The Impacts of Economic Growth and Governance on Migration: Evidence from Vietnam

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Abstract

We examine the effect of income level and governance quality on inter-province migration in Vietnam using a gravity model. Consistent with previous studies on migration, we find that people tend to move from low-income provinces to high-income ones. Among the income components, wage income is the most important in pushing and pulling migrants. Higher non-farm income also attracts more immigrants. The migration flow is also associated with the quality of governance and public administration. Low public services and administrative procedures tend to push people to emigrate, while better control of corruption and more transparency and accountability tend to pull immigrants.

Keywords Migration · Economic structure · Governance and public administration · Gravity model · Vietnam

Résumé

Nous examinons l'effet du niveau de revenu et de la qualité de la gouvernance sur la migration interprovinciale au Vietnam à l'aide d'un modèle de gravité. Tout comme les études antérieures sur la migration, nous constatons que les gens ont tendance à passer des provinces à faible revenu aux provinces à revenu élevé. Parmi les composantes du revenu, le revenu salarial exerce la force de répulsion-attraction (push

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and pull) la plus importante chez les migrants. Les revenus non agricoles plus élevés attirent aussi plus d'immigrants. Le flux migratoire est également associé à la qualité de la gouvernance et de l'administration publique. La faiblesse des services publics et des procédures administratives a tendance à pousser les gens à émigrer, tandis qu'un meilleur contrôle de la corruption et plus de transparence et de responsabilité ont tendance à attirer les immigrants.

JEL Classification J13 · J16 · J22 · H42

Introduction

Human capital plays a key role in economic growth (e.g., Barro 1991; Mankiw et al. 1992), and an important way to accumulate human capital is through migration. Researchers have long been interested in understanding the causes of migration. In this study, we examine the effect of income and governance quality on migration in Vietnam. Using a gravity model, we assess not only the push effect but also the pull effect of income level and governance quality on inter-province migration in Vietnam.

Economic growth and governance quality have a two-way relationship (e.g., Mauro 1995; Martin 2006; Khan 2009). It is widely agreed that people tend to move from low-income areas to high-income ones (Stark and Bloom 1985; Stark 1991; Stark and Taylor 1991). Recent literature has pointed out that political conditions of countries can be also 'push' and 'pull' factors of migration (e.g., Docquier and Rapoport 2012; Cooray and Schneider 2014). Low governance quality is found to reduce the return of education, since jobs and wages are then determined, based not only on ability but also on political connections (Lapshyna 2014; Cooray and Schneider 2014; Schneider 2015).

In this study, we investigate to what extent the income structure affects migration in Vietnam. Instead of looking at the aggregate income, we examine the effect on migration of different income components, including wages, crop income, income from other agricultural production, non-farm income, and income from the remaining sources. We also examine the role of the quality of governance and public administration in inter-province migration. By doing so, our paper is expected to make several contributions to the related literature, as follows.

Firstly, we estimate the effect of different income components on migration. Although there are a large number of studies on the effect of GDP on inter-country migration, few studies have examined the effect of economic structure. Several studies, such as Massey et al. (2008), Pradhan et al. (2008), Palat (2011), and Török (2014), conclude that economic transformations and re-structure can affect economic growth and thereby migration flow. Using global data on migration, Devarajan (2013) shows that the migration pattern follows wage differentials, labor demand for unskilled or highly skilled people, and job demands, along with education. To our knowledge, there is little (if any) evidence on the effect of different income components on migration.

Secondly, empirical findings of governance on migration are still mixed. For example, using data from 111 countries, Dimant et al. (2013) show that corruption is among the push factors of migration, especially skilled migration, while Ariu and Squicciarini (2013) find that emigration and immigration are both negatively affect by corruption. Moreover, previous studies on the effect of governance on migration focus on cross-country data. One of reasons for limited evidence at the sub-national level is the lack of consistent and comparable data (e.g., Glaeser et al. 2004; Dellepiane-Avellaneda 2010). Governance and public administration are a broad concept and not easy to measure (Rhodes 1996; Kaufmann et al. 2009). In this study, we exploit high-quality Vietnam Governance and Public Administration Performance Index (PAPI) surveys to measure the quality of governance. To our knowledge, our study is one of the first attempts to empirically examine the relationship between governance and migration within a country (at the sub-national level).

Thirdly, our paper provides empirical findings on the effect of not only economic growth but also governance and public administration on internal migration in Vietnam—an important study case. Vietnam is a country with dynamic internal and international migration. According to the 2009 Population and Housing Census of Vietnam, around 6.6 million people migrated within the country between 2004 and 2009. Together with the economic growth that has been achieved in recent decades, there is an increasing recognition that good governance and public administration are important for economic growth as well as for human development (Acuña-Alfaro et al. 2010). Although Vietnam has been implementing administration reform, there are still problems of inefficient public administration and corruption (World Bank 2010). Improvement of public administration and services can help increase human capital through migration.

In Vietnam, previous studies have indicated that migration is a key response of households and individuals to both economic opportunities and livelihood difficulties. Dang et al. (1997) find that the more highly developed provinces attract higher volumes of migrants, other things being equal. Phan and Coxhead (2010) also find that provinces with higher per capita income attract more migrants. Nguyen and McPeak (2010) use a macro-gravity model to study the determinants of interprovincial migration, and conclude that migration is influenced primarily by the cost of moving and expected income differentials. Recently, Nguyen (2019) shows that negative income shocks induce migration in rural Vietnam. However, there are no studies on the effect of the income structure and governance quality on migration in Vietnam.

The paper is organized into six sections. The second section discusses the theoretical framework and briefly reviews the literature on migration. The third section describes the datasets used in this study. The fourth section presents the descriptive analysis of migration in Vietnam. The fifth and sixth sections present the estimation method and the empirical results, respectively. Finally, the seventh section concludes the paper.

Theoretical Framework and Literature Review

In this study, we test two main following hypotheses:

Hypothesis 1 People move from low-income provinces to high-income ones in Vietnam.

Hypothesis 2 People move from provinces with low-quality governance to those with high-quality governance.

Economic level and governance quality not only push but also pull the migration flow. In this section, we discuss the potential effects of economic growth and governance on migration. Figure 1 illustrates the potential effects.

In traditional economic theory, individuals migrate to maximize utility given spatial variation in wage and price levels (Stark and Bloom 1985; Stark 1991; Stark and Taylor 1991; Valencia 2008; Molloy et al. 2011). People tend to move from low-income areas to high-income ones. In the New Economics of Labor Migration, decisions to migrate depend on characteristics of both migrants and their families such as education, age and gender (Stark and Bloom 1985; Stark and Taylor 1991).

While there is ample literature on the role of economic level on migration, there is less evidence on the effect of governance and public administration on migration. There are several channels through which governance and public administration can affect migration. Firstly, economic growth and governance have a two-way relationship (e.g., Mauro 1995; Martin 2006; Khan 2009). Corruption distorts markets and discourages investment, from both domestic and foreign sources. Public investment is also less efficient under corruption. Gupta et al. (2002) find that a one standard deviation increase in corruption decreases
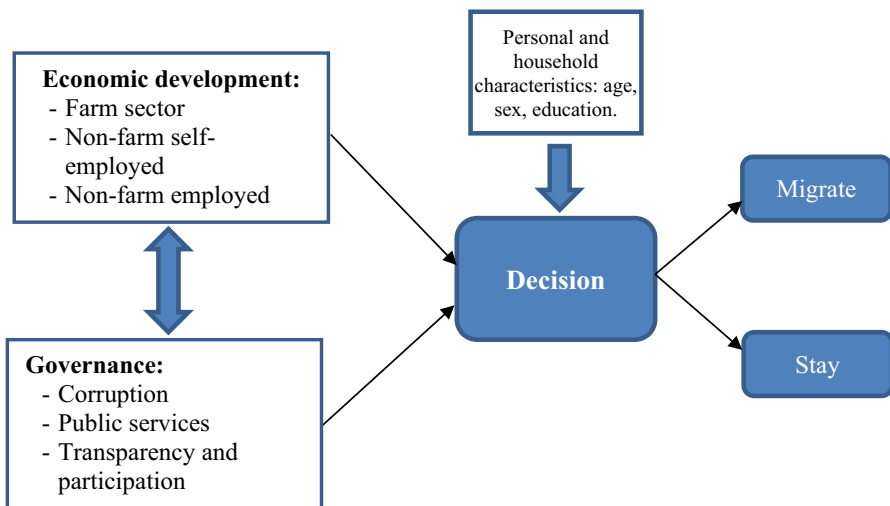

Fig. 1 Conceptual framework of migration. *Source* Authors' preparation

annual income growth rate by 5% points. Through the effect on economic growth, governance can influence migration.

Secondly, the characteristics of home and destination locations are also considered to be important factors exerting 'push' and 'pull' forces on migrants (e.g., see Kim and Cohen 2010; Ackah and Medvedev 2012). Social factors are known to be important, since the "trigger price" for migration is always found to be substantially higher than the financial cost of relocating (Davies et al. 2001). Differences in culture also impede migration (Belot and Ederveen 2012; Caragliu et al. 2013).

Democracy increases information transparency with regard to government policies, public services, and administration, which in turn improve the quality of public services (e.g., Tavaresa and Wacziarg 2001; Lassen 2005). Empirically, Caragliu et al. (2013) show that differences in democracy between European countries are a barrier to the migration flow in Europe. Public services are also considered in migrants' decisions, and people tend to move from low-quality public services to high-quality public services (e.g., McKenzie and Rapoport 2006; Zaiceva and Zimmermann 2008). Differences in labor market institutions between countries can also reduce migration flows (Belot and Ederveen 2012).

There have been a number of studies looking at the effect of corruption on migration using gravity models. Dimant et al. (2013) examine how corruption influences migration using data from 111 countries in the 1985–2000 period. They find that corruption is a significant push factor of migration, particularly for skilled people. The authors argue that corruption results in slow economic growth and worsen working and living conditions of citizens, therefore incentivizing emigration. Similarly, Cooray and Schneider (2014) conclude that corruption in home countries tends to push people with higher education to other countries. Corruption reduces the return to education, since, under corruption, jobs are not provided based on qualifications but political connections (Dimant et al. 2013).

Using a gravity model, Poprawe (2015) explores the relationship between corruption and migration. With a cross-sectional dataset of bilateral migration for 230 countries, the author shows that countries with high corruption encourage emigration and discourage immigration due to worse and unpredictable economic conditions, more insecurity, and a lower quality of life. The study also finds that education, per capita income, and inflation in the destination country, and corruption and education in the origin country, can significantly determine migration. Of those factors, corruption is a strong "push factor" of migration.

Schneider (2015) argues that corruption will result in poor public institutions and poor economic growth, and thus lead to unfair job distribution. Such a situation will in turn force highly educated people in countries to leave, as well as prevent similar ones from coming. Even in the worst corruption situation, low-skilled and low-income workers will seek leaving opportunities as they might pay highly disproportionate levels of bribery in their income. Bergh et al. (2015), using a gravity model approach with data from various countries, also show that the quality of institutions matters as a push factor for migration. Institutions—measured by such factors as effective bureaucracy and control of corruption—directly affect people's lives so that they would be strong pull factors for the countries of destination. In addition,

along with the lack of effective and transparent institutions in a developing context, poverty might be an important push factor of global migration flows.

Figure 1 also shows that there are heterogenous effects depending on characteristics of individuals and households, and intervening factors, either obstacles or facilitators. Age, gender and education are important intervening factors (Stark and Bloom 1985; Stark and Taylor 1991). People with different characteristics can respond to governance quality and income level in different ways. In this study, given the data availability, we examine whether the effect of governance quality and income level on migration differs for people with different ages and education levels.

Datasets

This study will rely on three datasets. The main dataset is the Vietnam Population and Housing Census in 2009 and the Intercensal Population and Housing Survey in 2014 (henceforth referred to as the 2009 VHPC and the 2014 IPHS, respectively). These data were conducted by the General Statistics Office of Vietnam in 2009 and 2014 with technical support from The United Nations Population Fund. The surveys are representative at the district level. The number of individuals covered in the 2009 VHPC and the 2014 IPHS were 14,177,590 and 4,214,452, respectively. The datasets contain demographic data on individuals and households. Individual data include demographics, education, and migration. Based on the questionnaires from the datasets, we define migrants as individuals who lived in a different province other than the current province five years ago, from which we can compute the migration between provinces.

The second dataset is the Vietnam Household Living Standard Surveys in 2004 and 2010 (henceforth referred to as VHLSS). The datasets contain very detailed data on individuals and households. Household data are on durables, assets, production, income and expenditures, and participation in government's programs. Individual data consist of information on demographics, education, employment, health, and migration. Using this dataset, we can compute the income structure of households at the provincial level.

It should be noted that the VHLSS have been conducted every 2 years by General Statistics Office of Vietnam (GSO) since 2002. However, we use the 2004 and 2010 VHLSS to estimate the income structure of provinces before the migration flow which is measured using the 2009 VHPC and the 2014 IPHS. The 2004 and 2010 VHLSS covered 45,944 and 69,360 households, which are representative at the provincial level.

The third dataset is from the Vietnam Governance and PAPI surveys. The PAPI surveys have been conducted annually since 2009 by the United Nations Development Program and Vietnam Fatherland Front (CECODES et al. 2014). The surveys collected information from citizens on their experiences on a number of aspects of the governance and public administration. In 2009, the PAPI survey was collected in 3 provinces, and in 2010 it was collected in 30 provinces. Beginning in 2011, each PAPI survey has covered around 14,000 individuals in all 63 provinces. In this study, we use the 2011 PAPI survey to measure the quality of provincial governance

and link this data with the migration data in 2014. The reason why we use the 2011 survey is that we aim to use data on governance and public administration before the migration flow. There are no data on governance before 2009, and, as a result, we cannot use the 2009 VPHC to model the impact of governance on migration.

In this study, we measure the quality of governance and public administration by an aggregate index (henceforth referred as to the PAPI index), which has been constructed by CECODES et al. (2014). This index is measured from six dimensions: (1) participation of local people in governance and public administration at local levels, (2) transparency of information on public services, (3) vertical accountability, (4) control of corruption, (5) public administrative procedures, and (6) public service delivery. Each dimension consists of several sub-dimensions, which are estimated from collected data. The aggregate dimensions are standardized from 1 (worst) to 10 (best) to measure the performance of a province. The aggregate PAPI is the sum of the six dimensions. It ranges from 6 (the lowest governance quality) to 60 (the highest governance quality).

Descriptive Analysis

Using the 2009 VHPC and the 2014 IPHS, we compute the incidence of inter-province migration in Vietnam. Based on the data availability, migrants are defined as those who lived in a province other than their current one during the previous 5 years. Figure 2 shows that the percentage of inter-province migrants in 2009 and 2014 was 4.3% and 3.2%, respectively. There is a strong correlation between migration and the age of individuals. Young people aged 15–30 years had the highest rate of migration, while older people and children have the lowest rate of migration. People with higher education are more likely to migrate.

Figure 3 presents the emigration and immigration rate of provinces over the 2009–2014 period. People in the provinces of the Mekong River Delta are most likely to migrate. The Southeast—the richest region—has the highest rate of immigration. Provinces in the Northern Mountains, the poorest region, has the lowest rate of immigration as well as of emigration.

In this study, we classify household income into five groups: wages, income from crop production, income from other agricultural production, non-farm income, and income from other sources such as remittances and social allowances. Figure 4 shows that wages accounted for 40.9% of total income in 2010, and 42.2% of the total income in 2014. The share of crop income in the total income decreased from 18.5 to 15.9% during this period. The share of non-farm income decreased slightly, while the share of income from other sources increased.

As mentioned, we use the PAPI index to measure the quality of governance and public administration in Vietnam. The PAPI index increased slightly from 35.6 in 2011 to 36.4 in 2014. Among the six dimensions that PAPI measures, there was a drop in the score in the participation of citizens at local levels (Fig. 5). On a positive note, public service delivery scores continued to increase modestly. The score in public administrative procedures was unchanged, while the scores in the other four dimensions increased during this period.
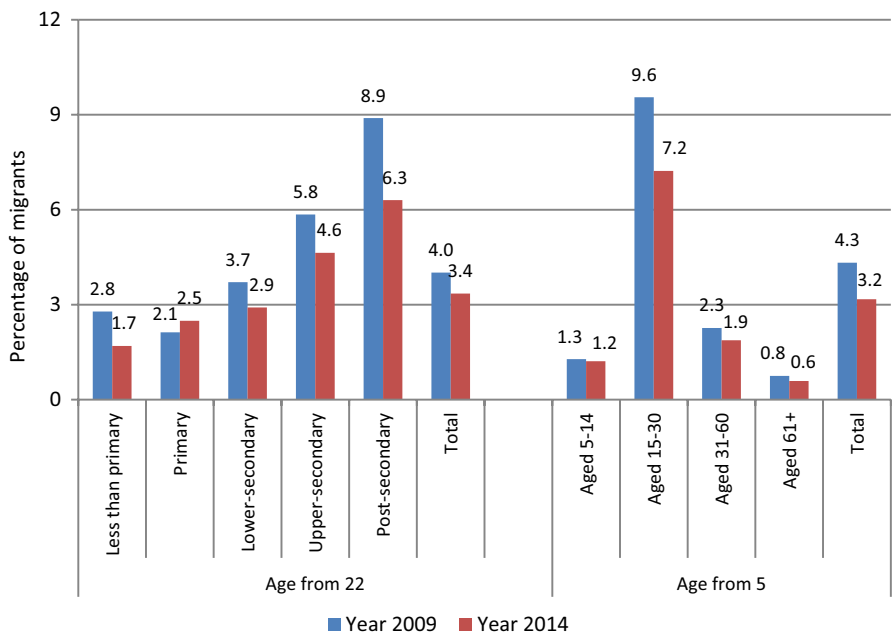
Fig. 2 Inter-province migration in Vietnam. *Source* Authors' estimation from the 2009 VHPC and the 2014 IPHS

Figure 6 depicts the mean per capita income and the index of governance and public administration of provinces in Vietnam. There are 63 provinces, which are located in six geographical regions in Vietnam. Compared with income, the provincial-level quality of public administration and governance has a larger variation within a region. Table 6 in the Appendix reports the regional estimates of the PAPI index and the six dimensions. Delta regions, including Red River Delta and Southeast, have the highest income, while the Northern Mountains and Central Highlands regions have the lowest income levels. There are no clear correlations between income and the governance quality. Central Coast and Mekong River Delta do not have the highest income levels, but these regions have the highest PAPI index. Among the six dimensions, public service delivery is more correlated with the income level. Northern Mountain and Central Highlands have the lowest income as well the lowest score of public service delivery. Regional differences differ for the six dimensions. For instance, Red River Delta, while performing the best in citizen participation and transparency in policy-making, has the lowest performance in control of corruption. By contrast, Mekong River Delta performs very well in vertical accountability and control of corruption but there is still much room for improvement in other dimensions.

Figure 7 presents the correlation between per capita mean income and migration rate of the provinces. The emigration rate increases as the per capita income increases. However, after the per capita income achieves a peak, migration tends

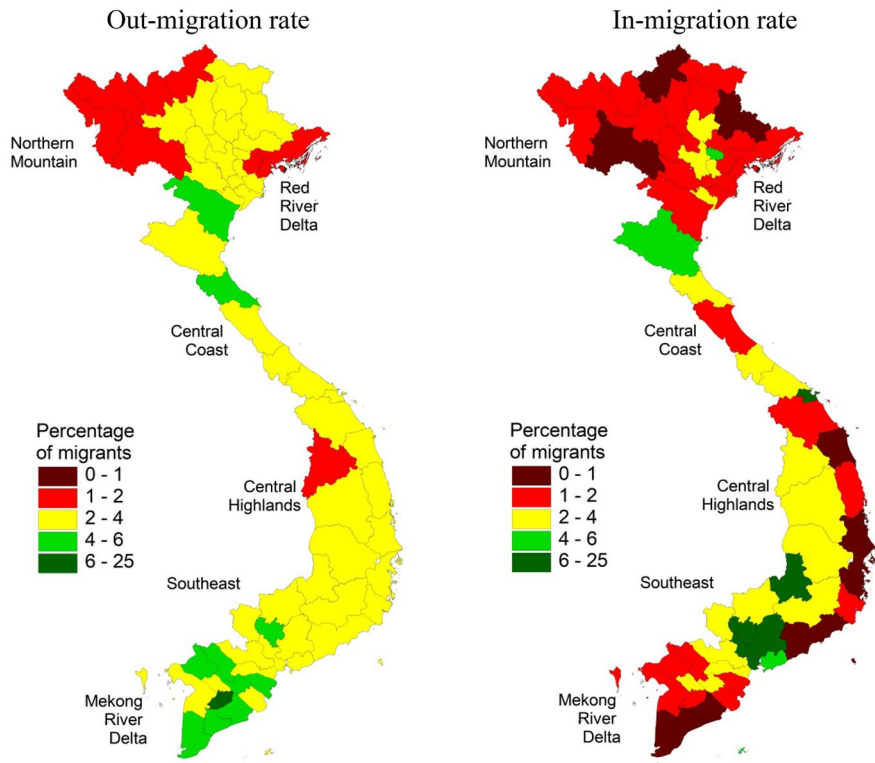**Fig. 3** Migration rate over the 2009–2014 period. *Source* Authors' estimation from the 2014 IPHS
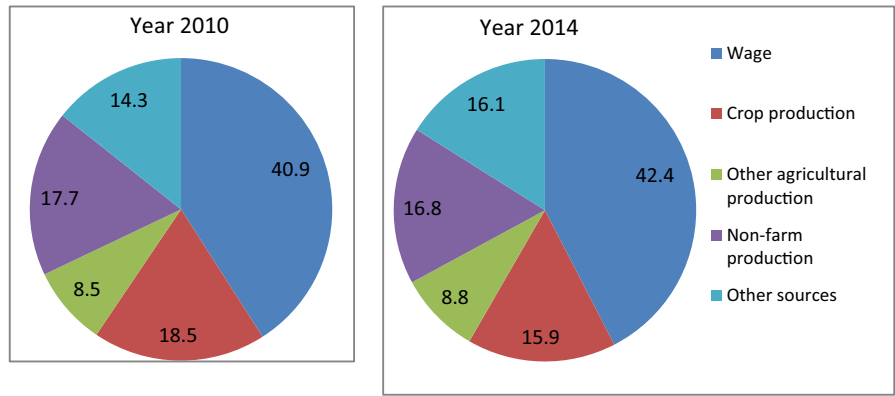

Fig. 4 Share of income sources. *Source* Authors' estimation from the 2010 and 2014 VHLSS
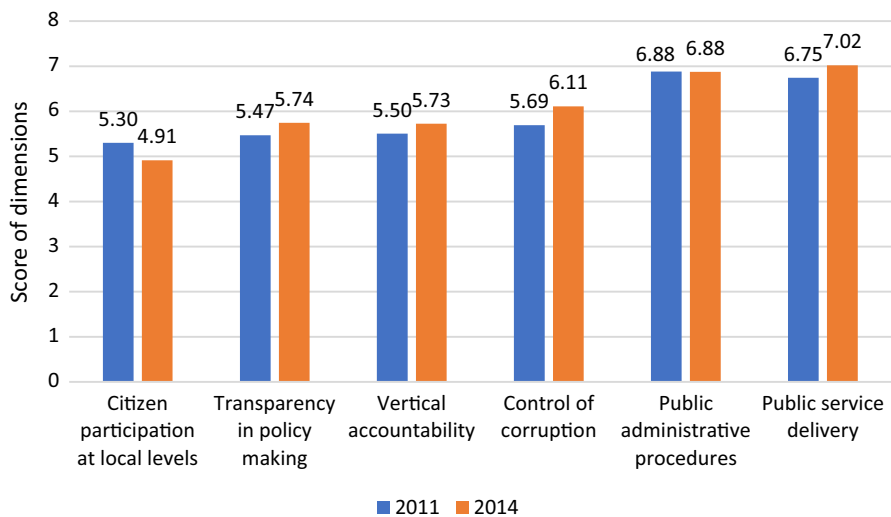
Fig. 5 Scores in the six dimensions over the 2011–2014 period. *Source* Authors' estimation from the 2011 and 2014 PAPI
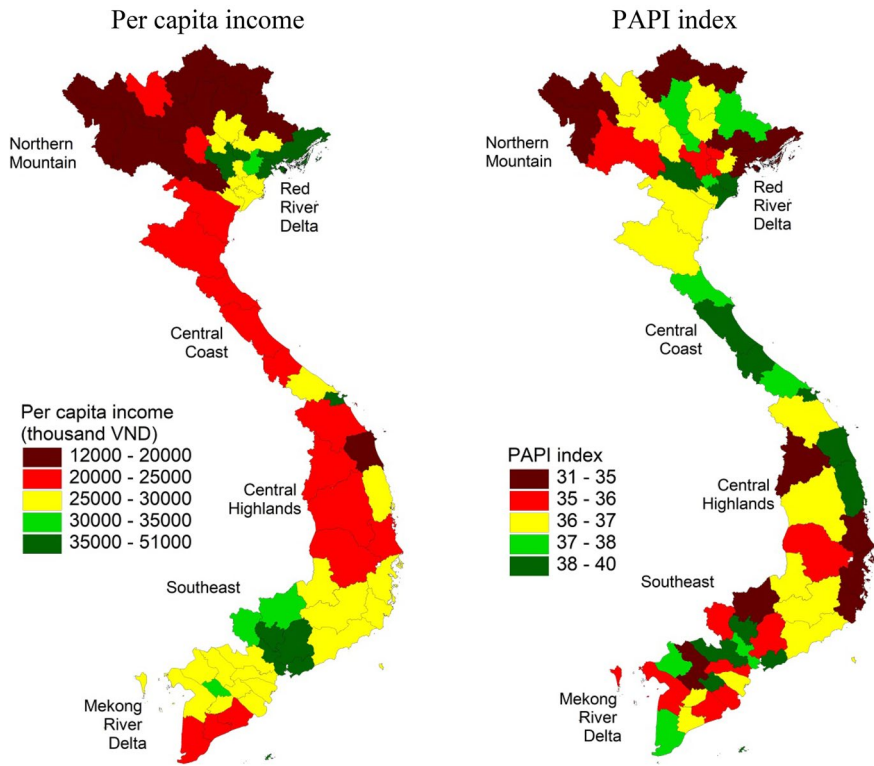

Fig. 6 Per capita income and PAPI index, 2014. *Source* Authors' estimation from the 2014 VHLSS and the 2014 PAPI

Note: Per capita income is measured for 2010, and the migration rate is measured for 2014
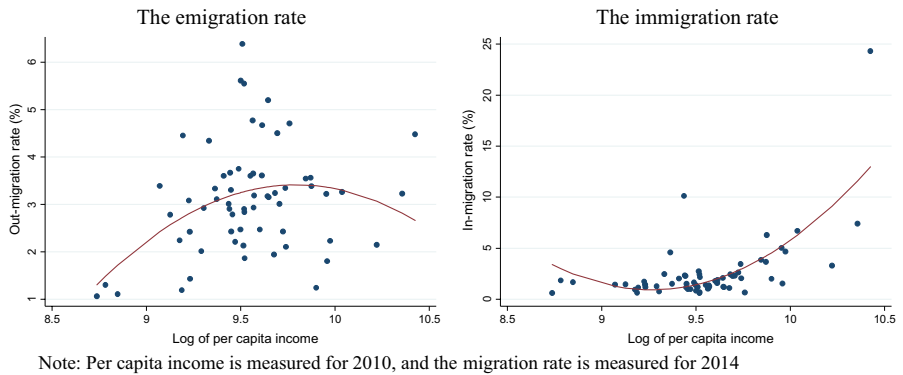
Fig. 7 Migration and per capita income. *Note* Per capita income is measured for 2010, and the migration rate is measured for 2014

to decrease. There is a positive correlation between immigration and per capita income, indicating that people tend to move to high-income provinces.

Figure 8 presents the correlation between governance quality and migration. There is a slight positive correlation between the migration rate and governance level. Provinces with a higher PAPI index tend to have higher emigration and immigration rates.

Econometric Model

Estimating the Effect of Income on Migration

To model the push–pull effects of a factor on migration, gravity models are widely used (e.g., Karemera et al. 2000; Grogger and Hanson 2011; Volger and Rotte 2000;

Note: the PAPI index is measured for 2011, and the migration rate is measured for 2014

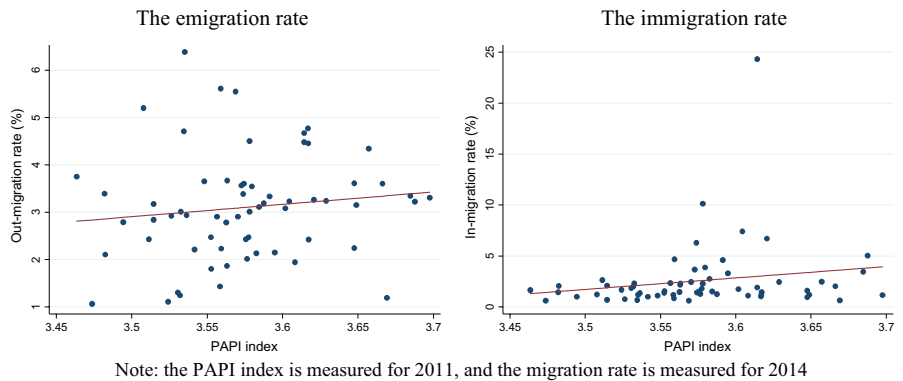**Fig. 8** Migration and PAPI index. *Note* The PAPI index is measured for 2011, and the migration rate is measured for 2014

Ortega and Peri 2013; Bunea 2012; Kim and Cohen 2010). The basic idea of the gravity model is that the migration flow between the two areas is positively associated with their population size and negatively associated with the distance between them. In this study, the econometric model of a gravity model is written as follows:

$$\log(M_{i,j,t}) = \alpha + \beta \log\left(\text{Distance}_{i,j}\right) + \gamma_1 \log\left(\text{Pop}_{i,t}\right) + \gamma_2 \log\left(\text{Pop}_{j,t}\right)$$
$$+ \theta_1 \log(\text{Income}_{i,t}) + \theta_2 \log\left(\text{Income}_{j,t}\right) + X'_{i,t}\varphi_1 + X'_{j,t}\varphi_2 + \delta T_t + \varepsilon_{i,j,t},$$
(1)

where $M_{i,j,t}$ is the out-migration flow from province I to province j in year t; $Distance_{ij}$ is the distance between the two provinces; $Pop_{i,t}$ and $Pop_{j,t}$ are the sizes of the population of provinces I and j in year t, respectively; $Income_{i,t}$ and $Income_{j,t}$ are the per capita income of provinces I and j in year t, respectively; X and ε are observed and unobserved variables.

We estimate Eq. (1) using provincial-level data on migration computed from the 2009 VHPC and the 2014 IPHS. The dummy variable, T_t, is equal to 1 for the year 2014 and 0 for the year 2009. The income data are measured before the migration flow to avoid reverse causality, and they are computed from the 2004 and 2010 VHLSSs.

In our study, the economic level of provinces is measured by per capita income from different components (wage, crop income, income from other agricultural activities, non-farm income, and income from other sources). The push effect of per capita income is measured by the coefficients θ_1, while the pull effect is measure by θ_2. If people tend to move from low-income provinces to high-income ones, we will have $\theta_1 < 0$ and $\theta_2 > 0$.

There are two empirical problems in estimating Eq. (1). Firstly, income level is not exogenous, and as a result estimation of Eq. (1) using OLS can be biased. To reduce the endogeneity bias, we control for dummies of pairwise origin–destination provinces. This means that any bias that is caused by time-invariant unobserved variables is addressed by the provincial dummies. Moreover, the income variables are measured before the migration flow to avoid reserve causality. However, if there is still a significant correlation between income level and time-variant unobserved variables, the estimate of the effect of the income level can be biased. Thus, the causality of the income level on migration should be interpreted with caution.

It should be noted that migration between two areas depends on the benefit and cost of migration in these two areas but also in other destinations. This issue is referred to as multilateral resistance to migration (e.g., see Bertoli and Moraga 2013; Ramos 2016; Royuela and Ordóñez 2018). To address this, we can control for province–year pairs (or province time-varying dummies) in addition to pairwise origin–destination provinces. In this study, since we have only two-period panel data, we are only able to control for pairwise origin–destination provinces. Thus, we cannot address the issue of multilateral resistance to migration, and as a result the causality of the income level on migration should be interpreted with caution.

Secondly, for some pairs of provinces, where there is no migration between them, we cannot take the logarithm of the migration flow. There are several ways to address this issue in the context of gravity models. The simplest way is to replace the 0 value of

migration flow by 1, and the log of 1 returns to 0. We can also transform Eqs. (3) and (4) into exponential functions and apply a Poisson pseudo-maximum likelihood (Gourieroux et al. 1984; Santos and Tenreyro 2006). However, these two methods would not estimate the same function as model (1) and change the interpretation of the original gravity model. A Tobit model can be used to address zero or missing values for the dependent variables, but the fixed-effects Tobit estimators are not available due to the incidental parameters problem (Greene 2004). In addition, a strong assumption of error term normality is required for the Tobit estimator to be consistent. Thus, in this study, we use a two-part model which is widely used to model a variable with a large number of zero values (Duan et al. 1983; Manning et al. 1987). In the first part, we model whether there is migration from province I to province j:

$$
\begin{aligned}
D_{i,j,t} = {} & \alpha + \beta \log\left(\text{Distance}_{i,j}\right) + \gamma_1 \log\left(\text{Pop}_{i,t}\right) + \gamma_2 \log\left(\text{Pop}_{j,t}\right) + \theta_1 \log(\text{Income}_{i,t}) \\
& + \theta_2 \log\left(\text{Income}_{j,t}\right) + X'_{i,t}\varphi_1 + X'_{j,t}\varphi_2 + T_t\delta + \varepsilon_{i,j,t},
\end{aligned}
$$

$$(2)$$

where $D_{i,j,t}$ is a dummy variable denoting the occurrence of a migration flow from province I to province j.

In the second part, we run a regression of the log of migration for pairwise provinces with a migration flow, as follows:

$$
\begin{aligned}
Log(M_{i,j,t}|D_{i,j,t} = 1) = {} & \alpha^* + \beta^* \log\left(Distance_{i,j}\right) + \gamma_1^* \log\left(\text{Pop}_{i,t}\right) + \gamma_2^* \log\left(\text{Pop}_{j,t}\right) \\
& + \theta_1^* \log(\text{Income}_{i,t}) + \theta_2^* \log\left(\text{Income}_{j,t}\right) + X'_{i,t}\varphi_1^* + X'_{j,t}\varphi_2^* \\
& + T_t\delta^* + \varepsilon_{i,j,t},
\end{aligned}
$$

$$(3)$$

where subscript * in Eq. (3) is used to distinguish coefficients between this equation and Eq. (2). θ_1^* and θ_2^* are the estimates of the effect of income on the migration flow for provinces with the occurrence of migration, i.e., the conditional migration flow $Log(M_{i,j,t}|D_{i,j,t} = 1)$. In this study, we are interested in the effect of income on the unconditional dependent variable $\log(M_{i,j,t})$. We first write the unconditional migration flow:

$$
M_{i,j,t} = D_{i,j,t}.(M_{i,j,t}|D_{i,j,t} = 1),
$$

$$(4)$$

and then we take the log of both sides of Eq. (4) to get:

$$
\log(M_{i,j,t}) = \log\left(D_{i,j,t}\right) + \log(M_{i,j,t}|D_{i,j,t} = 1).
$$

$$(5)$$

We can get the marginal effect of $\log(M_{ijt})$ by first taking the partial derivative of Eq. (5) with respect to the income variables with the assumption that the error term is uncorrelated with the income variables. For example, the marginal effect of the migration flow with respect to $\log\left(\text{Income}_{i,t}\right)$ is computed as follows:

$$
\partial \log(M_{i,j,t})/\partial \log\left(\text{Income}_{i,t}\right) = \theta_1 \cdot \left(1/D_{i,j,t}\right) + \theta_1^*.
$$

$$(6)$$

The marginal effect varies across the value of migration. We can estimate the average marginal effect by taking the expectation of Eq. (6):

$$E\left[\partial \log(M_{i,j,t})/\partial \log\left(\text{Income}_{i,t}\right)\right] = \theta_1 \cdot E(1/D_{i,j,t}) + \theta_1^*. \tag{7}$$

Similarly, the full effect of income of destination provinces on the log of unconditional migration flow is expressed as follows:

$$E\left[\partial \log(M_{i,j,t})/\partial \log\left(\text{Income}_{j,t}\right)\right] = \theta_2 \cdot E(1/D_{i,j,t}) + \theta_2^*. \tag{8}$$

We calculate the standard errors of the average marginal effect on unconditional log of migration using a non-parametric bootstrap with 500 replications.

It should be noted that we estimate Eq. (2) using a linear probability regression, although binary outcomes are often modeled using a logit or probit. However, there are no available fixed-effects probit estimators (Greene 2004). Thus, linear probability models can be used when no non-linear probability estimators are available (e.g., Angrist 2001; Angrist and Krueger 2001). Moreover, linear probability models are more robust to the assumption of error term distribution than probit or logit models (Nichols 2011).

Estimating the Effect of Income on Migration

We also use the two-part model to estimate the effect of governance on migration. However, data on governance quality (measured by the PAPI index) are only available since 2011. There are no data on the governance quality before the migration data in 2009 (estimated using the 2009 VHPC). Thus, we can only estimate the effect of governance (measured from the 2011 PAPI survey) on migration using single cross-sectional data on migration from the 2014 IPHS. The two-part models are similar to Eqs. (2) and (3) but without subscript t and dummy T:

$$
\begin{aligned}
D_{i,j} = \ &\alpha + \beta \log\left(\text{Distance}_{i,j}\right) + \gamma_1 \log\left(\text{Pop}_I\right) + \gamma_2 \log\left(\text{Pop}_j\right) + \theta_1 \log(\text{Governance}_I) \\
&+ \theta_2 \log\left(\text{Governance}_j\right) + X_I' \varphi_1 + X_j' \varphi_2 + \varepsilon_{i,j},
\end{aligned}
\tag{9}
$$

$$
\begin{aligned}
\log(M_{i,j}|D_{i,j} = 1) = \ &\alpha^* + \beta^* \log\left(\text{Distance}_{i,j}\right) + \gamma_1^* \log\left(\text{Pop}_I\right) \\
&+ \gamma_2^* \log\left(\text{Pop}_j\right) + \theta_1^* \log(\text{Governance}_I) \\
&+ \theta_2^* \log\left(\text{Governance}_j\right) + X_I' \varphi_1^* + X_j' \varphi_2^* + \varepsilon_{i,j},
\end{aligned}
\tag{10}
$$

where *Governance*$_I$ and *Governance*$_j$ are the governance and public administration quality (measured by the PAPI index) of provinces I and j in 2011, respectively.

The marginal effect of the governance quality on the unconditional migration is estimated using equations similar to Eqs. (7) and (8) in the previous section.

It should be noted that, although we are seeking evidence of a causal effect of governance and economic factors on migration, we are acutely aware of the difficulties in estimating causal effects in this field, and are therefore cautious in interpreting our findings.

Table 1 Province fixed-effects regressions of migration on income sources. *Source* Estimation from the 2004 and 2010 VHLSSs, the 2009 VHPC and the 2014 IPHS

Explanatory variables	(1) Having migration	(2) Log of migration flow	(3) Marginal effects in two-part models
Log of population of origin provinces	0.2035* (0.1055)	3.0834*** (0.3128)	3.364*** (0.392)
Log of population of destination provinces	0.7540*** (0.0953)	− 2.5039*** (0.2898)	− 1.464*** (0.367)
Log of per capita wage of origin provinces	0.0890** (0.0375)	− 0.6341*** (0.1171)	− 0.511*** (0.154)
Log of per capita crop income of origin provinces	− 0.0834*** (0.0232)	− 0.0547 (0.0669)	− 0.170** (0.085)
Log of per capita other agricultural income of origin provinces	0.0292 (0.0278)	− 0.1133 (0.0836)	− 0.073 (0.108)
Log of per capita nonfarm income of origin provinces	− 0.0861*** (0.0319)	0.0212 (0.1009)	− 0.097 (0.125)
Log of per capita other income of origin provinces	− 0.0313 (0.0276)	0.2591*** (0.0934)	0.216* (0.125)
Log of per capita wage of destination provinces	0.1044*** (0.0388)	0.4346*** (0.1162)	0.579*** (0.142)
Log of per capita crop income of destination provinces	− 0.0073 (0.0233)	0.1123* (0.0648)	0.102 (0.085)
Log of per capita other agricultural income of destination provinces	− 0.0294 (0.0263)	0.2158*** (0.0768)	0.175* (0.093)
Log of per capita nonfarm income of destination provinces	− 0.0310 (0.0317)	0.3378*** (0.1009)	0.295** (0.126)
Log of per capita other income of destination provinces	− 0.0546** (0.0271)	− 0.2246** (0.0927)	− 0.300** (0.120)
Dummy year 2014	− 0.4366*** (0.0509)	0.0226 (0.1585)	
Constant	− 5.6783*** (1.0701)	0.3353 (3.3304)	
Observations	7812	5665	
R-squared	0.715	0.951	

Robust standard errors in parentheses

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

Empirical results

The Effect of Income on Migration

This section discusses the effect of income on inter-province migration. Table 1 presents the fixed-effect regressions of the two-part model. In column (1), the dependent variable is a dummy variable indicating whether there is a flow of migration from a province of origin to a destination province. In column (2), the dependent variable is the log of migrants from origin to destination provinces. The average marginal effects on log of unconditional migration flow are computed using Eqs. (7) and (8), and they are presented in column (3). For simplicity, we use the average marginal effects of income variables on the log of unconditional migration for interpretation (column 3).

We only control for the population size of provinces before migration. Control variables should be exogenous, and they are not affected by income variables. (e.g., Heckman et al. 1999; Angrist and Pischke 2009). This means that we aim to estimate the total effect of the income structure on migration rather than the partial effect of the income structure with other variables held constant (Duflo et al. 2008). In addition, we use the province fixed-effects regressions, all time-invariant variables such as distances between provinces and geographical variables are controlled for.

Column (3) shows that people tend to migrate from provinces with a large population to those with a low population. Overall, people are more likely to move from a low-income province to another high-income one. Wage income is a strong factor that pushes and pulls people. People are more likely to move from low-wage provinces to high-wage ones. A 1% increase in per capita wages of original provinces reduces the number of emigrants (migration out of the provinces) by 0.51%. On the other hand, a 1% increase in per capita wage of destination provinces increases the number of immigrants (migration into the provinces) by 0.58%.

Crop income of original provinces is also an important factor affecting the emigration. A 1% increase in per capita crop income of original provinces reduces the number of emigrants by 0.17%. The effect of income from other agricultural activities, as well as non-farm income of original provinces on emigration, is negative but not statistically significant. Higher income from other agricultural activities and higher non-farm income attract more immigrants. A 1% increase in per capita agricultural income and per capita non-farm income of destination provinces increases the number of immigrants by 0.175% and 0.295%, respectively.

Interestingly, people tend to move from provinces with higher income from other sources to provinces with lower income from other sources. Income from other sources is mainly cash transfers (either public or private). Provinces receiving higher transfers are more likely to have lower economic growth and less employment opportunities, and people tend to move out of these provinces.

In Table 2, we look at the effect of income on inter-province migration of different age and education groups. This table reports only the average marginal effects of income variables on the log of unconditional migration. The regressions of the probability of migration and log of conditional migration are reported in Table 7 in the

Table 2 Province fixed-effects regressions of migration on income sources (the average marginal effects on log of unconditional migration flow). *Source* Estimation from the 2004 and 2010 VHLSSs, the 2009 VHPC and the 2014 IPHS

Explanatory variables	(1) Log of adult migration flow	(2) Log of elderly migration flow	(3) Log of migration of people below high-school education	(4) Log of migration of people with high-school education	(5) Log of migration of people with tertiary education
Log of population of origin provinces	3.603*** (0.380)	− 0.298 (1.477)	3.253*** (1.132)	2.543*** (0.575)	3.249*** (0.779)
Log of population of destination provinces	− 1.582*** (0.377)	− 5.883*** (1.127)	− 1.028 (1.434)	− 3.370*** (0.505)	− 3.970*** (0.697)
Log of per capita wage of origin provinces	− 0.494*** (0.158)	− 1.404*** (0.463)	− 1.559*** (0.516)	− 0.717*** (0.210)	− 0.387 (0.259)
Log of per capita crop income of origin provinces	− 0.124 (0.084)	− 0.075 (0.280)	− 0.246 (0.185)	0.082 (0.130)	0.134 (0.152)
Log of per capita other agricultural income of origin provinces	− 0.126 (0.110)	0.728* (0.381)	− 0.233 (0.235)	− 0.011 (0.143)	0.006 (0.205)
Log of per capita nonfarm income of origin provinces	− 0.084 (0.119)	− 0.440 (0.389)	0.006 (0.427)	0.158 (0.187)	− 0.140 (0.219)
Log of per capita other income of origin provinces	0.238* (0.123)	0.661* (0.356)	0.381 (0.280)	0.066 (0.173)	0.180 (0.211)
Log of per capita wage of destination provinces	0.580*** (0.147)	0.166 (0.497)	0.705 (0.547)	0.622*** (0.215)	0.343 (0.273)
Log of per capita crop income of destination provinces	0.124 (0.089)	0.347 (0.234)	0.269 (0.246)	0.030 (0.125)	0.367** (0.151)
Log of per capita other agricultural income of destination provinces	0.168 (0.102)	0.549* (0.288)	0.401 (0.397)	0.154 (0.149)	0.029 (0.179)

Table 2 (continued)

Explanatory variables	(1) Log of adult migration flow	(2) Log of elderly migration flow	(3) Log of migration of people below high-school education	(4) Log of migration of people with high-school education	(5) Log of migration of people with tertiary education
Log of per capita nonfarm income of destination provinces	0.279** (0.125)	0.309 (0.424)	0.275 (0.518)	0.240 (0.184)	0.545*** (0.211)
Log of per capita other income of destination provinces	− 0.269** (0.119)	− 0.996*** (0.378)	− 0.223 (0.505)	− 0.631*** (0.161)	− 0.434** (0.210)
Observations	7812	7812	7812	7812	7812

Adults are those with age 16–59 years, and older people are those aged from 60 years. Robust standard errors in parentheses

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

Appendix. Overall, wage income is the main push and pull factor of inter-province migration. The effect of wages on migration differs for different age groups. The emigration-reducing effect of wages of the original provinces is larger for older people. The pull effect of wages in the destination provinces is lower and not statistically significant for older people. Higher wages only attract immigration of adults. This is consistent with the argument that older people are less likely to move than younger people since they have a shorter period to collect migration investment returns. The smaller net gain to migration decreases the probability of migration (Borjas 2012). Similarly, non-farm income of the destination provinces has a pull-effect on the immigration of younger people but not of older ones.

Wage income of the original provinces have an emigration-reducing effect on people with lower education. The effect on older people is negative but not statistically significant. The effect is largest for people with less than high-school education. Possibly, the gain of migration is lower for low-education people and high wages in the original areas have a strong emigration-reducing effect. The pull effect of wages of destination provinces is significant for people with high-school education.

The Effect of Governance Quality on Migration

Tables 3 and 4 present the effect of governance and public administration on inter-migration. As mentioned, there are no PAPI data before the 2009 VHPC, and as a result we cannot use the 2009 VHPC. We also cannot use the province fixed-effects regression. Instead, we run the OLS regression of the migration flow measured in the 2014 IPHS on the PAPI index measured in the 2014 PAPI survey. The OLS can be biased because of omitted variables. Although the PAPI index is measured before the migration, there is still a problem of endogeneity. Thus, the results from the OLS regression should be interpreted as the association between governance quality and migration instead of the causal effect of governance quality on migration.

In addition to the main explanatory variables of the governance quality, the control variables include the distance between the original and destination provinces, the population size and the log of per capita income of the original and destination provinces. We tried interactions between the log of per capita income and log of PAPI index to examine the joint effect of the income and governance quality. However, these interactions are not significant. Thus, we do not include the interactions in the final regression models.

Similar to Table 1, Table 3 reports the regression results from the two-part model. Column (1) reports the regression of the probability of a migration flow a province of origin to a destination province, and column (2) reports regression of the log of migrants from origin to destination provinces. Column (3) presents the average marginal effects on the log of unconditional migration flow, and we use these estimates for interpretation. The distance has an expected size: people tend to move between closer provinces. High income has the pull effect of immigration. A 1% increase in

Table 3 OLS regressions of migration on the PAPI index. *Source* Estimation from the 2011 PAPI survey and the 2014 IPHS

Explanatory variables	(1)	(2)	(3)
	Having migration	Log of migration flow	Marginal effects from two-part models
Log of distance between origin and destination provinces	− 0.2576*** (0.0057)	− 0.6377*** (0.0244)	− 1.098*** (0.026)
Log of population of origin provinces	0.1807*** (0.0144)	0.6946*** (0.0513)	1.017*** (0.056)
Log of population of destination provinces	0.0483*** (0.0155)	0.7005*** (0.0528)	0.787*** (0.056)
Log of per capita income of origin provinces	− 0.0337 (0.0347)	0.1036 (0.1240)	0.043 (0.136)
Log of per capita income of destination provinces	0.1778*** (0.0347)	1.3129*** (0.1239)	1.630*** (0.128)
Log of PAPI index of origin province	0.3318** (0.1302)	0.3910 (0.4998)	0.983* (0.574)
Log of PAPI index of destination province	0.2537** (0.1257)	1.5182*** (0.4296)	1.971*** (0.435)
Constant	− 3.0088*** (0.7198)	− 21.6747*** (2.6005)	− 2.6239*** (0.6433)
Observations	3906	2188	3906
R-squared	0.322	0.440	0.186

Robust standard errors in parentheses

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

Table 4 OLS regressions of migration on PAPI index (the average marginal effects on log of unconditional migration flow). *Source* Estimation from the 2011 PAPI survey and the 2014 IPHS

Explanatory variables	(1) Log of adult migration flow	(2) Log of elderly migration flow	(3) Log of migration of people below high school education	(4) Log of migration of people with high school education	(5) Log of migration of people with tertiary education
Log of distance between origin and destination provinces	− 1.123*** (0.029)	− 0.790*** (0.069)	− 1.109*** (0.068)	− 1.038*** (0.028)	− 1.145*** (0.035)
Log of population of origin provinces	1.010*** (0.053)	1.344*** (0.129)	1.067*** (0.295)	1.001*** (0.060)	1.053*** (0.087)
Log of population of destination provinces	0.784*** (0.058)	0.928*** (0.123)	0.561*** (0.209)	0.943*** (0.066)	0.832*** (0.078)
Log of per capita income of origin provinces	0.069 (0.138)	0.050 (0.253)	− 0.251 (0.807)	− 0.101 (0.139)	0.999*** (0.174)
Log of per capita income of destination provinces	1.688*** (0.127)	1.382*** (0.274)	2.450*** (0.523)	1.481*** (0.149)	1.321*** (0.174)
Log of PAPI index of origin province	0.975* (0.544)	0.326 (1.030)	1.038 (1.772)	1.965*** (0.547)	2.312*** (0.646)
Log of PAPI index of destination province	1.914*** (0.442)	0.511 (1.023)	2.339** (1.485)	1.801*** (0.534)	0.918 (0.630)
Observations	3906	3906	3906	3906	3906

Adults are those with age 16–59 years, and older people are those aged from 60 years. Robust standard errors in parentheses

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

the per capita income of destination provinces is associated with a 1.6% increase in the number of immigrants.

The quality of governance and public administration has a positive association with both emigration and immigration. A 1% increase in the PAPI index of original provinces is associated with a 0.93% increase in the number of emigrants. In the meantime, a 1% increase in the PAPI index of destination provinces is associated with a 1.97% increase in the number of immigrants. As expected, provinces with better quality of governance and public administration attract more people. However, better quality of governance and public administration are also push factors of emigration.

Table 4 examines the association between the governance quality and inter-province migration of different age and education groups. This table reports only the average marginal effects of income variables on the log of unconditional migration. The regressions of the probability of migration and the log of conditional migration are reported in Table 8 in the Appendix. It shows that younger people tend to move to provinces with better governance and public administration. There are no significant associations between governance quality and migration of older people. Possibly, older people are not working and have less experience working with governance. As a result, the quality of governance and public administration is less important for them than for younger people. Better governance and public administration have a similar effect on different education groups. Overall, people tend to move from provinces with relatively high governance quality to provinces with higher governance quality.

In Table 5, we examine the correlation between different governance dimensions and migration. This PAPI index is an aggregated index constructed from six dimensions: (1) participation of local people in governance and public administration at local levels, (2) transparency of information on public services, (3) vertical accountability, (4) control of corruption, (5) public administrative procedures, and (6) public service delivery. We can regress the migration flow on these dimensions of the original and destination provinces. However, these dimensions are strongly correlated, and this can lead to multicollinearity in regression. To avoid this problem, as well as to make the interpretation consistent with the literature, we group the first three dimensions into one called 'Local participation, transparency and accountability', and group the fifth and six dimensions into 'Public service and administrative procedures'. The aggregated dimension is simply a sum of the original dimensions. The dimension 'Control of corruption' is kept unchanged. Higher values of the dimensions mean better performance of local governance on these dimensions.

Column (1) of Table 5 shows that better control of corruption and public services of provinces reduce the immigration. A 1% increase in the index of corruption control of original provinces is associated with a 0.72% decrease in the number of emigrants. Migrants not only seek better employment but also access to improved

Table 5 OLS regressions of migration on the PAPI dimensions (the average marginal effects on log of unconditional migration flow). *Source* Estimation from the 2004 and 2010 VHLSSs, the 2009 VHPC and the 2014 IPHS

Explanatory variables	(1) Log of migration flow	(2) Log of adult migration flow	(3) Log of elderly migration flow	(4) Log of migration of people below high-school education	(5) Log of migration of people with high-school education	(6) Log of migration of people with tertiary education
Log of distance between origin and destination provinces	− 1.7621*** (0.0324)	− 1.7606*** (0.0317)	− 0.2933*** (0.0264)	− 1.5263*** (0.0431)	− 1.2270*** (0.0332)	− 1.1054*** (0.0338)
Log of population of origin provinces	1.3871*** (0.0835)	1.3441*** (0.0820)	0.5144*** (0.0571)	1.1860*** (0.1623)	0.9886*** (0.0780)	0.9636*** (0.0772)
Log of population of destination provinces	0.7566*** (0.0929)	0.7626*** (0.0906)	0.1775*** (0.0566)	0.4872*** (0.1440)	0.6959*** (0.0819)	0.5612*** (0.0775)
Log of per capita income of origin provinces	0.1154 (0.2057)	0.1381 (0.2006)	0.1012 (0.1168)	0.0972 (0.3726)	0.0719 (0.1812)	0.5551*** (0.1754)
Log of per capita income of destination provinces	1.4016*** (0.2096)	1.3992*** (0.2044)	0.3668*** (0.1143)	1.7531*** (0.3374)	0.7712*** (0.1828)	0.5857*** (0.1788)
Log of index of participation, transparency, accountability of origin provinces	0.2064 (0.5701)	0.3588 (0.5570)	0.4616 (0.3194)	− 0.5916 (0.6634)	0.6619 (0.4832)	0.8359 (0.4580)
Log of corruption index of origin provinces	− 0.7264* (0.4353)	− 0.7224* (0.4226)	− 0.3219 (0.2434)	1.6485*** (0.5605)	− 1.7572*** (0.3746)	− 2.8038*** (0.3549)
Log of index of public services and procedures origin provinces	− 2.8484* (1.5648)	− 2.8473* (1.5182)	− 1.5599* (0.9141)	− 6.4530*** (1.9263)	− 0.3894 (1.3012)	0.1269 (1.2421)

Table 5 (continued)

Explanatory variables	(1) Log of migration flow	(2) Log of adult migration flow	(3) Log of elderly migration flow	(4) Log of migration of people below high-school education	(5) Log of migration of people with high-school education	(6) Log of migration of people with tertiary education
Log of index of participation, transparency, accountability of destination provinces	1.6781** (0.7155)	1.4599** (0.6992)	0.7187 (0.5343)	2.5321** (1.0399)	1.0791* (0.6301)	0.9181 (0.6250)
Log of corruption index of destination provinces	0.7238** (0.3592)	0.7580** (0.3537)	1.7092*** (0.2994)	2.6114*** (0.4127)	0.9151*** (0.3366)	0.3330 (0.3424)
Log of index of public services and procedures destination provinces	1.8461 (1.2713)	2.0252 (1.2391)	0.4354 (0.7841)	−0.1518 (1.7073)	4.4120*** (1.1139)	3.2418*** (1.0684)
Observations	3906	3906	3906	3906	3906	3906

Adults are those with age 16–59 years, and older people are those aged from 60 years. Robust standard errors in parentheses

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

public services in destination areas (e.g., McKenzie and Rapoport 2006; Zaiceva and Zimmermann 2008). The effect of public services and administrative procedures is higher. A 1% increase in the index of this dimension of original provinces is associated with a 2.8% decrease in the number of emigrants. This finding is similar to the case of Ghana, where Ackah and Medvedev (2012) find that poor public services of original communities push people to migrate regardless of their relatively disadvantaged education and inherent characteristics which are not favorable for them to move to other regions. Thus, for the case of Vietnam, one of reasons why people are migrating to other areas is high corruption and low quality of public services. However, there are no significant effects of transparency and accountability of emigration.

The governance quality of destination provinces also affects immigration, but in a slightly different way. The coefficient of public services and administrative procedures is positive but not statistically significant. This means that low quality of public services might be a push factor for migration, but high quality of public services might not be a pull factor. Dimensions 'Participation, transparency and accountability' and 'Control of corruption' are migrant-pulling factors. People tend to move to provinces with higher quality of the two dimensions. According to the PAPI 2016 survey, 54% of respondents agreed that bribes were needed to get employment in the public sector. High corruption can be a barrier for people to get a job, especially in the public sector. Thus, lower corruption and more participation and transparency can help people to find more employment opportunities, and as a result attract more immigrants.

The association between the governance dimensions and migration is quite similar for adults and older people. However, this association differs between low- and high-education people. Better control of corruption reduces emigration of people with high education but increases emigration of people with low education. This finding is consistent with Cooray and Schneider (2014) and Dimant et al. (2013), which conclude that corruption in home countries tends to push people with higher education and skills to other countries. Under lack of corruption control, jobs are not provided based on qualifications but political connections. Unfair in employment might cause out-migration of people with high education.

Conclusions

Migration plays an important role in the accumulation of human capital for economic growth. In this study, we estimate the effect of income and governance on inter-province migration in Vietnam using a gravity model and the most recent data on migration. Consistent with previous studies on migration, we find that people

tend to move from low-income provinces to high-income ones. Among the income components, wage income is the most important in pushing and pulling migrants. People migrate to provinces with higher wages to find high-wage employment. Higher non-farm income also attracts immigrants. The effect differs for different groups of people. Younger and middle education people are more likely to migrate because of wages and non-farm incomes.

The quality of governance and public administration is an important factor influencing migration. We find that people tend to move to provinces with better governance and public administration. Provinces with better control of corruption and more transparency in public information are more likely to attract immigrants. Low quality of public services and administrative procedure and low control of corruption tend to push people to migrate.

Findings from this study suggest that increasing employment opportunities and wages is essential to accumulate human capital through immigration. The employment shift from farm to non-farm sectors will improve labor productivity and formalization of the labor market. To do this, educational and vocational policies should be revised to invest in skills that are needed in the labor market, so as to close the mismatch between demand for and supply of skills. Improving the quality of government and public administration is also important to encourage immigration. Facilitating migration through safe and legal channels along with removing barriers will protect the rights of migrants. To do this, providing knowledge about migration processes will enhance integration and quicker adjustment of migrants to the new places where they want to stay. Household registration attached to access to basic social services should be fully removed, so that migrants, especially those without household registration, will not be confronted with discrimination, exclusion, exploitation, and abuse at all stages of the migration process.

Appendix

See Tables 6, 7 and 8.

Table 6 Public administration and governance by regions

Regions	Citizen participation at local levels	Transparency in policy making	Vertical accountability	Control of corruption	Public administrative procedures	Public service delivery	Aggregate PAPI index
Red River Delta	5.2	5.9	5.8	5.6	6.8	7.0	36.2
Northern Mountain	5.0	5.8	5.6	5.8	6.8	6.6	35.6
Central Coast	4.9	5.8	5.7	6.1	6.8	7.1	36.9
Central Highlands	5.1	5.7	5.6	5.9	7.0	6.7	35.6
Southeast	4.9	5.8	5.7	6.1	7.0	7.1	36.4
Mekong River Delta	4.7	5.6	5.8	6.7	6.8	7.0	36.8
Total	4.9	5.7	5.7	6.1	6.9	7.0	36.3

Table 7 Province fixed-effects regressions of migration (two-part model). *Source* Estimation from the 2004 and 2010 VHLSSs, the 2009 VHPC and the 2014 IPHS

Explanatory variables	Having adult migration (yes=1, no=0)	Log of adult migration flow	Having elderly migration (yes=1, no=0)	Log of elderly migration flow	Having migration of people below high school education (yes=1, no=0)	Log of migration of people below high school education	Having migration of people with high school education (yes=1, no=0)	Log of migration of people with high school education	Having migration of people with tertiary education (yes=1, no=0)	Log of migration of people with tertiary education
Log of population of origin provinces	0.2529** (0.1052)	3.2497*** (0.3039)	0.0731 (0.1175)	– 0.6103 (1.4526)	0.2456** (0.1125)	1.8810*** (0.4276)	0.3398*** (0.1171)	1.9048*** (0.4771)	0.5064*** (0.1141)	2.0447*** (0.6035)
Log of population of destination provinces	0.7655*** (0.0968)	– 2.6510*** (0.2854)	– 0.5784*** (0.1149)	– 3.4090** (1.3235)	0.6287*** (0.1054)	– 2.9656*** (0.3968)	0.3762*** (0.1119)	– 4.0765*** (0.4340)	– 0.2431** (0.1124)	– 3.3922*** (0.5553)
Log of per capita wage of origin provinces	0.0694* (0.0376)	0.5910*** (0.1171)	– 0.1907*** (0.0372)	– 0.5881 (0.4482)	0.2077*** (0.0397)	– 0.4332*** (0.1603)	– 0.0892** (0.0405)	– 0.5493*** (0.1721)	– 0.0658* (0.0393)	– 0.2307 (0.2113)
Log of per capita crop income of origin provinces	0.0903*** (0.0232)	0.0020 (0.0656)	– 0.0307 (0.0285)	0.0561 (0.2423)	0.1325*** (0.0241)	0.1210 (0.0788)	– 0.1348*** (0.0271)	0.3352*** (0.0996)	– 0.0374 (0.0284)	0.2227* (0.1248)
Log of per capita other agricultural income of origin provinces	0.0306 (0.0279)	– 0.1686** (0.0807)	0.0508* (0.0292)	0.5105 (0.3428)	0.0908*** (0.0300)	– 0.2704** (0.1111)	0.0445 (0.0299)	– 0.0949 (0.1286)	0.0595* (0.0309)	– 0.1357 (0.1614)
Log of per capita nonfarm income of origin provinces	– 0.0724** (0.0324)	0.0168 (0.0965)	0.0234 (0.0315)	– 0.5400 (0.4218)	– 0.0256 (0.0339)	0.1124 (0.1366)	0.0659* (0.0344)	0.0341 (0.1641)	0.0171 (0.0342)	– 0.1806 (0.1905)
Log of per capita other income of origin provinces	– 0.0302 (0.0279)	0.2801*** (0.0885)	0.0089 (0.0263)	0.6233 (0.4336)	0.0218 (0.0290)	– 0.0911 (0.1280)	– 0.0371 (0.0297)	0.1355 (0.1477)	0.0914*** (0.0286)	– 0.0379 (0.1750)

Table 7 (continued)

Explanatory variables	Having adult migration (yes=1, no=0)	Log of adult migration flow	Having elderly migration (yes=1, no=0)	Log of elderly migration flow	Having migration of people below high school education (yes=1, no=0)	Log of migration of people below high school education	Having migration of people with high school education (yes=1, no=0)	Log of migration of people with high school education	Having migration of people with tertiary education (yes=1, no=0)	Log of migration of people with tertiary education
Log of per capita wage of destination provinces	0.1007*** (0.0389)	0.4397*** (0.1137)	− 0.0574 (0.0371)	0.4118 (0.5559)	− 0.0278 (0.0403)	0.5316*** (0.1638)	0.0600 (0.0408)	0.5092*** (0.1898)	0.0781* (0.0404)	0.1570 (0.2347)
Log of per capita crop income of destination provinces	− 0.0147 (0.0235)	0.1447** (0.0639)	− 0.0535* (0.0297)	0.5763*** (0.2056)	− 0.0131 (0.0260)	0.1455* (0.0761)	− 0.1243*** (0.0267)	0.2635*** (0.0980)	− 0.0701** (0.0278)	0.5341*** (0.0982)
Log of per capita other agricultural income of destination provinces	− 0.0299 (0.0265)	0.2096*** (0.0756)	0.1042*** (0.0287)	0.1028 (0.3007)	0.0573** (0.0282)	0.2827*** (0.1051)	0.0713** (0.0288)	0.0204 (0.1199)	0.0751** (0.0293)	− 0.1491 (0.1493)
Log of per capita nonfarm income of destination provinces	− 0.0299 (0.0318)	0.3206*** (0.1001)	0.1014*** (0.0313)	− 0.1252 (0.4460)	− 0.0336 (0.0332)	0.2846** (0.1395)	− 0.0235 (0.0338)	0.2845* (0.1578)	− 0.0041 (0.0328)	0.5546*** (0.1777)
Log of per capita other income of destination provinces	− 0.0460* (0.0273)	− 0.2046** (0.0914)	− 0.0427 (0.0264)	− 0.8130* (0.4300)	− 0.0152 (0.0287)	− 0.2405* (0.1332)	− 0.0294 (0.0294)	− 0.5757*** (0.1476)	0.0044 (0.0282)	− 0.4448** (0.1858)

Table 7 (continued)

Explanatory variables	Having adult migration (yes=1, no=0)	Log of adult migration flow	Having elderly migration (yes=1, no=0)	Log of elderly migration flow	Having migration of people below high school education (yes=1, no=0)	Log of migration of people below high school education	Having migration of people with high school education (yes=1, no=0)	Log of migration of people with high school education	Having migration of people with tertiary education (yes=1, no=0)	Log of migration of people with tertiary education
Dummy year 2014	− 0.4335*** (0.0513)	0.0159 (0.1517)	− 0.1091** (0.0506)	1.7087** (0.6875)	− 0.1783*** (0.0540)	0.2612 (0.2037)	− 0.3856*** (0.0555)	0.4155* (0.2310)	− 0.3209*** (0.0541)	0.8329*** (0.2942)
Constant	6.0725*** (1.0765)	− 0.1723 (3.2350)	4.2416*** (1.1916)	31.4176* (16.1617)	4.5599*** (1.1540)	10.7477** (4.6442)	− 3.7996*** (1.2003)	18.2655*** (5.0697)	− 1.5057 (1.1559)	12.0489* (6.3602)
Observations	7812	5592	7812	1826	7812	4645	7812	4158	7812	3285
R-squared	0.716	0.954	0.684	0.959	0.737	0.943	0.736	0.950	0.741	0.946

Adults are those with age 16–59 years, and older people are those aged from 60 years. Robust standard errors in parentheses

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

Table 8 OLS regressions of migration on the PAPI index. *Source* Estimation from the 2011 PAPI survey and the 2014 IPHS

Explanatory variables	Having adult migration (yes=1, no=0)	Log of adult migration flow	Having elderly migration (yes=1, no=0)	Log of elderly migration flow	Having migration of people below high school education (yes=1, no=0)	Log of migration of people below high school education	Having migration of people with high school education (yes=1, no=0)	Log of migration of people with high school education	Having migration of people with tertiary education (yes=1, no=0)	Log of migration of people with tertiary education
Log of distance between origin and destination provinces	− 0.2619*** (0.0057)	− 0.6455*** (0.0236)	− 0.0678*** (0.0058)	− 0.0818*** (0.0295)	− 0.2270*** (0.0064)	− 0.3567*** (0.0255)	− 0.2306*** (0.0063)	− 0.3477*** (0.0235)	− 0.2114*** (0.0066)	− 0.3792*** (0.0252)
Log of population of origin provinces	0.1774*** (0.0145)	0.6870*** (0.0501)	0.1146*** (0.0120)	0.1465** (0.0598)	0.2129*** (0.0150)	0.5008*** (0.0554)	0.1506*** (0.0150)	0.5504*** (0.0483)	0.1470*** (0.0149)	0.5207*** (0.0542)
Log of population of destination provinces	0.0530*** (0.0155)	0.6877*** (0.0517)	0.0314*** (0.0116)	0.5994*** (0.0568)	0.0650*** (0.0160)	0.6273*** (0.0539)	0.0643*** (0.0155)	0.7500*** (0.0486)	0.0571*** (0.0146)	0.6247*** (0.0557)
Log of per capita income of origin provinces	− 0.0315 (0.0346)	0.1261 (0.1214)	0.0025 (0.0235)	0.0236 (0.1483)	− 0.0196 (0.0359)	0.0564 (0.1365)	0.0046 (0.0342)	− 0.1146 (0.1142)	0.0700** (0.0339)	0.7455*** (0.1327)
Log of per capita income of destination provinces	0.1807*** (0.0346)	1.3590*** (0.1223)	0.1113*** (0.0236)	0.2192 (0.1375)	0.1840*** (0.0355)	1.0794*** (0.1269)	0.1705*** (0.0340)	0.9704*** (0.1202)	0.1099*** (0.0329)	0.9232*** (0.1342)

Table 8 (continued)

Explanatory variables	Having adult migration (yes=1, no=0)	Log of adult migration flow	Having elderly migration (yes=1, no=0)	Log of elderly migration flow	Having migration of people below high school education (yes=1, no=0)	Log of migration of people below high school education	Having migration of people with high school education (yes=1, no=0)	Log of migration of people with high school education	Having migration of people with tertiary education (yes=1, no=0)	Log of migration of people with tertiary education
Log of PAPI index of origin province	0.3198** (0.1295)	0.3924 (0.4916)	0.0742 (0.0775)	− 0.4491 (0.6480)	0.1347 (0.1276)	0.0414 (0.5156)	0.4237*** (0.1226)	0.6959 (0.4533)	0.3169*** (0.1155)	1.1634** (0.4911)
Log of PAPI index of destination province	0.2569** (0.1253)	1.4460*** (0.4139)	− 0.0529 (0.0726)	1.0632 (0.6660)	0.1388 (0.1242)	1.5430*** (0.4427)	0.4033*** (0.1194)	0.5926 (0.4361)	0.1242 (0.1137)	0.4681 (0.5232)
Constant	− 3.0224*** (0.7209)	− 22.0230*** (2.5238)	− 1.7362*** (0.4457)	− 5.0863 (3.5272)	− 2.7788*** (0.7257)	− 17.9183*** (2.6007)	− 4.4775*** (0.7194)	− 15.6469*** (2.4388)	− 3.2464*** (0.6893)	− 23.9498*** (2.9475)
Observations	3906	2144	3906	374	3906	1601	3906	1304	3906	1078
R-squared	0.329	0.461	0.126	0.452	0.293	0.354	0.300	0.497	0.284	0.514

Adults are those with age 16–59 years, and older people are those aged from 60 years. Robust standard errors in parentheses

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

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