrants' employment conditions abroad on household outcomes at the origin, this study adopts a quasi-experimental approach using the following setup: First, I focus on a sample of international migrant households in Vietnam, whose migrants are spread over a large set of destination countries worldwide. Second, as recommended by McKenzie and Yang (2012), I rely on plausibly exogenous and heterogeneous shocks conditional on migrants' destination and educational attainment prior to departure generated by the Great Recession which affected households in Vietnam through their migrants abroad. Third, the data used provides the location of (domestic and foreign) migrants and the outcome variables of interest for a panel of households at the origin, both before and after the Great Recession. Given this setting, I conduct a difference-in-difference analysis based on a continuous shock measure, controlling for time-invariant household and destination country characteristics as well as for potentially confounding changes over time at the level of the province of origin. Consequently, the identifying variation comes from households in Vietnam being subject to differential magnitudes of employment shocks depending on their migrants' skill level within a specific destination country.

The underlying identifying assumption is that if the shocks faced by migrants with different skill levels within a certain destination had been of the same magnitude, then changes in outcomes at origin would not have varied systematically across families left behind. In order to verify this parallel trend assumption, I conduct the following placebo test for the correlation between the shock measure and the pretreatment trends of the household outcomes of interest. Using data on the migration history of members and migrants from the baseline survey, I reconstruct the key outcome variables for my sample

households in 2003, i.e. 5 years prior to the baseline survey. In the robustness checks, I then replicate my estimations as if the Great Recession had happened five years earlier, i.e. between the years 2003 and 2008. Note that this specification is a direct test for the presence of pretreatment parallel trends and the results provide evidence in favor of this assumption.

A common issue when estimating the causal effect of migrant economic conditions on the outcomes of their families left behind is that, due to economic conditions not being randomly allocated, any observed relationship between the two may simply reflect the influence of unobserved third factors at the household or destination country level. This could, for instance, occur if more ambitious households migrated more frequently or targeted more attractive destinations which, in turn, suffered from the crisis more severely. I account for this problem by including household fixed effects in my estimations, which absorb unobserved, time-invariant characteristics of the household of origin. Furthermore, relying on within destination country-variation of the shock measure also allows me to include destination country dummies, which control for time-invariant factors at the destination country level.

Another potential concern when relying on treatment variation generated by employment shocks abroad is that they might be correlated with economic outcomes at the origin. For example, despite the fact that the Great Recession affected mainly developed countries, which tend to be traditional destination countries for Vietnamese migrants, there is some evidence that the crisis also had an indirect impact on the Vietnamese economy through a decrease in trade with and foreign direct investment from affected countries (Nabli 2011).[22] In order to deal with this, on top of the time trend that captures aggregate changes, I also include a set of province of origin-year dummies in the baseline equation, which accounts for potentially confounding changes in economic development over time in each of the Vietnamese sample provinces.

Additionally, taking advantage of the availability of a large non-migrant household sample from the same survey (i.e. households without migrants from the same enumeration areas), I also conduct a direct test to verify that the economic shocks that neighboring households experienced through their migrants at the destination are uncorrelated with the outcomes of non-migrant households in the same locality. The results of this test indicate that the shock measure used is uncorrelated with changes in demographic or financial outcomes among non-migrant households in Vietnam. In other words, they provide evidence that employment shocks abroad related to the Great Recession only affected sample households through their migrants in the respective destination country.

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[22]Note that there was no correlation in the formal labor market performance between the destinations and Vietnam (see bold line in Figure 1).

4.2 Estimation Specification

Based on shock the measure as calculated in equation 3 and the identification strategy outlined, I estimate the following difference-in-difference benchmark equation:[23]

$$Y_{hpt} = \alpha + \beta_1 Shock_h \times T_t + (\beta_2 Shock_h \times T_t \times High_h) + \beta_3 T_t + \delta_h + \gamma_{pt} + \eta_d + \varepsilon_{hpt} \quad (5)$$

where Y_{hpt} is the outcome of interest for household h from province of origin p, and in year t, with $t = 2008$ or 2013. $Shock_h$ is the destination and skill-specific shock measure and T is a time dummy which equals 1 for the post-shock period 2013. $High_h$ is a subgroup dummy being equal to one if the household's expenditure per capita level is above the sample median and zero otherwise. δ_h are household fixed effects and γ_{pt} and η_d are sets of province of origin-year-specific as well as destination-specific dummies respectively. ε_{hpt} is the error term and standard errors are clustered according to the baseline destination country of foreign migrants.[24] Given the relatively low number and unequal distribution of the clusters in this empirical setting, conventional cluster-robust standard errors have been criticized for being artificially low, leading to over rejection in standard asymptotic tests. I deal with this by implementing the wild bootstrap procedure proposed by Cameron et al. (2008) to calculate standard errors.[25]

For each outcome variable, I estimate the baseline specification first for the full sample and, subsequently, by subgroups in order to analyze their heterogeneous reactions.[26] I do so by augmenting the regression equation by a complete set of interaction terms with the subgroup dummy variable ($High_h$). In the following analysis, I report β_1 (labeled *Shock*) and the interaction term of β_2 with the high-skilled dummy ($Shock \times High$), respectively. In the analysis the coefficient on β_1 reflects the causal treatment effect for the below median expenditure subgroup, while β_2 measures the difference in treatment effects between the two subgroups. The separate effect for the above median expenditure subgroup is determined by the net effect of the two coefficients and I test whether this difference is equal to zero using an F-test on the linear restriction.

Given the continuous character of the shock measure used, each coefficient reflects the impact of a one percentage point increase in the unemployment rate during the crisis years 2007 to 2009 that households in Vietnam were exposed to through their migrants abroad. However, since my shock measure effectively ranges between -2.01 and +8.9 pp,

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[23]Note that I omit those time-invariant difference-in-difference interaction terms in equation 5 which are effectively absorbed by the set of fixed effects.

[24]For households who had migrants to more than one destination, the error term is clustered according to the destination country of the eldest migrant (Yang 2008).

[25]Standard errors reported in the analysis are calculated relying on the user-written Stata command by Caskey (2015) based on 2.000 replications.

[26]In order to correct for endogenous sample design, all regressions are performed applying probability weights at the household level (Solon et al. 2015).

one can also interpret the estimates as follows: multiplying the coefficients by the mean shock measure of 2.33 (4.78) gives the effect for the average shock (respectively of one additional standard deviation). In what follows, I refer to the effect of the average shock, unless otherwise indicated. Note that, due to the lag between baseline and follow-up, the estimates capture the medium-term impact in the aftermath of the Great Recession. In robustness checks, I also estimate an alternative regression specification, using the destination-specific shock measure as reflected in measure 4 without foreign migrant destination dummies (η_d).

5 Results

This section is organized as follows. First, I analyze how the unemployment shock abroad affected the extensive margin of labor supply of families left behind in Vietnam. Second, I focus on the dynamics of foreign migration and, subsequently, proceed to analyze domestic migration patterns. Finally, I provide evidence on the impact of the crisis on households' key financial outcomes.

5.1 Origin Household Demographics

Results on household labor supply at the origin are presented in Table 4. The coefficients in columns (1) and (2) capture the total number of household members (i.e. the household nucleus size, excluding any migrants). The point estimate on the full sample in column (1) is small and insignificant, suggesting no effect of the shock on the overall size of households at the origin. However, once I include an interaction term with the dummy for rich migrant households (i.e. high-median expenditure per capita) in column (2), the two coefficients turn out to be large in magnitude, statistically significant and with opposite signs. The point estimates for the poor migrant household subsample is significant at the 5% level and its magnitude suggests an increase in the household nucleus size of approximately 0.125 individuals for a one percentage point increase in the shock measure, or 0.3 individuals for the average shock (×2.33). This translates into a 7% increase compared to the mean dependent variable for the average shock. The point estimate for the difference between the two subgroups is negative and significant, suggesting that rich households' nucleus size did actually increase by 0.1 individuals in response to a one percentage point shock, or 0.23 individuals for the mean shock (i.e +5.5% compared to the baseline mean), compared to poor ones. Note that the net effect of the two coefficients is highly statistically significant as indicated by F-test on the linear restriction.

Looking at the subgroup of household nucleus members reported working in column (3), the coefficient is positive, but insignificant, indicating a moderate increase for the full sample. Once estimated separately for the two subgroups in column (4), again, the

coefficients become larger in magnitude and of opposite signs. The point estimates indicate a significant increase in the number of working members among the poor subsample of 0.23 individuals for the mean shock (i.e. 11% compared to the baseline level) and a zero effect for the rich migrant households as indicated by the F-test (note that net effect is not statistically significant). Combining the results of columns (1) through (4) so far, we see that the increase in the nucleus size coincides with an increase in the number of working individuals among the poor subsample, suggesting a positive net inflow of working individuals to the origin household due to the economic shock abroad.[27] Another potential explanation for the increase in the household nucleus size among the poor subsample and the decrease among the rich subsample identified in column (2), are changes in fertility in response to the economic shock over the course of the five years between 2008 and 2013. In column (5) and (6), I therefore analyze the number of young children between the age of 0–5 years (i.e. those who were born after the baseline data collection). The coefficient for the full sample in column (5) is zero. When estimated separately for the two subsamples in column (6), again we observe strong subgroup heterogeneity: the coefficients turn larger in magnitude, become statistically significant, and carry opposite signs. The coefficient on the poor subsample is positive and highly significant, indicating an increase in the number of young children of approximately 0.14 individuals for the mean shock or +50% compared to baseline levels. On the other hand, the coefficient on the subgroup difference is negative and significant, indicating a decrease in the number of young children among the rich subsample of around 0.1 individuals for the mean shock or 40% compared to baseline levels.

In sum, the labor market shocks abroad during the Great Recession triggered important demographic changes among poor migrant families left behind in Vietnam. The results provide evidence of an increase in the number of working members, which appears mainly to be driven by a net inflow of individuals from outside the nucleus. Simultaneously, fertility increases and contributes partly to the increase in the nucleus size, consistent with former migrants and spouses returning to their family left behind again. On the other hand, we observe a decrease in the size of rich migrant households, which can partly be explained by a decrease in fertility, while labor supply does not change among this subsample.

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[27]In unreported regressions, I also analyze the effect on the number of non-working nucleus members, which shows a small and insignificant decrease among the poor subsample, suggesting that the increase in labor supply at the origin is indeed driven by changes in migrant flows. Further, I also check whether the crisis abroad had any impact on the skill formation process at the origin. It could potentially be the case that the crisis lead families left behind to invest more in education. When looking at the number of members in education, however, I find no effect.

5.2 Domestic Migration

The results on domestic migration are provided in Table 5.[28] Column (1) and (2) provide the results for the aggregate level of domestic migration. The point estimate on the full sample is negative and significant at the 10% level, indicating a small decrease in the number of domestic migrants for the full sample. Looking at the coefficients in column (2), we observe that the point estimate for the poor subgroup is large, negative, and highly significant, suggesting a decrease of 0.16 in the number of domestic migrants as a response to the average shock (i.e. -50% compared to baseline levels). For the rich subsample, again, the effect is zero as indicated by the F-test. These results add to the ones in the previous section by providing evidence that the increase in the household size among the poor subsample coincided with a decrease in the number of domestic migration, suggesting a positive net inflow of individuals to the household nucleus.

Columns (3) and (4) present suggestive evidence on the number of flows of domestic labor migrants, i.e. of baseline household members leaving the household becoming domestic labor migrants. The regression results here are very similar to the previous ones. The coefficient on the poor subsample is negative, highly significant and of similar magnitude compared to the one in column (2), indicating a negative correlation between the shock measure and the number of domestic labor migrants ex-post. This provides suggestive evidence that the aggregate decrease in the number of domestic migrants is mainly driven by labor migrants returning to the household. Again, the coefficient for the rich subsample is not significantly different from zero. Finally, columns (5) and (6) capture only the number of domestic labor migration to long-distance destinations, i.e. outside of the households' province of origin. The results are very similar to the previous one, suggesting that inter-provincial labor migration is the main driver for this correlation. Together these results provide further evidence that the decrease in domestic migration was driven by labor migrants particularly, consistent with the increase in the number of working nucleus members from the previous section.

5.3 Foreign Migration

Results from the analysis of foreign migration responses are provided in Table 6. Columns (1) and (2) present the results for the total number of foreign migrants. The coefficient on the full sample is positive and highly significant, indicating a general increase of 0.11 individuals in the number of foreign migrants for the average shock (i.e. a 9% increase

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[28]Note that, due to data limitations, there are two different specifications of domestic migration outcomes in this section: levels of aggregate domestic migration in columns (1) and (2) and of domestic migration conditional on migrants' occupation and destination in columns (3) through (6). While the former coefficients are fully identified, the latter are not due to a lack of information on domestic migrants' occupation in the baseline survey, which results in these variables having only cross-sectional character. For this reason, these coefficients should only be interpreted as suggestive evidence, reflecting correlations instead of causal effects.

compared to baseline levels). When analyzing the effects by subgroup, the coefficients on the poor subsample in column (2) is significantly positive and of similar magnitude as in column (1). On the other hand, the coefficient on the rich subgroup is small and negative, but not significant. The F-test indicates that the net effect of the two coefficients is different from zero, suggesting that the shock also lead to an increase in the number of foreign migrants among the rich subsample, although with a smaller magnitude.

In columns (3) and (4), the outcome variable is the number of foreign labor migrants, i.e. international migrants conditional on having left for labor motives. While the co-efficient on the full sample is zero, the estimates by subsample have opposite signs, are highly significant, and have larger magnitudes compared to the aggregate outcomes in foreign migration. The point estimate for the poor subsample suggests an increase of 0.18 individuals or 20% compared to baseline levels. In contrast, the point estimate on the subgroup differences is negative and significant, indicating a zero effect for the rich sub-sample once again. Columns (5) and (6) report the results for a dummy that is specified to be one if migrants change the foreign destination country over the course of the five years between baseline and follow-up.[29] Note that the descriptive statistics show very few households actually doing so and, unsurprisingly, the coefficients do not indicate any effect whatsoever. This suggests that, despite of the shock abroad, additional foreign migrants targeted the *same* destinations of previous migrants instead of diversifying into new ones. This is consistent with an explanation of migration destination decisions being path dependent and determined by social networks.

Summarizing above results, the analysis provides evidence that labor market shocks in migrant destinations during the Great Recession led to important and heterogeneous demographic changes among families left behind in Vietnam. Poor migrant households responded by decreasing the number of domestic migrants by 0.16 individuals (-50%) in response to the average shock, while increasing the number of foreign migrants by 0.12 individuals (+10%). These aggregate effects were driven by labor migration in particular. This can be interpreted as a partial substitution effect between domestic and international migration strategies as a response to the crisis abroad. In line with my theoretical framework, these results show that the elasticity of foreign (domestic) migration with respect to foreign wages was negative (positive) for the poor subsample. The positive net inflow of domestic labor migrants returning to the origin household is reflected in an increase in the number of working nucleus members. The return of migrant spouses also led to a rise in fertility, which further contributed to the increase in the nucleus size.

On the other hand, rich migrant households remained relatively resilient to the crisis

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[29]Note that these coefficients are not fully identified due to the cross-sectional character of the outcome variable and should, therefore, only be interpreted as suggestive evidence, reflecting correlations instead of causal effects.

abroad: the results provide no evidence of any medium-term impact on their labor supply at home or to domestic destinations. If anything, the analysis of foreign migration shows that this subgroup also increased the number of foreign migrants, however, to a lower degree and for other motives than poor migrant households (the effect on the number of labor migrants is zero). Together with the drop in fertility, these changes resulted in a decrease of the nucleus size among rich migrant households. In what follows, I analyze household financial outcomes to shed light on the financial consequences of these demographic changes.

5.4 Household Finance

I first analyze how home income responded and compare the results to those for migrant income, i.e. remittances. I then present the results on the household asset position and overall expenditure. A way to understand this exercise is to write down the household budget constraint. In period t, the household receives income y_t^h from its activities at home, receives transfers from domestic and foreign migrant sources $\tau_t = \sum_s \tau_t^s$ ($s \in \{d, f\}$), and adjusts its asset position Δb_t. Transfers are positive if there is a net inflow to the origin household and Δb_t is negative if the household depletes its assets during the period. Finally, the household consumes c_t, such that:

$$y_t + \tau_t - \Delta b_t = c_t.$$

The shock supposedly lowers remittances from foreign migrants (τ_t^f) initially, and I want to investigate how they react ex-post, after the increase of foreign migration has taken place, and whether $\tau_t - \Delta b_t$ is sufficiently large to allow the household to maintain constant consumption.

The results are presented in Table 7.[30] Note that the standard errors in columns (1) through (6) are relatively large and most statistical tests are underpowered. Therefore, the results should be considered as suggestive evidence. Starting with home income in columns (1) and (2), the point estimates are generally close to zero and insignificant. If anything the coefficient for the poor subsample suggests that home income remained constant, despite the increase in the number of working members. One explanation for that could be that the increase in labor supply was directed towards unpaid or work at low pay or, alternatively, that the most productive members were sent abroad. On the other hand, the coefficient on the subgroup difference is positive and larger than the one for the poor subgroup, but the null hypothesis for the net effect cannot be rejected.

Looking at the second specification with net remittances from foreign migrants in column (3), the point estimate has a positive sign, indicating a 10% increase for the average

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[30]Note that all variables are expressed in logarithmic US$ (PPP) per capita, i.e., adjusted by the number of nucleus members, excluding any migrants.

shock.[31] The results in column (4) show that this aggregate increase is driven by the rich subsample in particular: the point estimate suggests a 40% increase in remittances per capita for this subgroup (note that the net effect is weakly significant). On the other hand, the coefficient for the poor subsample is negative and large, indicating a decrease of around 40% for the average shock.

The specifications in columns (5) and (6) capture the change in the household asset position as measured by the stock of savings in cash and kind. The coefficient on the full sample is negative, indicating a general decrease. The estimates in column (6) show that this aggregate effect is driven by the poor subsample. The point estimate for this subgroup is large, suggesting a decrease in the household asset position of around 50% for the mean shock. The coefficient on the subgroup difference is positive and, if anything, suggests that the effect is zero for the high-skilled subgroup.

Turning to the expenditure measures in column (7) and (8), the coefficient on the full sample is again close to zero and insignificant, suggesting no change. Looking at the effects by subsample in column (8), the coefficients become much larger, statistically significant, and carry opposite signs. The point estimate for the poor subgroup translates into a decrease in total expenditure of around 10%, measured five years after the baseline survey and approximately three years after the peak of the crisis. The effect on the rich subgroup is again zero.

Taken together, the suggestive results on households' financial outcomes can be interpreted in the following way: poor migrant families left behind were negatively affected by the crisis abroad in the medium-term while the rich subgroup remained largely unaffected. Although the results provide no evidence of any change in home income (y_t^h), the decrease in net remittances (τ_t^f) for the poor subsample can be interpreted as the lasting consequences of negative labor market shocks abroad. In contrast, rich migrant households achieved to increase remittances simultaneously to a significant degree. Together, these results provide evidence that the allocation of additional labor abroad did not result in an immediate increase in remittances receipts at the origin for the poor subgroup.

Further, the results also suggest that the crisis had a negative effect on the asset position (Δb_t) of the poor subsample, while there seemed to be no change for the rich one. This is consistent with the fact that foreign migration tends to be quite expensive in Vietnam and requires substantial upfront investment on behalf of sending households (Hoang and Yeoh 2015). The continued loss of remittances among the poor subsample together with the pronounced deterioration of household assets ultimately implied a significant decrease in expenditure (c_t). Identifying a negative expenditure impact for poor migrant households even three years after the peak of the Great Recession and despite all shock coping efforts, can be interpreted as the long-term adverse effect of the Great Recession. These findings suggest that foreign migration can be understood as a high-

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[31]Due to data constraints, I do not observe transfers from domestic migrants (τ_t^d) in the baseline.

risk, high-return livelihood strategy for poor households in developing countries, which can have profound and lasting effects both on the demographic composition of the family left behind, domestic and foreign migration decisions as well as households' financial outcomes.

6 Robustness Checks

I perform a series of robustness checks that are divided into two groups for the ease of exposition: placebo tests are reported in the Appendix Table 8 and modifications of the shock measure and outcome variables in Table 9. Starting with Table 8, panel A presents the results when estimating equation 5 in a placebo shock setup between the years 2003 and 2008 as if the Great Recession had happened five years earlier.[32] Note that this is a direct test for the presence of parallel trends in the pretreatment period, i.e. before the occurrence of the Great Recession. All coefficients are close to zero, providing no evidence of any significant correlations between the economic shocks in destination countries and the trends in households' main outcome variables before the occurrence of the Great Recession.[33]

In panel B and C, I draw on the non-migrant household sample which, by definition, had not been exposed to unemployment shocks abroad through any migrants. I assign those households the average shock of neighboring migrant households from the same enumeration area (EA).[34] I then estimate equation 5 on the sample of non-migrant households to analyze the correlation of economic shocks abroad on the outcomes of non-migrant households in Vietnam. Despite some of the coefficients from this exercise indicating modest correlations, none of them is statistically significant. Taken together, the results from this exercise provide evidence that the shock measure used is exogenous to the outcomes of non-migrant households in Vietnam, controlling for time-invariant household, destination, and time-province of origin factors. In other words, the results suggest that economic shocks in migrant destination countries during the Great Reces-

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[32]In this exercise, I rely on demographic recall data from the baseline survey in order to reconstruct the main outcomes of interest at the household level in 2003. Note that I cannot repeat this test for household financial outcomes due to data constraints.

[33]Note that while the subgroup coefficient in specification (6) is weakly significant, the net effect is not statistically significant at standard levels of significance.

[34]Each EA is constituted by small sub-village level entities in rural areas or blocks in urban ones, and contains around 100 households on average. This matching routine appears adequate for two reasons: First, households tend to be quite homogeneous within EAs in Vietnam, which makes them comparable in terms of observable characteristics. Second, migration networks tend to have a strong spatial correlation at the local level and, therefore, foreign migration destinations are highly clustered within EAs. This implies that migrant households from the same neighborhood tend to be highly representative of potential migration options that neighboring non-migrant households are exposed to. There are around 3 households per EA, on average, and, in line with the sample stratification strategy, one migrant and one non-migrant household in each of them. In 40 out of 466 EAs where more than one migrant household is present, I randomly chose one of them to be matched to the non-migrant household.

sion did not affect demographic or financial household outcomes at the origin other than through having foreign migrants at the destination.

Turning to Table 9, the results on the destination-specific shock measure as calculated in formula 4 are reported in panel A. Note that these estimations rely on variations in the shock measure across destination countries only and, therefore, do not account for time-invariant factors at the level of the migrant destination. Comparing the coefficients across the different specifications shows that the results are both quantitatively and qualitatively in line with the ones from my benchmark specification. Note, however, that the magnitudes in this exercise are between 30 to 50% larger than the ones in the benchmark specification. This can partly be attributed to the different mean of the shock measure, for which average effect is derived by multiplying the point estimates by 1.9 instead of 2.3. Another part is supposedly due to an omitted variable bias at the level of the destination country.

In panel B, the dependent variable is specified to be the net number of the respective outcome, instead of the total numbers. Consequently, these variables capture the *change* in the outcome variables between period $t-1$ and t for both waves in 2008 and 2013. Again, the results are very similar, both in qualitative and quantitative terms, to the ones from my benchmark estimations. In panel C, the independent variable is specified to be a net migration index, taking on the value of 1 if the household experiences positive net out-migration in year t, 0 if the household's net migration is neutral, and -1 when the household experiences negative net migration (i.e. positive return migration). In contrast to my benchmark specification which captures the intensive margin of migration decisions via the number of migrants sent, this specification is informative about the extensive margin of the change in households' migration status. Despite the magnitudes of these coefficients being slightly smaller compared to those in panel B, they remain very similar to those from the benchmark specification.

Another concern is related to sample attrition, which can be worrisome if it is correlated with the shock variable. Sample selectivity could then lead to biased estimates. In unreported regressions, I estimate the benchmark specification on the unbalanced household panel. The results are remarkably similar to those from the balanced benchmark regressions, both qualitatively and quantitatively. Additionally, I also run regressions on the baseline sample with the dependent variable being an attrition indicator for households that could not be tracked in the follow-up survey (=1 and 0 otherwise) in order to check that attrition is not correlated with the shock.[35] The coefficient on the shock measure is small and not significantly different from zero (coefficient: 0.00609, standard error: 0.00485), providing no evidence that attrition could be a problem in this setting.

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[35]Standard errors clustered at the level of the migrant destination country. The regression includes household location fixed effects and controls for household characteristics (i.e. the demographic composition as well as the age, employment status, and educational attainment of the household head.

7   Conclusion

The results presented in this study document that employment shocks abroad led to large and heterogeneous demographic changes among families left behind in Vietnam in the aftermath of the Great Recession. In contrast to classic migration theories, poor migrant households responded by decreasing the number of domestic, while increasing the one of international migrants in response to the shock abroad. These aggregate effects were driven by changes in labor migration in particular and provide the first evidence of a trade-off between domestic and international migration strategies among migrant households in developing countries of origin. The positive net inflow of migrants returning to the origin also led to a rise in fertility and, subsequently, to an increase in the nucleus size of poor families left behind. These results reveal that different types of migration are interrelated and can have important and unexpected repercussions on a large range of outcomes among families left behind. Therefore, focusing on either domestic or international migration separately may be misleading for research on the family left behind.

The results on household finance also suggest that the crisis had a lasting negative effect on the expenditure patterns of poor families left behind, which is consistent with the fact that international migration tends to be quite expensive in Vietnam and requires substantial pre-departure investment (Hoang and Yeoh 2015). From this perspective, international migration can be understood as a high-risk, high-return livelihood strategy for households in developing countries. For the most remittance-dependent ones, labor market shocks abroad can result in liquidity or debt traps at origin if remittance flows dry up and local employment opportunities are missing or insufficient to maintain minimum levels of consumption. For sending countries, labor export policies like the one implemented in Vietnam, should, therefore, be scrutinized such as to minimize these risks for poorer households aspiring international migration. Different approaches should be evaluated in this regard, for example, raising the awareness about migration-related risks through pre-departure seminars (Barsbai et al. 2016) or improving households' financial decision making skills (Seshan and Yang 2014).

My analysis faces two limitations: First, due to the timing of data collection, my results are only informative about the medium-term outcomes and do not allow drawing direct conclusions about the short-term impacts. Second, the analysis does not account for potential spill-over effects on either end of the migration corridor. While the impact on the destination country is out of the scope of this paper, sustained immigration despite economic crises raises important questions about the impact on the host economy: where do low-skilled newcomers work, which jobs are they doing, and how do their skills compete with those of the native population? Also, what role do host country immigration policies play in this context and is there a case for a change in these policies? Further research is required to answer these important questions.

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A   Figures and Tables

Figure 1: Unemployment Rates in Top 12 Destination Countries and Vietnam
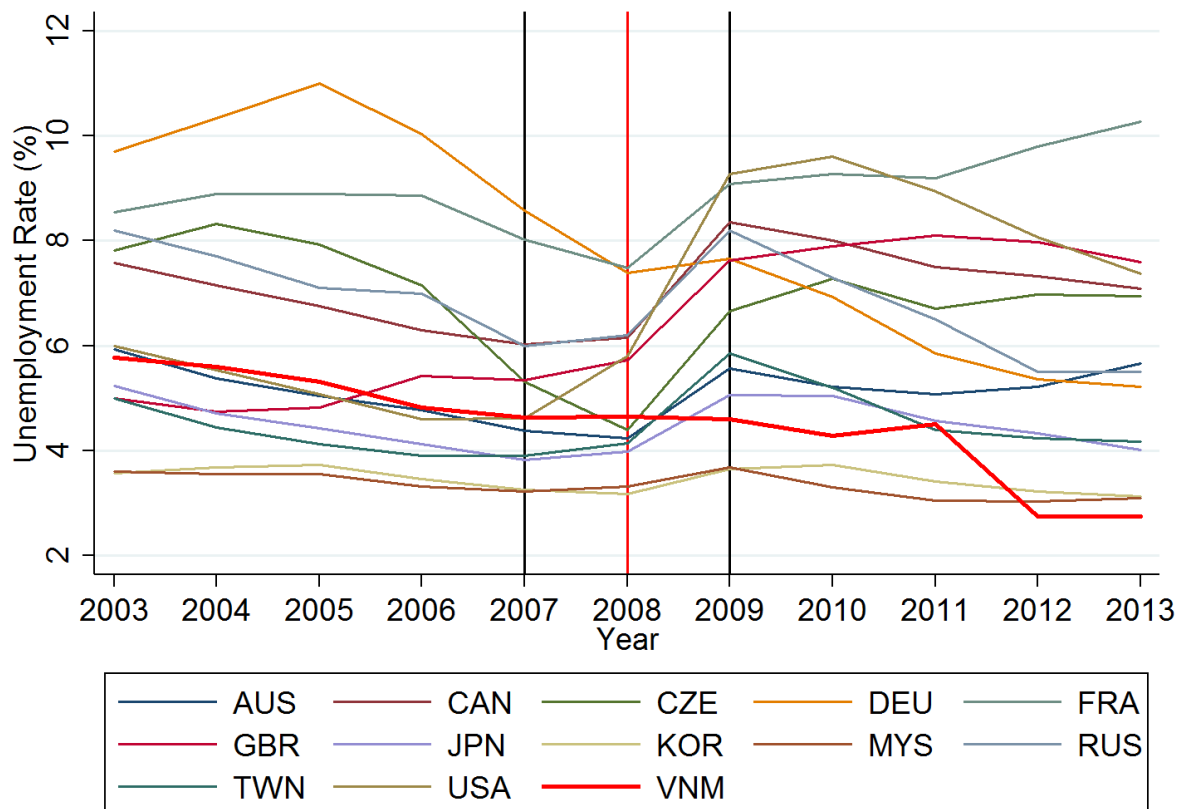
Source: IMF World Economic Outlook database. *Note*: Yearly unemployment rates (percent of total labor force) between 2003 and 2013 in the top 12 destination countries and Vietnam.

Figure 2: Change in Unemployment Rate in Migrant Destination Countries 2007-2009
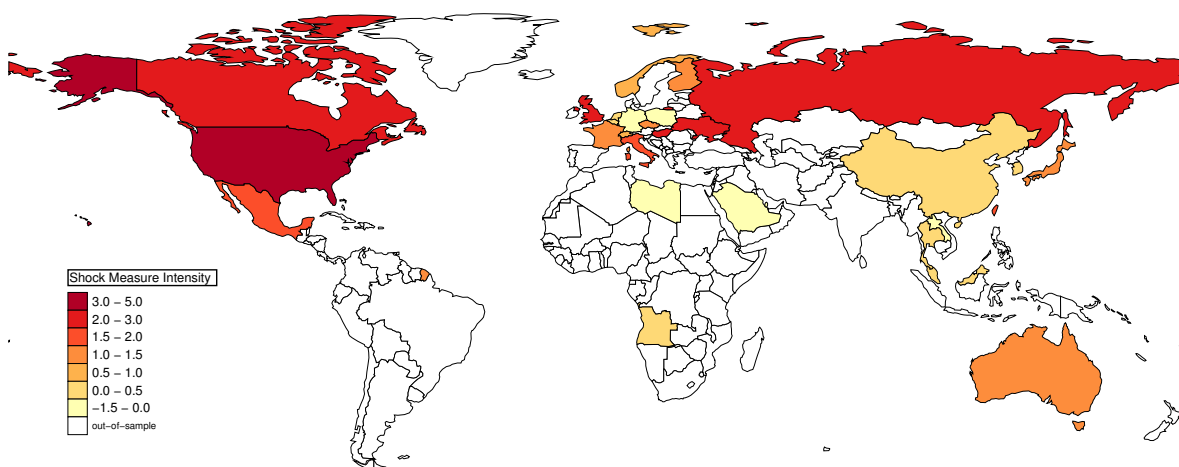
Source: IMF World Economic Outlook database. *Note*: Graphical visualization of percentage point changes in unemployment rate (percent of total labor force) between 2007 and 2009 in migrant destination countries ($\Delta UR_{d,2007-2009}$). Visualization using Pisati (2007).

Table 1: Top 10 Migrant Destinations in 2008 and Shock Measure

| | **Panel A**: Migrant Destinations | | | **Panel B**: Shock Measure | | |
| | | | | by education level: $\Delta UR_{d,s}$ | | |
Country	Count	Percent	ΔUR_d	Primary	Secondary	Tertiary
United States	185	27.7	4.67	7.3 [50]	6.0 [102]	2.8 [31]
Taiwan	99	14.9	1.94	1.5 [45]	2.3 [52]	1.6 [2]
Malaysia	61	9.2	0.45	0.6 [12]	0.5 [43]	-0.1 [4]
Republic of Korea	58	8.7	0.40	0.2 [10]	0.3 [43]	-0.6 [4]
Germany	44	6.6	-0.91	-1.3 [5]	-0.9 [30]	-0.4 [8]
Russia	42	6.3	2.20	6.9 [1]	3.5 [41]	-
Australia	28	4.2	1.20	5.9 [1]	1.9 [19]	0.7 [8]
Japan	26	3.9	1.23	1.6 [1]	1.4 [16]	0.8 [8]
Czech Republic	25	3.8	1.34	3.4 [5]	2.3 [17]	0.6 [3]
Canada	14	2.1	2.33	3.8 [3]	3.2 [7]	0.9 [4]
Other†	83	12.5				
Total	**665**	**100.0**	**2.01**	**3.5 [139]**	**2.5 [412]**	**1.2 [87]**

Panel A *Source*: DOTM data 2008. *Note*: Distribution of international migrants across destination countries reported for the balanced dataset in 2008, including 665 migrants in 30 destinations. Panel B *Source*: DOTM data 2008, IMF World Economic Outlook database, ILO statistical database, World Development Indicators, and national statistical offices. *Note*: The shock measure is the absolute change in the unemployment rate (percent of total labor force) between 2007 and 2009 by destination (column 1) and migrants' educational attainment prior to migration (column 2–4). Measure in column 1 rounded to two digits, columns 2-4 to one. Cell sample size by educational attainment in brackets. Marginal differences in sample sizes between panel A and B due to missing country level or educational attainment data. †: "Other" include Angola, Belgium, China, Finland, France, Hungary, Italy, Laos, Libya, Mexico, Netherlands, Norway, Poland, Qatar, Saudi Arabia, Singapore, Switzerland, Thailand, Ukraine, and United Kingdom.

Table 2: Foreign Migrant Individual Characteristics 2008

Number of observations: 665	Mean	SD
Age	31.3	11.7
Year of departure	2004	4.4
Gender (=female) *(indicator)*	0.56	
Marital status is married *(indicator)*	0.62	
Highest educational attainment before departure *(indicator)*		
$\leq primary$	0.44	
secondary	0.43	
$>secondary$	0.13	
Reasons for departure *(indicator)*⋆		
economic	0.55	
family	0.43	
education	0.17	
Frequency of communication with origin *(indicator)*		
$\leq weekly$	0.40	
$weekly<monthly$	0.42	
$\geq monthly$	0.18	

Source: DOTM data 2008. *Note*: Descriptive statistics reported for the balanced panel, including 665 migrants in 30 destinations. ⋆ Three most frequently reported motives for migrant departure: Multiple answers allowed, reasons not mutually exclusive. *Economic* includes "easier to get a steady job", "earn more money", and "send money back". *Family* includes "mutual family decision", "left to get married", and "joined family abroad". *Education* includes "study and get additional qualifications" and "learn to speak another language".

Table 3: Household Descriptive Statistics 2008/2013 by Skill Level

Number of observations: 507	2008				2013			
Skills	Low		High		Low		High	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Demography*								
Total household size	4.93	1.86	3.5	1.65	4.84	2.23	3.69	1.75
thereof: working	2.30	1.33	1.75	1.11	1.98	1.19	1.68	1.19
Urban location *(indicator)*	0.48		0.63		0.48		0.63	
Finance*								
Domestic income	1,432	1,102	2,525	2,652	1,894	1,909	2,674	3,171
Net remittances	492	1,013	558	1,856	296	681	250	2,660
Total expenditure	1,659	589	5,734	3,383	2,663	2,595	4,740	3,720
Foreign Migration†								
Probability(migrant)	1		1		0.66		0.71	
Total no. migrants	1.2	0.53	1.36	0.81	0.95	0.97	1.13	1.12
thereof: Labor	0.87	0.65	0.93	0.77	0.72	0.73	0.86	0.88
conditional on migrant	1.2	0.53	1.36	0.81	1.44	0.85	1.59	1.02
No. migrants *(indicator)*								
0	0		0		0.34		0.29	
1	0.84		0.78		0.48		0.48	
2+	0.16		0.22		0.18		0.33	
No. destinations *(indicator)*								
0	0		0		0.34		0.29	
1	0.96		0.96		0.63		0.67	
2+	0.04		0.04		0.03		0.04	
Migrant education *(indicator)*								
pre-primary	0.01		0.02		0.00		0.00	
primary	0.27		0.13		0.35		0.16	
lower secondary	0.29		0.17		0.26		0.18	
upper secondary	0.26		0.39		0.23		0.39	
post-secondary	0.08		0.09		0.05		0.05	
tertiary first stage	0.09		0.18		0.11		0.19	
tertiary second stage	0.00		0.02		0.00		0.03	
Domestic								
Probability(migrant)	0.17		0.22		0.37		0.28	
Total no. migrants	0.22	0.56	0.41	0.97	0.76	1.24	0.50	1.03
thereof: Labor	-	-	-	-	0.41	0.80	0.29	0.62
Shock Measure								
Destination-specific					1.75	1.73	2.03	1.86
Destination-Skill-specific					2.21	2.50	2.52	2.40

Source: DOTM panel data 2008–2013. *Note*: Descriptive statistics by the households level relative to the consumption per capita median in 2008. * Working: Members reported employed or self-employed. ⋆ All monetary variables are expressed in real USD per capita. † Foreign labor migration includes former household members being reported to having left the country to work abroad or for one of the following motives: "easier to get a steady job", "earn more money", and "send money back". Migrant educational attainment prior to departure according to International Standard Classification of Education 1997 levels. Domestic labor migration includes former household members being reported to having migrated domestically and were either employed or self-employed during the reference period. ‡ Conditional on the household head being employed or self-employed.

Table 4: Origin Household Demographics

| | Number of Household Nucleus Members | | | | | |
| | All | | Working | | Children (0-5y) | |
	(1)	(2)	(3)	(4)	(5)	(6)
Shock×T (β_1)	-0.00449	0.125**	0.0472	0.102**	0.0005	0.0583***
	(0.0730)	(0.0633)	(0.0365)	(0.0502)	(0.0177)	(0.0196)
Shock×T×High (β_2)		-0.221**		-0.0955		-0.103***
		(0.0906)		(0.0956)		(0.0311)
Household FE	✓	✓	✓	✓	✓	✓
Destination FE	✓	✓	✓	✓	✓	✓
Province-Year FE	✓	✓	✓	✓	✓	✓
Observations	1,014	1,014	1,014	1,014	1,014	1,014
Households	507	507	507	507	507	507
Cluster	26	26	26	26	26	26
R^2	0.103	0.121	0.090	0.101	0.073	0.108
Mean Dep. Var.	4.20	4.20	2.02	2.02	0.25	0.25
F-test (p-value)		0.003		0.48		0.002

Source: DOTM panel data 2008–2013. *Note*: Each column displays the result of a separate regression based on equation 5. I only report the Difference-in-Difference coefficients, i.e. the shock coefficient interacted with a time dummy for the follow-up wave 2013 (β_1) and a triple interaction with a dummy for the specifications on the subgroup of high-skilled households with above median consumption in the baseline respectively (β_2). The F-test p-value is for the null hypothesis of the net effect for high-skilled households being zero ($\beta_1 + \beta_2 = 0$). Wild bootstrapped standard errors based on 2,000 replications in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Domestic Migration

| | Number of Domestic Migrants | | | | | |
| | All | | Labor | | Labor Long-Distance | |
	(1)	(2)	(3)	(4)	(5)	(6)
Shock×T (β_1)	-0.0230*	-0.0712***	-0.0242**	-0.0640***	-0.0315***	-0.0654***
	(0.0130)	(0.0216)	(0.0123)	(0.0194)	(0.0109)	(0.0198)
Shock×T×High (β_2)		0.0846**		0.0711***		0.0600***
		(0.0403)		(0.0172)		(0.0167)
Household FE	✓	✓	-	-	-	-
Destination FE	✓	✓	-	-	-	-
Province-Year FE	✓	✓	✓	✓	✓	✓
Observations	1,014	1,014	507	507	507	507
Households	507	507	507	507	507	507
Cluster	26	26	26	26	26	26
R^2	0.102	0.130	0.177	0.220	0.174	0.226
Mean Dep. Var.	0.32	0.32	-	-	-	-
F-test (p-value)		0.50		0.59		0.71

Source: DOTM panel data 2008–2013. *Note*: There are two the different specifications of domestic migration in this table: levels of aggregate domestic migration in columns (1) and (2) and of domestic migration conditional on migrants' occupation and destination in columns (3) through (6). The latter variables have only cross-sectional character and are, therefore, not fully identified. For this reason, they should be interpreted as suggestive evidence, reflecting correlations only instead of causal effects. Each column displays the result of a separate regression based on equation 5. I only report the Difference-in-Difference coefficients, i.e. the shock coefficient interacted with a time dummy for the follow-up wave 2013 (β_1) and a triple interaction with a dummy for the specifications on the subgroup of high-skilled households with above median consumption in the baseline respectively (β_2). The F-test p-value is for the null hypothesis of the net effect for high-skilled households being zero ($\beta_1 + \beta_2 = 0$). Wild bootstrapped standard errors based on 2,000 replications in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Foreign Migration

| | Number of Foreign Migrants | | | | | |
| | All | | Labor | | Destination Change | |
	(1)	(2)	(3)	(4)	(5)	(6)
Shock×T (β_1)	0.0491***	0.0533**	0.0084	0.0774***	-0.0113	0.0041
	(0.0149)	(0.0230)	(0.0241)	(0.0268)	(0.0104)	(0.0052)
Shock×T×High (β_2)		-0.0120		-0.120**		-0.0270
		(0.0240)		(0.0509)		(0.0210)
Household FE	√	√	√	√	-	-
Destination FE	√	√	√	√	-	-
Province-Year FE	√	√	√	√	√	√
Observations	1,014	1,014	1,014	1,014	507	507
Households	507	507	507	507	507	507
Cluster	26	26	26	26	26	26
R^2	0.285	0.286	0.163	0.176	0.075	0.118
Mean Dep. Var.	1.28	1.28	0.90	0.90	-	-
F-test (p-value)		0.02		0.25		0.14

Source: DOTM panel data 2008–2013. *Note*: Each column displays the result of a separate regression based on equation 5. I only report the Difference-in-Difference coefficients, i.e. the shock coefficient interacted with a time dummy for the follow-up wave 2013 (β_1) and a triple interaction with a dummy for the specifications on the subgroup of high-skilled households with above median consumption in the baseline respectively (β_2). The F-test p-value is for the null hypothesis of the net effect for high-skilled households being zero ($\beta_1 + \beta_2 = 0$). Wild bootstrapped standard errors based on 2,000 replications in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Household Financial Outcomes

| LOG US$ PC | Home Income | | Net Remittances | | ΔAssets | | Total Expenditure | |
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Shock×T (β_1)	0.0161	-0.0274	0.0445	-0.191	-0.0863	-0.221	-0.0049	-0.0432**
	(0.0747)	(0.0778)	(0.185)	(0.269)	(0.133)	(0.135)	(0.0152)	(0.0210)
Shock×T×High (β_2)		0.0708		0.421**		0.229		0.0624*
		(0.213)		(0.209)		(0.211)		(0.0344)
Household FE	√	√	√	√	√	√	√	√
Destination FE	√	√	√	√	√	√	√	√
Province-Year FE	√	√	√	√	√	√	√	√
Observations	1,014	1,014	1,014	1,014	1,014	1,014	1,014	1,014
Households	507	507	507	507	507	507	507	507
Cluster	26	26	26	26	26	26	26	26
R^2	0.045	0.068	0.233	0.245	0.046	0.063	0.132	0.189
F-test (p-value)		0.97		0.10		0.98		0.47

Source: DOTM panel data 2008–2013. *Note*: All variables are expressed in logarithmic US$ (PPP) per capita, i.e., adjusted by the number of permanent household members excluding migrants. Income is from labor activities within the household of origin only and net of informal transfers, such as remittances. Remittance receipts from overseas migrants are net of any remittances sent by the household. Assets are the stock of savings in cash and kind. Each column displays the result of a separate regression based on equation 5. I only report the Difference-in-Difference coefficients, i.e. the shock coefficient interacted with a time dummy for the follow-up wave 2013 (β_1) and a triple interaction with a dummy for the specifications on the subgroup of high-skilled households with above median consumption in the baseline respectively (β_2). The F-test p-value is for the null hypothesis of the net effect for high-skilled households being zero ($\beta_1 + \beta_2 = 0$). Wild bootstrapped standard errors based on 2,000 replications in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

B Appendix (For Online Publication)

B.1 Robustness Checks

Table 8: Placebo Tests

Panel A	Number of Household					
Pretreatment Trends	Members		Domestic Migrants		Foreign Migrants	
	(1)	(2)	(3)	(4)	(5)	(6)
Shock×T (β_1)	0.0018	0.0266	0.0036	0.0063	-0.0010	-0.0459
	(0.0192)	(0.0574)	(0.0171)	(0.0410)	(0.0108)	(0.0395)
Shock×T×High (β_2)		-0.0478		-0.0032		0.0822*
		(0.0467)		(0.0320)		(0.0456)
Household FE	√	√	√	√	√	√
Destination FE	√	√	√	√	√	√
Province-Year FE	√	√	√	√	√	√
Observations	1,014	1,014	1,014	1,014	1,014	1,014
Households	507	507	507	507	507	507
Cluster	26	26	26	26	26	26
R^2	0.435	0.439	0.076	0.078	0.518	0.523
Panel B	Number of Household					
Non-migrant Sample	Members		Domestic Migrants		Foreign Migrants	
	(1)	(2)	(3)	(4)	(5)	(6)
Shock×T (β_1)	-0.0120	-0.117	0.0722	0.0896	0.0002	-0.0020
	(0.0422)	(0.181)	(0.0506)	(0.134)	(0.0016)	(0.0052)
Shock×T×High (β_2)		0.138		-0.0165		0.0030
		(0.197)		(0.106)		(0.0048)
Household FE	√	√	√	√	√	√
Destination FE	√	√	√	√	√	√
Province-Year FE	√	√	√	√	√	√
Observations	652	652	652	652	652	652
Households	326	326	326	326	326	326
Cluster	68	68	68	68	68	68
R^2	0.020	0.028	0.074	0.096	0.063	0.066
Panel C	Household					
Non-migrant Sample	Home Income		Net Remittances		Total Expenditure	
LOG US$ PC	(1)	(2)	(3)	(4)	(5)	(6)
Shock×T (β_1)	-0.0471	-0.0808	-0.0115	-0.0515	-0.0265	0.0037
	(0.0770)	(0.121)	(0.0088)	(0.0350)	(0.0490)	(0.0211)
Shock×T×High (β_2)		0.0429		0.0551		-0.0342
		(0.129)		(0.0357)		(0.0299)
Household FE	√	√	√	√	√	√
Destination FE	√	√	√	√	√	√
Province-Year FE	√	√	√	√	√	√
Observations	652	652	652	652	652	652
Households	326	326	326	326	326	326
Cluster	68	68	68	68	68	68
R^2	0.021	0.022	0.067	0.074	0.099	0.161

Source: DOTM panel data 2008–2013. *Note*: Each column displays the result of a separate regression based on equation 5. I only report the Difference-in-Difference coefficients, i.e. the shock coefficient interacted with a time dummy for the follow-up wave 2013 (β_1) and a triple interaction with a dummy for the specifications on the subgroup of high-skilled households with above median consumption in the baseline respectively (β_2). The F-test p-value is for the null hypothesis of the net effect for high-skilled households being zero ($\beta_1 + \beta_2 = 0$). Wild bootstrapped standard errors based on 2,000 replications in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 9: Shock Measure and Outcome Variable Modifications

Panel A	Number of Household					
Shock Measure 2	Members		Domestic Migrants		Foreign Migrants	
	All	Working	All	Working	All	Working
	(1)	(2)	(3)	(4)	(5)	(6)
Shock×T (β_1)	0.223	0.194**	-0.107	-0.0989	0.128***	0.120***
	(0.150)	(0.0876)	(0.0730)	(0.0704)	(0.0348)	(0.0322)
Shock×T×High (β_2)	-0.288**	-0.229***	0.112	0.122*	-0.0821**	-0.145
	(0.139)	(0.0695)	(0.0714)	(0.0734)	(0.0375)	(0.0974)
Household FE	√	√	√	-	√	√
Province-Year FE	√	√	√	√	√	√
Observations	1,032	1,032	1,032	516	1,032	1,032
Households	516	516	516	516	516	516
Cluster	26	26	26	26	26	26
R^2	0.060	0.092	0.124	0.223	0.193	0.156
Panel B	Number of Household					
Net Number	Members		Domestic Migrants		Foreign Migrants	
	All	Working	All	Working	All	Working
	(1)	(2)	(3)	(4)	(5)	(6)
Shock×T (β_1)	0.0987	0.0993	-0.0775**	-0.0648***	0.100	0.128**
	(0.0775)	(0.0648)	(0.0343)	(0.0196)	(0.0744)	(0.0611)
Shock×T×High (β_2)	-0.174*	-0.124	0.0878	0.0753***	-0.0950*	-0.197*
	(0.0940)	(0.0853)	(0.0809)	(0.0288)	(0.0522)	(0.117)
Household FE	√	√	√	-	√	√
Destination FE	√	√	√	-	√	√
Province-Year FE	√	√	√	√	√	√
Observations	1,014	1,014	1,014	507	1,014	1,014
Households	507	507	507	507	507	507
Cluster	26	26	26	26	26	26
R^2	0.192	0.050	0.073	0.217	0.443	0.328
Panel C	Number of Household					
Net Index	Members		Domestic Migrants		Foreign Migrants	
	All	Working	All	Working	All	Working
	(1)	(2)	(3)	(4)	(5)	(6)
Shock×T (β_1)	0.00807	0.0526*	-0.0530**	-0.0516***	0.125*	0.141**
	(0.0338)	(0.0294)	(0.0210)	(0.0156)	(0.0688)	(0.0665)
Shock×T×High (β_2)	-0.0398	-0.0574	0.0324	0.0553***	-0.0795	-0.174**
	(0.0539)	(0.0362)	(0.0424)	(0.0217)	(0.0598)	(0.0766)
Household FE	√	√	√	-	√	√
Destination FE	√	√	√	-	√	√
Province-Year FE	√	√	√	√	√	√
Observations	1,014	1,014	1,014	507	1,014	1,014
Households	507	507	507	507	507	507
Cluster	26	26	26	26	26	26
R^2	0.087	0.091	0.049	0.173	0.498	0.419

Source: DOTM panel data 2008–2013. *Note*: Each column displays the result of a separate regression based on equation 5. I only report the Difference-in-Difference coefficients, i.e. the shock coefficient interacted with a time dummy for the follow-up wave 2013 (β_1) and a triple interaction with a dummy for the specifications on the subgroup of high-skilled households with above median consumption in the baseline respectively (β_2). The F-test p-value is for the null hypothesis of the net effect for high-skilled households being zero ($\beta_1 + \beta_2 = 0$). Wild bootstrapped standard errors based on 2,000 replications in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

B.2 Theoretical Framework: Mathematical Derivation

1. **Elasticity of <u>domestic</u> migration w.r.t. foreign wages**

   - Solve the household size constraint for m_h,

   $$m_h = n - m_d - m_f$$

   - the budget constraint for m_f,

   $$m_f = \frac{c - w_d m_d}{w_f}$$

   - and replace m_h and m_f in the maximization problem:

   $$\underset{m_d}{\text{Max}} \quad \left\{ u(n - m_d - (\frac{c - w_d m_d}{w_f})) - \alpha m_d - \beta(\frac{c - w_d m_d}{w_f}) \right\}$$

   - Differentiation w.r.t. m_d, yields the first-order condition:

   $$\frac{dU}{dm_d^*} = \frac{w_d - w_f}{w_f} u'(m_h) - \alpha + \beta \frac{w_d}{w_f} = 0.$$

   - Total differentiation yields:

   $$\frac{dm_d^*}{dw_f} = -\frac{\frac{d}{dw_f}}{\frac{d}{dm_d^*}} = -\frac{-\frac{w_d}{w_f^2}u'(m_h^*) + \frac{(w_d - w_f)m_d^*}{w_f^2}u''(m_h^*) - \beta \frac{w_d}{w_f^2}}{\left.\frac{dU^2}{dd^2}\right|_{d=d^*}}.$$

   - Since, by assumption: $\frac{dU^2}{dm_d^2} < 0$, the sign of the elasticity of domestic migration w.r.t. foreign wages is determined by the sign of the numerator $(\frac{d}{dw_f})$:

   $$sgn(\frac{d}{dw_f}) = sgn(-\frac{w_d}{w_f^2}u'(m_h^*) + \frac{(w_d - w_f)m_d^*}{w_f^2}u''(m_h^*) - \beta \frac{w_d}{w_f^2}).$$

2. **Elasticity of <u>foreign</u> labor migration w.r.t. foreign wages**

- Solve the household size constraint for m_h,

$$m_h = n - m_d - m_f$$

- the budget constraint for m_d,

$$m_d = \frac{c - w_f m_f}{w_d}$$

- and replace m_h and m_d in the maximization problem:

$$\underset{m_f}{\text{Max}} \quad \left\{ u(n - (\frac{c - w_f m_f}{w_d}) - m_f) - \alpha(\frac{c - w_f m_f}{w_d}) - \beta m_f) \right\}$$

- Differentiation w.r.t. m_f, yields the first-order condition:

$$\frac{dU}{dm_f^*} = \frac{w_f - w_d}{w_d} u'(m_h) + \alpha \frac{w_f}{w_d} - \beta = 0.$$

- Total differentiation yields:

$$\frac{dm_f^*}{dw_f} = -\frac{\frac{d}{dw_f}}{\frac{d}{dm_f^*}} = -\frac{\frac{1}{w_d} u'(m_h^*) + \frac{(w_f - w_d) m_f^*}{w_d^2} u''(m_h^*) + \alpha \frac{1}{w_d}}{\left. \frac{dU^2}{dm_f^2} \right|_{m_f = m_f^*}}.$$

- Since, by assumption: $\frac{dU^2}{dm_f^2} < 0$, the sign of the elasticity of foreign migration w.r.t. foreign wages is determined by the sign of the numerator $(\frac{d}{dw_f})$:

$$sgn(\frac{d}{dw_f}) = sgn(\frac{1}{w_d} u'(m_h^*) + \frac{(w_f - w_d) m_f^*}{w_d^2} u''(m_h^*) + \alpha \frac{1}{w_d}).$$

B.3   Theoretical Framework: Calibration Exercise

In order to illustrate the heterogeneous predictions of this model for the discrete case of my sample households, I conduct a simple parametrization exercise. Table 10 summarizes the parameters used in this exercise for a hypothetical low and high-skilled household, comparing two periods, before (t_0) and after (t_1) the occurrence of an economic shock abroad. I assume that the household optimally distributes $n = 5$ members across *home*, *domestic*, and *foreign* locations, which corresponds approximately to the mean household size in my sample, including migrants. Discrete optimization is important in this context because households' migration decisions are binary and the set of potential migration candidates is strictly finite.

Table 10: Parametrization of Household Migration Model

Parameters — Skills	Period 0 (*before*)		Period 1 (*after*)	
	Low	**High**	**Low**	**High**
Domestic wage (w_d)	2	4	2	4
Foreign wage (w_f)	8	9	6	7
Foreign wage shock (Δw_F)			-2	-2
Domestic cost parameter (α)	0.1	0.1	0.1	0.1
Foreign cost parameter (β)	0.3	0.3	0.3	0.3
Results				
Members at home (m_h^*)	3	3	3	3
Domestic migrants (m_d^*)	1	1	0	1
Foreign migrants (m_f^*)	1	1	2	1
Consumption ($\underline{c}^*$)	10	13	12	11

Note: Minimum consumption, $\underline{c} = 10$ units, utility function: $u(m_h) = ln(m_h) - \alpha m_d - \beta m_f$.

Households' skill distribution is normalized and ranges between 0 and 1, with low-skilled households earning the minimum wage for unskilled labor ($s = 0$) and high-skilled ones ($s = 1$) receive the maximum returns to schooling additionally. Domestic wages are determined by: $w_f = 2 + 2s$, which implies returns to skills of 100% for the high-skilled. Comparing the case of an unskilled worker with the one of a college graduate with 15 years of education, this translates into yearly returns to schooling of approximately 6.67%. This figure corresponds quantitatively to the estimated returns to schooling for Vietnam by World Bank (2008) (5.5.%) and Montenegro and Patrinos (2014) for South Asia (7.7%). Foreign migrants, on the other hand, earn $w_f = 8 + 1s$, which implies that the foreign minimum wage is fourfold compared to the domestic one. On average, this is consistent with the estimated wage ratios for observably identical workers between Vietnam and the US (3.92) by Clemens et al. (2008). In respect to the returns to schooling, this implies a 12.5% mark-up for the high-skilled in foreign destinations, which is considerably lower compared to the domestic one, as hypothesized in the general framework. Furthermore, I assume that foreign migration causes three times more disutility than the domestic one

($\alpha = 0.1$ and $\beta = 0.3$).

In period 1, a negative economic shock occurs, which leads to a uniform reduction in the foreign wage by 2 units ($\Delta w_f = -2$), such that the foreign wage equation turns into $w_f = 6 + 1s$. This absolute wage shock translates into a 25% decrease in the foreign wage of low-skilled and 22% for the high-skilled workers, respectively. The relative magnitude of this shock parameter is in line with the estimates by González and del Pino (2012) for the accumulated change in remittances from the USA to Mexico between 2007 and 2009 (-19%). It also corresponds to their lower bound estimate for the change in earnings by non-citizen Mexican immigrant workers in the US with post-secondary, non-tertiary education level (-21.7%) during the same period. This subgroup is most comparable to the migrants in my sample, who usually don't have citizenship in their host country and who predominantly posses a secondary educational degree. Since we are interested in the reaction of migrant households, i.e. the ones with $d, f > 0$, the minimum consumption level is assumed to be greater or equal to the earnings of a low-skilled household with one domestic and foreign migrant each ($\underline{c} \geq 10$).

Under these assumptions, comparative statics of this simple model generate the following predictions. Given the ex-ante migration decisions in period t_0, low-skilled households realize exactly the consumption minimum, while high-skilled ones earn somewhat more than $\underline{c}$, due to the household's choice set being discrete. When the shock strikes in t_1 and foreign wages decrease, low-skilled households fall below the minimum consumption level, while high-skilled households remain unaffected: they can compensate the shock from their excess earnings, such that their initial portfolio remains optimal.[36] Low-skilled households, on the other hand, are forced to re-optimize their migration decisions and do so by increasing the allocation of labor to foreign markets by one member as the marginal wage abroad is still superior compared to the domestic one they face. As additional foreign migration occurs and the household's budget constraint is satisfied once again, the income from the remaining domestic migrant does not provide any more utility. Due to the household's home bias of locational preferences, they derive positive utility from calling the domestic migrant back home, such that the allocation of members to domestic destinations decreases to zero.

In summary, this simple discrete optimization exercise demonstrates that, for low-skilled households with the given parameters, the model predicts that the elasticity of domestic migration with respect to foreign wages is positive and the one of foreign migration is negative. In other words, for low-skilled households, the income effect dominates the substitution effect. The optimal shock coping strategy for low-skilled households in this example is to trade-off domestic migrants with foreign ones. High-skilled households'

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[36]Note that the probability of the budget constraint becoming binding as a result of any income shock for any given consumption minimum is generally larger for low- compared to high-skilled households in the discrete case due to their lower wage levels.

migration decisions, on the other hand, remain unaffected by the shock.

Under this scenario, the model also predicts that the aggregate flows of foreign migrants become more negatively selected on skills in relative terms because of low-skilled households sending more members abroad, while high-skilled ones do not. This corresponds qualitatively to a situation in which the migrant skill composition in the foreign destination deteriorates in relative terms (compared to the non-crisis counterfactual). On the other hand, the model does not capture intra household skill selection into migration, since all members are assumed to be equal within the household. In practice, however, domestic and foreign migrant individuals often share certain characteristics, such that domestic migrants may be more likely to becoming foreign migrants compared to the average family member.