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Essays on Return Migration and Economic Growth

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To my family, for their unending love and support

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Abstract

This dissertation addresses different aspects of return migration of labor, which represents a challenging field for investigation due to data limitations and methodological issues.

The dissertation consists of three chapters. The first chapter, written in co-authorship with Byeongju Jeong, models selection of migrants with respect to educational attainment. We attempt to explain relatively low return rates among migrants with only secondary education compared to those of low- and highly educated migrants observed in the data. We develop a two-country overlapping generations (OLG) model with emigration and return migration undertaken by agents heterogeneous in terms of education. Our model is built on the decision mechanism proposed by Borjas & Bratsberg (1996), which we augment by assimilation costs and immigration policy restrictions. The U-shape pattern of return rates with respect to education is driven by a combination of two forces: sizable wage differentials between the foreign and home countries, which decline with education, and uncertain opportunities for status adjustment to permanent residence. Our model predicts that migrants with secondary education have both incentives and opportunities to remain permanently in the foreign country.

In the second chapter, using the example of Vietnam, we estimate returns to temporary migration experience. We test the hypothesis of human capital accumulation in the process of on-the-job training, which migrants undergo during their temporary stay abroad. In the case of Vietnam, we find a positive wage differential (experience premium) of 28 % on average, and reveal substantial variation of this premium across genders and educational attainments. In particular, the largest premium was estimated for the highly educated returnees and in the case of females. For males, we find a U-shape pattern of the experience premium variation with respect to education.

The third chapter of the dissertation reveals an expansionary effect of temporary migration of labor on the economies of countries of origin. We construct a tractable two-county two-period OLG model, with migration and return decisions of agents heterogeneous in terms of skills. The model is based on the assumption that human capital

is upgraded in the destination country in both skill groups. We show that when returns to skills in the country of origin are higher than in the destination country, emigration of skilled labor will be insufficient to close the technological gap with the foreign country. Next, we consider the possibility of government intervention in the form of subsidizing return migration of a particular skill type. Our model predicts that when skilled labor is sufficiently scarce or has a sufficiently large output share, the entire subsidy should be channeled to the skilled labor.

Abstrakt

Dizertační práce se věnuje různým aspektům zpětné migrace pracovní síly, což představuje náročnou oblast výzkumu z důvodu omezených dat a metodologických problémů.

Dizertační práce se skládá ze tří kapitol. První kapitola, jejímž spoluautorem je Byeongu Jeong, modeluje výběr migrantů v závislosti na úrovni dosaženého vzdělání. Pokoušíme se vysvětlit poměrně malý podíl zpětné migrace u migrantů se středoškolským vzděláním ve srovnání s tímto podílem u málo a vysoce vzdělaných migrantů, který je pozorován na datech. Vytváříme model dvou zemí s překrývajícími se generacemi (OLG) o dvou obdobích, ve kterém je emigrace i zpětná migrace podstoupena heterogenními agenty z hlediska vzdělání. Náš model je založen na rozhodovacím mechanismu navrženém Borjasem & Bratsbergem (1996), který rozšiřujeme o asimilační náklady a omezení dané imigrační politikou. Závislost ve tvaru U mezi mírou zpětné migrace a vzděláním je způsobena kombinací dvou faktorů: značným mzdovým diferenciálem mezi cizí a domácí zemí, který klesá se vzděláním, a nejistými možnostmi přizpůsobení statusu k trvalému bydlišti. Náš model predikuje, že migranti se středním vzděláním mají jak pobídky, tak i možnosti, zůstat trvale v cizí zemi.

V druhé kapitole odhadujeme výnosy z dočasné migrace na příkladu Vietnamu. Testujeme hypotézu akumulace lidského kapitálu v procesu odborné praxe, kterou migranti podstupují během jejich dočasného pobytu v zahraničí. V případě Vietnamu nacházíme pozitivní mzdový diferenciál (prémii za zkušenost) v průměrné výši 28% a odhalujeme významnou variaci ve výši této prémie v závislosti na pohlaví a výši vzdělání. Konkrétně největší prémie byla odhadnuta u vysoce vzdělaných zpětných migrantů a u žen. U mužů nacházíme vztah ve tvaru U mezi variací prémie za zkušenost a vzděláním.

Třetí kapitola dizertační práce ukazuje expanzivní efekt dočasné migrace pracovní síly na ekonomiky zemí původu. Vytváříme přehledný model dvou zemí s překrývajícími se generacemi (OLG) o dvou obdobích, ve kterém heterogenní agenti z hlediska vzdělání rozhodují o migraci a navrácení do země původu. Model je založen na předpokladu, že lidský kapitál je obohacen během migrace v obou dovednostních skupinách. Ukazujeme,

že pokud jsou výnosy z dovedností v zemi původu vyšší než v cílové zemi, pak emigrace kvalifikované pracovní síly nebude dostatečná, aby uzavřela technologickou mezeru s cizí zemí. Dále uvažujeme možnost vládní intervence ve formě podpory zpětné migrace konkrétního typu kvalifikace. Náš model predikuje, že pokud kvalifikovaná pracovní síla je dostatečně vzácná nebo má dostatečně velký podíl na produkci, pak by celá podpora měla být nasměrována ke kvalifikované pracovní síle.

Introduction

International labor mobility is a much-debated issue due to the serious implications that migration creates for both destination countries and countries of origin. In the framework of the dissertation, we look at migration from the perspective of origin countries, analyzing different aspects of return migration. In particular, we pose questions such as who returns, how returnees are favored in the home labor market, and how return migration may potentially contribute to the economic growth of countries of origin. Despite substantial return migration flows and the predominantly temporary nature of resettlement, many aspects of return migration remain under researched due to data limitations and methodological issues.

Return migration brings many challenges to countries of origin while, at the same time, it is believed to create development opportunities. The challenging aspect of return migration is the successful re-integration of returnees into society and the labor market. The evidence for the success of such re-integration is very mixed and rather fragmented. Our study of Vietnamese return migrants contributes to these pools of evidence and reveals a positive impact of temporary migration on the earnings of returnees despite a generally negative social attitude toward return migration which persists in this country.

The development potential of return migration originates from the financial, human and social capital of return migrants. It depends, to a large extent, on the quality of the human capital which returns and on the size of return migration flows, as well as on the ability of origin countries to accommodate the skills and experience of return migrants. In this dissertation, we analyze the growth implications of emigration and return migration of labor with different skill types and highlight the role of the policies of countries of origin in the enhancement of this growth impact.

The dissertation is divided into three parts. In the first chapter, co-authored with Byeongju Jeong, we model the selection of return migrants with respect to skills. Our objective is to explain the U-shaped pattern of return migration rates with respect to education which is observed in the data. We develop a two-country overlapping generations

model with emigration and return migration decisions undertaken by agents heterogeneous in terms of education. Our model predicts that the combination of two forces — cross-country differences in wages and the restrictive immigration policies of destination countries with respect to a status adjustment towards permanent residence — create incentives and opportunities for migrants with secondary education to remain in the foreign country permanently. The return migration decision in our model is driven by the wage premium received upon return, which improves earnings prospects at home.

In the next chapter, we assess the relative performance of return migrants in the labor market of the home country, estimating the wage differentials between returnees and the relevant sedentary population. We are looking for the empirical justification for the assumption, used by the theoretical literature in the field and employed in the first chapter of the dissertation, that human capital is upgraded in the process attaining foreign work experience and that this is the case for all educational attainments. Using the dataset for Vietnam, we find a positive experience premium as high as 28 %. Moreover, the experience premium varies with education, following a U-shaped pattern with respect to skills for male returnees and strictly increasing with education in the case of female returnees. Migrants are positively selected with respect to observable characteristics and show no strong evidence for selection on unobservables.

The last chapter studies the role of return migration as the channel of economic growth. We develop a two-country two-period OLG model with heterogeneous labor in terms of skills, which freely decides about emigration and return migration. We show that under the assumption that both skill types increase their productivity abroad, their return is beneficial for the country of origin. Our model predicts that the growth impact of return migration would depend on the number of returnees in each skill group. We show that government intervention in the form of a wage subsidy may help to stimulate higher migration activity among the relatively scarce skilled population, which would result in faster growth in the home country. A larger share of the subsidy should be directed to skilled labor when this type of labor is either sufficiently scarce or has a larger output share.

Chapter 1

Why Don't Migrants with Secondary Education Return?[*]

(In coathorship with Byeongju Jeong)

This chapter attempts to explain a U-shaped pattern of return migration rates with respect to educational attainment. We develop a two-period OLG model with emigration and return migration decisions undertaken by agents heterogeneous in terms of educational attainment. The immigration policy is considered as an additional determinant of a migration decision. The model predicts that the combination of two forces — relative returns to schooling and uncertain opportunities for status adjustment — result in favorable conditions for migrants with secondary education to remain abroad permanently.

1.1 Introduction

The significant disparities in development that exist between countries motivate people to move to locations with better earning opportunities and higher standards of living. However, despite the availability of employment and possibilities to accumulate savings and send remittances provided by the destination countries, a substantial number of migrants eventually return to their origins. Statistical evidence reveals that the re-emigration rates from the traditional destination countries are as high as 40 % for the UK, 23 % for Canada and 19 % for the USA, with major re-emigration taking place within the first five years and significantly declining after that (Borjas & Bratsberg, 1996; OECD, 2009; Dustmann & Weiss, 2007).[2]

In the past, return migration was perceived as an outcome of failure or inability to assimilate in the destination. Contemporary trends in international labor mobility reveal a predominantly temporary nature of resettlement. Today, return migration is more often perceived as a measure of immigration success, as it takes place when the initial emigration objective, for instance, achievement of a savings target is reached (Massey & Sanchez, 2010).

A growing number of surveys conducted among the returned population in the source countries sheds light on the motivation behind the return decision of migrants. Among the dominant reasons for return migration family circumstances are mentioned very often, followed by legal barriers imposed by immigration policies, homesickness, and failed expectations (Massey & Redstone, 2006; DoTM, 2010).[3] As for the reasons for initial emigration, the most frequently mentioned are the lack of employment opportunities in

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[2]The terms "re-emigration rate" and "return rate" are used interchangeably throughout the paper. However, the re-emigrating population includes two categories: those who return to the country of origin and those who move to a third location. Partial justification for the synonymous usage of the two terms can be drawn from Nekby (2006) and Bratsberg, Raaum & Sorlie (2007) who show, using data from Sweden and Norway, that a substantial share of the re-emigrating population is actually returning to the countries of origin rather than moving to a third location. However, return rates substantially vary across countries of origin.

[3]Using data for seven source countries covered in the framework of the Development on the Move Project, we obtain the following ranking of reasons for return migration (average percentage of responses): family circumstances — 30 %; legal barriers — 28 %; homesickness — 13 %; end of the contract — 12 %; failed expectations — 10 %, etc. Own calculations of the authors.

the origin countries and substantial wage differentials between developed destinations and developing source countries.

Migrants represent a non-random sample of the source country's population, being self-selected into emigration and subsequent return with respect to observable and unobservable characteristics (Borjas, 1987; Borjas & Bratsberg, 1996). One of the important and widely analyzed dimensions of selectivity is the *educational attainment* of migrants — an observable component of human capital which is used as a proxy for individual skills. The educational composition of migration flows has a direct impact on the economic development of the countries of origin (Beine, Docquier & Rapoport, 2001; Docquier & Marfouk, 2006). For instance, substantial return migration flows create a potential channel of economic growth for the countries of migrants' origin (Dos Santos & Postel-Vinay, 2003). Knowledge of educational selectivity and an understanding of the motivation guiding the return decision in different skill groups are also important for efficiency improvements to motivation schemes developed by the source countries and intended to lure back their expatriates.

The available statistical evidence on the educational composition of migration flows reveals a number of peculiar patterns. In particular, emigration rates, as a rule, increase with education (Feliciano, 2005; Grogger & Hanson, 2011). A handful of countries represent the traditional suppliers of relatively low-skilled labor, among them Mexico, Morocco, and Turkey (OECD, 2009). Such positive selectivity of migrants along the educational dimension can be partially explained by the quality-selective immigration policies adopted by major destination countries in the late 1980s in favor of advanced education and special skills (Docquier & Marfouk, 2006; Papademetrious, Meissner & Rosenblum, 2009).

The analysis of return migration is complicated by the lack of relevant data. The return flows are latent as the returning population, as a rule, does not undergo direct registration at the moment of re-entry. The data which do exist reveal that return rates tend to be the highest among the least educated and migrants with an advanced education, and relatively lower among migrants with only a secondary education. This U-shape pattern of return

rates is observed both in the aggregate immigrant stock of the destination countries, as well as in the single source country stock of return migrants. In particular, according to the OECD International Migration Outlook 2008, the average re-emigration rates among men who entered the U.S. at the age of 30 or older after five years of residence comprise: 34.4 % for the low-educated, 4.4 % for the middle-educated, and 23.5 % for the highly educated (Figure 1.1).[4]

At the level of individual source countries, return migration rates are also found to be U-shaped with respect to educational attainment. As an illustration, Figures 1.2a and 1.2b depict the return migration rates from such destinations as the U.S. and Spain for a group of Latin American countries.

Recently collected data by the Institute of Public Policy Research, London (IPPR) in seven developing countries provide additional evidence on the educational selectivity of return migrants. For such countries as Jamaica, Ghana, Vietnam, and Macedonia, the return pattern was found to be U-shaped with respect to education (DoTM, 2010). The return migration ratios for these countries are summarized in Table 1.1.

The U-shaped pattern of return migration rates observed in the data cannot be accounted for by the existing theoretical models of migrants' selectivity. On the contrary, the theory predicts the pattern to be either an inverse U-shape (Borjas & Bratsberg, 1996) or positively sloped (Mayr & Peri, 2008). Our paper addresses this puzzle as we develop a theoretical framework which attempts to provide a rationale for the relatively low return rates among migrants with a secondary education. In particular, we build a two-period OLG model with heterogeneous agents in terms of educational attainment who make migration and return decisions during their life cycle. Our model is based on the migration decision mechanism proposed by Borjas & Bratsberg (1996); however, it incorporates two additional determinants of migration decisions — immigration costs and immigration policy parameters.

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[4] We adopt the following classification of the population: low-educated — less than secondary school; middle-educated — completed secondary school or an equivalent vocational training program; highly educated — college degree and higher (OECD, 2008).

The migration outcome based on the individual optimization problem is influenced by a set of economic and non-monetary factors. Besides the economic determinants of the individual migration decision such as cross-country wage differentials and the experience premium proposed by previous studies, we incorporate the effect of non-monetary factors, which are modeled in the form of immigration costs. The latter reflect the costs of assimilation and the psychological costs of separation from family. The role of non-monetary, idiosyncratic factors in the decision of migrants to return seems to be important, as signaled by the findings of recent surveys conducted among the returned population (DoTM, 2010; Massey & Sanchez, 2010).

Another deviation of our framework from similar studies is in the consideration of the immigration policy impact, which shapes the individual migration outcome. The evidence concerning the educational composition of migration and return migration flows presented above is based on census data, which register the foreign born population regardless of the category of admission. Previous theoretical studies analyzed the migration behavior of those migrants who enter destination countries holding a permanent residence permit. It explains why the impact of immigration policy was not considered. However, our brief investigation of immigration policy, in particular U.S. immigration policy (as the major destination country), indicates that immigration policy is restrictive at the stage of initial emigration but is even more selective at the stage of a status adjustment towards permanent residence. As a status adjustment is restricted on an educational basis, it should be incorporated into the analysis of the return migration decision undertaken by migrants with different educational attainments.

Predictions of the existing theoretical models concerning the educational composition of return migration flows are largely dependent on an assumption about the relative returns to schooling in the source and destination countries. We check the predictions of our model by considering actual values of the returns to schooling for the sample of source and destination countries. Our sample reveals that returns to schooling tend to be higher in the source countries, reflecting a relative scarcity of educated labor.

As an outcome, our model explains the variation of return migration rates across educational levels by the combination of two forces — incentives and opportunities — which create favorable conditions for migrants with secondary education, in particular, to remain abroad on a permanent basis. At the ends of the skills distribution, migrants with low educational attainment have incentives for permanent immigration but lack opportunities, while those with high educational attainment have opportunities to adjust their status but lack the incentives.

The rest of the paper is organized as follows. In the next section, we provide a brief summary of the theoretical and empirical literature on educational selectivity of return migrants. Next, using a sample of sending and receiving countries, we draw conclusions about the patterns of variation of emigration and return migration rates across educational attainments and compare returns to schooling in the source and destination countries from our sample. In the modeling section, we develop a theoretical model with emigration and return migration decisions undertaken by heterogeneous agents in terms of education, and consider its predictions under two regimes — free labor mobility and restricted immigration opportunities. In the last section, we conclude.

1.2 Literature Review

In this paper, we consider the subgroup of migrants called *economic migrants*, those who emigrate for employment purposes in order to take a job offer abroad or to search for employment. The countries of migrants' origin, as a rule, are characterized by a rapidly growing labor force and slow economic growth, resulting in a shortage of employment opportunities (OECD, 2009; UNDR, 2009). Moreover, the wage differentials that exist between the source and destination countries are substantial, thus allowing migrants to accumulate savings and send remittances to the households left in the country of origin (DoTM, 2010).

However, the motivation guiding the return decision of migrants is more complex and poorly understood. The theoretical literature provides several explanations for return

migration, and their comprehensive summary is presented in Yang (2006). Return takes place due to location specific preferences, achievement of a savings target, or due to the improvement of individual earning prospects in the home country realized in the form of an experience premium.

A number of recent surveys conducted in the source countries among the returned population provide evidence for the reasons behind emigration and return decisions. Examples of such surveys include the Latin American Migration Project and the New Immigrant Survey by the Center for Migration and Development at Princeton University, and the Development on the Move Project conducted in the cooperation of the Institute of Public Policy Research, London and the Global Development Network (GDN). Despite different coverage of the source and destination countries and an open-ended question format, surveys yield similar findings concerning migrants' motivation and the ranking of motives. Among the reasons for initial emigration, lack of employment opportunities in the country of origin predominates, followed by the savings motive and desire to send remittances. As for the return migration decision, the primary motives for return revealed by all surveys are family reasons such as idiosyncratic family events, followed by homesickness, policy constraints that create a barrier for the prolongation of the foreign stay on a legal basis, and to a lesser extent the achievement of a savings target, preference for the home country, and failed expectations (Massey & Redstone, 2006; Massey & Sanchez, 2010; DoTM, 2010).

Next, we analyze the findings concerning the difference in motivation among migrants with different educational levels. A seminal paper by Borjas (1987) represents one of the earliest attempts to model the decision mechanism that explains the emigration behavior of educationally heterogeneous agents. The author introduces two types of selection — *positive* and *negative* — the realization of which is determined by the extent of income inequality in the home and destination countries. In the case of higher income inequality at the destination, the most skilled agents leave the home country to reap the benefits from higher returns to skills offered abroad. Thus, migrants are said to be *positively self-selected* with respect to education. On the contrary, when income inequality is larger at

home, returns to skills are higher in the source country compared to the foreign country; thus, only agents from the lower tail of the skills distribution emigrate, while the most skilled remain at home (*negative selection*).

Return migrants comprise a sub-sample of the immigrant population; thus, the type of selection into initial emigration affects the educational composition of the returning population. In their seminal paper, Borjas & Bratsberg (1996) show that return migration intensifies the type of selection, which guides initial emigration. In particular, in the case of a positive selection, the emigration of natives from the upper tail of the skills distribution, those who decide to return, are the least skilled migrants out of them. In the case of a negative selection, the situation is reversed. Therefore, the selection mechanism proposed by Borjas & Bratsberg (1996) predicts that regardless of the type of the initial selection, migrants with skills from the middle part of the distribution always return, while those at the ends of the skills distribution are always better off remaining abroad. For the aggregate stock of the immigrant population in the destination country, the model predicts intermediate (inverse U-shape) selection into re-emigration. The authors tested their theoretical predictions using U.S. data on permanent residence permit holders from the entry cohorts of 1970-1985. Due to the lack of data on the educational attainment of migrants, the authors used the wage distribution to divide migrants into different educational groups.

Besides returns to schooling, the theoretical literature considers other determinants of emigration and return decisions that affect the educational composition of migration flows. Among them are the costs of resettlement and the experience premium (Borjas & Bratsberg, 1996; Chiquiar & Hanson, 2005). An individual migration decision is based on a comparison of wages paid in the destination country net of the resettlement costs with wages received at home. However, the immigration experience is thought to improve individual earnings in the home country, rewarding returnees for the additional human capital accumulated abroad in the process of on-the-job training. Therefore, migration improves individual earnings both through permanent or temporary migration.

Predictions of the existing theoretical models concerning the educational composition of return migration flows are driven by the models' assumptions. For instance, the assumption of higher returns to schooling in the foreign country compared to that in the source country results in a positive selection into emigration as well as in a positive selection into the consequent return in the models by Borjas & Bratsberg (1996) and Mayr & Peri (2008). Other crucial assumptions concern the distribution of resettlement costs and the experience premium across educational attainments. In the next section, using a sample of the source countries, for which the return migration rates were found to be U-shaped with respect to the educational attainment, and a sample of the corresponding destination countries, we analyze the available evidence on the returns to schooling for different educational attainments. Our brief investigation reveals that returns to schooling tend to be higher in the source countries, and this finding will be used later in the paper when deriving the predictions of our theoretical model concerning return migration patterns.

The theoretical models described above consider the unidimensional structure of skills. A recent theoretical paper by Dustmann, Fadlon & Weiss (2011) introduces a two-dimensional structure of skills, divided into home specific and foreign specific. The difference in the costs of skills accumulation and returns to various types of skills in the origin and destination countries result in a rich set of selection patterns with respect to the educational attainment of migrants. However, the major issue of such approach is the subjective nature of the criterion used to discriminate between the two types of skills. In the framework of our paper, we adopt the unidimensional structure of individual skills.

The theoretical literature on the educational selectivity of return migration flows cannot account for the relatively lower return rates among the migrants with secondary education compared to other educational attainments observed in the data. This implies that other determinants of the return decision exist which have not been accounted for. In the framework of our analysis, we will consider two additional determinants such as assimilation costs and immigration policy restrictions.

1.3 Statistical Evidence

The assumption about relative returns to schooling in the source and destination countries shapes, to a large extent, the predictions of the existing theoretical models concerning educational sorting of the immigrant and returning population. In particular, the returns to schooling are assumed to be higher in the developed destination countries. In order to judge to what extent this important assumption is realistic, in this section we analyze the evidence on the returns to schooling for a sample of source countries. Our sample includes eleven source countries, for which the U-shaped return migration rates were found, and two corresponding destination countries, the U.S. and Spain. The composition of the sample is determined by the data availability. Our findings are summarized in Tables 1.1, 1.2, and 1.3 and will be used later when checking the predictions of our theoretical model.

Table 1.2 contains the data on relative skills supply and relative returns to education. The left-hand side of Table 1.2 allows us to judge the educational composition of the labor force. In the case of source countries, it is characterized by a large share of agents with primary education and at the same time a very negligible share of the tertiary-educated. The educational composition of the population in the developed destination countries, for instance in the U.S., significantly differs, being characterized by a large share of people with completed secondary education, followed by a significant share of the tertiary-educated labor. The relative scarcity of educated labor observed in the countries of origin is reflected in the high returns to schooling in these countries.

The returns to schooling presented in the right-hand side of Table 1.2 stand for the log wage differentials between workers with a secondary and primary education (SP_1), and between the tertiary-educated and secondary-educated (SP_2/SP_1). The returns to secondary education are robustly higher in all source countries compared to that in the U.S. and Spain. Moreover, returns to tertiary education are higher for the majority of source countries with a minor exception for Argentina and Mexico, where the skill premium for people with advanced education is smaller than in the U.S.

Despite higher returns to schooling, emigration rates in our sample of source countries

increase with educational attainment. The emigration rates presented in Table 1.3 are calculated as shares of the emigrant population with a particular educational attainment in the resident population of the source country with the same educational attainment. They measure the extent of brain drain. Our sample reveals a predominantly positive selection into emigration, which is an anticipated result due to the highly discriminative nature of the immigration policies adopted by major destination countries in the last decade of the 20th century. Comparing the educational selectivity of emigrants across destinations, we observe that the selection pattern is positive for the case of the U.S., and more diverse in the case of Spain. This might be an indicator of a more restrictive U.S. policy than the policy of Spain.

The source countries in our sample are characterized by a U-shaped return migration pattern with respect to educational attainment. As for the relative magnitude of return migration rates at the ends of the skills distribution, it varies substantially across destinations. In the case of the U.S., the return rates among the low-educated are higher than among the highly educated. In the case of Spain, the return rates among the highly educated are, on the contrary, larger than among the low educated.

The selection patterns observed in the data hint at the importance of immigration policy in shaping the size and composition of the immigrant flows by restricting opportunities for certain groups to emigrate in the first place, and for those who manage to emigrate to remain in the destination permanently and on a legal basis. The existing theoretical models of migrants' selectivity by Borjas & Bratsberg (1996) and Mayr & Peri (2008) analyze the return migration behavior of migrants who move to the destination countries holding permanent residence permits, thus facing no legal barrier for permanent resettlement. However, the statistical evidence on the educational composition of return migration flows presented in the introduction is based on census data. This type of data does not allow us to discriminate between different admission categories, thus, providing evidence on the return behavior of migrants who enter the destination countries under temporary as well as semi-permanent and permanent visas. Therefore, immigration pol-

icy may be a potential determinant of the educational selectivity of migrants. Below, we analyze the restrictive role of immigration policy using the example of the U.S.

The immigration policies of destination countries are highly discriminative with respect to migrants' education and origin (Papademetrious, Meissner & Rosenblum, 2009). At the stage of emigration, the policy limits the number of admission categories, for which low-educated migrants qualify, and imposes annual quotas on admission under these categories. The number of admission categories and the size of quotas increase with the educational attainment of migrants. As an illustration, Table 1.4 summarizes the U.S. admission categories available for economic migrants from different educational groups. The table reveals that for low-educated migrants, only the H-2 admission category is available, which is intended exclusively for temporary stays and, in general, does not impose any educational requirements. Thus, agents with a secondary education also qualify for H-2 visas. The annual admission limit for this category is set to 66,000 visas.

The emigration opportunities for the middle skilled are extended by an additional option — Visa Diversification Program or the Green Card lottery — which grants 55,000 permanent residence permits annually. The lottery has two notable restrictions: educational requirement (at minimum a high school degree and two years of experience) and a restricted list of countries of origin that are allowed to participate in the program.

A variety of admission categories are available for agents with a tertiary education. Besides the two options available for the middle skilled — H-2 visas and Visa Diversification Programs — the highly educated qualify for H-1B and O-type admissions. The latter are subject to a strict educational requirement of at minimum a bachelor degree. The size of the annual admission quotas for the H-1B category is set to 85,000 visas.

Immigration policy also plays an important role in the second stage of the migration process, when those agents who managed to migrate in the previous period apply for permanent residence. The transition from non-immigrant temporary admission into permanent residence is known as *status adjustment*. The restrictions imposed by the immigration policy on the process of a status adjustment put low-educated migrants in an

even less favorable position compared to migrants from other educational groups than at the stage of initial emigration. Table 1.4 also summarizes available options for acquiring permanent residence among different educational groups.

Temporary non-immigrant admissions do not include an option for direct status adjustment, with the exception of the H-1B visa. One possibility for economic migrants to apply for a status adjustment is under an employment-sponsorship petition. The size of annual admissions for this category is limited to 120,000 permits, which are granted on the basis of educational attainment within four preference categories. As a rule, preference is given to applicants with an advanced degree and special abilities. Another possibility for acquiring permanent residence is through the Diversification program, which is available only for agents with a secondary education or higher. Therefore, U.S. immigration policy limits the opportunities for permanent immigration for low-educated migrants on the basis of employment sponsorship. As a rule, low-educated migrants acquire permanent residence on the basis of family sponsorship, as close relatives of U.S. citizens or legal immigrants, or by overstaying their temporary visas and switching to the group of illegal migrants (Massey & Sanchez, 2010).

We incorporate the immigration policy parameters into our model. First, we make an assumption about free labor mobility and later relax this assumption by considering the effect of the policy at both stages of the migration process.

1.4 The Model

Our theoretical framework is based on the selection mechanism developed by Borjas & Bratsberg (1996). However, we introduce additional determinants of the migration and return decisions and incorporate the selection mechanism into a complete model, explicitly stating the production and population structure. We construct a two-country model: the home country (indexed H) is a small, open economy, and the foreign country (indexed F) is a large country. A single, non-storable consumption good is produced by competitive firms in each country and consumed by residents.

Technology

Competitive firms in the home country employ the CRS production function with disaggregate labor inputs:

$$Y^H = A^H (L_0^H)^{\alpha_H} (L_1^H)^{\beta_H} (L_2^H)^{\gamma_H}, \tag{1}$$

where Y^H is output, A^H is total factor productivity, L_0^H, L_1^H, L_2^H are inputs and $\alpha_H, \beta_H, \gamma_H$ are output shares of low, middle, and highly educated labor respectively. The disaggregation of labor inputs across the three educational groups is used on purpose in order to explicitly model the emigration and return migration decisions of agents from each group.

The foreign country employs a similar CRS production function:

$$Y^F = A^F (L_0^F)^{\alpha_F} (L_1^F)^{\beta_F} (L_2^F)^{\gamma_F}, \tag{2}$$

where Y^F is output of the foreign country, A^F is foreign total factor productivity, L_0^F, L_1^F, L_2^F are inputs and $\alpha_F, \beta_F,$ and γ_F are output shares of low, middle, and highly educated labor respectively.

The home country is assumed to be a developing economy, and the foreign country is assumed as developed. These assumptions translate into the condition $A^F > A^H$, implying that a part of the wage differential between countries is due to the difference in productivity levels.

Perfect competition and cost minimization of the firms imply that factor prices are set equal to their marginal products:

$$W_i^H = MP_{L_i^H}, \tag{3}$$

where W_i^H is the home country wage in the skill group i, and $MP_{L_i^H}$ is the marginal product of home labor with skill i, for $i \in \{0, 1, 2\}$. We assume a composite structure of wages, which consist of a base wage and a skill premium:

$$W_i^H = \mu^H SP_i^H, \tag{4}$$

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where μ^H is the base wage as a compensation for work, which requires a minimum level of education, and SP_i^H is the skill premium in the ith skill group, which reflects returns to additional education. The skill premium is defined as a wage gap between a corresponding skill group and the group of low-skilled agents:

$$SP_i^H = \frac{W_i^H}{W_0^H},$$ (5)

where $SP_i^H \geq 1$ for any i, and $SP_2^H > SP_1^H > SP_0^H$. Thus, by definition, $SP_0^H = 1$, and the skill premium is increasing in education. We obtain explicit expressions for the skill premium by substituting wages with expressions for marginal products of labor. The skill premium becomes a function of the relative skill supply and the corresponding output shares of labor inputs:

$$SP_1^H = \frac{\beta_H L_0^H}{\alpha_H L_1^H},$$ (6)

$$SP_2^H = \frac{\gamma_H L_0^H}{\alpha_H L_2^H}.$$ (7)

The wages in the foreign country are determined in a similar way. They are set to be equal to the marginal project of labor and represent a product of the foreign country base wage and the skill premium for the corresponding skill type i:

$$W_i^F = \mu^F SP_i^F,$$ (8)

where μ^F is the foreign country base wage, and SP_i^F is the skill premium for the skill type i, for $i \in \{0, 1, 2\}$. The foreign skill premium is defined in a similar way as in the home country, and it represents a wage gap between a particular skill group and the group of unskilled labor.

In order to create incentives for emigration of labor from each skill group, we assume that wages in the foreign country are larger than that in the home country: $W_i^F > W_i^H$, for any i. This assumption implies that $\mu^F > \mu^H$. We make an additional assumption about the difference in the skill premium in the foreign country relative to that in the

home country. In particular, in Section 1.3 of the paper we analyzed returns to schooling using a sample of source and destination countries. We found that returns to schooling in developing source countries are larger than returns to schooling in advanced destination countries, and that this is the case for all educational attainments. Moreover, returns to schooling in the destination country relative to returns to schooling in the country of origin decline with education. Consequently, in our analysis, we assume that $SP_i^H \geq SP_i^F$ for any $i \in \{0, 1, 2\}$, and the skill premium in the foreign country relative to the skill premium in the home country is declining with education: $\frac{SP_0^F}{SP_0^H} > \frac{SP_1^F}{SP_1^H} > \frac{SP_2^F}{SP_2^H}$. These assumptions will be crucial for the interpretation of our results with respect to migrants' selection into emigration and return.

Population

The population in the home country is characterized by an overlapping generations structure. Every period, a new cohort of a fixed unit size and a fixed educational structure is born. The educational composition of a new cohort is determined exogenously:

$$z_0 + z_1 + z_2 = 1, \tag{9}$$

where z_0, z_1, z_2 are shares of the low, middle, and highly educated population respectively in the total size of a new cohort. We do not model schooling decision of agents and assume exogenous educational structure; however, it has been shown in previous studies that emigration opportunities may affect educational choices of the population and create incentives for the acquisition of more education.

Each agent lives two periods, being *young* (indexed 1) and *old* (indexed 2), and faces a decision about emigration to a foreign country in the first period of life. No emigration is allowed in the second period. Decision about return migration is made by immigrants in the second period of life. Consequently, every period, the population of the home country includes agents from two generations: a young sedentary population and old population who are either return migrants or a part of the sedentary population.

Each agent supplies one unit of labor in the first and second periods of life. The composition of the effective labor force in the home country every period is equal to:

$$L_i^H = L_i^{H_1} + L_i^{H_2} + EL_i^{FH_2}, \qquad (10)$$

where L_i^H is the size of the effective labor force with educational attainment i; $L_i^{H_1}$ is the size of the young population with educational attainment i; $L_i^{H_2}$ is the size of the old population with educational attainment i, which includes those agents who did not emigrate in the last period; $L_i^{FH_2}$ is the number of old agents with education i who emigrated in the previous period but returned in the current period. The experience premium (E) reflects the augmentation of the labor endowment of return migrants in the process of on-the-job training undertaken while working in the foreign country, and is modeled as being greater than 1.

The individual optimization problem

In the beginning, we assume that migration opportunities are not restricted by the immigration policy of destination countries. This assumption will be relaxed later. Further, we assume no resettlement costs; however, living abroad is associated with immigration costs which we denote as M. The latter include the costs of assimilation (learning a foreign language, adjusting to a new culture) together with the psychological costs (i.e., family separation). The immigration costs are paid in both periods of life in the case of permanent immigration. They are randomly distributed among agents within each educational group, and their size is known at the beginning of the first period. The distribution of costs is such that in each educational group some agents have very negligible immigration costs (due to kin abroad, foreign language proficiency, or lack of family ties) meaning that they would always emigrate, while for some agents the costs go to infinity, and they never emigrate. This assumption is important to ensure the *interior solution*, so that emigration and return migration take place among agents from each educational group. Table 1.3 shows that in all source countries from our sample, emigration rates are substantial in all educational groups.

We assume further that the distribution of immigration costs is the same in each educational group. The costs are modeled in additive form as a lump-sum amount in order to match the data regularities. The lump-sum immigration costs taken in "time-equivalent" terms, thus as a fraction of wage, place a heavier burden on the low-educated migrants, and decline with an increase in education. The lump-sum representation of immigration costs can be justified, for instance, by the same degree of homesickness among migrants with different educational attainments, or the equal costs of maintaining contacts with the origin country. As an alternative, we model the variation of immigration costs across educational attainment assuming their multiplicative form (as a fraction of wage); however, this version of the model did not yield the realistic predictions concerning the patterns of educational selectivity observed in the data.[5]

Upon return to the country of origin, migrants receive the wage premium, which we introduced into our model as the experience premium E. The experience premium was found by a number of empirical studies, which estimate it to be 20-30 % on average (Co, Gang, & Yun, 2000; Lacuesta, 2006; Reinhold & Thom, 2009). Migration experience translates into higher individual earnings upon return to the country of origin through several mechanisms. The major explanation is that the key destination countries are highly developed, and by working abroad migrants are exposed to advanced technologies and managerial approaches, which increase their productivity. In the case of return, migrants transfer their augmented human capital, thus increasing the average stock of the human capital in the home country. Thus, temporary migration allows agents to improve their earnings, which is otherwise impossible without educational upgrading.

At the beginning of the first period, agent j learns his educational type i, which determines the amount of labor efficiency supplied for one unit of time.

We assume the following form of the individual inter-temporal utility function (discounting is ignored):

$$U_i = W_i^1 + W_i^2, \tag{11}$$

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[5]A version of the model with multiplicative immigration costs is presented in section 1.8.1 in the Appendix.

where W_i^1, W_i^2 are the wages in the first (young) and second (old) periods of life for agents with educational attainment i. Agents are assumed to be risk-neutral as they are concerned only with the maximization of the expected life-time earnings. The individual optimization problem represents the maximization of utility:

$$max\ U_i = W_i^1 + W_i^2,\tag{12}$$

s.t. the constraints that depend on the location choice:

First period earnings

- Agent j with educational attainment i lives in the home country:

$$W_i^1 = W_i^H.\tag{13}$$

For the sedentary population, wages in the second period are equal to that in the first period.

- Agent j with educational attainment i lives in the foreign country:

$$W_i^1 = W_i^F - M_{ij},\tag{14}$$

where M_{ij} is the value of the individual immigration costs of agent j with educational attainment i. In the case of permanent immigration, in the second period of life, agent j earns the same wage as in the first period and continues to pay costs.

Second period earnings

- Agent j with educational attainment i returns to the home country:

$$W_i^2 = W_i^H E,\tag{15}$$

for $i \in \{0, 1, 2\}$. The experience premium (E) is modeled as exogenous and constant fraction of wage same in all educational groups, as in Borjas & Bratsberg (1996).

The individual optimization problem is solved backwards. At the beginning of the second period, an individual who emigrated in the first period decides whether to remain in the foreign country or to return home and receive benefits in the form of the experience premium. The second period optimization problem yields the threshold value for the immigration costs $\bar{M}_i$ (permanent immigration threshold). A marginal agent whose immigration costs are equal to the threshold value is indifferent between remaining abroad and returning home. All migrants with immigration costs lower than the threshold are better off remaining abroad, while migrants with higher values of immigration costs than the threshold value are better off returning. In the case when immigration costs are equal to the threshold value, we assume that migrants return to the country of origin.

The individual migration decision in the first period is made based on the maximization of life time utility. The solution of the first period optimization problem yields the threshold value of immigration costs $\tilde{M}_i$ (initial emigration threshold), at which agents are indifferent between emigrating and remaining at home. Thus, those agents with immigration costs lower than the threshold would always emigrate, while those with costs higher or equal to the threshold value would remain in the home country. The derivation of the threshold values of the immigration costs are presented in section 1.8.2 in the Appendix.

The immigration costs thresholds are mapped into population shares in the following way:

$$\bar{M}_i = a\bar{N}_i^{b}, \tag{16}$$

$$\tilde{M}_i = a\tilde{N}_i^{b}, \tag{17}$$

where a and b are parameters of the immigration costs function, and $b > 1$. Two thresholds $\bar{N}_i$ and $\tilde{N}_i$ partition the population within each educational group i into three categories with respect to migration status: sedentary population $(1 - \tilde{N}_i)$, permanent immigrants $(\bar{N}_i)$, and temporary migrants $(\tilde{N}_i - \bar{N}_i)$. The distribution of the immigration costs is depicted by Figure 1.3.

Table A below summarizes population shares with respect to migration status within

each educational group.

Table A. Population shares

Educational group	Permanent migrants $(\bar{N}_i)$	Emigrants $(\tilde{N}_i)$
Low	$\left[\frac{1}{a}\left(\frac{\mu^F}{\mu^H}-E\right)\mu^H\right]^{\frac{1}{b}}$	$\left[\frac{1}{a}\left(\frac{\mu^F}{\mu^H}-(2-E)\right)\mu^H\right]^{\frac{1}{b}}$
Middle	$\left[\frac{1}{a}\left(\frac{\mu^F SP_1^F}{\mu^H SP_1^H}-E\right)\mu^H SP_1^H\right]^{\frac{1}{b}}$	$\left[\frac{1}{a}\left(\frac{\mu^F SP_1^F}{\mu^H SP_1^H}-(2-E)\right)\mu^H SP_1^H\right]^{\frac{1}{b}}$
High	$\left[\frac{1}{a}\left(\frac{\mu^F SP_2^F}{\mu^H SP_2^H}-E\right)\mu^H SP_2^H\right]^{\frac{1}{b}}$	$\left[\frac{1}{a}\left(\frac{\mu^F SP_2^F}{\mu^H SP_2^H}-(2-E)\right)\mu^H SP_2^H\right]^{\frac{1}{b}}$

The effective labor force in the home country defined by (10), can be re-written in term of population thresholds:

$$L_i^H = \left[(1-\tilde{N}_i^1)+(1-\tilde{N}_i^2)+E(\tilde{N}_i^2-\bar{N}_i^2)\right]z_i, \tag{18}$$

where $\tilde{N}_i^1$ and $\tilde{N}_i^2$ are the shares of emigrants from young and old generations, and $\bar{N}_i^2$ is the share of permanent immigrants from the old generation.

The equilibrium population shares $\bar{N}_i^*$ and $\tilde{N}_i^*$ are obtained by combining the supply and demand sides of the model. We end up with a system of six equations and six unknowns summarized in the Appendix. However, due to its non-linearity, the system does not yield an explicit analytical solution.

The definition of equilibrium

Given prices $\{W_0^F, W_1^F, W_2^F, W_0^H, W_1^H, W_2^H, E\}$, the exogenous distribution of immigration costs (M), and the exogenous educational composition of a new cohort (z_0, z_1, z_2), the equilibrium is a sequence $\{\tilde{N}_0^*, \tilde{N}_1^*, \tilde{N}_2^*, \bar{N}_0^*, \bar{N}_1^*, \bar{N}_0^*\}$, which partitions the population into three categories with respect to emigration status: permanent migrants, temporary migrants, and the sedentary population, such that no agent can be better off by changing his migration status, and the following holds:

1. $\{\tilde{N}_0^*, \tilde{N}_1^*, \tilde{N}_2^*, \bar{N}_0^*, \bar{N}_1^*, \bar{N}_0^*\}$ solves the individual optimization problem (12)-(15).

2. $\{W_0^H, W_1^H, W_2^H\}$ and $\{W_0^F, W_1^F, W_2^F\}$ solve the firm's optimization problem (3) and (8) in home and foreign countries respectively.

3. Input markets clear: $SP_1^H = \frac{\beta_H L_0^H}{\alpha_H L_1^H}$ and $SP_2^H = \frac{\gamma_H L_0^H}{\alpha_H L_2^H}$, where $L_i^H s$ are defined by equation (18), and the population thresholds $\bar{N}_i, \tilde{N}_i$ are summarized in Table A.

The characterization of equilibrium

Our model does not yield an explicit analytical solution. However, we analyze the return migration rates which we define as fractions of the returned population in the total number of emigrants:

$$RR_i = \frac{\tilde{N}_i - \bar{N}_i}{\tilde{N}_i} = 1 - \frac{\bar{N}_i}{\tilde{N}_i} = 1 - \left[\frac{\frac{\mu^F SP_i^F}{\mu^H SP_i^H} - E}{\frac{\mu^F SP_i^F}{\mu^H SP_i^H} - (2 - E)} \right]^{\frac{1}{b}}, \tag{19}$$

for $i \in \{0, 1, 2\}$. Return rates vary across educational attainments due to the variation in returns to skills in the foreign country relative to returns in the home country. In particular, as the wage gap between the foreign and home countries is closing up with education, the return migration intensifies: $\frac{\partial RR_i}{\partial (SP_i^F / SP_i^H)} < 0$. The return migration rates are also the functions of the skill-invariant experience premium ($\frac{\partial RR_i}{\partial E} > 0$), relative base wages in the foreign and home countries ($\frac{\partial RR_i}{\partial (\mu^F / \mu^H)} < 0$), and parameters of the immigration costs function.

Our model predicts positive selection into return migration. As the wage gap between foreign and home countries declines for higher educational levels, making the wages of skilled labor more competitive in two locations, better educated migrants face more incentives to return.

Next, we consider the educational sorting of emigrants. The emigration rates summarized in the third column in Table A represent the functions of relative returns to schooling in the foreign and destination countries and the home country skill premium. Other determinants of emigration rates such as the experience premium, relative base wage in the foreign and home countries, and parameters of the immigration costs function are

education-invariant. Our model predicts a positive selection into emigration; however, this result is not automatically satisfied. We derive conditions that generate this result in Section 1.8.2 in the Appendix.

Result 1. Predictions of the model

Assume the following:

- The labor mobility is free from policy restrictions.

- Lump-sum immigration costs are constant and equally distributed in all educational groups.

- The experience premium comprises a constant fraction of wage in all educational groups.

- The skill premium in the home country is larger or equal to the skill premium in the foreign country ($SP_i^H \geq SP_i^F$, for $i \in \{0, 1, 2\}$).

- The skill premium in the foreign country relative to the premium in the home county is decreasing with education ($\frac{SP_0^F}{SP_0^H} > \frac{SP_1^F}{SP_1^H} > \frac{SP_2^F}{SP_2^H}$).

- The base wage in the foreign country relative to the home country is sufficiently large:
$$\frac{\mu^F}{\mu^H} > (2 - E)max \left\{ \frac{SP_1^H - 1}{SP_1^F - 1}; \frac{SP_2^H - SP_1^H}{SP_2^F - SP_1^F} \right\}.$$

The model predicts *positive* selection into emigration and *positive* selection into return migration.

The current specification of the model predicts that emigration rates increase with education. As wages increase with educational attainment, emigration becomes more affordable for the highly educated. The immigration costs, which are assumed to be equally distributed across different educational groups, place a heavier burden on migrants

with low education as they comprise a larger fraction of their wage. As a result, the share of the population for which emigration is affordable increases with educational attainment.

An important role in a positive selection of migrants belongs to the difference in base wages between foreign and home countries. We have derived a condition which states that this gap in base wages between the foreign and home countries should be sufficiently large. Our model is based on a rather realistic assumption that returns to skills in the developing origin countries are larger than that in the developed destination country. Moreover, we assume that the wage distribution in the foreign country is more equal in comparison to the home country. Large skill premium paid to highly educated labor in the home country makes wages in this educational group comparable to wage in the foreign country. Therefore, to guarantee a larger share of migrants among the highly skilled, the difference in base wage in two countries should be sufficiently large.

As for return migration, the wage gap between the foreign and home countries becomes smaller with an increase in education. The experience premium which is obtained by skilled migrants upon return makes earnings abroad and at home comparable, thus motivating skilled migrants to return. Low-skilled migrants with the largest wage gap between two locations would have less incentives to return. The current specification of the model yields realistic predictions concerning the selection of the emigrants. However, the U-shaped pattern of the return migration rates remains unexplained.

1.5 The Role of Immigration Policy

The model described in Section 1.4 is built on the assumption of free labor mobility. Below, we relax this assumption and model the impact of the immigration policy of the destination country on the emigration and return decisions of agents. In particular, we consider two variations of the model with lump-sum immigration costs, introducing in turn two sources of uncertainty: uncertain *emigration opportunities* and uncertain *opportunities for status adjustment*. First, we consider the role of the policy at the initial stage of emigration. A limited number of admission categories and annual restrictions on

the number of admissions (quotas or immigration caps) result in an uncertain emigration outcome for those agents who made a decision to emigrate. Thus, as a first modification, we introduce the immigrants acceptance rate p_i, which we assume as increasing with educational attainment $p_0 < p_1 < p_2$.

Second, as an alternative modification, we introduce immigration policy restrictions in the form of uncertain opportunities for a status adjustment in the second period for those migrants who wish to remain abroad permanently. The employment-based adjustment of status is subject to those preference categories which favor migrants with advanced education. We introduce the second-period uncertainty as the status adjustment rate q_i, which is assumed to be increasing in educational attainment of migrants $q_0 < q_1 < q_2$.

1.5.1 Uncertain Emigration Opportunities

The uncertainty of the emigration outcome in the first period does not change the individual optimization problem. Agents decide to emigrate if the net income obtained abroad outweighs the income received at home. Once the individual decision concerning emigration is made, a system of admission quotas is applied randomly to the pool of agents who made the decision to go abroad. The acceptance rates are known to agents at the beginning of the first period and they affect only the number of agents who emigrate ($\tilde{N}_i$). A solution of the individual optimization problem is presented in section 1.8.3 in the Appendix. The immigration costs thresholds, being the solutions of the individual optimization problem, are the same as in the model from Section 1.4. The fact that p_i does not affect the individual optimization problem implies that those agents who are better off migrating would always apply for admission regardless of the size of the acceptance rate.

As the acceptance rate affects the number of agents who actually emigrate, it also affects the number of permanent immigrants as the latter represent a subsample of the emigrating population. Consequently, the impact of p_i on the return migration rates vanishes:

$$RR_i = \frac{p_i \tilde{N}_i - p_i \bar{N}_i}{p_i \tilde{N}_i} = 1 - \frac{\bar{N}_i}{\tilde{N}_i}.$$

Therefore, uncertain emigration opportunities do not affect individual decisions to emigrate and return, as those migrants who benefit from migrating would consider any p_i and would always apply for admission. Moreover, p_i has no effect on the return migration rates, and therefore does not allow us to improve the predictive power of our model.

1.5.2 Uncertain Opportunities for Status Adjustment

Next, we consider the impact of the immigration policy at the second stage of the migration process. We introduce a status adjustment rate q_i, which we assume to be increasing in educational attainment: $q_0 < q_1 < q_2$. The rate is known to agents in the beginning of the first period.

A solution for the individual optimization problem is presented in Section 1.8.3 in the Appendix. Below, we summarize the major predictions of the current specification of the model. The status adjustment rate q_i does not affect the individual decision in the second period concerning permanent immigration. In particular, an individual decides on permanent immigration verses return migration based solely on economic reasoning, and applies for a status adjustment at any value of q_i. However, the status adjustment probability limits the actual number of migrants who are allowed to remain abroad permanently. It is randomly applied to the pool of migrants who have intentions to become permanent immigrants and who apply for a status adjustment.

The first period optimization problem of agents who prefer temporary migration is not affected by the uncertain opportunities for a status adjustment as they intend to return from the beginning. However, for these agents the immigration costs are so low that they are better off emigrating in the first period regardless of the uncertainty of a status adjustment in the second period. Their expected earnings would be higher from emigration, even if they fail to be accepted into permanent immigration, than the earnings they would receive when staying in the home country. Thus, agents with low values of immigration costs would always emigrate in the first period. Consequently, the size of the emigrant population remains unchanged $\tilde{N}_i$.

As the policy affects only the number of permanent immigrants, this effect is reflected in the return migration rates:

$$RR_i = 1 - \frac{q_i \bar{N}_i}{\tilde{N}_i} = 1 - \left[\frac{\frac{\mu^F SP_i^F}{\mu^H SP_i^H} - E}{\frac{\mu^F SP_i^F}{\mu^H SP_i^H} - (2 - E)} \right]^{\frac{1}{b}} \cdot q_i, \tag{20}$$

for $i \in \{0, 1, 2\}$. Under the current specification of the model, the return migration rates are the functions of relative returns to schooling abroad and at home ($\frac{\partial RR_i}{\partial \frac{SP_i^F}{SP_i^H}} < 0$) and status adjustment rates ($\frac{\partial RR_i}{\partial q_i} < 0$). Derivations are presented in Section 1.8.3 in the Appendix. However, relative returns to schooling and the status adjustment rate move in opposite directions with an increase in education. In particular, the status adjustment rate increases with educational attainment , but relative returns to schooling decline. As an outcome, the return migration rates may vary across educational groups in a number of ways.

As a next step, we derive conditions that would allow the model to yield a U-shaped pattern of return migration rates along the educational dimension. Our task is to show that pairs $\{(\frac{SP_0^F}{SP_0^H}, \frac{SP_1^F}{SP_1^H}; \frac{SP_2^F}{SP_2^H}), (q_0, q_1, q_2)\}$ exist, such that $RR_0 > RR_1$ & $RR_2 > RR_0$ for given parameter values. The pair-wise comparison of return rates from different skill groups is presented in section 1.8.3 in the Appendix. We end up with a set of conditions, which are necessary and sufficient for our model to generate the U-shape return migration rates. We summarize these conditions in Result 2 below.

Result 2. Predictions of the model

Assume the following:

- Uncertain opportunities for permanent immigration are modeled in a form of exogenous and skill-specific rate of status adjustment q_i, where $q_i \neq 0$, for $i \in \{0, 1, 2\}$.

- Lump-sum immigration costs are constant and equally distributed in all educational groups.

- The experience premium comprises a constant fraction of wage in all educational groups.

- The skill premium in the home country is larger or equal to the skill premium in the foreign country $(SP_i^H \geq SP_i^F$, for $i \in \{0, 1, 2\})$.

- The skill premium in the foreign country relative to the premium in the home county is decreasing with education $(\frac{SP_0^F}{SP_0^H} > \frac{SP_1^F}{SP_1^H} > \frac{SP_2^F}{SP_2^H})$.

- The base wage in the foreign country relative to the home country is sufficiently large:
$$\frac{\mu^F}{\mu^H} > (2-E) max \left\{ \frac{SP_1^H - 1}{SP_1^F - 1}; \frac{SP_2^H - SP_1^H}{SP_2^F - SP_1^F} \right\}.$$

- The wage gap between the foreign and home countries is large enough that return migration rates are positive at all educational levels: $\frac{W_i^F}{W_i^H} \geq E$.

- The status adjustment probability of the low-educated immigrants relative to that of the middle-educated immigrants is sufficiently low:
$$\frac{q_0}{q_1} < \left(1 - \frac{2(E-1)}{\frac{\mu^F SP_1^F}{\mu^H SP_1^H} - (2-E)} \right)^{\frac{1}{b}} \cdot \left(1 + \frac{2(E-1)}{\frac{\mu^F}{\mu^H} - E} \right)^{\frac{1}{b}}. \tag{21}$$

- The status adjustment probability of the middle-educated immigrants relative to that of the highly educated immigrants is sufficiently high:
$$\frac{q_1}{q_2} > \left(1 - \frac{2(E-1)}{\frac{\mu^F SP_2^F}{\mu^H SP_2^H} - (2-E)} \right)^{\frac{1}{b}} \cdot \left(1 + \frac{2(E-1)}{\frac{\mu^F SP_1^F}{\mu^H SP_1^H} - E} \right)^{\frac{1}{b}}. \tag{22}$$

The model yields *positive* selection into emigration and *U-shaped return migration rates.*

We are not able to derive the restrictions for the individual values of status adjustment rates q_i, but only for their ratios $\frac{q_0}{q_1}$ and $\frac{q_1}{q_2}$. Different combinations of values for these two

ratios result in different selectivity patterns among return migrants. The threshold values of ratios obtained from (21)-(22) divide the ratio space into four regions as depicted in Figure 1.4. The return migration rates follow a U-shape in the region where, in relative terms, the ratios $\frac{q_0}{q_1}$ and $\frac{q_1}{q_2}$ significantly differ in magnitude. In particular, this is the region where the status adjustment rate of migrants with secondary education is close enough to the rate for the highly educated migrants and, at the same time, significantly larger than the status adjustment rate for the low-educated migrants. These imply that the immigration policy of the destination country is especially restrictive toward low-educated migrants, and these restrictions are relaxed for higher levels of educational attainment.

The model's predictions concerning the selection into the initial emigration remain the same as in Section 1.4, because the emigration rates are not affected by the size of the status adjustment rate in the second period. Therefore, the current specification of the model generates a positive selection into emigration, imposing restriction on the value of the relative base wage in the foreign and home countries, which is required to be large enough to offset a smaller skill premium abroad than in the home country.

1.6 Explaining the U-shape

The final specification of the model presented in Section 1.5.2 reveals two forces – a wage differential between foreign and home countries and the immigration policy restrictions – that drive the differences in return migration rates in three educational groups. Wages in the advanced foreign country are assumed to be larger than in the home country for all educational attainments, in order to create incentives for the population in every educational group to emigrate. However, the distribution of wages in the origin country is assumed to be more unequal and characterized by a substantial skill premium paid to the tertiary-educated, who comprise a relatively scarce population group. On the contrary, the wage distribution in the foreign country is modeled as less unequal compared to the home country.

Larger returns to education in the home country should discourage emigration of

skilled workers, as the wage gap between two locations shrinks with education. Moreover, a relatively larger wage gap in the group of the low-skilled labor compared to other groups that exists between two countries, would stimulate larger emigration rates among the unskilled. However, a positive selection of migrants in the first stage of the migration process can still be generated by the model, conditional on the difference in base wages in two locations being sufficiently large. In this case, despite a larger skill premium in the home country, the wage differential in the group of highly skilled labor is large enough to yield a larger share of the skilled population which can afford to cover the lump-sum immigration costs compared to other educational groups.

As the cross-country wage gap is assumed to be declining with education, the home country wage of the skilled returnees after receiving the experience premium becomes comparable to the wage obtained abroad. As we have assumed earlier, in the case of equal earnings, the home country population strongly prefers residence in the home country. Thus, a shrinking wage differential between the foreign and home countries creates more incentives for the low-educated labor to remain abroad and for the highly educated labor to return.

The immigration policy restrictions with respect to the status adjustment in the second stage of migration process affect only the return migration decision. The status adjustment probabilities differ depending on the level of educational attainment of immigrants, being more restrictive in the case of low skilled. Thus, skilled migrants face better opportunities for the status adjustment from the temporary to permanent residence being eligible for more admission categories. The size of admission quotas increases with education, placing stricter constraints for the low educated.

The two forces described above, when combined together, act in opposite directions, creating different incentives and providing different opportunities in three educational groups. In particular, low-educated agents have the strongest incentives to migrate and remain abroad permanently, as the wage differential between the foreign and home countries in this group is the largest compared to other educational groups. Among them,

those agents who manage to emigrate in the first period have incentives to remain abroad permanently, as the experience premium offered upon return represents a smaller improvement of wages compared to the net gains from immigration. Only those migrants with a high value of immigration costs would return. However, the opportunities for a status adjustment in the low-skilled group are restricted. The temporary nature of occupations for which low-educated migrants qualify, for example construction or agriculture, does not allow them to apply for status adjustment under the employment sponsorship petition, which requires a long-term employment contract. Consequently, the low-educated migrants, in order to remain abroad, either adjust their status through family sponsorship, as the nearest relatives of US citizens or legal immigrants, or remain illegally by overstaying their temporary admissions. Those migrants who do not have relatives in the destination country and do not want to remain illegally engage in a "yo-yo" migration pattern, reaping the benefits from repeated migration incidents (OECD, 2009). Therefore, low-educated migrants have incentives to remain abroad, yet their opportunities for permanent immigration are heavily restricted by the immigration policy, resulting in sizable return rates among them.

Substantial emigration among the skilled labor is explained by the relative "inexpensiveness" of immigration costs, as higher wages paid at this educational level make the immigration costs easily affordable. However, higher returns to schooling in the home country, combined with the experience premium received upon return, make the wages of skilled returnees competitive with the wages in the destination country. Therefore, this educational group does not have incentives to remain abroad permanently. Moreover, the evidence shows that highly educated migrants face discrimination and prejudice in the destination countries (Massey & Sanchez, 2010). With respect to opportunities for permanent immigration, migrants with an advanced education are welcomed by the quality-selective immigration policies of destination countries.

Compared to other educational groups, migrants with a middle level of education possess both the incentives and the opportunities for permanent immigration. In terms of

initial emigration, the middle-skilled agents hold an intermediate position compared to other educational groups. Higher wages relative to the low-educated allow more middle-educated agents to afford paying the immigration costs, resulting in a more sizable emigration among them. At the second stage of the migration process, middle-educated migrants turn out to have more opportunities to remain abroad permanently than low-educated migrants, and at the same time more incentives for permanent immigration compared to the highly educated. The occupational specifics of jobs in this educational group are characterized by more permanent employment contracts compared to the temporary occupations of the low-educated, which allows the middle-educated migrants to apply for status adjustment on the basis of employment sponsorship and not only to rely on family sponsorship as in the case of the low-educated. In a situation when the status adjustment opportunities available for the middle-educated migrants are sufficiently close to that available for the highly skilled immigrants, but at the same time are substantially larger than the status adjustment rates available for the low skilled, our model generates the U-shaped return pattern with respect to educational attainment. Statistical evidence for the U.S. reveals that the highest naturalization rates are observed in particular among migrants with only a secondary education compared to other educational groups (Massey & Sanchez, 2010).

1.7 Conclusion

This paper presents a theoretical analysis of the educational selectivity of return migration and attempts to explain the U-shaped return migration rates observed in the data. We develop an OLG model and introduce additional determinants of the migration decision. The U-shaped pattern results from a combination of two forces: a sizable wage differential between the foreign and home countries declining with education (incentives) and uncertain opportunities for status adjustment to permanent residence (opportunities). Low-educated migrants have the strongest incentives to emigrate and remain abroad permanently, but they lack opportunities to stay abroad on a legal basis. Highly educated

migrants have opportunities, but they lack the incentives. The combination of the two forces in the case of migrants with secondary education results in both incentives and opportunities available in this group for permanent immigration on a legal basis.

The model can be extended in several ways. In particular, instead of the exogenous educational structure of each new cohort, schooling decisions of agents could be considered, which would depend on migration opportunities available in each educational group. In addition, the experience premium variation across educational attainments could be considered. An empirical assessment of the experience premium among Irish return migrants undertaken by Barrett & Goggin (2010) reveals a U-shaped pattern of the experience premium with respect to three educational groups. This implies that variation in the experience premium across educational attainments may potentially contribute to the explanation for the U-shaped return migration rates.

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1.8 Appendix

1.8.1 Multiplicative Immigration Costs

The individual optimization problem

$$maxU_i = W_i^1 + W_i^2, \tag{23}$$

s.t. the constraints that depend on the location choice:

First period earnings

- Agent j with educational attainment i lives in the home country

$$W_i^1 = W_i^H. \tag{24}$$

  If a person does not migrate in the first period of life, wages in the second period are equal to the first period earnings.

- Agent j with educational attainment i lives in the foreign country

$$W_i^1 = \frac{W_i^F}{M_{ij}}. \tag{25}$$

Second period earnings

- Agent j with educational attainment i returns to the home country

$$W_i^2 = W_i^H E. \tag{26}$$

The individual optimization problem is solved backwards.

<u>Second period</u>: Return migration vs. Permanent immigration

Return migration takes place when:

$$\frac{W_i^F}{M_{ij}} \leq W_i^H E,$$

hence

$$M_{ij} \geq \frac{W_i^F}{W_i^H E}.$$

The threshold value of the immigration costs: $\bar{M}_i = \frac{W_i^F}{W_i^H E}$.

First period: Initial emigration decision

Agent j with educational attainment i will emigrate in the first period of life when:

$$\frac{W_i^F}{M_{ij}} + W_i^H E > 2W_i^H,$$

hence

$$M_{ij} < \frac{W_i^F}{(2-E)W_i^H}.$$

The threshold value of the immigration costs is: $\tilde{M}_i = \frac{W_i^F}{(2-E)W_i^H}$, where $E \in (1,2)$.

The immigration costs thresholds partition the population in each educational group i into three categories with respect to migration status. The costs thresholds are mapped into the population shares in the following manner:

- **Low-educated migrants**

$$\bar{N}_0 = \left[\frac{\mu^F}{aE\mu^H} \right]^{\frac{1}{b}}, \tag{27}$$

$$\tilde{N}_0 = \left[\frac{\mu^F}{a(2-E)\mu^H} \right]^{\frac{1}{b}}. \tag{28}$$

- **Middle-educated migrants**

$$\bar{N}_1 = \left[\frac{\mu^F SP_1^F}{aE\mu^H SP_1^H} \right]^{\frac{1}{b}}, \tag{29}$$

$$\tilde{N}_1 = \left[\frac{\mu^F SP_1^F}{a(2-E)\mu^H SP_1^H} \right]^{\frac{1}{b}}. \tag{30}$$

- **Highly educated migrants**

$$\bar{N}_2 = \left[\frac{\mu^F SP_2^F}{aE\mu^H SP_2^H} \right]^{\frac{1}{b}}, \tag{31}$$

$$\tilde{N}_2 = \left[\frac{\mu^F SP_2^F}{a(2-E)\mu^H SP_2^H} \right]^{\frac{1}{b}}. \tag{32}$$

The equilibrium population shares are obtained from combining the demand (firms' optimization problem) and supply (individual optimization problem) sides of the labor market.

Demand side: Returns to schooling

$$SP_1^H = \frac{W_1^H}{W_0^H} = \frac{\beta_H L_0^H}{\alpha_H L_1^H}, \tag{33}$$

$$SP_2^H = \frac{W_2^H}{W_0^H} = \frac{\gamma_H L_0^H}{\alpha_H L_2^H}. \tag{34}$$

We can re-write the home country base wage and the skill premium in terms of population shares:

$$\mu_H = \alpha_H A^H ([2(1-\tilde{N}_0)+E(\tilde{N}_0-\bar{N}_0)]z_0)^{\alpha-1}([2(1-\tilde{N}_1)+E(\tilde{N}_1-\bar{N}_1)]z_1)^{\beta}([2(1-\tilde{N}_2)+E(\tilde{N}_2-\bar{N}_2)]z_2)^{\gamma}, \tag{35}$$

$$SP_1^H = \frac{\beta_H [2(1-\tilde{N}_0)+E(\tilde{N}_0-\bar{N}_0)]z_0}{\alpha_H [2(1-\tilde{N}_1)+E(\tilde{N}_1-\bar{N}_1)]z_1}, \tag{36}$$

$$SP_2^H = \frac{\gamma_H [2(1-\tilde{N}_0)+E(\tilde{N}_0-\bar{N}_0)]z_0}{\alpha_H [2(1-\tilde{N}_2)+E(\tilde{N}_2-\bar{N}_2)]z_2}. \tag{37}$$

Substituting these expressions into equations (27)-(32), we end up with a system of six equations and six unknowns. The solution of the system consists of $\{\bar{N}_0^*, \tilde{N}_0^*, \bar{N}_1^*, \tilde{N}_1^*, \bar{N}_2^*, \tilde{N}_2^*\}$. However, due to the non-linearity of equations, the solution cannot be derived analytically.

Return migration rates

$$RR_i = \frac{\tilde{N}_i - \bar{N}_i}{\tilde{N}_i} = 1 - \frac{\bar{N}_i}{\tilde{N}_i} = 1 - \left[\frac{2-E}{E} \right]^{\frac{1}{b}} \tag{38}$$

The return migration rates represent the functions of the experience premium (E) and the parameter b of the immigration costs function. Both parameters are invariant with

respect to education implying that return migration rates are constant across educational groups (neutral selection).

As for the *selection into emigration*, the emigration rates $\tilde{N}_i$ are the function of relative base wages and relative returns to schooling in the foreign and home countries, the experience premium, and the parameters a and b of the immigration costs functions. All these determinants except relative returns to schooling are education invariant.

Result. Predictions of the model

Assume the following:

- Labor mobility is free from policy restrictions.

- The multiplicative immigration costs are constant and equally distributed in all educational groups.

- The experience premium comprises a constant fraction of wage in all educational groups.

- The skill premium in the home country is larger or equal to the skill premium in the foreign country ($SP_i^H \geq SP_i^F$, for $i \in \{0, 1, 2\}$).

- The skill premium in the foreign country relative to the skill premium in the home country is decreasing with education: ($\frac{SP_0^F}{SP_0^H} > \frac{SP_1^F}{SP_1^H} > \frac{SP_2^F}{SP_2^H}$).

The model predicts *negative* selection into emigration and *equal* return migration rates, thus neutral selection into return migration.

The predictions of the current specification of the model about emigration and return migration patterns are quite unrealistic. The immigration costs comprise an equal fraction of wages in all educational groups and they cannot account for the difference in migration patterns across educational groups. The only driving force behind migration decisions of agents is the wage gap that exists between foreign and home countries at each educational

level. We have assumed, based on the statistical evidence from Section 1.3, that the largest wage differential exists in the group of low-skilled labor. For higher educational levels, wages in two locations are more comparable. The decision about return migration is driven only by the experience premium, which is modeled as education-invariant, thus resulting in neutral selection of return migrants.

As a possible modification of this model, we relaxed the assumption about the equal distribution of immigration costs across educational groups. In particular, we assumed that the value of parameter a in cost functions (16) and (17) varies with education, such that $a_0 > a_1 > a_2$, implying a higher value of immigration costs for low-educated agents. However, this modification did not affect the return rates.

1.8.2 Lump-sum Immigration Costs

Individual optimization problem

Second period: Permanent immigration vs. Return migration

Return migration (conditional on emigration in the previous period) takes place when:

$$W_i^H E \geq W_i^F - M_{ij}.$$

Migrants with small values of the immigration costs ($M_{ij} < W_i^F - W_i^H E$) remain in the foreign country in the second period. The costs threshold for the permanent immigration is:

$$\bar{M}_i = W_i^F - W_i^H E.$$

First period: The Initial emigration decision

Agent j with educational attainment i and immigration costs smaller than $\bar{M}_i$ would emigrate on a permanent basis. Agents with a larger or equal value of immigration costs than the threshold $\bar{M}_i$ value would consider only temporary immigration. Temporary

migration would take place, if:

$$W_i^F - M_{ij} + W_i^H E > 2W_i^H,$$

hence

$$M_{ij} < W_i^F - (2 - E)W_i^H.$$

The threshold value of the immigration costs for the initial emigration decision is equal to:

$$\tilde{M}_i = W_i^F - (2 - E)W_i^H.$$

Agents with immigration costs smaller than the threshold value would emigrate, while agents with high values of immigration costs would never emigrate.

Population shares

$$\tilde{N}_0 = \left[\frac{1}{a} \left(\frac{\mu^F}{\mu^H} - (2 - E) \right) \mu^H \right]^{\frac{1}{b}} \tag{39}$$

$$\bar{N}_0 = \left[\frac{1}{a} \left(\frac{\mu^F}{\mu^H} - E \right) \mu^H \right]^{\frac{1}{b}} \tag{40}$$

$$\tilde{N}_1 = \left[\frac{1}{a} \left(\frac{\mu^F SP_1^F}{\mu^H SP_1^H} - (2 - E) \right) \mu^H SP_1^H \right]^{\frac{1}{b}} \tag{41}$$

$$\bar{N}_1 = \left[\frac{1}{a} \left(\frac{\mu^F SP_1^F}{\mu^H SP_1^H} - E \right) \mu^H SP_1^H \right]^{\frac{1}{b}} \tag{42}$$

$$\tilde{N}_2 = \left[\frac{1}{a} \left(\frac{\mu^F SP_2^F}{\mu^H SP_2^H} - (2 - E) \right) \mu^H SP_2^H \right]^{\frac{1}{b}} \tag{43}$$

$$\bar{N}_2 = \left[\frac{1}{a} \left(\frac{\mu^F SP_2^F}{\mu^H SP_2^H} - E \right) \mu^H SP_2^H \right]^{\frac{1}{b}} \tag{44}$$

Return migration rates

Low-educated

$$RR_0 = 1 - \left[\frac{\frac{\mu^F}{\mu^H} - E}{\frac{\mu^F}{\mu^H} - (2 - E)} \right]^{\frac{1}{b}}, \tag{45}$$

Middle-educated

$$RR_1 = 1 - \left[\frac{\frac{\mu^F SP_1^F}{\mu^H SP_1^H} - E}{\frac{\mu^F SP_1^F}{\mu^H SP_1^H} - (2 - E)} \right]^{\frac{1}{b}}, \tag{46}$$

Highly educated

$$RR_2 = 1 - \left[\frac{\frac{\mu^F SP_2^F}{\mu^H SP_2^H} - E}{\frac{\mu^F SP_2^F}{\mu^H SP_2^H} - (2 - E)} \right]^{\frac{1}{b}}. \tag{47}$$

Conditions for a positive selection

Using expressions for the emigration rates $\{\tilde{N}_0, \tilde{N}_1, \tilde{N}_2\}$ from (39), (41), and (43), and a set of the model's assumptions: $SP_i^H \geq SP_i^F$ and $\frac{SP_0^F}{SP_0^H} > \frac{SP_1^F}{SP_1^H} > \frac{SP_2^F}{SP_2^H}$, a positive selection into emigration can be described by two conditions:

$$\frac{\tilde{N}_1}{\tilde{N}_0} > 1 \ \& \ \frac{\tilde{N}_2}{\tilde{N}_1} > 1.$$

These conditions are satisfied if:

$$\frac{\mu^F}{\mu^H} > \frac{SP_1^H - 1}{SP_1^F - 1} \cdot (2 - E), \tag{48}$$

and

$$\frac{\mu^F}{\mu^H} > \frac{SP_2^H - SP_1^H}{SP_2^F - SP_1^F} \cdot (2 - E). \tag{49}$$

Combining (48) and (49), we obtain the following restriction for the value of the base wage in the foreign country relative to that in the home country:

$$\frac{\mu^F}{\mu^H} > (2 - E) max \left\{ \frac{SP_1^H - 1}{SP_1^F - 1}; \frac{SP_2^H - SP_1^H}{SP_2^F - SP_1^F} \right\}.$$

This restriction implies that a positive selection of migrants with respect to education takes place when the cross-country gap in base wages is sufficiently large.

1.8.3 Policy Impact

Uncertain emigration opportunities

<u>Second period</u>. Individual optimization problem: Return migration vs. Permanent immigration. Conditional on having emigrated during the first period of life, a person decides to remain abroad permanently when:

$$W_i^F - M_{ij} > EW_i^H,$$

hence
$$M_{ij} < W_i^F - EW_i^H.$$

The immigration costs threshold is: $\bar{M}_i = W_i^F - EW_i^H$.

<u>First period</u>: Emigration decision. Agent j with educational attainment i emigrates in the first period of life if:

$$p_i[(W_i^F - M_{ij}) + EW_i^H] + (1 - p_i)[W_i^H + W_i^H] > 2W_i^H,$$

hence
$$M_{ij} < W_i^F - (2 - E)W_i^H.$$

The immigration costs threshold $\tilde{M}_i = W_i^F - (2 - E)W_i^H$ is not affected by the acceptance rate. However, the number of agents who actually emigrate and remain abroad permanently is determined by the immigration policy and are equal to $p_i\tilde{N}_i$ and $p_i\bar{N}_i$ respectively. The migration policy has no effect on return migration rates:

$$RR_i = 1 - \frac{p_i\bar{N}_i}{p_i\tilde{N}_i} = 1 - \frac{\bar{N}_i}{\tilde{N}_i}.$$

Uncertain opportunities for permanent immigration

<u>Second period</u>. Individual optimization problem: Return migration vs. Permanent immigration. Conditional on having emigrated during the first period of life, a person remains abroad permanently if:

$$q_i(W_i^F - M_{ij}) + (1 - q_i)EW_i^H > EW_i^H,$$

hence

$$M_{ij} < W_i^F - EW_i^H.$$

Permanent immigration threshold in terms of the immigration costs is: $\bar{M}_i = W_i^F - EW_i^H$. The total number of permanent immigrants in every educational group i is equal to $q_i \bar{N}_i$.

<u>First period</u>. The emigration decision of *temporary* emigrants is not affected by the status adjustment rate. Emigration takes place if:

$$W_i^F - M_{ij} + EW_i^H > 2W_i^H.$$

The emigration threshold is $\tilde{M}_i = W_i^F - (2 - E)W_i^H$.

The emigration decision of *permanent* immigrants is:

$$W_i^F - M_{ij} + q_i(W_i^F - M_{ij}) + (1 - q_i)EW_i^H > 2W_i^H.$$

The immigration costs threshold for the case of permanent immigrants is:

$$\tilde{M}_i' = W_i^F - \frac{2 - (1 - q_i)E}{1 + q_i}W_i^H.$$

As $\bar{M}_i < \tilde{M}_i' < \tilde{M}_i$, the immigration costs threshold in the first period remains $\tilde{M}_i$.

Return migration rates are defined in the following way:

$$RR_i = 1 - \frac{q_i \bar{N}_i}{\tilde{N}_i} = 1 - \left[\frac{\frac{\mu^F SP_i^F}{\mu^H SP_i^H} - E}{\frac{\mu^F SP_i^F}{\mu^H SP_i^H} - (2 - E)} \right]^{\frac{1}{b}} \cdot q_i.$$

The return rates are not defined if $\frac{\mu^F SP_i^F}{\mu^H SP_i^H} = 2 - E$. However, the left-hand side of this expression is greater than 1, as the foreign wage is larger than the home country wage in all skill groups. The right-hand side of this equation is a non-negative number between 0 and 1, as we have earlier assumed that $E > 1$. Thus, this condition is not relevant under the initial assumptions of the model. Moreover, return migration rates are not defined if the expression in the brackets is negative. In order to eliminate such a possibility, we

impose the following restriction:

$$\frac{\mu^F SP_i^F}{\mu^H SP_i^H} \geq E.$$

First-order partial derivatives

$$\frac{\partial RR_i}{\partial \frac{SP_i^F}{SP_i^H}} = -\frac{2q_i\mu^F}{b\mu^H} \left(1 - \frac{2(E-1)}{\frac{\mu^F SP_i^F}{\mu^H SP_i^H} - (2-E)}\right)^{\frac{1-b}{b}} \frac{E-1}{\left(\frac{\mu^F SP_i^F}{\mu^H SP_i^H} - (2-E)\right)^2} < 0,$$

$$\frac{\partial RR_i}{\partial q_i} = -\left(1 - \frac{2(E-1)}{\frac{\mu^F SP_i^F}{\mu^H SP_i^H} - (2-E)}\right)^{\frac{1}{b}} < 0.$$

Partial derivatives of return migration rates are continuous and negative under the assumptions of the model.

Conditions for the U-shaped return migration rates

The U-shape return pattern with respect to educational attainment of migrants can be described by the following conditions:

$$RR_0 > RR_1 \ \& \ RR_2 > RR_1.$$

We proceed by a pair-wise comparison of return migration rates from different educational groups.

1) *Low-educated* vs. *Middle-educated* return migrants

Given the following expressions for return migration rates derived above:

$$RR_0 = 1 - \left[\frac{\frac{\mu^F}{\mu^H} - E}{\frac{\mu^F}{\mu^H} - (2-E)}\right]^{\frac{1}{b}} \cdot q_0 \,,$$

$$RR_1 = 1 - \left[\frac{\frac{\mu^F SP_1^F}{\mu^H SP_1^H} - E}{\frac{\mu^F SP_1^F}{\mu^H SP_1^H} - (2-E)}\right]^{\frac{1}{b}} \cdot q_1,$$

and the following assumptions of the model: $W_i^F > W_i^H$, $\frac{SP_1^F}{SP_1^H} < 1$, and $\frac{\mu^F SP_i^F}{\mu^H SP_i^H} \geq E$, $RR_0 > RR_1$ if:

$$\frac{q_0}{q_1} < \left[\frac{\frac{\mu^F SP_1^F}{\mu^H SP_1^H} - E}{\frac{\mu^F SP_1^F}{\mu^H SP_1^H} - (2 - E)} \right]^{\frac{1}{b}} \div \left[\frac{\frac{\mu^F}{\mu^H} - E}{\frac{\mu^F}{\mu^H} - (2 - E)} \right]^{\frac{1}{b}} , \quad q_1 \neq 0.$$

The right-hand side of the inequality generates a value smaller than 1. Thus, the status adjustment probability in the case of low-educated immigrants is significantly larger than the probability of status adjustment of the middle-educated immigrants.

2) *Middle-educated* vs. *Highly educated* return migrants

Given the following expressions for return migration rates derived above:

$$RR_1 = 1 - \left[\frac{\frac{\mu^F SP_1^F}{\mu^H SP_1^H} - E}{\frac{\mu^F SP_1^F}{\mu^H SP_1^H} - (2 - E)} \right]^{\frac{1}{b}} \cdot q_1,$$

$$RR_2 = 1 - \left[\frac{\frac{\mu^F SP_2^F}{\mu^H SP_2^H} - E}{\frac{\mu^F SP_2^F}{\mu^H SP_2^H} - (2 - E)} \right]^{\frac{1}{b}} \cdot q_2,$$

and the following assumptions of the model: $W_i^F > W_i^H$, $\frac{SP_1^F}{SP_1^H} > \frac{SP_2^F}{SP_2^H}$, and $\frac{\mu^F SP_i^F}{\mu^H SP_i^H} \geq E$, $RR_2 > RR_1$, if the following conditions hold:

$$\frac{q_1}{q_2} > \left[\frac{\frac{\mu^F SP_2^F}{\mu^H SP_2^H} - E}{\frac{\mu^F SP_2^F}{\mu^H SP_2^H} - (2 - E)} \right]^{\frac{1}{b}} \div \left[\frac{\frac{\mu^F SP_1^F}{\mu^H SP_1^H} - E}{\frac{\mu^F SP_1^F}{\mu^H SP_1^H} - (2 - E)} \right]^{\frac{1}{b}} , \quad q_2 \neq 0.$$

This inequality implies that the probability of status adjustment for the middle-educated immigrants is close enough to that of the highly educated immigrants.

Chapter 2

Is Temporary Migration a Profitable "Investment" for All? The Case of Vietnam[*]

Using the survey data for Vietnam, we estimate the difference in earnings of return migrants and the comparable sedentary population controlling for possible self-selection of migrants. In particular, we are interested in the variation of the earnings' differentials across educational attainments. We estimate a positive experience premium as high as 28 % on average. Migrants are positively selected with respect to observable characteristics, and we find no significant evidence for selection on unobservables. The difference in earnings of return migrants and the sedentary population varies with education, being the largest for migrants with tertiary education. With respect to gender, female returnees receive the highest pay-off from migration. Incorporating the data on absent migrants, we estimate a double-fold migration decision which consists of emigration and return migration stages.

2.1 Introduction

Temporary migration represents the dominant pattern of international labor mobility with major re-emigration taking place within the first five years after the resettlement and sharply declining afterward (Borjas & Bratsberg, 1996; Dustmann & Weiss, 2007; OECD, 2009). Despite a significant research effort, many aspects of return migration remain puzzling. Among them is the motivation behind return decisions of migrants. A growing number of surveys conducted among the returning population in countries of origin yield surprising findings with respect to reasons behind returning. In particular, returnees in the first place mention personal and family circumstances as the principal motive for return. Restrictive immigration policies of destination countries are in second place followed by homesickness or disappointment in life abroad. The economic motives such as improved earning' prospects in the country of origin due to temporary migration, which play an important role in the theoretical modeling of migration processes, are mentioned rarely (Table 2.1).

Studies show that many return migrants (except seasonal migrants), rarely undertake another emigration attempt, mostly due to the discrimination and hardship experienced while living abroad (OECD, 2009). This leads to another important aspect of return migration analysis, i.e. the re-integration of returnees into the context of the origin country and, in particular, to the domestic labor market. The evidence concerning the success of such re-integration is mixed and origin specific.

Foreign work experience, especially in the economically advanced destinations, in theory, allows migrants to accumulate human and social capital, which is otherwise impossible to obtain without additional schooling in the country of origin. If this is the case, the improved productivity of return migrants should be reflected in their earnings and competitiveness in the labor market upon return. Thus, temporary migration can be viewed as an investment into productivity improvement. Highly skilled migrants are believed to have more opportunities for human capital accumulation at their destination compared to manual unskilled workers. Moreover, developed destinations with advanced technologies

and more effective approaches to work offer more possibilities for human capital accumulation compared to less developed host countries.

Several studies provide evidence for the disadvantageous position of return migrants in the home labor market relative to the non-immigrant population. It is explained by the loss of home-specific human and social capital in the case of longer emigration spells, loss of qualifications due to job downgrading (brain waste) experienced abroad, and by the overall negative attitude in society toward return migration, which is perceived as a signal of failure in the destination country (Kuyper, 2008).

The major objective of our study is to assess the relative performance of return migrants in the labor market of the country of origin using the example of Vietnam. In particular, we attempt to quantify the *experience premium*, which stands for the difference in earnings between return migrants and the comparable sedentary population due to the migration experience only. Further, we analyze the variation of this premium across different socio-economic characteristics and, in particular, across educational attainments.

A wider definition of the experience premium attributes the improvement of earnings of return migrants to a higher propensity of returnees to engage in entrepreneurial activities upon return, a longer job-search for better offers, the improvement of self-esteem, and a higher social status of return migrants that allows them to apply for high-end jobs, for which they do not exactly qualify (Hazans, 2008; Epstein & Radu, 2007) .

The concept of the experience premium was first introduced in the theoretical migration literature (Borjas & Bratsberg, 1996). The premium is considered as an important driving force behind emigration and return decisions, affecting predictions of the theoretical models concerning the patterns of migrants' selection with respect to skills. The experience premium is modeled as an exogenous and constant function of earnings for all skill groups; thus, it increases in absolute value with education. Our study attempts to find the empirical justification for this assumption and shed light on the role of the experience premium in the return decisions of migrants.

Vietnam represents a relevant and interesting case for the analysis of the experience

premium. Historically, migration was on a temporary basis, taking place under bilateral agreements with destination countries and included a compulsory return clause. Thus, with substantial numbers of migrants eventually returning, Vietnam is a good testing ground for the human capital accumulation hypothesis in the process of temporary migration. In our study, we use the data collected by the Institute of Public Policy Research (IPPR), London in cooperation with the Global Development Network (GDN) in the framework of the Development on the Move Project (DotM) during 2008-2010.

Our study contributes to the existing scope of the literature in the following ways. First, we reveal the existence of a positive experience premium for return migrants in Vietnam and its U-shaped variation across educational attainments. Second, at estimation, we take into account the double-fold nature of the migration process, which consists of two stages: initial emigration and consequent return.

Our analysis has several important implications. Vietnam is an example of a country where the government tries to solve the problem of unemployment and a rapidly growing labor force by means of labor export. In a situation where a substantial number of migrants eventually return, it is important to assess the consequences of such a policy for migrants. Moreover, if return migrants are found to benefit from a temporary foreign work experience, the Vietnamese government can use this finding as important evidential support when developing return migration incentive programs that aim to attract human capital back into the country, in particular, the most skilled members of the overseas diaspora.

The rest of the paper is organized as follows. The next section briefly describes migration patterns in Vietnam. Then, the literature review section outlines major findings of the existing empirical studies of the experience premium. After that, we discuss the estimation strategy, which allows us to obtain consistent and unbiased estimates of the experience premium. Then, we proceed to the data description and estimation results of alternative specifications of the model. In the final section, we summarize our findings and draw conclusions.

2.2 Migration Context of Vietnam

Vietnam is characterized by substantial migration flows, both internal and international. It is a densely populated country with a relatively young and rapidly growing labor force. Resettlement within the country and labor export to foreign countries have been the long-standing government strategies for coping with unemployment.

Internal migration in Vietnam is a survival strategy for households in the Northern and Central Coastal regions — the poorest and most unproductive areas characterized by the scarcity of land, its uneven suitability for agriculture, and climate hazard (Ahn, Tacoli & Thanh, 2003). Internal migration is directed to the major rice-growing areas of the Mekong Delta River and Read Delta River, and two major cities — Ho Chi Minh and Hanoi. Migrants, as a rule, are the heads of rural households, those without land and with a large number of children. Though it is a strong moral obligation of a male to migrate for work, women often engage in migration to help their husband to build an economically stable household (Locke, Nguyen & Nguyen, 2012). Internal migration is mostly temporary, and long spells of family separation or emigration of spouses to different locations are considered as indicators of failed migration experience.

In contrast, international migration is not affordable for the poorest households as it is associated with substantial costs and efforts. Traditionally, international migration was closely regulated by the government and it took place within bilateral agreements with partner countries of Eastern Europe and the Soviet bloc. Recent migration flows are freed of strict governmental control and they are characterized by new destinations. Today, more Vietnamese migrants prefer the East-Asian countries such as Taiwan, Japan, South Korea, and Malaysia, as well as the oil-rich Gulf countries. The state labor-export programs are still in use; however, major migration takes place through the intermediary agencies or with the help of relatives settled in destination countries.

International migration is a costly process that involves borrowing substantial sums of money either from relatives or intermediary agencies (Kuyper, 2008). The average costs of emigration are as high as $5000-$6000. These include employment placement, language

training before departure, documentation, transportation, and a large deposit paid to the intermediary agencies as a guarantee of the fulfillment of the contract's obligations. The costs vary with destinations, among which the most expensive, but at the same time the most desirable and profitable destination, is Japan (Ishizuka, 2013).

A pre-arranged employment contracts includes a compulsory return clause, which is often violated by contract deserters, who upon arrival to the destination, change places of employment and overstay their visas. High emigration costs require longer migration periods in order to cover the initial costs and, in addition, to accumulate savings while regularly remitting home during the entire duration of the foreign stay.

International migrants from Vietnam can be classified into several categories. The first group includes highly skilled professionals who leave under government agreements with destination countries or go to the foreign subsidiaries of domestic companies. These migrants, as a rule, are obliged to return at the end of their contracts, and they are absorbed by such sectors as research institutes, state administration, business, and services. The duration of their foreign stays is relatively short. Such migrants are sent for the purpose of human capital accumulation to advanced destination countries.

The second group of migrants is the most sizable. It includes less-skilled individuals who emigrate with the help of intermediary agencies. This category of migrants is characterized by longer duration of emigration spells, which is necessary to cover substantial resettlement costs. The major motivation for emigration is economic, such as improvement of the household well-being and elimination of budget constraints in the face of significant household's events: weddings, education of children, or treatment of sick family members, as well as purchases of land and business start-ups (Chan & Tran, 2011).

Another sizable stream of migrants is comprised of women migrating for marriage purposes to the neighboring countries in the region. It is a special form of economically motivated emigration, as brides remit to their parents. This type of migration is typical for households with female children. The major markets for Vietnamese brides are Malaysia and Taiwan. The geographical source of this type of emigration is very specific –

rural areas of the Mekong Delta River. We do not consider this type of migration in our analysis; however, it is an interesting field for further investigation on its own.

A substantial number of people emigrate for educational purposes. Education is highly valued and respected in Vietnam, and it primarily determines the social status of a person rather than wealth or material possessions. Acquisition of foreign education opens the doors of big corporations, providing returnees with a desirable wage employment, which is considered as the most stable and rewarding. Wage employees have fewer incentives for emigration and a household with more than one wage earner is considered as a well-off family. For the purpose of our study we do not consider this type of migration as it may bias the true effect of temporary migration on earnings.

The types of migration outlined above are temporary in their nature and lead to return upon completion of a contract or end of studies. Resettlement on a permanent basis takes the form of family reallocation, rather than individual moves, and very often is directed to destinations where other relatives are settled. Prolonged periods of separation of spouses and their children are not acceptable in the highly traditional society of Vietnam. Children's responsibility for parents precludes them from emigration on a permanent basis, being especially relevant for the case of elder sons, who traditionally remain in the parents' house and play the role of primary earners in the family (Locke, Nguyen & Nguyen, 2012). Moreover, international migration will be unlikely if there are no other earners who remain in the household during the period of emigration of another household member.[7]

International migration of women for employment purposes takes place at later stages of their lives, as a rule, after children are grown up and their primary roles of mothers and keepers of a household are fulfilled. Younger females usually do not engage in international migration both for security reasons and the necessity of fulfillment of their social roles of a wife and a mother. However, younger females increasingly engage in internal migration, being pulled to the cities by the demand from export-oriented and female-intensive manufacturing sectors such as clothing, footwear, and electronics

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[7]Information obtained from the author's interview with members of the Vietnamese diaspora in Prague, the Czech Republic.

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(Fukase, 2013). Overall, Vietnamese society is distinguished by its negative attitude toward individual emigration of women abroad, as the latter are accused of being trafficked and engaged in disrespectful activities, which affect the reputation of the entire family (Locke, Nguyen & Nguyen, 2012).

Vietnamese people are characterized by a significant attachment to their country, and, according to the authors' personal interviews with members of the Vietnamese diaspora in Prague, significant reasons should exist for emigration to the foreign country on a permanent basis. Many migrants return for retirement to Vietnam, which is partly motivated by the burial traditions of Confucianism, as the religion requires the exhumation of the corpse 5 years after burial, and the cremation of the remaining bones. Violation of this rule precludes a successful reunification of the soul with ancestors and is highly reproached by society.

Our assessment of the experience premium in the case of Vietnam may be complicated for several reasons. Some sources point to a negative social attitude in society toward return migrants and difficulties faced by returnees in terms of their re-integration into the labor market. If that is the case, the difference in earnings between return migrants and non-migrants will be insignificant or even negative, especially for the case of recent returnees. Moreover, a system of equal wages prevailing in state firms, which equates the earning opportunities of return migrants with those of non-migrant workers, as well as a seniority system in use, may bias the true effect of the migration experience for the labor market outcomes of return migrants. However, looking ahead, our findings do not support these claims, revealing substantial differentials between return migrants and the sedentary population after controlling for self-selection of migrants.

2.3 Literature Review

Our discussion of the relevant literature will be divided into two parts: the existence of the experience premium and migrants' selection across observable and unobservable characteristics. Table 2.2 summarizes the existing empirical studies on the experience

premium and their major findings. All studies reveal a positive and statistically significant experience premium which substantially varies across countries of origin, ranging from 7% in Mexico and Ireland up to more than 60% for Hungarian and Albanian returnees.

Despite the consensus about the existence of a positive experience premium, its patterns of variation across genders and destinations are very country-specific and differ from one country of origin to another. For example, Co, Gang & Yun (2000) find a statistically significant experience premium for females while the premium for males was not statistically significant. An opposite conclusion was reached by Epstein & Radu (2007), who find a significant and positive premium for males and no premium for females. Other studies in the field reveal the premium for both genders (Coulon & Piracha, 2005; Lacuesta, 2006; Barrett & Goggin, 2010).

With respect to destination countries, studies find the highest experience premium in the case of return from OECD destinations and much smaller returns to migration experience in non-OECD destinations. However, the majority of studies are not able to differentiate between migration destinations due to limitations imposed by the data at hand.

All studies reveal a substantial increase in earnings for return migrants who switch into self-employment upon return. This gain is attributed to a better understanding of business opportunities and newly-acquired human capital abroad, which contribute to such occupational change, as well as to the accumulated savings used for start-ups.

In our study, we are particularly interested in decomposing the experience premium across educational attainments. To our knowledge, a single study by Barrett & Goggin (2010) explicitly decomposes the experience premium across educational levels of return migrants. The experience premium is estimated separately for three population subsamples with low, middle, and high education, and differences in the experience premium between the subsamples are tested. The authors find that in the case of Irish migrants, the experience premium is the largest for people with primary (13%) and tertiary (10 %) education and the smallest in the case of secondary education (5%).

However, after testing the significance of these differences between the subsamples, the authors show that the difference in the experience premium between highly skilled and middle-skilled labor is significant, while the difference in premiums of low-skilled and middle-skilled labor is not statistically significant.

Next, we turn to the findings of the existing literature with respect to migrants' selection on observable and unobservable components of human capital. Studies yield contradictory conclusions concerning the type of migrants' selection across different dimensions. With respect to observable characteristics, in countries like Mexico and Albania, return migrants are younger, less educated and more likely to be males compared to the sedentary population (Lacuesta, 2006; Reinhard & Thom, 2009; Coulon & Piracha, 2005). On the contrary, in countries like Hungary, Romania, and Ireland, return migrants are older and represent a more educated group of the population from urban areas. Different selection patterns with respect to observable characteristics are explained by the difference in historical migration trends in countries of origin as well as by the difference in labor market demand in diverse destinations.

These profiles of return migrants represent the post migration portraits of returnees. A subsample of return migrants is directly compared to the sedentary population, thus eliminating a subsample of the population, which has actually emigrated.

Unobservable components of human capital such as innate ability, motivation, and attitude to risk, are thought to determine the earnings' capacity of the population and affect migration decisions. A more detailed discussion on how the selection on unobservables can be accounted for is presented in the next section.

The existing studies find, in the case of Albania, Romania and Mexico, a negative selection of return migrants with respect to unobservables. The authors argue that a negative selection on unobservables implies that initially, prior to emigration, returnees lack important unobservable characteristics that determine a better earning capacity in the country of origin. In order to overcome this constraint, they have to migrate, and their migration experience, being rewarded upon return, compensates for missing unobservable

characteristics. As is discussed in the methodology section below, a negative selection on unobservables may also reflect a large bias in estimates of the premium, which originates from a weak correlation of the instrument with a migration indicator. However, in some studies, a selection on unobservable characteristics is not present (Epstein & Radu, 2007; Barrett & Goggin, 2010), and in others — it is positive but gender specific (Co, Gang & Yun, 2000).

The studies differ in terms of the methodology used to obtain consistent estimates of the experience premium, and it will be discussed in more detail below.

Overall, the early analysis of the experience premium is complicated by data limitations such as relatively small samples of return migrants, lack of detailed migration histories, and missing observations on absent migrants who have not returned to the country of origin at the moment of the survey. Also, for countries like Albania and Hungary, the data was collected in the early years of transition to market economies. More recent studies are characterized by more advanced methodology, larger samples, and extensive data on pre-, during -, and post-migration particulars, that allow for the in-depth analysis of the question at hand.

2.4 Empirical Strategy

2.4.1 The Benchmark Model

We consider the earnings equation in the form of Mincer's (1974) human capital earnings function, augmented by the indicator variable for migration experience. The following model is estimated using a pooled sample of the sedentary population and return migrants (Co, Gang & Yun, 2000; Epstein & Radu, 2007; Reinhold & Thom, 2009):

$$Log(Earnings_i) = X_i'\beta + \gamma RM_i + u_i, \tag{50}$$

where $log(Earnings_i)$ is logarithm of monthly earnings, X_i' is a vector of observable socio-economic characteristics, RM_i is a dummy variable for migration experience equal to 1

in the case of return migrants, and u_i is the error term. The coefficient γ for RM_i reflects the size of the experience premium or the *average treatment effect*:

$$E[Log(Earnings_i)|RM_i = 1] - E[Log(Earnings_i)|RM_i = 0] = \gamma. \qquad (51)$$

This is a constant treatment effect model. However, the estimated earnings' differential can be decomposed across observable characteristics of return migrants, for example, across educational attainments, which is of primary interest for our analysis. In order to do so, we need to introduce into equation (50) the interaction terms of the return migration indicator with educational dummies.

In our model, migration experience has only an intercept effect on earnings, so that the earnings of return migrants represent a parallel shift of earnings of non-migrants. Thus, returns to other components of human capital are assumed to be the same in two population groups. An alternative formulation of the model assumes migration to have a slope effect on earnings, implying different returns to observable characteristics in two population groups (Coulon & Piracha, 2005; Iara, 2006; Epstein & Radu, 2007). The earnings' equation (50) is estimated separately for the sedentary population and returnees (switching regressions case), and the experience premium is calculated as a difference between average estimated earnings in two groups.

The migration status of a person is an outcome of a multi-stage sequential decision process. Thus, the migration indicator in equation (50) is potentially *endogenous*, as migrants represent a nonrandom sample of the population, being self-selected into emigration and consequent return with respect to observable and unobservable characteristics. We are able to control for selection on observable components of human capital by explicitly including them into the model. However, potential selection with respect to unobservable characteristics may create a problem and influence the model's estimates. Unaccounted unobservable characteristics remain in the error term, and their correlation with the models' regressors violates OLS assumptions and requires a special treatment. In the case of

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endogenous migration status, estimation of (50) by OLS yields biased and inconsistent estimates of the experience premium and other coefficients of the model (Wooldridge, 2013).

The issue of endogenous regressors can be handled in several ways. The first approach is to ignore a potential endogeneity of the treatment, estimating the model by simple OLS. If migration status is indeed endogenous, the estimates of the model's parameters will be inconsistent and biased. The direction of the bias will depend on the sign of the correlation coefficient between unobservable components and migration status. We anticipate that individuals with higher abilities, either innate or due to circumstances of birth, who are more motivated and risk-taking, earn more and are more likely to emigrate. Consequently, in the case of a positive selection on unobservables, the OLS estimates of the model will be inflated, overstating the true size of the experience premium. We estimate the earnings equation (50) by simple OLS as a benchmark case, with which we would compare the estimates from alternative approaches.

2.4.2 A Single Migration Rule

An alternative approach is to recognize the selective nature of migration decision and correct for self-selection using a correction technique *a la* Heckman (1979). This approach implies a separate estimation of the earnings equation and migration decision rule, which assigns population into different migration categories.

At first, we assume migration and return migration choices as a single, non-separable decision about temporary migration. In such a formulation, a person is choosing between remaining in the origin country vs. migrating on a temporary basis. As in the benchmark case, we consider only a subsample of observations, which includes return migrants and the sedentary population. Thus, we are making an unrealistic assumption that return migrants represent a random sample of the total pool of migrants who emigrated in the first stage. Such an assumption is common for other studies in the field and is motivated by the lack of observations on the total pool of emigrants.

Formally, the decision about temporary migration is modeled in the following way:

$$RM_i^* = Y_i' \mu + e_i, \tag{52}$$

where RM_i^* is a *latent* variable, which reflects a net benefit from temporary migration as a function of individual characteristics; Y_i' is a vector of exogenous variables, and e_i is the error term. We observe only the outcome of the individual decision process such as whether a person migrated temporarily or stayed in the country of origin:

$$RM_i = 1[RM_i^* > 0]. \tag{53}$$

The model, which includes equations (50) and (52)-(52), is a *constant treatment effect* model. It can be estimated either by Maximum Likelihood or using a Two-Step procedure, which represents the extension of Heckman's sample selection correction model to the case of endogenous treatment indicator (Maddala, 1983). For the purpose of estimation, we use the Two-Step method.

The *identification* of the model requires additional assumptions about joint distribution of error terms in outcome and selection equations. In particular, we assume that u_i and e_i follow a bivariate normal distribution with mean 0 and covariance matrix:

$$\begin{pmatrix} \sigma & \rho \\ \rho & 1 \end{pmatrix},$$

where ρ is a correlation coefficient between error terms from two equations and σ is a variance of the error term in the outcome equation. The variance of the error term from the selection equation is normalized to 1. We anticipate ρ being positive, implying that unobservable ability that contributes to higher earnings also affects personal decisions about temporary migration in a positive way. If $\rho = 0$, the return migration indicator in (50) is exogenous; thus, the OLS estimates will be consistent and unbiased.

As a first step, the migration decision rule (52) is estimated using *probit* and yielding

predicted probabilities of temporary migration:

$$E[RM_i^*|Y_i] = P(RM_i = 1|Y_i) = \Phi(Y_i'\mu), \tag{54}$$

where $\Phi()$ is a distribution function of the standard normal distribution.

From the first step, for each observation i, we calculate values of the inverse Mill's ratio (or non-selection hazards):

$$h_i = \begin{cases} \frac{\phi(Y_i'\hat{\mu})}{\Phi(Y_i'\hat{\mu})}, \text{if } RM_i = 1, \\[2ex] \frac{-\phi(Y_i'\hat{\mu})}{1-\Phi(Y_i'\hat{\mu})}, \text{if } RM_i = 0, \end{cases}$$

where $\phi()$ is a density function of a standard normal distribution.

Next, we include h_i as a selection-correction term into the earnings equation (50) and estimate the model by simple OLS: [8]

$$E[Log(Earnings_i)|RM_i] = X_i'\beta + \gamma RM_i + \rho\sigma h_i. \tag{55}$$

The difference in expected earnings between return migrants and the sedentary population is:

$$E[Log(Earnings_i)|RM_i = 1] - E[Log(Earnings_i)|RM_i = 0] = \gamma + \rho\sigma\frac{\phi_i}{\Phi_i(1 - \Phi_i)} \tag{56}$$

The treatment effect model yields consistent estimates of the experience premium by taking into account the endogeneity of the temporary migration decision. If the correlation coefficient ρ is not statistically different from zero, thus no selection on unobservables is present, and the estimated experience premiums from OLS and treatment effect approaches coincide.

For the identification of the treatment effect model, it is desirable though not neces-

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[8]In Stata, we estimate the model using command **treatreg** with option for the Two-Step method. In the case of weighted estimator, treatreg is using only the Maximum Likelihood method.

sary to have exclusion restriction (Cong & Drukker, 2000). Ideally, we need an exogenous variable, which affects migration decision and has no effect on earnings except through migration indicator. Therefore, we need to instrument out migration status. The treatment effect model represents a variation of the instrumental variable approach for the case of binary endogenous variable. The discussion of instruments used in our analysis is presented in Section 2.6.2.

2.4.3 A Double-Fold Migration Process

The dataset at hand contains observations on the socio-economic characteristics of absent migrants, those who have not returned to the origin country at the moment of survey. That allows us to control for selection of return migrants out of the total emigrant population. Thus, we extend our analysis further by taking into account the two-fold nature of the migration process, which consists of emigration and return migration decisions. Possible outcomes of the two-stage migration process are summarized below.

Migrate/Return	0	1
0	Non-migrant	Non-migrant
1	Absent migrant	Return migrant

As the migration process is sequential, the second decision is undertaken only by a sub-sample of agents who decide to emigrate in the first stage. Therefore, for the sedentary population, we do not distinguish between outcomes of the second decision rule.

The extended version of the model can be represented as follows:

$$Log(Earnings_i) = X_i'\beta + \gamma RM_i + u_i, \tag{57}$$

$$Mig_i^* = Z_i'\alpha + e_{1i} \tag{58}$$

$$RM_i^* = Y_i'\mu + e_{2i}, \tag{59}$$

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and the observable outcomes are:

$$Mig_i = 1[Mig_i^* > 0], \tag{60}$$

$$RM_i = 1[RM_i^* > 0], \tag{61}$$

where RM_i is observed only when $Mig_i = 1$.

Latent variables Mig_i^* and RM_i^* reflect the net benefits from emigration and return migration decisions respectively, being functions of individual characteristics; Mig_i and RM_i are the observed outcomes of two decisions; Z' and Y' are the vectors of exogenous variables reflecting socio-economic characteristics of the population; e_{1i} and e_{2i} are the error terms from two migration decisions.

The outcome equation (57) together with two decision rules (58)-(59) can be estimated jointly either by Maximum Likelihood or Two-Step procedure. We use the Two-Step procedure extended for the case of two selection equations by Tunali (1986). Identification of the model requires additional distributional assumptions with respect to error terms. We assume that $\{u_i, e_{1i}, e_{2i}\}$ follow a trivariate normal distribution with mean zero and covariance matrix Σ:

$$\Sigma = \begin{pmatrix} \sigma & \rho_{12} & \rho_{13} \\ \rho_{12} & 1 & \rho \\ \rho_{13} & \rho & 1 \end{pmatrix},$$

where ρ is a correlation coefficient for the error terms from two decision rules (58)-(59).

As a first stage, migration and return migration rules are estimated jointly using bivariate probit. If two decisions are independent, the correlation coefficient ρ is zero, and two equations can be estimated separately by univariate probits or seemingly unrelated probits. This is the case when both decisions are made simultaneously before the initial move using the same information set available at departure. If the return decision is influenced by the situation experienced in the destination, then two migration decisions are made sequentially based on different information sets. In this case, ρ will be non-zero.

An additional complication for the joint estimation of two decision rules arises from the fact that the outcome of the second decision rule is observed only for the case of $Mig_i = 1$, and is not observed for the sedentary population. Therefore, we are facing a problem of sample selection or incidental truncation with partial observability of dependent variable in second decision rule due to the self-selection at the first stage. For the case of bivariate probit with sample selection we jointly estimate two decision rules using **heckprobit** command in Stata.

As a second stage, we use the estimates from bivariate probit to calculate two selection-correction terms for the earnings' equation. The double-selection analogs of inverse Mills' ratios proposed by Tunali (1986) are the following:

$$\lambda_{0i} = -\frac{\phi(Z_i\alpha)}{\Phi(-Z_i\alpha)}, \text{ if } Mig_i = 0 \ \& \ RM_i = 0, \tag{62}$$

$$\lambda_{1i} = \frac{\phi(Z_i\alpha)\Phi\left(\frac{Y_i\mu - \rho Z_i\alpha}{(1-\rho^2)^{1/2}}\right)}{\Phi_2(Z_i\alpha, Y_i\mu, \rho)}, \text{ if } Mig_i = 1 \ \& \ RM_i = 1, \tag{63}$$

$$\lambda_{2i} = \frac{\phi(Y_i\mu)\Phi\left(\frac{Z_i\alpha - \rho Y_i\mu}{(1-\rho^2)^{1/2}}\right)}{\Phi_2(Z_i\alpha, Y_i\mu, \rho)}, \text{ if } Mig_i = 1 \ \& \ RM_i = 1, \tag{64}$$

where $\phi()$ is a standard normal density function; $\Phi()$ is a distribution function of standard normal distribution; $\Phi_2()$ is a standard bivariate normal distribution function.

Next, we construct two selection-correction terms for the earnings' equation (50):

$$\lambda_i^{Mig} = (1 - Mig_i)\lambda_o + Mig_i(1 - RM_i)\lambda_1 \tag{65}$$

$$\lambda_i^{RM} = Mig_i \cdot RM_i \cdot \lambda_2 \tag{66}$$

where λ_i^{Mig} and λ_i^{RM} are selection-correction terms for migration and return migration decisions respectively.

The outcome equation augmented by selection-correction terms takes the following form:

$$Log(Earnings_i) = X_i'\beta + \gamma RM_i + \nu_1 \lambda_i^{Mig} + \nu_2 \lambda_i^{RM} + \epsilon_i, \tag{67}$$

where $\epsilon_i = u_i - \nu_1 \lambda_i^{Mig} - \nu_2 \lambda_i^{RM}$ is a new error term.

Consistent estimates of (50) with selection-correction terms can be obtained by simple OLS. If selection on unobservables is present in the model, selection-correction terms will be statistically significant. The OLS estimates of the augmented earnings equation reveal signs and magnitudes of the parameters; however, we cannot judge the significance of the coefficients as inclusion of selection-correction terms results in incorrect standard errors. We are using the procedure outlined in Tunali (1986) for the adjustment of standard errors.

2.5 Data Description

2.5.1 Sample Design

In our study, we use the data from the Development on the Move Project undertaken by the IPPR, London during 2008-2010 in collaboration with GDN. The cross-section dataset contains observations on 7945 individuals from 1200 households. The data was collected in five out of eight regions in Vietnam. The regions covered by the survey are the wealthiest cities and metropolitan areas, as well as major rice growing regions such as the Red Delta River and Mekong Delta. Only one relatively poor and disadvantageous in terms of natural resources region such as North Central Coastal was surveyed.

The dataset contains observations on three population categories with respect to migration status: sedentary population, return migrants, and absent migrants. A person is classified as a *migrant* when they continuously spend three months or more outside Vietnam. If a migrant was away at the time of the survey, he was classified as an *absent migrant*, and the information about him was collected from other household members.

The DotM survey employs a disproportional probability sampling strategy that results

in oversampling of migrant-producing households. The survey is built on the methodology of the World Bank and represents the LSMS-type survey.[9] The *sampling procedure* runs in two stages. In the first stage, the primary sampling units (PSUs) are identified using the data on census enumeration units. Then, PSUs are stratified on the basis of migration frequencies, which are assessed through expert opinions. In order to ensure the over-representation of migrant households, PSUs from a high migration frequency stratum were oversampled on the probability basis.

As a second stage of the sampling procedure, within each selected PSU, a roughly equal number of households is selected, applying a systematic random sampling on addresses. All households were divided into two strata – migrant-yielding households and non-migrant households. All migrant-yielding households were interviewed, while a random sampling of non-migrant households was performed to achieve a required sample size. In order to correct for the bias which originates from disproportional sampling applied in the first and second stages, the weights are calculated and provided with the dataset to be used for descriptive analysis and in estimation.

The dataset at hand provides a number of advantages for our analysis. It contains a large set of socio-economic characteristics for three population categories including absent migrants — the feature which was not available for the majority of prior studies in the field. The retrospective nature of the data allows us to trace migration histories, revealing pre-, during-, and post- migration individual and household characteristics of the population. Moreover, as the data was collected both at individual and household levels, we can judge the composition of households and family circumstances prior to departure, which sheds light on the reasons behind migration decisions.

2.5.2 Descriptive Statistics

The following restrictions are applied to the initial sample of 7945 observations. First, we restrict our sample to the *working age* population of 18-65 years of age. For the case

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[9]LSMS — Living Standards' Measurement Study — stands for sampling with probability proportional to size.

of migrants (either return or absent), we consider only those who were of working age at the moment of departure and at the time of the survey. Thus, we eliminate migrants who left as children and those who returned for retirement.

Second, the total pool of migrants includes those who left in the distant past (1957 as the earliest departure year), as well as those who emigrated in more recent years. We restrict our sample to migrants who emigrated and returned after 1990, thus eliminating migration episodes in the distant past. We also distinguish from within the total pool of migrants a group of *recent migrants* — those who left Vietnam within five years prior to the survey date.

The structure of the final sample is summarized in Table 2.3. An additional restriction on the sample comes from the data itself. In particular, the data on earnings is not available for the entire sample of the working age population. The number of usable observations with available earnings in the final sample comprises approximately 75%. The majority of observations without earnings stand for individuals who are either out of the labor force (at school, retired, working at home) or unemployed at the time of the survey. The average rate of non-response is approximately 10 %. No information on foreign earnings of absent migrants is available.

The final sample shrinks to 5049 observations, out of which return migrants account for a 10 % share, while absent migrants hold a slightly larger share of 14.5 %.

As a starting point, we compare and test whether the difference in average earnings of return migrants and the sedentary population is positive and statistically significant. Our dataset contains observations on monthly earnings expressed in Vietnamese Dongs, which we convert into U.S. dollars using the average quarterly exchange rates for the relevant quarters of 2008 when the survey took place. Our findings are summarized in Table 2.4. The average earnings in the two groups are compared across genders, destinations, occupation type, industries, and education. Within the group of return migrants we distinguish between recent returnees and the total pool of return migrants.

We find large and statistically significant earnings differentials, as high as 70% for the

total sample of return migrants. However, the difference in earnings varies substantially across individual characteristics, industries and locations. Moreover, the patterns slightly differ when we differentiate between recent returnees and their total pool. Female migrants gain the most from the temporary migration experience, revealing earnings' differentials twice the size of those for male returnees. It is an interesting finding, as previous studies in the field point at much higher premium for males, with Hungary being an exception.

A large difference in earnings is observed in the group of tertiary educated labor and also in the case of wage employees at state enterprises. Across industries, the largest differences were found in the processing and trade industries. The differences in earnings in the two population groups are observed in both urban and rural localities, being the largest in urban areas. However, recent migrants reveal substantial earnings' differentials in the case of self-employment activities and in rural localities. With respect to regions, the largest differential is observed in the South East region, which includes Ho Chi Ming city — the richest part of the country and the key destination for internal migrants. Common for both groups of return migrants are large earnings differentials in the case of return from an OECD destination. This finding is similar to Co, Gang & Yun (2000).

Our findings are in line with the findings of other studies in the field that reveal larger earnings differentials for migrants with tertiary education working in urban localities. However, we found a surprisingly high and statistically significant difference in wages for females. Women reveal a relatively low participation rate in the labor market upon return, and those of them who actually become employed are highly rewarded for their experience. Large earnings' differentials of females are preserved at all educational levels.

No definite pattern emerges from comparison of the earnings' differentials between the groups of recent returnees and the total pool of return migrants. The overall differential is smaller in the case of recent returnees, perhaps reflecting difficulties with re-integration into the domestic labor market due to the overall negative attitude toward return migration. Recent migrants exhibit a larger earnings differential in the case of female returnees, self-employment status, and rural localities.

From the comparison of average earnings we conclude that a substantial gap exists in the earnings of return migrants and non-migrants, and this difference is highly dependent on the socio-economic characteristics of migrants. We continue with a comparison of two population groups across other observable characteristics. Our findings with respect to the socio-economic profiles of return migrants and the sedentary population are summarized in Table 2.5.

Return migrants differ from the sedentary population with respect to individual and household characteristics. In particular, returnees are predominantly males, more likely to have a tertiary education and less likely to hold primary education. No differences in the average age of the two groups is observed. However, when we analyze the age at departure, which is 31 on average for the total pool of return migrants, we confirm that emigration takes place at a younger age. More recent returnees do not differ in their characteristics from the total pool of return migrants, though they are slightly younger, with other distinctions from the sedentary population being preserved as in the total sample, though being of a smaller magnitude. The differentials in the case of recent returnees are often not statistically significant, which is explained by a small number of observations in this group.

The labor market profiles of return migrants and the sedentary population are very similar. Returnees are equally likely to be involved in entrepreneurial activities as non-migrants and equally likely to work in different industries, with the exceptions of the processing industry, where they work more often, and the government sector to which the access for return migrants is limited. However, several differences are observed in the case of recent returnees who are more likely to engage in self-employment activities and rarely work in state enterprises or in the government sector.

Return migrants and the sedentary population in the sample predominantly reside in urban localities. Migrants are likely to originate from the Northern and Red Delta River regions, compared to the sedentary population. However, a substantial number of returnees settle upon in the South East region which has more employment opportunities.

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Another important dimension of comparison comprises family and household characteristics. For return migrants, our dataset allows us to analyze the state of variables at the moment of departure to the foreign country. For the sedentary population, we take the state of variables at the moment of survey. We find that return migrants are less likely to be married at the moment of departure, which is consistent with our earlier finding that emigration takes place at a younger age. Returnees are more likely to have other household members either with past or current migration experience. Households with return migrants are characterized by a smaller size compared to non-migrant households, and they are distinguished by a smaller number of adult males, who are the primary breadwinners. Moreover, return migrants are more likely to live in the parental household. Such family and household characteristics will be important for our estimation of the treatment effect model and will be discussed in details below.

2.6 Estimation Results

2.6.1 The Benchmark Case

We begin by estimating the earnings equation (50) using a pooled sample of return migrants and non-migrants by OLS. Estimation results are summarized in Table 2.6. In order to understand whether the survey design is informative for the estimation of our model, we provide results from both ordinary and weighted Least Squares methods. While sampling weights are widely used in descriptive statistics, there is no consensus in the literature on whether the sampling weights should be used in regression analysis (Faielle, 2010; Solon, Heider & Wooldridge, 2013). Weighted estimators suffer from larger variance; however, they are robust to model misspecification. In the case of informative weights, applying OLS would yield biased and inefficient estimates if the model is misspecified. On the contrary, if sampling design is ignorable, the WLS estimator would yield larger variance and result in the loss of efficiency.

A sampling design is informative when the selection of observations into a sample was done based on the outcome variable of interest. If sample selection is done based on

independent variables, which are controlled for by their explicit inclusion into the model, weights can be ignored. Moreover, sampling weights are used to correct for heteroskedasticity observed with respect to dependent variable.

A sampling design of our dataset was discussed in the previous section. The selection of variables into the sample was done on the basis of the migration status of the household, without taking into account the income level of the household. We also observe a large variation in wages for the case of return migrants. However, as we use the logarithm of monthly wages in our estimations, the logarithmic transformation of a variable reduces heteroskedasticity. Table 2.6 allows us to gauge a difference in estimated coefficients from unweighted and weighted approaches. A formal test for design ignorability would be to include the sampling weights and their interaction terms with regressors to the earnings equation (50) and test their significance (Faiella, 2010). However, due to a potentially endogenous migration status in the earnings equation, estimated coefficients for weights and their cross-terms may be biased. Another option is to plot the residuals from the unweighted OLS against the sampling weights and look for the correlation patterns (Figure 2.1). We find a slightly larger variation of residuals for small values of weights which correspond to migrants; however, as we have mentioned above, the logarithmic transformation of wages reduces the variance of this variable.

As a starting point, we compare estimation results from unweighted and weighted approaches. Our primary interest is in the value of the experience premium. The average experience premium in the benchmark case is estimated around 20% and it is statistically significant. Other components of human capital have a significant and anticipated effect on earnings. In particular, earnings increase with age, and this effect reverses in the older years. The gender earnings' differential is estimated at around 17 % in favor of males. The self-employed are earning slightly less than wage workers, but this difference is not statistically significant. Earnings in urban localities are slightly higher compared to rural areas. We do not report the estimated coefficients for industry dummies, but their difference with the omitted agriculture industry used as a base category is statisti-

cally significant and positive for almost all industries. Earnings substantially vary across regions. As a base category in our estimation we take the South East region, which is considered to be the richest in the country. Estimation results reveal that earnings in all other regions are significantly lower compared to the South East region, on average by 30 %, with a minor exception for the Mekong Delta River region adjacent to the South East region.

Comparing estimation results from the two approaches, we observe that the magnitudes, signs and significance of the estimated coefficients are very similar. The weighted approach yields a slightly larger value of the experience premium equal to 28 %, compared to 20 % in the unweighted case. The most substantial difference in the magnitude of coefficients is observed for self-employment status and locality type.

Educational attainment represents another important determinant of earnings. Our results show that earnings increase with education, and the difference in average earnings between the least and the most educated is as high as 60 %. We also analyze the variation of the experience premium across educational groups by estimating the earnings equation augmented by interaction terms for the migration experience indicator and educational dummies (Wooldridge, 2009). Estimation results for the augmented model are presented in the third and fourth columns in Table 2.6. From the augmented specification, we can judge the magnitude of the experience premium in each educational group; however, in order to assess its statistical significance, we need to re-estimate the augmented specification, each time changing the base category for the educational attainment indicators.

Table 2.7 summarizes estimates of the experience premium for different educational groups and genders. For Vietnam, we find a positive and statistically significant experience premium for migrants with *primary* and *tertiary* education, equal to 25 % and 45 % respectively, and no premium in the group of secondary-educated (1.1 %). OLS estimates show that the difference in the experience premium between educational groups is statistically significant, and the premium in the case of the tertiary educated is almost twice the size of the premium of the primary educated. The estimates from WLS are not

substantially different from OLS estimates, and they also reveal the U-shape pattern of variation of the experience premium with respect to education. However, the estimated premium in the group with secondary education is much larger than that from OLS (18 % vs. 1.1 %). Moreover, larger standard errors of WLS estimates affect the significance of the experience premium differentials across educational groups.

As a next step, we re-estimated the augmented specification of the benchmark model separately for males and females and tested whether the difference in the coefficients in two subsamples is statistically significant. For males, the experience premium was found to be very similar in both magnitude and the pattern of variation to the average premium, estimated using the total sample as males comprise a larger share of returnees. The premium follows the U-shape, being the largest in groups with primary and tertiary education with statistically significant differences between educational attainments. The findings from OLS and WLS are in line with each other. As for females, two estimation approaches yield substantially different results. In the case of OLS, the experience premium for females follows the U-shape, with the premium in the case of the tertiary-educated being four times larger than that in the group of the primary-educated, and the premium in the group of the secondary-educated being negative. The WLS results suggest that the premium for women strictly increases with education.

We obtain slightly different results when we re-estimate the model using only a sub-sample of recently returned migrants. The overall experience premium is 1 % larger for the case of unweighted estimation and substantially larger (more than 10%) in weighted estimation. The patterns of variation with respect to educational groups are preserved in the unweighted estimation approach; however, for the weighted estimation we obtain a very similar magnitude of the experience premium in three educational groups, which is higher overall than for the total sample of return migrants.

The U-shape pattern of the experience premium variation across educational groups is an interesting finding. It is similar to the pattern of return migration rates for Vietnam, where the largest return takes place among migrants with primary and tertiary education

and is relatively low among migrants with only secondary education. However, the theoretical literature on migrants' selection assumes the experience premium as being a constant fraction of the wage, and the same in all educational groups (Borjas & Bratsberg, 1996; Dustmann & Weiss, 2007). Such similarity in the patterns of return migration and the experience premium is an interesting point for further investigation. It implies that the experience premium may potentially explain the U-shaped return migration rates with respect to educational attainments, which is a rather robust pattern for a number of countries of origin.

When comparing the estimation results from the unweighted and weighted approaches, we observe only slight differences. In particular, the experience premium is slightly larger in the case of weighted estimates. Moreover, the variation of the experience premium across educational attainment in the unweighted case yields a more pronounced U-shaped pattern preserved across genders. Weighted estimates point to a larger and positive experience premium received by return migrants with secondary education, but still yield the U-shape, which is observed in the sample of male returnees. However, for the case of females, the experience premium strictly increases with education. Moreover, from Figure 2.1 which plots residuals from the unweighted approach against sampling weights, we do not observe any pronounced pattern of association between the two. The residuals tend to be only slightly more dispersed for low values of weights.

2.6.2 A Single Migration Decision Rule

Estimation results for the *treatment effect model* are summarized in Tables 2.8.1 and 2.8.2. We estimate the model using sampling weights as well as under the assumption of design ignorability. In the case of the unweighted estimation, we use both Maximum Likelihood and Two-Stage approaches. If the model is correctly specified, both approaches should yield asymptotically identical results (Vreyer, Gubert, & Robilliard, 2010). When we incorporate sampling weights, we estimate the model only by Maximum Likelihood.

The role of exclusion restrictions in our model is played by several variables. The first

candidate for the instrument for migration status is the *share of males in the total number of working age members of the household* present at the moment of departure. The gender and age composition of the household members are exogenous with respect to unobservable components of human capital. At the same time, we believe that it affects the probability of emigration, serving as a proxy for the household budget constraint. In particular, the primary motive for temporary migration is the target-earning motive. Traditionally, the role of primary earners in Vietnamese households belongs to males. Moreover, a common practice is to send males abroad rather than females. However, a larger number of male earners in a family allows the household to accumulate necessary financial resources without bearing substantial migration costs. We find that a share of adult males in the household has a negative and statistically significant effect on the emigration decision.

The second candidate for the instrument is the indicator for a *parent living in the household*. As we consider only the working age population, living in the same household with parents implies that very likely a person is an elder child. According to Vietnamese tradition, the elder child always remains in the parental household and takes care of his/her parents in their advanced age. We are not able to assess directly the order of birth of a person, as other siblings may live in another household and our data does not allow us to track that. We find that living with a parent negatively affects the probability of temporary migration, and this is an anticipated result.

Another variable that significantly affects the migration decision is the *migration experience (either past or current) of other household members before departure*. This variable serves as a proxy for a networking effect. However, in our sample, we observe that this variable has a direct and significant effect on earnings, even in the case of wage employment. For the case of the self-employed, the migration experience of other household members results in a stream of remittances and savings sent from abroad, which enables the starting of a more serious business, the acquisition of land or better equipment, and thus, the achievement of higher earnings. For wage employees, a positive effect of this

variable potentially originates from remittances and savings, which allow other household members to acquire better qualification or give a bribe in order to obtain a well-paid placement or a desirable and stable wage employment.

Estimation results of the outcome equation corrected for self-selection and estimated by weighted approach reveal a slight increase in the average experience premium from 29 % to 34 % compared to the benchmark case. The correlation coefficient of two error terms from the outcome and selection equations is negative, very small in magnitude and statistically insignificant ($\rho = -0.041, p - value = 0.578$). Thus, the treatment effect model provides no evidence for the selection on unobservables in the case of weighted estimation.

Variables used as exclusion restrictions are highly statistically significant and both have a negative sign as anticipated. We perform a test for the overidentifying restrictions, as we have two instruments for one potentially endogenous variable. In particular, we save residuals from the treatment effect model and regress them on all exogenous variables from the outcome equation and decision rule. We obtain the value of $R^2 = 0.0002$. The test statistic is nR^2 and follows a χ_q^2 distribution with q degrees of freedom. We calculate the value of $nR^2 = 0.62$ for $q = 1$, which is a very small value in a χ_q^2 distribution. Therefore, our two exclusion restrictions pass the overidentification test.

The unweighted approach yields substantially different results. We estimate the treatment effect model using Maximum Likelihood and Two Stage Least Squares. Estimates from two approaches should converge in the case when the model is correctly specified. When we re-estimate the treatment effect model without sampling weights, we obtain strong evidence for a negative selection on unobservables. This implies that migrants initially lack unobservable components of human capital which affect their earnings, and they compensate for this shortage by temporary migration, which allows them to accumulate additional human and social capital while working abroad. The estimated average experience premium jumps from 20 %, as in the benchmark case, up to 52 %. The correlation coefficient ρ for the error terms in the outcome and migration decision equation is

negative and statistically significant, being equal to -0.26. Thus, the benchmark OLS estimates are biased downwards, and the experience premium is larger when the endogenous nature of migration decision is taken into account.

An alternative explanation for the inflated experience premium compared to OLS estimates is the weak performance of instruments used in the estimation of the migration decision rule. The IV estimator is initially biased, but this bias gets even larger in the case when the correlation of instruments and the endogenous variable is weak. Moreover, if the correlation of instruments with the error term in the outcome equation exists, the size of the bias gets even larger.

We find that variables which play the role of exclusion restrictions have highly significant coefficients with anticipated signs. However, when we perform a test for the overidentifying restrictions using the procedure described above, we obtain the value of the test statistics $nR^2 = 29.9$ for $q = 1$. As this value exceeds the critical value for any conventional levels of significance, we reject the null hypothesis that all exclusion restrictions are exogenous and conclude that at least one of them is endogenous. In particular, when regressing residuals on all exogenous variables from two stages, we observe that the share of male adults in the household is slightly correlated with residuals from the treatment effect model.

Other variables in the model, whose coefficients are estimated using weighted and unweighted approaches, reveal the following patterns. We observe that the probability of migration is higher for younger males and increases with education. Other members of the household, with either previous or current migration experience, positively affect an individual migration probability, providing evidence for the networking effect. However, we obtain an opposite result in the case of the unweighted estimation. The probability of migration is lower for households with a larger number of adult male earners and for those people who live in households with parents. With respect to locality, the migration probability increases for those coming from the North Central Coastal region – the poorest in the country, which is characterized by the largest streams of both internal and

international migration flows. Migration from the Mekong Delta region is much smaller compared to other regions. The Mekong Delta specializes in the emigration of women for marriage purposes and we do not consired this type of migration in our analysis. All estimates provided in Table 2.8.1 are expressed in the form of marginal effects.

Estimation results for the outcome equation (50) are very similar to the benchmark case. Earnings increase with age and this effect reverses in the older years. Returns to education increase with educational attainment. The wage gap between males and females is estimated as high as 17 %. Urban locality are associated with slightly larger earnings; however, the coefficient is not statistically significant. Self-employment status results in lower earnings, but its effect is not statistically significant either. A low significance of the parameter estimates in the case of WLS than in the unweighted OLS is explained by larger standard errors. Having other members of the household with migration experience is associated with higher earnings, and earlier we have discussed the intuition for this result. Marital status has a negligible negative effect on earnings, which is not statistically significant. Wage differentials between other regions and the South Eastern region as a base category are negative and highly significant.

As a final step, we analyze the variation of the experience premium across the educational attainments of migrants. For this purpose, we introduce the interaction term of the migration indicator with educational dummies into the outcome equation of the treatment effect model. When the treatment indicator is endogenous, the interaction terms also become endogenous. However, for the weighted approach we did not find any evidence for the selection on unobservables. Thus, when we include the interaction terms for educational attainments and the migration indicator and re-estimate the model, we obtain similar results to those in the benchmark case. We observe the largest experience premium in the case of tertiary educated returnees, and its size is 51 % compared to 49.5 % from the OLS. The size of the experience premium in the groups with primary and secondary education is equal to 27 % and 20 % respectively. These findings are very similar to the benchmark case estimates summarized in Table 2.7.

2.6.3 The Double-Fold Nature of the Migration Process

The dataset at hand allows us to shed light on the characteristics of migrants who were still abroad at the time of the survey. Thus, we can judge the possible selection of migrants at the second stage of the migration process with respect to observable characteristics. As a rule, existing studies in the field do not have observations on absent migrants, with a minor exception of the studies on Mexico.

We begin by comparing the socio-economic profiles of return and absent migrants at the moment of emigration, as the retrospective nature of the data allows for such comparison. Table 2.9 summarizes descriptive statistics for two population groups, distinguishing between the total pool of migrants and recent migrants. We notice no significant differences in the profiles of absent and return migrants in the total pool and in the subsample with recent migration episodes. Overall, return migrants emigrate at a more mature age (in their mid 30's) compared to absent migrants who leave in their late 20's. There are no significant differences in gender composition in groups of return and absent migrants, both of them having only a slightly larger share of males and being very close to the gender parity.

With respect to educational attainment, absent migrants show intermediate selection compared to the sedentary population with the largest emigration rates being in the group with secondary education. Return migrants show a positive selection in terms of education with respect to the sedentary population, as emigration rates increase with educational attainment. Moreover, return migrants reveal U-shape return rates with respect to education when compared to the total pool of migrants. Similar patterns are observed in the subsample of recent migrants.

Comparing the labor market activity, we observe that return migrants are more likely to be employed prior to departure. Both groups are equally likely to be self-employed, with the majority of migrants having a paid job rather than working for themselves. With respect to industries, return migrants tend to work in both the low-end industries such as in agriculture, processing, trade and construction, as well as in the high-end industries

such as science, education, and government. In contrast, absent migrants are more likely to be in the service and transportation industries, as well as health and mining, which require secondary and tertiary education. Return migrants are distinguished by emigration with a pre-arranged contract in the destination country. The majority of absent migrants choose OECD destinations.

In terms of location, major migration takes place from urban areas. Return migrants are less likely to originate from the poorest regions of the country and more likely to reside in the richest South East region. On the contrary, absent migrants are more likely to originate from the poorest parts of Vietnam such as the North Central Coastal and South Central Coastal regions.

Return migrants only slightly differ from absent migrants in terms of household characteristics. In particular, no substantial differences are observed in terms of having other members of the household with migration experience and in terms of the share of male adults in the household. However, absent migrants are more likely to have a household member in the destination during their migration episode, and they are more likely to live in the household with a parent and have siblings.

Summarizing our findings with respect to socio-economic profiles of return and absent migrants, we can make a number of conclusions. Those migrants who eventually return to the county of origin emigrate at an older age. They are more educated, more likely to hold a job at the moment of departure and more often have a pre-arranged contract at the destination. Moreover, they are less likely to have other relatives in the destination during their emigration episode, thus their attachment to the foreign country is smaller. On the other hand, absent migrants are younger, emigrate when younger, come from larger households and are more likely to be unemployed before the departure and have no pre-arranged employment in the destination country. Also, absent migrants more often have kin in the destination while staying abroad. Moreover, the OECD destination countries are highly associated with permanent immigration. The largest share of the absent migrants resides in the United States (32 % of the sample), while major return

migration takes place from countries in the region such as Japan, Malaysia, Taiwan, and also from Russia and the U.S.

Analyzing the duration of migration episodes, we compute migration survival rates for return migrants, measured as a percentage of migrants who remained in the destination after 1, 2, and up to 13 years. Our findings are summarized in Figure 2.2. We conclude that 50 % of migrants return within the first three years. After the fourth year, the survival rate is as low as 20 % and it sharply declines thereafter. These results are in line with findings from other studies in the field that show that the majority of returns take place within the first five years after resettlement and drop significantly in later years (Borjas & Bratsberg, 1996; Dustmann & Weiss, 2007).

Next, we move to the estimation of two decision rules — emigration and return migration. We will estimate them separately and jointly using different information sets. In particular, if two decisions are made independently and prior to the initial emigration move, we can estimate them separately using the same set of covariates available at the moment of departure. As an alternative, decisions are made sequentially, and the return decision depends on the decision outcome of initial emigration. In this case, the information sets used for decision-making at each step are different, and the return migration decision is affected by the events that take place in a destination.

Tables 2.10 reports estimation results under the assumption that both decisions are made using the same information set, i.e., before emigration. We are estimating two decision rules separately by probits. The first migration rule is estimated using the total sample of observations on non-migrants, return migrants and absent migrants. The second decision rule is estimated using only a subsample of observations on return and absent migrants. We begin by comparing the estimation results for the initial emigration decision with a similar rule estimated using only a subsample of observations on return migrants and the sedentary population, the results of which are summarized in Table 2.8.1. The estimation results from two approaches are very similar. Emigration takes place among younger males, it increases with education and it is higher in the case of having other

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household members with migration experience. A larger share of male adults in the households is associated with a lower migration probability. Moreover, emigration is larger from urban localities and from the poorest regions of the country such as the North Central Coastal region and the Red Delta River. The only difference is in the case of the variable such as living in the household with a parent, which is associated with a higher emigration probability when the full sample of observations is used.

Estimation results from the unweighted approach are similar to the weighted estimates as well as to the previous results when the model was estimated using only a subsample of return migrants and non-migrants. The only difference is in the sign of the coefficient for the indicator variable for previous migration experience of other members of the household. In the case of unweighted estimation the sign of this coefficient is negative.

Next, we move to the comparison of estimation results from two decision rules. From Table 2.10 we observe that the same set of covariates has good explanatory power for the case of a migration decision but performs weakly with respect to a return migration decision. Neither individual characteristics such as age or educational attainment, nor the household particulars or the locality type have a significant effect on a return migration decision. The unweighted estimates perform slightly better, as educational attainment of return migrants follows the pronounced and statistically significant U-shaped pattern with respect to educational attainments, and previous migration experience of other household members negatively affects the probability of return migration.

Such poor performance of the set of covariates used for estimation of the initial emigration decision in explaining the decision to return signals that some important variables are not taken into account. These are the particulars of destination country and migration episodes, for which the data is available only for the subsample of return and absent migrants. Thus, we use different information sets when estimating emigration and return migration decisions. In particular, we use a number of additional variables that help us to differentiate between return and absent migrants such as the type of destination, an indicator for having kin in the destination during immigration, and others.

Estimation results for bivariate probits for the weighted and unweighted cases are summarized in Tables 2.11.1 and 2.11.2 respectively. For the joint estimation of two decision rules it is desirable to have exclusion restrictions. In particular, we use the variable kin in destination as an exclusion restriction for the initial emigration decision and the share of male adults in the household as an exclusion restriction for the return migration decision. In the case of weighted estimates, the regression coefficients from separate probits and bivariate probit are very similar. The correlation coefficient between error terms in two selection rules is negative ($\rho = -0.48$) and it is only marginally statistically significant. Therefore, unobservable characteristics affect both emigration and return migration decisions but in opposite directions. The estimation results of two migration rules can be summarized as the following. The migration probability is higher for younger males, those who are more educated, live in urban localities and have other household members with migration experience. The emigration probability is lower for households with a larger share of male adults. These results are in line with previous findings, when the emigration decision rule was estimated using only a subsample of return migrants and the sedentary population.

The probability of return was found to be higher for male migrants, for those migrants who stay in non-OECD destinations and have no kin in the destination country during their migration episode. Moreover, employment status before departure to the destination country and a pre-arranged employment contract in the destination positively affect the probability of return migration. The signs of all coefficients are as anticipated.

The unweighted estimates are similar in terms of magnitude of the coefficients and their statistical significance to the results from weighted estimates with several exceptions. The indicator variable for having other household members with either current or past migration experience negatively affect the emigration decision. Moreover, the correlation coefficient between the error terms in two decision rules is negative and highly statistically significant compared to the weighted case where it was only marginally significant. No other substantial differences in results from two approaches are observed. In order to

assess the magnitude of the coefficients in two decision rules, one needs to compute the marginal effects.

To summarize, when absent migrants are included in the analysis, the results from the estimation of the initial emigration decision do not change in terms of the direction of effects and their statistical significance. Therefore, at the stage of initial emigration, return and absent migrants do not differ substantially with respect to observable characteristics. However, two types of migrants differ from each other in terms of emigration objectives. In particular, we find that return migrants more often emigrate having a pre-arranged contract in the destination country which signals the temporary nature of their resettlement. Moreover, those migrants who eventually return to the country of origin tend to be employed before the departure. Return migrants are also distinguished by their educational attainment as they tend to hold a tertiary degree or have primary education, being employed in low-skilled jobs such as agriculture and processing or in high-end jobs such as science, education, and government respectively. Those migrants who were absent at the time of the survey emigrate mostly without a pre-arranged contract, they experience unemployment before the departure and they are more likely to hold a secondary degree. Absent migrants seem to be more attached to the destination country as many of them report to having kin in the destination.

As a final stage of our estimations, we attempt to estimate the earnings equation (50) using two selection-correction terms λ_i^{Mig} and λ_i^{RM} to account for the possible selection of migrants on unobservables at both stages of the migration process. For this purpose, we take the estimation results from bivariate probits to compute the selection correction terms using the methodology proposed by Tunali (1986), which was described in the estimation strategy section. We re-estimate equation (50) including correction terms as separate regressors. Table 2.12 summarizes the estimation results. We observe that the size of the coefficient for migration experience in the earnings equation has substantially increased compared to the treatment effect model in both weighted and unweighted estimations while the coefficients for other variables remain similar to the benchmark results.

This indicates a substantial bias, which is introduced due to the potential correlation of the error terms of two decision rules with the error term of the outcome equation. Unfortunately, with the dataset at hand we are not able to find any additional strongly exogenous variables that would affect only one decision rule, has no effect on the second decision rule and is uncorrelated with the error term from the earnings equation.

2.7 Conclusion

The major objective of our study was to assess the relative labor market performance of return migrants compared to the sedentary population using the data for Vietnam. In particular, we attempted to estimate the earnings differential between groups of return migrants and non-migrants, which is due solely to the migration status, controlling for possible self-selection of migrants with respect to observable and unobservable characteristics. Moreover, we decomposed the estimated premium across educational attainments, which is often assumed to be a constant fraction of wages in all educational groups in the theoretical literature.

We found a positive and statistically significant average experience premium between the groups of return migrants and non-migrants. The experience premium for Vietnam was estimated to be around 30 %. The premium was found to be very volatile with respect to the educational attainments of migrants, in particular, being largest for returnees with tertiary and primary education and smaller in the case of the tertiary educated. When decomposed across genders, the U-shaped pattern of the experience premium persists in the group of male migrants, and the premium increases with education in the case of female returnees. Therefore, we do not find supporting evidence for the assumption of the theoretical studies about the experience premium being a constant fraction of wage at all educational levels.

The selection of migrants with respect to observable socio-economic characteristics highlights the following distinctions compared to the sedentary population. Migration takes place in the early years of adult life and reveals a positive selection of migrants with

respect to educational attainments. When the total pool of migrants is decomposed into return and absent migrants, we find that the absent migrants are much younger at the moment of emigration, they reveal an intermediate selection with respect to education and come from sizable households and very specific regions of the country — the most disadvantageous such as the North Central Coastal region. Return migrants emigrate at a more mature age than absent migrants, have a pre-arranged contract at the destination, have predominantly tertiary education, and originate from urban localities. The majority of returns take place within the first three years after resettlement, reaching a 20 % survival rate at the fifth year and sharply declining thereafter.

We find no evidence for the selection on unobservables for the case of weighted estimates, but we find a negative selection when the sampling design is ignored in the estimations. In the latter case, a negative selection on unobservables yields estimates twice as large, and the experience premium increases up to 50 %.

Our finding of the U-shaped experience premium with respect to educational attainment, which is similar to the U-shaped pattern of return migration rates with respect to education for the case of Vietnam, is very interesting. It suggests a further investigation into the role of the experience premium in the selection of migrants into return migration along educational dimension.

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Chapter 3

Return Migration and Economic Growth: The Role of Home Country Policies

Temporary migration to advanced destinations allows migrants to accumulate human capital in the process of on-the-job training and, upon return, contribute to knowledge diffusion. We construct a tractable two-country OLG model with migration and return decisions of agents heterogeneous in terms of skills. We assume that human capital is upgraded in immigration in both skill groups. When returns to skills in the country of origin are higher than in the destination, the emigration of skilled labor will be insufficient to close the technological gap with the foreign country. We analyze the possibility for government intervention in the form of subsidizing return migration of a particular skill type. Our model predicts that when skilled labor is sufficiently scarce or has a sufficiently large output share, the entire subsidy should be channeled to the skilled. In this case, the skill composition of the country of origin improves, and technological and output gaps between foreign and home countries decline, and the home country experiences a faster growth.

JEL Classification: F22, O4, O15

Keywords: international migration, human capital, economic growth, migration policy

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All errors remaining in the text are the responsibility of the author.

3.1 Introduction

Temporary migration, being the dominant pattern of international labor mobility, results in sizable return flows, which both pose a challenge and offer development opportunities for the countries of migrants' origin (OECD, 2009). The challenging aspect of return migration is the successful re-integration of returnees into society and the labor market in particular. The growth potential of return migration has started to be recognized only recently. It originates from a possible contribution of returnees in the form of savings accumulated abroad, an entrepreneurial attitude, and enhanced human and social capital while abroad. The countries of migrants' origin attempt to shape the return migration flows by means of policies, creating incentives for a sustainable return of the most skilled and well-financed members of their overseas diaspora (Jonkers, 2008).

In our paper, we focus on the human capital of return migrants as a potential channel of economic growth for countries of origin. Statistical evidence reveals that emigration rates robustly increase with education, implying a positive selection of migrants (Docquier & Marfouk, 2006). Moreover, the emigration of skilled people from developing countries has significantly increased in magnitude over the past few decades (Docquier & Rapoport, 2012). High emigration rates among skilled members of the population are coined in the literature as the problem of *brain drain*. The depletion of the stock of human capital in the countries of origin results in a drop in average productivity and, consequently, a drop in output, as well as reducing the possibility of knowledge spillovers (Acemoglu, 2008). Today, among the most affected by brain drain are disadvantaged regions, for example, the Caribbean, the Pacific, Sub-Saharan Africa, and Central America (OECD, 2009).

Growing evidence for return migration flows challenges the initially pessimistic attitude of countries of origin toward emigration and opens new development opportunities for them. The new attitude toward migration is grounded in the observations of the sizable return migration flows and comparably high return rates among highly skilled migrants as well as the low skilled (OECD, 2009). The return of low-skilled migrants, to a large

extent, is an outcome of the restrictive immigration policies of destination countries, which create obstacles for status adjustments to permanent residence on the basis of education. The return migration of the highly skilled is explained in the theoretical literature by higher returns to foreign work experience, which make the earnings received at home comparable to those received abroad (Borjas & Bratsberg, 1996). However, the surveys conducted among the returning population reveal that the dominant motives behind migrants' return decisions, regardless of their skill type, are personal and family circumstances (DotM, 2010).

In the case of return, migrants bring back their initial stock of human capital, which was available at emigration, but also augment their human capital in the foreign country either by acquiring additional schooling or from on-the-job training. If the human capital is indeed augmented with foreign work experience, then temporary migration can be viewed as an investment into human capital accumulation, which is otherwise impossible to achieve without the acquisition of additional education. The majority of migrants are moving to developed destination countries that have advanced technology and work practices, and, upon return, migrants may potentially transfer and implement their newly acquired knowledge and practices in the context of their countries of origin. The success of such transfers depends on many aspects, which will be discussed below.

Empirical studies provide supportive evidence for the hypothesis of human capital upgrading by migrants in the process of on-the-job training (Coulon & Piracha, 2005; Epstein & Radu, 2007). They find a positive gap in earnings between returnees and the comparable sedentary population after controlling for the self-selective nature of migration decisions. Such an earnings' differential, which is attributed solely to the migration experience, is known in the literature as the *experience premium.* The premium reflects a higher productivity of return migrants compared to the population with the same level of schooling and no migration experience. The experience premium was found to be very volatile across countries of origin and with respect to different socio-economic characteristics of returnees. For instance, the size of the average experience premium

ranges from 7% in Mexico and Ireland up to 60 % for Hungarian and Albanian returnees (Co, Gang, & Yun, 2000; Coulon & Piracha, 2005).

Highly skilled migrants, due to the nature of their jobs, are assumed to have more opportunities for human capital accumulation compared to manual low-skilled workers. However, a handful of empirical studies on the experience premium, including the second chapter of this dissertation, challenge this assumption and reveal that the premium is increasing with education, but it is also substantial in the group of low-skilled returnees, implying that human capital is upgraded at all skill levels (Barrett & Goggin, 2010). If this is the case, the return of migrants with all educational attainments can be potentially beneficial for the countries of origin and can contribute to their economic growth.

The growth impact of return migration depends on the extent of return flows, their skill composition and, which is more important, on the ability of the countries of origin to accommodate the knowledge and experience of returnees (Dos Santos & Postel-Vinay, 2003; Docquiere & Rapoport, 2012). Traditionally, return migration is viewed as an outcome of a combination of individual motives and restrictions with respect to permanent residence imposed by the immigration policies of destination countries. However, as a recent development, countries of origin are trying to influence return migration by means of policies which create incentives for the return of migrants either on a temporary or, more desirably, on a permanent basis.

In this paper, we consider a particular type of incentive, which is intended to stimulate permanent return, namely a *wage subsidy* offered to return migrants by the countries of their origin. The subsidy is a common instrument, for instance, in policies that intend to stimulate a permanent return of highly skilled research workers employed in public units and educational institutions (Jonkers, 2008). We develop a dynamic, two-country model with the OLG population structure, where heterogeneous agents in terms of skills make decisions about emigration and return. We use the model to draw conclusions about the "optimal" allocation of a government subsidy between return migrants with different skill types, which would result in the largest growth for the countries of origin.

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The rest of the paper is organized as follows. The next section provides an overview of the theoretical literature, which models the growth impact of return migration through the human capital accumulation channel. Section 3.3 presents a summary of the policies from countries of both origin and destination, which aim to stimulate the return of migrants. In the modeling section, we construct a tractable model of emigration and return migration. Next, we consider the impact of the endogenous wage subsidy and its different allocations across return migrants with different skill types on the technological and output gaps between the home and foreign countries. In the last section, we conclude.

3.2 Literature Review

Human capital is defined as a sum of personal characteristics that determine individual productivity. The accumulation of human capital, which is considered as an important source of economic growth in the macroeconomic literature, takes place through schooling and in the process of on-the-job training (Lucas, 1988). Human capital affects economic growth in two ways. The increase in the stock of human capital in the economy increases the overall productivity of labor, and, consequently, the output. However, changes in human capital do not explain major differences in growth patterns across countries, but rather what matters is the stock of human capital available in the economy at any period of time (Acemoglu, 2008). Nelson and Phelps (1966) claim that the level of human capital, which determines workers' ability to cope with changes in technology and innovations and to adopt and implement new technologies, is vital for economic growth. A larger stock of human capital results in spill-over effects, thus increasing the productivity of all workers, and stimulating the process of knowledge diffusion.

The depletion of the stock of human capital in the process of labor migration and its growth implications for countries of origin represent the research agenda for many studies dating back to 1960s. A comprehensive overview of the four generations of these studies is presented in a seminal work by Docquier & Rapoport (2012). Early studies express a pessimistic view about the effect of the human capital withdrawal on the growth and

welfare of the population in sending countries. These studies are based on the evidence of high emigration rates among skilled labor and the permanent nature of resettlement. Their major objective was a search for remedies that would help to mitigate these negative consequences.

Later generations of studies demonstrate changes in attitude toward migration in the light of better statistical evidence. They show that despite a positive selection of migrants and their permanent resettlement, migration results in a stream of remittance and may potentially encourage a larger accumulation of human capital by sending countries in the case of uncertain migration opportunities (Stark, 1989; Mountford, 1997).

The last generation of studies that analyze the development impact of international labor mobility for sending countries takes into account a temporary nature of resettlement. Increasing evidence of substantial return migration flows, and high return rates among skilled migrants create another potential channel for economic growth for countries of origin in the form of return migration. In the case of return, migrants not only bring back their initial endowment of human capital, but rather an augmented endowment, having acquired additional schooling in the destination, or having improved their productivity in the process of on-the-job training undergone abroad. Growing number of empirical studies find supportive evidence for human capital accumulation by return migrants in immigration, revealing a positive wage differential between returnees and the comparable sedentary population (Co, Gang & Yun 2001; Coulon & Piracha, 2005; Barrett & Goggin, 2010; Epstein & Radu, 2009).

The literature on growth implications of return migration through the human capital accumulation channel is summarized in Table 3.1. The growth potential of return migration is determined by the extent of return flows, their skill composition, and by assumptions with respect to the human capital accumulation mechanisms (schooling, on-the-job training, or a combination of the two). Even in the case of a negative selection into return migration, meaning that only low-skill migrants return while highly skilled migrants always remain abroad, a sending country will have growth possibilities due to the incentive

mechanism, as uncertain migration opportunities would stimulate labor to acquire more human capital compared to the state of autarky (Stark, Helmenstein & Prskawetz, 1997). Moreover, being combined with a possibility for the human capital accumulation in the destination country in the process of on-the-job training, the gain for countries of origin becomes even more substantial (Mayr & Peri, 2008; Docquier & Rapoport, 2012).

The existing models in the field consider the role of the immigration policy of destination countries, which is introduced in the form of uncertain emigration possibilities, reflecting a limited number of admissions (Dos Santos & Postel-Vinay, 2004; Mayr & Peri, 2008). Such uncertainty is assumed to result in a larger stock of human capital acquired by the population of the origin countries, which anticipates higher expected returns to skills in the case of emigration. Moreover, in the case of temporary admissions, the human capital is returning to the country of origin either in the augmented form or in the pre-migration amount.

The restrictive immigration policies of destination countries often apply to low-skilled migrants, pushing them to return. The incentive policies of origin countries represent a more recent development and create a stimulus for the return of highly skilled migrants. In the paper, we develop a basic model of the migration and return migration decisions of labor and introduce the incentives offered by countries of origin in the form of a wage subsidy paid to returnees. Our main objective is to reveal the "optimal" allocation of a government subsidy across migrants with different skill types, which yields the smallest values of the output gap and relative output per capita in the foreign and home countries and results in faster growth of the country of origin.

We build our model using the theoretical framework proposed by Dos Santos & Postel-Vinay (2003). The authors construct a dynamic two-country two-period overlapping generations model with free labor mobility. Individuals, differing in terms of immigration costs decide about emigration and return migration by comparing the net benefits in two locations. Emigration to a more technologically advanced destination country allows migrants to accumulate human capital in the process of "on-the-job training" and return

with the augmented labor endowment; thus, the total stock of human capital in the home country increases, stimulating knowledge diffusion, and, consequently, growth. We extend the model by introducing skill heterogeneity of labor and the policy intervention of the home country government, which aims to stimulate the return of labor by means of wage subsidies.

3.3 Return Migration Policies: Overview

Beside individual and family circumstances, which motivate the return decisions of migrants, return flows are shaped, to a large extent, by the policies of the countries of destination and origin. In this section, we review the existing policies focusing on the policies of the countries of origin, which intend to stimulate persistent and voluntary return migration flows.

The important driving force behind return migration, especially among low-skilled migrants, is the immigration policies of destination countries which create obstacles for the adjustment of status to permanent residence on the basis of education, origin, and employment contract. An alternative approach used by destination countries is to create incentives for immigrants, the unemployed and those with illegal status, to return to the countries of origin in the framework of the *voluntary return migration programs.* Immigrants who are willing to return permanently are provided with a one-way ticket home for themselves and other members of their households and with a lump-sum benefit per person (Pleva, 2012). Those immigrants who plan to start a business upon return are provided with start-up funds. In some cases, return migrants are offered counseling services in the country of origin, which help them to re-integrate into society and the labor market.

Voluntary return migration programs have been in practice since 1970, and they are implemented through the close cooperation of destination countries with the International Organization for Migration (Black, Collyer & Somerville, 2011). Among the first nations to introduce such programs were the Netherlands, Germany, France, and much

later the U.K. Such programs are more cost-efficient, being less expensive for destination countries compared to forced return. They are quicker to implement and do not require any cooperation with destination countries. As a recent example, Spain has used voluntary return migration programs to cope with the unemployment problem among migrants during the current financial crisis (Pleva, 2012).

However, the voluntary return migration programs suffer from relatively low participation rates and have proven to be inefficient at precluding returning migrants from consequent re-emigration back to destination countries (OECD, 2009). As an illustration, for the period of November 2008 - May 2010, approximately 5400 immigrants were assisted with return under the Spanish program, out of 130,000 of unemployed foreigners who satisfied the selection criteria in 2008. The IOM Spanish program of assisted return yielded more modest results compared to the initiatives of the Spanish government. During the period 2003-2009, the IOM Spain assisted 5500 immigrants in the process of their return.

Recently, countries of origin have started to actively participate in the development of policies which intend to stimulate return migration. Such policies are known as *return migration incentive schemes* and they target the most skilled (those with tertiary education) and well-financed members of the overseas diaspora and create incentives for their return or knowledge circulation (Agunias & Newland, 2007). The increasing statistical evidence on return migration, the anecdotal evidence on success stories of the countries of origin deriving benefits from their returnees, as well as the willingness of migrants to maintain strong ties with origin countries, explain a recent increase of work in the development of such incentive schemes.

The work of the countries of origin with their overseas diaspora starts, as a rule, with the establishment of a relevant government body which is responsible for the collection of information on emigrants and for direct work with diaspora members. As examples the Ministry of Diaspora Affairs in Ghana and the Ministry of Overseas Foreign Affairs in India can be mentioned. Such government units develop incentive packages for different

target groups, being responsible for informing emigrants about available benefits and return opportunities. The target groups are selected based on the development objectives of the countries of origin and their strategic areas of growth. This approach is used in India, Taiwan, Malaysia, and more recently in Ghana, who encourage the return of specialists working in the areas of ICT, biotechnologies, research and development, and climate change (Jonkers, 2008).

As return migration takes different forms, ranging from permanent return to circular movements known as transnationalism,the incentive schemes offered by the countries of origin take into account such differences and tailor incentive packages for different types of returnees. The most valuable, in terms of potential development impact, is the permanent return migration of highly skilled labor. However, studies reveal a rather careful attitude of skilled emigrants with respect to permanent return, when the return migration decision is not motivated by other circumstances (Agunias & Newland, 2007). Highly skilled returnees are looking not only for the necessary infrastructure and interesting job opportunities, but they take into account the overall development trend of the country of origin, reflected in its socio-economic and political conditions.

Moreover, some countries do not encourage permanent return in fear of losing the flow of remittances, which in some countries, for example India, constitute a substantial flow of foreign exchange. India creates incentives for the engagement of the diaspora, but does not explicitly encourage the permanent return of its workers, rather stimulating transnationalism or "brain circulation" (Jonkers, 2008). Thus, permanent verses temporary return migration is a debatable issue for many countries of origin, as it involves substantial trade offs.

Permanent return migration is defined as the return with intention to remain in a home country for at least one year (UNDP, 2010). This type of return requires the most incentives to be provided in terms of personal and professional benefits, and is considered as the most challenging policy for implementation. As a rule, policies target "permanent" immigrants, those who have spent substantial time abroad, even second

generation migrants. Due to the large reward offered in the framework of such programs, they impose strict selection criteria with respect to education, experience, current position and the duration of the foreign stay. For instance, the Malaysian Returning Expert Program (REP) requires a minimum 2 years of migration duration for emigrants with doctoral degree, and up to 5 years for those with only a bachelor degree.

Policies which intend to promote the permanent return of the highly qualified migrants are very expensive for origin countries due to the large investment into the infrastructure and wage subsidies which they require. Among the countries which concentrate on such incentive programs Taiwan and China encouraged by the successful experience of South Korea, can be mentioned as the most recent examples. These countries, attempt to shift their comparative advantage from being low-skill labor-abundant countries to more skill- and capital-abundant by means of diaspora members.

Return migration incentive programs distinguish between two broad groups of re-turnees, namely entrepreneurs and experts. Entrepreneurs are absorbed mostly by the private sector, while experts end up in public research and educational institutions. Consequently, the incentives offered in the two groups differ substantially. Entrepreneurs are looking for profitable business start-up opportunities, and they are attracted by a suitable business environment and concessions with respect to taxes, as well by the availability of financial capital. On the other hand, the group of researchers and scientists is attracted by opportunities for career development and autonomous research (Jonkers, 2008).

Return of researchers. Permanent return migration of researchers, scientists and engineers represents a recent policy objective of China — a country which is trying to imitate the successful practices of Taiwan and Korea back in late 1960s. The target group for such policies is ethnic Chinese scientists with foreign citizenship, predominantly younger professionals. The country has an ambition to turn its 100 universities into world-class research centers by 2020 (Agunias & Newland, 2007). One of the major incentives offered to returning scientists, particularly in China, is a salary top-up, thus making their earnings comparable to that received in the destination country. India, within the

framework of the Ramanujan Fellowship, also targets high caliber scientists among the diaspora members and offers them grants of 800 Euros monthly for a period of 5 years, providing conference support and covering other costs associated with research activities.

However, beside direct compensation, returnees obtain a number of intangible benefits. The Chinese government, for example, is investing into infrastructure and building world class research laboratories equipped with cutting-edge technologies. Returnees are given high status positions, research autonomy and opportunities to build up their own research groups (Jonkers, 2008). Beside economic benefits, returning migrants obtain assistance in terms of housing via interest-free housing loans, employment of spouses and access to schooling for their children. Moreover, they obtain tax exemptions with respect to income taxes and taxes on assets brought from abroad. Another important aspect is the transferability of retirement benefits from abroad. The government assistance is provided at all stages of the return process and includes pre- and post-return counseling services and reintegration assistance. All travel costs of return migrants and their family members are reimbursed by the government.

Return of entrepreneurs. Another group of permanent returnees are those who are interested in entrepreneurship activities, in particular *technoproneurs* with innovative ideas which can be commercialized. The development potential of this group of return migrants is in their contribution to job creation and innovation. For entrepreneurs, the primary incentives for return is a favorable economic environment suitable for investment and a favorable tax regime, as well as the availability of financial capital which can be borrowed at low interest rate.

As an example of a suitable infrastructure provided by the countries of origin for the potential entrepreneurs special economic zones in India or export processing zones in China can be mentioned, which offer a tax-free operation regime in the case of export-oriented production activities. Such zones provide full exemption from income tax for 5 years, fuel subsidies, and reduction of licensing requirements (Jonkers, 2008).

Another type of incentive scheme offered for returnees takes the form of scientific

parks. This form blends both experts and entrepreneurs, and creates opportunities for knowledge spillovers. Additional benefits include interest-free capital, tax exemptions and inexpensive office space. The earliest example of technoparks are represented by the Hinschu Science-Based Industrial Park in Taiwan, established in 1980. The objective was to transfer the Silicon Valley model to a domestic context. Aside from providing necessary infrastructure, the government subsidized the construction of western-type accommodation and commercial services in that area. As a result, in 2000, 4108 out of 102,000 employees in the Park were return migrants and 113 out of 289 companies were established by former immigrants from the U.S. (Jonkers, 2008). Return migrants were attracted by entrepreneurial opportunities and interesting projects which could be implemented within the available infrastructure. As a result, Taiwan currently possesses the largest venture capital industry represented by the IT sector outside of North America, having the largest rate of new firm formation and the highest rate of investment safety (Hunger, 2004). Other examples of technoparks include technology parks in Bangalore and Hyderabad in India and China's 110 science parks and high-tech zones near Beijing, which employ about 15,000 return migrants, and the most recent Ghana Technology park project.

The development of special business and research infrastructure requires substantial investment of the governments in the countries of origin. It explains why only a handful of countries undertake such initiatives.

The efficiency of return migration incentive schemes by the countries of origin can be assessed by the number of returning migrants who participate in these programs. For example, in the case of Malaysia, the Returning Experts Program described above for the period 2001 - 2010 attracted around 1500 applications, out of which only 57.7 % were approved. [11]

As we mentioned earlier, high-caliber representatives of the overseas diaspora are cautious about permanent return and prefer return on a temporary basis. Consequently,

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[11]We are grateful for the Malaysian Ministry for Human Resources, and in particular for Mr. Mohd Napiah Haris, for the information provided.

the majority of policies of the countries or origin are designed to stimulate temporary or circular return migration flows, which is easier to implement and at lower costs. An active role in the programs of temporary return is played by the International Organization for Migration, which has access to the overseas diaspora, and works closely with countries of destination and origin. Such programs imply a return for a limited period of time (from 2 weeks up to several months), and they are intended for knowledge transfers. For instance, the Brain Gain Malaysia Program stimulates communication between the diaspora and ministries, small and medium enterprises, and the key development clusters. The members of the overseas diaspora are reimbursed travel costs and provided with accommodation, as well as paid subsistence fees. They target experts in the areas close to the key development objectives. The major requirement of the program is that the collaboration should take place in Malaysia. Other examples include the initiative of the IOM known as Migration for Development Program (MIDA), Migration for Development in Africa, and Temporary Virtual Return to the Balkans, as well as the UNDP Transfer of Knowledge Through Expatriate Nationals (TOKEN).

3.4 The Model

Technology

We consider interactions between two countries — a "small" open economy of the *home country* and a "large" *foreign economy* denoted as H and F respectively. Both countries employ the CRS production function, producing a single homogeneous good with labor of two skill types. The home country technology:

$$Y_t^H = \left(A_{u,t}^H L_{u,t}^H\right)^\alpha \left(A_{s,t}^H L_{s,t}^H\right)^{1-\alpha},$$ (68)

where Y_t^H is aggregate output at time t, $L_{u,t}^H$ and $L_{s,t}^H$ are labor inputs of unskilled and skilled types respectively at time t, expressed in efficiency units; α and $1-\alpha$ are shares of unskilled and skilled labor in the output, and $A_{u,t}^H$ and $A_{s,t}^H$ are scaling factors of the

labor-augmenting technological progress in the groups of the unskilled and skilled labor respectively, which reflect the state of available technology in each skill group. The total factor productivity in the home country (A_t^H) is defined in the following way:

$$A_t^H = \left(A_{u,t}^H\right)^\alpha \left(A_{s,t}^H\right)^{1-\alpha}. \tag{69}$$

The production function of the foreign country:

$$Y_t^F = \left(A_{u,t}^F L_u^F\right)^\beta \left(A_{s,t}^F L_s^F\right)^{1-\beta}, \tag{70}$$

where Y_t^F is aggregate output at time t, $L_{u,t}^F$ and $L_{s,t}^F$ are labor inputs of unskilled and skilled types respectively at time t, expressed in efficiency units; β and $1 - \beta$ are shares of unskilled and skilled labor in the output. $A_{u,t}^F$ and $A_{s,t}^F$ are scaling factors for the labor-augmenting technological process in the foreign country at time t. Similar to the home country, the overall technological progress or the total factor productivity of the foreign country (A_t^F) is modeled as a combination of labor-augmenting changes in two skill groups:

$$A_t^F = \left(A_{u,t}^F\right)^\beta \left(A_{s,t}^F\right)^{1-\beta}. \tag{71}$$

For any t, the foreign country is assumed to be more technologically advanced compared to the home country: $A_t^F \geq A_t^H$. We further assume that the foreign economy is growing at the *exogenous* rate g, which is the growth rate of the total factor productivity. The home country is assumed to have no exogenous source of growth. The only growth possibility for the home country is through the human capital accumulation in the process of temporary migration, which is described in detail below.

Firms' optimization problem. The profit maximizing behavior of competitive firms in the home country implies that the labor is paid its marginal product:

$$W_{u,t}^H = \alpha A_t^H \left(\frac{L_{s,t}^H}{L_{u,t}^H}\right)^{1-\alpha}, \tag{72}$$

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$$W_{s,t}^H = (1 - \alpha)A_t^H \left(\frac{L_{u,t}^H}{L_{s,t}^H} \right)^\alpha, \tag{73}$$

where $W_{u,t}^H$ and $W_{s,t}^H$ are the home country wages of unskilled and skilled labor respectively at time t.

Wages in the foreign country are determined in a similar way:

$$W_{u,t}^F = \beta A_t^F \left(\frac{L_{s,t}^F}{L_{u,t}^F} \right)^{1-\beta}, \tag{74}$$

$$W_{s,t}^F = (1 - \beta)A_t^F \left(\frac{L_{u,t}^F}{L_{s,t}^F} \right)^\beta, \tag{75}$$

where $W_{u,t}^F$ and $W_{s,t}^F$ are the wages of unskilled and skilled labor respectively in the foreign country at time t. We introduce a special notation for the relative skill supply in each country. In particular:

$$\lambda_{H,t} = \frac{L_{s,t}^H}{L_{u,t}^H}, \tag{76}$$

$$\lambda_{F,t} = \frac{L_{s,t}^F}{L_{u,t}^F}, \tag{77}$$

where $\lambda_{H,t}$ and $\lambda_{F,t}$ are the relative skill supply in the home and foreign country respectively. Thus, in both countries, wages are the functions of the current state of technologies and relative skill supply.

Population structure

The population in both countries is characterized by an overlapping-generations (OLG) structure. In the home country, every period t, a new cohort of a *unit size* and a fixed skill composition is born:

$$z_u^H + z_s^H = 1, \tag{78}$$

where z_u^H and z_s^H are shares of the unskilled and skilled population in a new cohort respectively. We assume no population growth. Every individual is endowed with one unit of labor, which is supplied inelastically in the labor market. Every cohort lives for two

periods. In autarky, the population of the home country is of size 2, and it is comprised of the population from two generations.

The foreign country has a similar OLG population structure with a new cohort of a unit size and a fixed skill composition:

$$z_u^F + z_s^F = 1, \tag{79}$$

where z_u^F and z_s^F are the shares of the unskilled and skilled population in a new cohort respectively. The size and skill composition of the population in the foreign country are constant in every period t. Due to the "large" country assumption, the effect of labor migration on the foreign country can be ignored. No population growth is assumed for the foreign country, as well as no possibilities for human capital accumulation. Consequently, the relative skills supply in the foreign country will be constant in every period: $\lambda_{F,t} = \lambda_F$.

When free labor mobility is allowed, the size of the home country population and its skill composition are no longer constant, and they change with the migration choices of the population. Temporary or permanent migration of the home country population are the outcomes of the individual optimization problem.

The Individual optimization problem

At the beginning of the first period, an individual learns his skill type and faces the choice of either remaining in the home country, participating in the labor market and receiving a wage according to his skill type, or emigrating to a foreign country. We assume that spending a fraction of their working life abroad, migrants improve their productivity in the process of on-the-job training, thus acquiring additional human capital regardless of their skill type. In the case of return to the home country in the second period of life, migrants bring back their augmented human capital, which contributes to the economic growth of the home country in two ways. First, the stock of effective labor is increasing, allowing for the larger output of the economy. Second, through the human capital externality,

the larger stock of human capital offers more opportunities for technological spillovers, thus affecting the productivity of all workers in the home country in the next period.

Emigration is allowed only in the first period of life. In the second period, conditional on the emigration decision of the first period, an individual decides about return migration. Migration and return migration take place in the case of positive net benefits related to the move. We assume that life abroad is associated with individual immigration costs (M_k) that reflect the costs of assimilation in the destination, as well as psychological costs. The immigration costs are randomly distributed in the population according to the known distribution. We insure that some individuals always emigrate and for some of them the costs of migration are so large that they never emigrate. Within each skill group, the immigration costs are distributed identically.

The individual intertemporal utility function (discounting is ignored):

$$U_{i,t,t+1} = W_{i,t} + W_{i,t+1}, \tag{80}$$

where $W_{i,t}$ and $W_{i,t+1}$ are the *net earnings* of an individual with skill i in periods t and $t+1$ respectively, for $i \in \{u, s\}$. Earnings in each period depend on the individual location choice in the following way:

- An individual k with skill i at time t lives in the home country:

$$W_{i,t} = W_{i,t}^H. \tag{81}$$

- An individual k with skill i at time t emigrates to the foreign country:

$$W_{i,t} = \frac{W_{i,t}^F}{M_k}. \tag{82}$$

- An individual k with skill i returns to the home country at time $t+1$:

$$W_{i,t+1} = (1 + E_{i,t+1})W_{i,t+1}^H, \tag{83}$$

where $W_{i,t}^H$ and $W_{i,t}^F$ are wages in the skill group i in the home and foreign counties respectively at time t, and $E_{i,t}$ is the *experience premium* received by return migrants with skill i at time t. The premium reflects an increase in labor productivity (augmentation of labor endowment) of return migrants due to the foreign work experience. The skill-specific premium is endogenous, and it is modeled as a non-linear function of the technological gap between two countries that exists in groups of unskilled and skilled labor:

$$E_{u,t} = E\left(T_{u,t}\right), \qquad T_{u,t} = \frac{A_{u,t}^F}{A_{u,t}^H}, \tag{84}$$

$$E_{s,t} = E\left(T_{s,t}\right), \qquad T_{s,t} = \frac{A_{s,t}^F}{A_{s,t}^H}, \tag{85}$$

where $T_{u,t}$ and $T_{s,t}$ are *technological gaps* in unskilled and skilled labor groups respectively, $E_{i,t}' \geq 0$, and $E_{i,t}(1) = 0$. The premium declines as the home country catches up with the foreign country and completely vanishes if the home country reaches the productivity level of the foreign country. Moreover, we assume the following functional form for the experience premium:

$$1 + E_{u,t} = \psi(T_{u,t})^\varphi, \tag{86}$$

$$1 + E_{s,t} = \psi(T_{s,t})^\varphi, \tag{87}$$

where ψ is a scaling factor and φ is elasticity of the human capital accumulation by technological gap, such that $\varphi \leq 1$. When $\varphi = 1$, the experience premium function is linear. For $\varphi < 1$, the rate of productivity enhancement declines as the technological gap widens. We set the value of ψ equal to 1. If the scaling factor is less than one, as the home country catches up with the foreign country, and the technological gap between the two vanishes, the experience premium may become negative. If ψ is greater than 1, in the case when the home country completely catches up with the foreign country, the experience premium would still remain positive, despite the fact that no accumulation of human capital takes place.

The individual optimization problem runs in two stages and is solved backwards.

A detailed solution is presented in Section 3.7.1 in the Appendix. The solution of the individual optimization problem is expressed as a pair of the immigration costs thresholds $\{\bar{M}_{i,t}, \tilde{M}_{i,t}\}$ that partition the population in the home country in each skill group i into three categories with respect to migration status: *sedentary population* (non-migrants), *emigrants*, and *return migrants*. The immigration costs thresholds are mapped into the population shares in the following way:

$$\bar{M}_{i,t} = a(\bar{N}_{i,t})^b, \tag{88}$$

$$\tilde{M}_{i,t} = a(\tilde{N}_{i,t})^b, \ a > 0, \ b > 1, \tag{89}$$

where $\{\bar{M}_{i,t}, \tilde{M}_{i,t}\}$ are the immigration costs thresholds for permanent immigration and initial emigration decisions respectively, and $\{\bar{N}_{i,t}, \tilde{N}_{i,t}\}$ are shares of permanent immigrants and emigrants respectively in the population of the home country in period t. The population shares are summarized in Table B below.

Table B. Population shares with respect to migration status

Skill group	Permanent Immigrants ($\bar{N}_t$)	Emigrants ($\tilde{N}_t$)
Unskilled	$\left[\frac{C_u}{(1+E_{u,t})}\frac{T_t}{(\lambda_{H,t})^{1-\alpha}}\right]^{1/b}$	$\left[\frac{C_u \cdot T_t}{\left[(\lambda_{H,t})^{1-\alpha} - E_{u,t+1}\left(\frac{A_{t+1}^H}{A_t^H}\right)(\lambda_{H,t+1})^{1-\alpha}\right]}\right]^{1/b}$
Skilled	$\left[\frac{C_s}{(1+E_{s,t})}\frac{T_t}{(\lambda_{H,t})^{-\alpha}}\right]^{1/b}$	$\left[\frac{C_s \cdot T_t}{\left[(\lambda_{H,t})^{-\alpha} - E_{s,t+1}\left(\frac{A_{t+1}^H}{A_t^H}\right)(\lambda_{H,t+1})^{-\alpha}\right]}\right]^{1/b}$

The terms C_u and C_s being the functions of the model's parameters are defined in the following way:

$$C_u = \frac{1}{a}\frac{\beta}{\alpha}(\lambda_F)^{1-b}, \tag{90}$$

$$C_s = \frac{1}{a}\frac{(1-\beta)}{(1-\alpha)}(\lambda_F)^{-b}. \tag{91}$$

In period t, the population of the home country is characterized by the following structure. A fraction $\tilde{N}_t$ of the newly-born population emigrates, while a fraction $(1-\tilde{N}_t)$

remains at home. The size of the returning population in period t is equal to $(\tilde{N}_{t-1} - \bar{N}_t)$.

The effective labor pool in the home country at time t is comprised of two generations:

$$L_{u,t}^H = \left[(1 - \tilde{N}_{u,t-1}) + (1 - \tilde{N}_{u,t}) + (1 + E_{u,t})(\tilde{N}_{u,t-1} - \bar{N}_{u,t}) \right] z_u^H, \tag{92}$$

$$L_{s,t}^H = \left[(1 - \tilde{N}_{s,t-1}) + (1 - \tilde{N}_{s,t}) + (1 + E_{s,t})(\tilde{N}_{s,t-1} - \bar{N}_{s,t}) \right] z_s^H. \tag{93}$$

The population in the home country at time t includes unskilled and skilled individuals from two generations:

$$N_{u,t}^H = \left[2 - \tilde{N}_{u,t} - \bar{N}_{u,t} \right] z_u^H, \tag{94}$$

$$N_{s,t}^H = \left[2 - \tilde{N}_{s,t} - \bar{N}_{s,t} \right] z_s^H, \tag{95}$$

where $N_{u,t}^H$ and $N_{s,t}^H$ are the number of unskilled and skilled individuals respectively at time t. We denote the overall *technological gap* between the foreign and home countries as $T_t = \frac{A_t^F}{A_t^H}$.

In the foreign country, the size of unskilled labor is equal to $2z_u^F$, and the size of skilled labor is $2(1 - z_u^F)$ in every period. Moreover, the size of effective labor is equal to the population size $L_{i,t}^F = N_{i,t}^F$. The relative skill supply in the foreign country is constant over time: $\lambda_F = \frac{1 - z_u^F}{z_u^F}$. The relative skill supply in the home country (λ_t^H) is, on the contrary, time-dependent due to the changing structure and skill composition of the labor force in the process of migration.

Economic growth

In our model, the foreign country is growing at an exogenous rate of technological change (g). We make a simplifying assumption that the home country does not have a source of economic growth in autarky. However, when free labor mobility is allowed, the home country potentially benefits from the augmented human capital of return migrants in two ways. A direct benefit results from the enhanced productivity of return migrants compared to the non-immigrant population, which contributes to a larger pool of effective labor $(L_{i,t}^H)$ and,

consequently, to a larger output of the home economy. An indirect benefit originates from a larger stock of human capital in the home country, which stimulates knowledge spillovers and knowledge diffusion, resulting in the technological advancement of labor of all skill types in the next period.

A conventional way of modeling the knowledge diffusion is to set the next period technology as a function of the human capital stock in the current period. In our framework, the general level of technology is modeled as a function of technological levels in two skill groups, and the knowledge diffusion takes the following form:

$$\frac{A_{u,t+1}^H}{A_{u,t}^H} = \frac{L_{u,t}^H}{N_{u,t}^H},$$ (96)

$$\frac{A_{s,t+1}^H}{A_{s,t}^H} = \frac{L_{s,t}^H}{N_{s,t}^H}.$$ (97)

Thus, the next period technology in each skill group is equal to the average productivity of the group in the current period. Combining equations (96)-(97) with equation (69), we obtain the law of motion of the total factor productivity for the home country:

$$\frac{A_{t+1}^H}{A_t^H} = \left(\frac{L_{u,t}^H}{N_{u,t}^H}\right)^\alpha \left(\frac{L_{s,t}^H}{N_{s,t}^H}\right)^{1-\alpha}.$$ (98)

Thus, the growth of the total factor productivity in the home country is a function of the average stock of human capital in each skill group.

Steady state

We assume that the economy of the foreign country is in the steady state. As the foreign country grows in every period at a constant rate of technological change (g), its steady state represents the *balanced growth path*. We make the additional assumption that the technology in each skill group in the foreign country is growing at the same rate g:

$$\frac{A_{u,t+1}^F}{A_{u,t}^F} = 1 + g,$$ (99)

$$\frac{A_{s,t+1}^{F}}{A_{s,t}^{F}} = 1 + g. \tag{100}$$

The steady state for the home economy is characterized by constant emigration and permanent immigration rates among the population in two skill groups. In the steady state, the technological gap between the foreign and home countries is constant:

$$\frac{A_{t}^{F}}{A_{t}^{H}} = \frac{A_{t+1}^{F}}{A_{t+1}^{H}} = T^{*}, \tag{101}$$

where T^{*} is the steady-state overall technological gap. The steady state for the home economy also represents the balanced growth path, when the home country is growing at the same rate as the foreign country:

$$\frac{A_{t+1}^{F}}{A_{t}^{F}} = \frac{A_{t+1}^{H}}{A_{t}^{H}} = 1 + g. \tag{102}$$

Moreover, the technological gap in each skill group is constant:

$$T_{u}^{*} = \frac{A_{u,t}^{F}}{A_{u,t}^{H}} = \frac{A_{u,t+1}^{F}}{A_{u,t+1}^{H}}, \tag{103}$$

$$T_{s}^{*} = \frac{A_{s,t}^{F}}{A_{s,t}^{H}} = \frac{A_{s,t+1}^{F}}{A_{s,t+1}^{H}}. \tag{104}$$

Consequently, the rate of technological change in the home country in each skill group is equal to the rate of technological change in the corresponding group in the foreign country:

$$\frac{A_{u,t+1}^{H}}{A_{u,t}^{H}} = 1 + g, \tag{105}$$

$$\frac{A_{s,t+1}^{H}}{A_{s,t}^{H}} = 1 + g. \tag{106}$$

In the balanced growth path, the population structure in the home country remains con-

stant. The steady state values of the relative skill supply and population shares:

$$\lambda_H^* = \frac{\left[2 - \tilde{N}_s^* - \bar{N}_s^* + E(T_s^*)(\tilde{N}_s^* - \bar{N}_s^*)\right] z_s^H}{\left[2 - \tilde{N}_u^* - \bar{N}_u^* + E(T_u^*)(\tilde{N}_u^* - \bar{N}_u^*)\right] z_u^H}, \tag{107}$$

$$\tilde{N}_u^* = \left[\frac{T^*(\lambda_F^*)^{1-\alpha}}{a(\lambda_H^*)^{1-\alpha}\left[1 - E(T_u^*)(1 + g)\right]}\right]^{\frac{1}{b}}, \tag{108}$$

$$\bar{N}_u^* = \left[\frac{T^*(\lambda_F^*)^{1-\alpha}}{a(\lambda_H^*)^{1-\alpha}(1 + E(T_u^*))}\right]^{\frac{1}{b}}, \tag{109}$$

$$\tilde{N}_s^* = \left[\frac{T^*(\lambda_F^*)^{-\alpha}}{a(\lambda_H^*)^{-\alpha}\left[1 - E(T_s^*)(1 + g)\right]}\right]^{\frac{1}{b}}, \tag{110}$$

$$\bar{N}_s^* = \left[\frac{T^*(\lambda_F^*)^{-\alpha}}{a(\lambda_H^*)^{-\alpha}(1 + E(T_s^*))}\right]^{\frac{1}{b}}. \tag{111}$$

We make a simplifying assumption that two countries utilize the same production function: $\alpha = \beta$.

From (98), we obtain the steady state values of the average productivity in each skill group:

$$\left(\frac{L_u^H}{N_u^H}\right)^* = \frac{\left[2 - \tilde{N}_u^* - \bar{N}_u^* + E(T_u^*)(\tilde{N}_u^* - \bar{N}_u^*)\right]}{\left[2 - \tilde{N}_u^* - \bar{N}_u^*\right]} = 1 + g, \tag{112}$$

$$\left(\frac{L_s^H}{N_s^H}\right)^* = \frac{\left[2 - \tilde{N}_s^* - \bar{N}_s^* + E(T_s^*)(\tilde{N}_s^* - \bar{N}_s^*)\right]}{\left[2 - \tilde{N}_s^* - \bar{N}_s^*\right]} = 1 + g. \tag{113}$$

The overall technological gap between two countries:

$$T^* = (T_u^*)^\alpha (T_s^*)^{1-\alpha}. \tag{114}$$

We define the return migration rate in the following way:

$$RR_i^* = \frac{\tilde{N}_i^* - \bar{N}_i^*}{\tilde{N}_i^*} = 1 - \frac{\bar{N}_i^*}{\tilde{N}_i^*}, \tag{115}$$

where RR_i^* is the steady state value of return migration rate in skill group i. The return rate is an increasing function of the technological gap ($RR_{T_i}^* \geq 0$). When the technological gap between the home and foreign countries increases, the return rates increase, being driven by a larger experience premium.

Definition of the steady state equilibrium

Given

- Exogenous skill composition of a new cohort $\{z_u^H, z_s^H, z_u^F, z_s^F\}$,

- Exogenous distribution of the immigration costs (M) in the population with parameters a and b,

- Parameters of the aggregate production function α and β,

- Exogenous rate of technological change in the foreign country g,

the steady state equilibrium is a set of shares $\{\tilde{N}_u^*, \tilde{N}_s^*, \bar{N}_u^*, \bar{N}_s^*\}$ that partition the population in the home country into three groups with respect to migration status (permanent immigrants, emigrants, and return migrants), a vector of the long-run technological gaps $\{T_u^*, T_u^*, T_s^*\}$, and a vector of experience premium $\{E_u^*, E_s^*\}$, such that the following holds:

- $\{\tilde{N}_u^*, \tilde{N}_s^*, \bar{N}_u^*, \bar{N}_s^*\}$ solve the individual optimization problem;

- $\{W_u^H, W_s^H, W_u^F, W_s^F\}$ are the solutions for the firms' optimization problem in the home and foreign countries (64)-(67);

- The markets for unskilled and skilled labor clear.

As the system of equations (107)-(114) does not have an explicit analytical solution, we consider its numerical solution. Below, we summarize our numerical findings.

3.4.1 Numerical results

As a starting point, we discuss our choice of the models' parameters used for numerical solution. A set of parameters includes $\{z_u^F, z_u^H, \alpha, g, a, b, \varphi\}$.

The foreign country differs from the home country in terms of the skill composition of the population, which is determined by z_u^F. We assume that the population of the home country is relatively more unskilled-labor-abundant compared to the foreign country: $z_u^H > z_u^F$. The cross-country evidence reveals that developing countries are distinguished by larger shares of the low-skilled population compared to developed countries (OECD, 2012). For simplicity, we assign equal shares to unskilled and skilled labor in the population of the foreign country: $z_u^F = 0.5$. The value of z_u^F is not crucial for our analysis. What is important is our assumption that the home country has a larger share of unskilled labor than the foreign country. In particular, as the benchmark, we consider two cases when $z_u^H = 0.7$ and $z_u^H = 0.9$, which we call the cases of *middle-income* and *low-income* countries respectively.

Another important parameter is a parameter of the production function, which determines output shares of unskilled and skilled labor inputs. We assume for simplicity a similar production technology utilized in both countries ($\alpha = \beta$), and we pick the benchmark value $\alpha = 0.3$, so as to ensure a positive skill premium in the foreign country, where both skill types are equally represented in the population.

The growth rate of the foreign country g is set to 2 %, which is a rather realistic value for the case of developed countries. The parameters of the cost function a and b are chosen to ensure the interior solution for the individual optimization problem. Parameter φ, which represents the elasticity of the human capital accumulation by technological gap is set to 0.4.

For the benchmark parameter values, the numerical solution is summarized in Table 3.2. The model predicts that the steady state emigration rates among the skilled population are lower than the emigration rates among the unskilled population ($\tilde{N}_s^* < \tilde{N}_u^*$). In the home country, a relative scarcity of skilled labor drives up the skill premium, making

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the wages of skilled labor compatible with that received in the foreign country. On the contrary, emigration rates among the relatively-abundant unskilled population are high due to the larger wage differentials that exist between two countries in the unskilled group. Therefore, we find a negative selection of migrants with respect to skills. This prediction is not in line with statistical evidence on a positive selection of migrants, as emigration rates tend to increase with education. However, a handful of countries exhibit a negative selection, among them are the traditional suppliers of unskilled labor such as Morocco and Turkey. A positive selection observed in the data is potentially driven by the quality-selective immigration policies of destination countries, as well as by the costs of resettlement and other factors, from which we abstract in our analysis.

A relatively small pool of skilled labor in the home country and low emigration rates among the skilled explain a small increase in the stock of human capital in the skilled group as an outcome of migration. Consequently, the steady state technological gap in the group of skilled labor is larger than in the group of unskilled labor, resulting in a larger experience premium. This experience premium, together with a substantial skill premium, explain high return migration rates among the skilled population.

Despite smaller return migration rates, the absolute number of unskilled returnees is larger than the skilled. Migration of unskilled labor results in a larger stock of human capital in this skill group and leads to a technological catch-up with the foreign country. As the outcome, the experience premium and return migration rates in the unskilled population are smaller than in the skilled. The predictions of our model with respect to the experience premium heterogeneity across skill groups are in line with the findings of Barrett & Goggin (2010).

As a next step, we compare migration patterns for low-income and middle-income countries. In both cases, the skilled population is characterized by smaller emigration and larger return migration rates than the unskilled. However, emigration rates of skilled labor in the middle-income country are larger than in the low-income country as the skill premium is smaller in the former. Consequently, a more sizable emigration among the

skilled population in the middle-income country results in a technological catch-up of its skilled labor, while the low-income country reveals a larger technological gap with the foreign country in the skilled labor group.

For unskilled labor the situation is the opposite. Emigration rates among the unskilled are lower in the middle-income country than in the low-income country. This result is driven by two forces. First, by a smaller wage gap in this group between the foreign and home countries. Second, a larger skilled population in the middle-income country and higher emigration rates in this group contribute to the technological development of skilled labor, which comprises a larger output share. The overall improvement of the home country economy results in larger wages at home which, in turn, discourage emigration.

We assess the relative performance of the home and foreign countries in terms of technological and output gaps that exist between them. In the benchmark case, the overall technological gap is larger in the low-income country than in the middle-income country. The low-income country is characterized by larger disparities in development of technology in two labor groups, as unskilled labor is catching up with the foreign technology, while a relatively scarce skilled labor increases its technological gap with the foreign country. More sizable emigration among the skilled population in the middle-income country contributes to the technological development of skilled labor, resulting in a smaller technological gap in this skill group compared to the low-income country. Due to the initial assumption about the larger output share of skilled labor, the technological catch-up of skilled labor results in the lower overall technological gap in the middle-income country despite the fact that the technological gap in the unskilled group deteriorates.

In our analysis, we consider several measures of the output gap. First, we calculate the *overall output gap* as a ratio of aggregate outputs in the foreign and home countries. Second, we consider *relative output per capita*. For the home country, the output per capita is calculated as aggregate output per resident worker, accounting only for the population present in the home country, thus excluding migrants. In addition, we calculate *relative national income per capita*. For the foreign country, total national income is

equal to aggregate output due to the large country assumption. For the home country, national income includes domestic output and income of migrants received abroad. When calculating total national income per capita, we use the entire population of the home country regardless of their place of residence, which is equal to 2 in each time period. Our model predicts a similar behavior of the output gap across all three measures. Thus, we report our results using only one measure such as the overall output gap between the foreign and home countries.

The output gap is a function of the technological gap and relative skill supply in two countries. Changes in the technological gap affect changes in the output gap in the same direction. The increase in technological differences between two countries results in a larger output gap. Changes in the relative skill supply affect the output gap in the opposite direction. A larger pool of effective labor, as an outcome of migration process, translates into larger output of the home country, and, consequently, to a smaller output gap with the foreign country.

For the benchmark parameter values, the low-income country ends up with a larger output gap. The same is true for the other measure of the output gap described above. Moreover, the low-income country would have a larger technological gap and a smaller stock of skilled human capital compared to the middle-income country.

As a next step, we analyze how migration patterns and relative performance of the home and foreign countries in the balanced growth path change with the variation in the models' parameters. First, we consider changes in output shares of unskilled and skilled labor. For the benchmark value of $\alpha = 0.3$, the technology in both countries is more intensive in skilled labor. As α increases and the technology becomes relatively more unskilled-labor-intensive, emigration rates in both skill groups decline. Smaller emigration rates among the skilled are explained by a lower skill premium in the foreign country, which declines as α increases. The wages of unskilled labor in the home country increase with α, thus discouraging emigration in this group. The emigration rates of skilled labor remain lower than that of the unskilled. The overall migration activity of

the population is lower compared to the benchmark case, resulting in larger technological gaps in both skill groups. As a result, the experience premium in both skill groups increases, stimulating more sizable return migration flows. With larger α, the output of the home country increases, reducing the gap with the foreign country. However, the behavior of the overall technological gap is not robust as the gap increases for $\alpha \leq 0.5$ and declines for larger values of the parameter.

Second, we consider changes in z_u^F, which determines the skill composition of the population in the foreign country. If the skill composition of the foreign country improves, and thus the share of unskilled labor drops, wages of skilled labor decline and discourage the emigration of the skilled population from the home country. The emigration patterns among the unskilled are the opposite. The wages of unskilled labor increase as the unskilled become relatively scarcer in the foreign country, thus encouraging emigration of unskilled labor from the home country. The emigration rates among unskilled labor are larger than among the skilled. The relative migration patterns in the low-income and middle-income countries remain as in the benchmark case.

The technology of unskilled labor is catching up with the foreign country in the process of migration, thus reducing the technological gap with the foreign country in the unskilled group. The technological gap in the skilled group, on the contrary, is increasing as z_u^F declines. The overall technological gap between two countries increases, and the output gap deteriorates.

In the opposite situation, when the share of unskilled labor in the population of the foreign country increases, the migration behavior of the home country population reverses. Now, skilled labor has more incentives to emigrate being attracted by higher returns to skills abroad. An outcome of this is that the technology of skilled labor improves. Unskilled labor emigrates less and the technological gap with the foreign country in the unskilled group deteriorates. The overall technological gap and the output gap between the foreign and home countries decline.

Third, we consider changes in the growth rate of the foreign country. A faster growth

of the foreign country (larger g) results in larger emigration rates in both skill groups as wage gaps between two countries increase. The acceleration of the economic growth of the foreign country also leads to larger technological gaps, as it becomes more difficult for the home country to catch up. As an outcome, the experience premium for both skill types increases, stimulating a more sizable return migration flows compared to the benchmark case. However, the steady state technological and output gaps become wider with an increase in g. The relative performance of the low-income and the middle-income countries remains the same. The output gap in the low-income country is larger than in the middle-income country for any value of g.

The overall technological gap in the low-income country can be either smaller or larger than in the middle-income country. As g increases, larger emigration and return migration rates among the unskilled population in the low-income country may result in a lower technological gap in this skill group than in the middle-income country. Despite the increase in the technological gap in the skilled group, the low-income country may end up with a narrower overall technological gap.

Next, we consider changes in parameter φ, which determines the rate of human capital upgrading in the process of migration being a function of the technological gap. If φ increases, the productivity of migrants is upgraded more, so that they contribute a larger amount of human capital upon return, and the home country is growing faster. The overall improvement of the home country economy results in a decline in emigration rates and larger return migration flows in both skill groups. The technological gaps in both skill groups drop, as do the overall technological gap and the output gap which decline with an increase in φ. No differences in the behavior of the low-income and middle-income countries compared to the benchmark case are observed.

Finally, we consider changes in the immigration costs, which are determined by parameters a and b. When the costs increase with larger values of a and/or smaller values of b, the emigration rates in both skill groups decline, and migration becomes more temporary, as a larger share of migrants return. Consequently, technological gaps are larger

than in the benchmark case, and the output gap is wider.

In order to present the results of the comparative statics exercises more formally, we specify the ranges of parameter values. Parameters are subjected to three types of constraints. First, for certain values of parameters, the model predicts a negative wage differential between the foreign and home countries in the skilled group . This implies that wages in the home country are larger than abroad, but emigration still takes place, as migrants are motivated by even larger returns as an outcome of temporary migration. As such a situation does not seem realistic, we limit the parameter to values, which yield only positive wage differentials between countries. This constraint affects the values of parameter z_u^H, imposing the upper bound, which we denote as $\tilde{z}_u^H$. The lower bound for parameter z_u^H is determined by the value of z_u^F due to our assumption that unskilled labor comprises a more sizable category in the home country than in the foreign.

Second, we eliminate cases when the skill premium in the foreign country is negative, so that the wages of skilled labor become smaller than the wages of the unskilled. This constraint creates the upper bound for parameter α, limiting its range to values less than 0.5. Moreover, it creates a lower bound for parameter z_u^F at the value of 0.3. Third, for certain parameter values, the model does not have a real solution. This creates the upper bound for parameter φ at the value of 0.85 and the lower bound for parameter a at the value of 5.

As a result, we obtain the threshold values for possible ranges of the model's parameters, which we summarize in Table C.

As a first step, we consider changes in one parameter at a time, while keeping the others at the benchmark values. Then, for each set of parameters $\{\alpha, z_u^F, g, a, b, \varphi\}$, as a second step, we consider the variation of z_u^H in the range $(z_u^F, \tilde{z}_u^H)$. We obtain the following result from the numerical solution of the model valid for the parameters' ranges summarized by Figure 3.1

Table C. Parameter values and their variations

Parameter	Benchmark value	Variation range
α	0.3	$(0,\ 0.5)$
z_u^F	0.5	$(0.3,\ 1)$
g	0.02	$(0,\ 10)$
a	50	$(5,\ 500)$
b	2	$[1,\ 4]$
φ	0.4	$(0,\ 0.85)$
z_u^H	$\{0.7,\ 0.9\}$	$(z_u^F,\ \tilde{z}_u^H)$

Result 1.

- The steady state value of the technological gap in the skilled group is larger than in the unskilled:

$$T_s^* > T_u^*.$$

- As the share of skilled population in the home country increases, the emigration rates of skilled labor rise and the technological gap in the skilled group decreases:

$$\tilde{N}_s^* \text{ is increasing in } z_s^H \text{ and } T_s^* \text{ is decreasing in } z_s^H.$$

- Consequently, the ratio of technological gaps in two skill groups declines, the output gap between the foreign and home countries shrinks:

$$\frac{T_s}{T_u} \text{ and } \frac{Y^F}{Y^H} \text{ are decreasing in } z_s^H \ .$$

- However, the steady state value of the overall technological gap can either fall or rise:

$$T^* \text{ is decreasing or increasing in } z_s^H, \text{ depending on other parameters.}$$

For the benchmark parameter values, the overall technological gap increases as the share of unskilled population in the home country rises. However, for sufficiently large values of z_u^H, in particular, greater than 0.95, the overall technological gap declines sharply. When almost the entire population in the home country is unskilled, the emigration rates among the unskilled increase sharply, being driven by large wage differentials between two countries. In this case, a larger share of the unskilled population emigrates; the number of return migrants among the unskilled is also large, resulting in a sharp drop in the technological gap in the unskilled group. The technological gap in the skilled group, in turn, increases, as the share of the skilled population is small. However, as some percentage of skilled labor always emigrates, the technology of skilled labor does not stagnate entirely. The overall technological gap declines, being pulled down by the technological catch up of the home country in the unskilled group, but the output of the home country is very small due to high emigration rates among the unskilled population and a negligible share of the skilled population.

Migration patterns, being the outcomes of the individual optimization problem, are characterized by low migration activity among relatively-scarce skilled labor, which results in a larger technological gap in the skilled group relative to the unskilled. As a result, the steady state value of the output gap is increasing. One possibility of reducing disparities in technological development in two skill groups is provided by incentives for a more sizable emigration of the skilled labor, for instance, by subsidizing return migration of skilled labor. This possibility for government intervention is analyzed in the next section.

3.5 Subsidized Return Migration

We have shown earlier that the relative scarcity of skilled labor in the home country drives the skill premium up, making the earnings of skilled labor comparable to that in the foreign country and discouraging emigration. Consequently, emigration rates of the skilled population are smaller than the emigration rates among the unskilled. Despite larger return migration rates, the steady state stock of human capital in the skilled group

is smaller and the technological gap with the foreign country is larger than in the unskilled group.

In order to encourage a more sizable emigration of the skilled population, the government of the home country may consider intervening and providing additional stimulus to temporary migrants. We assume that the government of the home country is putting aside a fraction of its budget to subsidize the wages of return migrants in both skill groups. Our analysis is based on the assumption that human capital is augmented in the process of migration in both skill groups.

The model presented in Section 3.4 will be modified in the following way. A migrant who returns to the home country in period t receives the following wage depending on the skill type:

$$W_{u,t}^{FH} = (1 + \gamma_{u,t})(1 + E_{u,t})W_{u,t}^{H},$$

$$W_{s,t}^{FH} = (1 + \gamma_{s,t})(1 + E_{s,t})W_{s,t}^{H},$$

where $\gamma_{s,t}$ and $\gamma_{u,t}$ are subsidies for skilled and unskilled returnees respectively, expressed as a percentage of wage: $\gamma_{i,t} \in [0,1]$, for $i \in \{u,s\}$. The individual optimization problem does not change in any other respect. The new immigration costs thresholds that partition the population into three groups with respect to migration status are presented in Section 3.7.2 in the Appendix.

We are interested in the "optimal" allocation of a subsidy across two skill groups, which would yield the largest growth impact for the home country. Again, we use three measures — the overall output gap ($\frac{Y^F}{Y^H}$), relative output per capita ($\frac{(Y^F/N^F)}{(Y^H/N^H)}$), and relative national income ($Y^F/[Y^H + (\tilde{N}_u^H + \bar{N}_u^H)W_u^H + (\tilde{N}_s^H + \bar{N}_s^H)W_s^H]$) — in order to access the relative performance of the home country compared to the foreign. However, as was mentioned previously, we obtain similar results from three measures.

The government of the home country is spending a fixed fraction θ of the output on subsidizing wages of return migrants in both skill groups. The total subsidy budget is equal to:

$$\theta Y_t^H = \gamma_{s,t}(1 + E_{s,t})W_{s,t}^H(\tilde{N}_{s,t} - \bar{N}_{s,t})z_s^H + \gamma_{u,t}(1 + E_{u,t})W_{u,t}^H(\tilde{N}_{u,t} - \bar{N}_{u,t})z_u^H. \tag{116}$$

A fraction ν of the subsidy budget is spent on high-skill returnees, and a fraction $(1 - \nu)$ is spent on low-skill return migrants:

$$\nu\theta Y_t^H = \gamma_{s,t}(1 + E_{s,t})W_{s,t}^H(\tilde{N}_{s,t} - \bar{N}_{s,t})z_s^H, \tag{117}$$

$$(1 - \nu)\theta Y_t^H = \gamma_{u,t}(1 + E_{u,t})W_{u,t}^H(\tilde{N}_{u,t} - \bar{N}_{u,t})z_u^H. \tag{118}$$

The final system of equations that characterizes the home economy in the balanced growth path looks as the following:

$$\lambda_H^* = \frac{\left[2 - \tilde{N}_s^* - \bar{N}_s^* + E(T_s^*)(\tilde{N}_s^* - \bar{N}_s^*)\right](1 - z_u^H)}{\left[2 - \tilde{N}_u^* - \bar{N}_u^* + E(T_u^*)(\tilde{N}_u^* - \bar{N}_u^*)\right]z_u^H}, \tag{119}$$

$$\gamma_s^* = \frac{\theta\nu[2 - \tilde{N}_s^* - \bar{N}_s^* + E(T_s^*)(\tilde{N}_s^* - \bar{N}_s^*)]}{(1 - \alpha)(1 + E(T_s^*))(\tilde{N}_s^* - \bar{N}_s^*)}, \tag{120}$$

$$\gamma_u^* = \frac{\theta(1 - \nu)[2 - \tilde{N}_u^* - \bar{N}_u^* + E(T_u^*)(\tilde{N}_u^* - \bar{N}_u^*)]}{\alpha(1 + E(T_u^*))(\tilde{N}_u^* - \bar{N}_u^*)}, \tag{121}$$

$$\tilde{N}_u^* = \left[\frac{T^*(\lambda_F^*)^{1-\alpha}}{a(\lambda_H^*)^{1-\alpha}\left(1 + [1 - (1 + \gamma_u^*)(1 + E(T_u^*))](1 + g)\right)}\right]^{\frac{1}{b}}, \tag{122}$$

$$\bar{N}_u^* = \left[\frac{T^*(\lambda_F^*)^{1-\alpha}}{a(\lambda_H^*)^{1-\alpha}(1 + \gamma_u^*)(1 + E(T_u^*))}\right]^{\frac{1}{b}}, \tag{123}$$

$$\tilde{N}_s^* = \left[\frac{T^*(\lambda_F^*)^{-\alpha}}{a(\lambda_H^*)^{-\alpha}\left(1 + [1 - (1 + \gamma_s^*)(1 + E(T_s^*))](1 + g)\right)}\right]^{\frac{1}{b}}, \tag{124}$$

$$\bar{N}_s^* = \left[\frac{T^*(\lambda_F^*)^{-\alpha}}{a(\lambda_H^*)^{-\alpha}(1 + \gamma_s^*)(1 + E(T_s^*))}\right]^{\frac{1}{b}}, \tag{125}$$

$$\left(\frac{L_u^H}{N_u^H}\right)^* = \frac{\left[2 - \tilde{N}_u^* - \bar{N}_u^* + E(T_u^*)(\tilde{N}_u^* - \bar{N}_u^*)\right]}{\left[2 - \tilde{N}_u^* - \bar{N}_u^*\right]} = 1 + g, \tag{126}$$

$$\left(\frac{L_s^H}{N_s^H}\right)^* = \frac{\left[2 - \tilde{N}_s^* - \bar{N}_s^* + E(T_s^*)(\tilde{N}_s^* - \bar{N}_s^*)\right]}{\left[2 - \tilde{N}_s^* - \bar{N}_s^*\right]} = 1 + g, \tag{127}$$

$$T^* = (T_u^*)^\alpha (T_s^*)^{(1-\alpha)}. \tag{128}$$

The system of equations does not have an explicit analytical solution. Below, we summarize a numerical solution presented in Tables 3.3 and 3.4 and illustrated by Figures 3.2 and 3.3. We compare new results to the benchmark case without a subsidy presented in Table 3.2.

3.5.1 Numerical results

When return migration is subsidized by the government, regardless of the allocation of a subsidy between unskilled and skilled returnees, it has an expansionary effect on the economy of the home country. Comparing Tables (3.3)-(3.5), we observe that for the benchmark parameter values, the overall technological and output gaps between the foreign and home countries shrink in the presence of government intervention. When the entire subsidy budget is channeled to one skill type, emigration and return migration rates in this skill group increase compared to the benchmark case. As an outcome, the technological gap with the foreign country in the subsidized group decreases. On the contrary, the labor in the skill group without a subsidy, on the contrary, experiences lower emigration rates and higher return rates. Such behavior is a result of a positive spillover effect from the development of technology in the subsidized skill group, which contributes to the overall growth in the home country and results in larger wages for both skill types at home. However, the technological gap in the unsubsidized group increases slightly. Overall, the technological and output gaps between the foreign and home countries are lower than in the case without government intervention.

For some parameter values, the "optimal" scenario of the subsidy allocation is a mix of subsidies channeled to both skill types. When the subsidy is divided between skilled

and unskilled labor, rather than allocated exclusively to one skill group, emigration and return migration rates in both groups can be higher than in the benchmark case. A mixed allocation prevents the technological gap in the skill group, which receives a smaller share of the subsidy budget from getting too large relative to the technological gap in the subsidized group.

For instance, for the benchmark values of $z_u^H = 0.7$ and $z_u^H = 0.9$, which correspond to the cases of low-income and middle-income countries, the "optimal" subsidy allocation is $1/2 < \nu < 1$ and $\nu = 1$ respectively. Figures 3.2 and 3.3 depict the behavior of the output gap with respect to changes in ν. As we will show below, in the case when a share of skilled labor is sufficiently small, or the output share of skilled labor is sufficiently large, the "optimal" allocation of the subsidy would be a corner solution.

For the middle-income country, the "optimal" subsidy strategy is to channel a larger subsidy share to a relatively scarce skilled labor and provide a smaller subsidy share for the unskilled returnees, who comprise a larger population group. In this way, the technological gap in the unskilled group is prevented from becoming too large relative to the technological gap in the skilled group, and the disparities in development of technologies in two skill groups are not as large as in the case when the unskilled group remains unsubsidized.

As a next step, we analyze how the variation in the models' parameters affects the "optimal" allocations of the subsidy between two skill groups. The benchmark parameter values and parameter ranges, which we consider in our comparative statistics exercise are summarized in Table D below. The parameter α has an upper bound determined by z_u^F, which guarantees a positive skill premium in the foreign country. Moreover, the parameter z_u^H has a lower bound determined by z_u^F, as the skill composition of the home country is distinguished by a smaller share of skilled labor compared to the foreign country.

For each value of $z_u^F = \{0.3,\ 0.5,\ 0.7,\ 0.9\}$, we consider the variation of parameters $\alpha \in (0, z_u^F)$ and $z_u^H \in (z_u^F, 1)$, and find ν that yields a minimum value of the output gap.

Table D. Parameter values and their variations

Parameter	Benchmark value	Variation range
α	0.3	$(0, z_u^F)$
z_u^F	0.5	$\{0.3, 0.5, 0.7, 0.9\}$
z_u^H	$\{0.7, 0.9\}$	$(z_u^F, 1)$
θ	0.01	0.01
g	0.02	0.02
a	50	50
b	2	2
φ	0.4	0.4

Figure 3.4 summarizes the predictions of the model regarding the "optimal" allocation scenarios for the benchmark value of $z_u^F = 0.5$. We have considered variations of Figure 3.4 for different values of z_u^F, which we do not present in the paper, as they yield similar results to the benchmark value of $z_u^F = 0.5$. Two types of allocation scenarios — a mixed allocation of the subsidy between two skill groups and an exclusive subsidizing of skilled labor — are "optimal" depending on the values of α and z_u^H. In particular, when a share of the skilled population in the home country is sufficiently small, the entire subsidy budget should be given to skilled returnees. In this case, a high skill premium in the home country, driven by relative scarcity of skilled labor, results in low emigration rates among the skilled and leads to the deterioration of technology in skilled group. Consequently, to encourage more active emigration among skilled labor, the government should subsidize only this labor group.

In addition, the corner subsidy allocation with respect to skilled labor will be "optimal" when the technology utilized in the home country is relatively more intensive in the skilled labor. In this case, the larger emigration and return migration rates of unskilled labor have

a smaller effect on the economic performance of the home country, while low emigration rates among the skilled have more detrimental consequences. The lower left corner of Figure 3.4 depicts parameter values, for which the "optimal' subsidy allocation is $\nu = 1$.

A mixed allocation allows the home country to moderate the disparity of technology gaps across skill groups while providing a larger share of the subsidy budget to the skill group with a larger output share. The upper right corner of Figure 3.4 is the area where the subsidy pattern reverses, and the "optimal" allocation represents a larger share of the subsidy channeled to unskilled labor. In particular, when the share of unskilled labor is sufficiently small, and the output share of unskilled labor is sufficiently large, a larger subsidy share should be given to unskilled labor. However, under the benchmark parameter values, another corner allocation, when the entire subsidy is given to unskilled labor, cannot be reached.

Therefore, from Figure 3.4 and its variations under alternative values of z_u^F, we conclude that parameters z_u^H and α have thresholds, which we denote as $\bar{z}_u^H$ and $\bar{\alpha}$ respectively, so that when $\alpha < \bar{\alpha}$ or $z_u^H > \bar{z}_u^H$, the "optimal" subsidy allocation is the corner with respect to skilled labor ($\nu = 1$).

Below, Result 2 summarizes the model's predictions with respect to the choice of ν.

Result 2.

- There is $\bar{\alpha}$ that depends on the other parameter values, so that if $\alpha < \bar{\alpha}$, then $\nu = 1$, and if $\alpha > \bar{\alpha}$, then $\nu < 1$.

- There is $\bar{z}_u^H$ that depends on other parameter values, so that if $z_u^H > \bar{z}_u^H$, then $\nu = 1$, and $z_u^H < \bar{z}_u^H$, then $\nu < 1$.

- If $\alpha > \bar{\alpha}$ or $z_u^H < \bar{z}_u^H$, a share of the subsidy budget received by skilled labor declines with α and increases with z_u^H.

3.6 Conclusion

The major objective of our study is to reveal the expansionary effect of return migration for the countries of origin and analyze its determinants. Our analysis is based on the assumption that migrants accumulate human capital in the process of on-the-job training while working in an advanced destination country and contribute to the stock of human capital in the home country upon return. Moreover, we assume that unskilled migrants enhance their human capital while abroad in a similar way to skilled migrants. The accumulation of human capital and knowledge diffusion serve as a channel of economic growth in our model.

The model predicts that the growth impact of return migration would depend on the number of return migrants in each skill group. In a situation where the population of the home country is characterized by a small share of skilled labor, which is the case for many developing countries, the migration activity of skilled labor will be low, resulting in a large technological gap with the foreign country. On the contrary, the technology of unskilled labor will catch up with that in the foreign country due to a more sizable emigration and return of the unskilled population. The overall performance of the home country relative to the foreign country would deteriorate with an increase in the disparity of technological gaps cross skill groups. As the share of skilled labor in the population of the home country increases, the number of temporary migrants among the skilled increases as well, leading to the technological advancement of skilled labor and, consequently, to the overall growth of the economy of the home country. Thus, raising the share of skilled labor, for instance by subsidizing education, may help the home country to improve its economic performance by means of temporary migration.

As an alternative, in order to encourage migration activity among skilled labor, the government of the home country may subsidize the return migration of labor. The subsidy, regardless of its allocation between the two skill groups, results in larger return migration, thus contributing to the overall growth of the home country. The largest growth impact is achieved by subsidizing only the skilled returnees if the size of the skilled population in the

country of origin is sufficiently small, or the output share of skilled labor is sufficiently large. As the output share of unskilled labor increases or the share of skilled labor in the population of the home country rises, the optimal share of the subsidy channeled to skilled labor declines, and the largest growth impact is achieved when both skill groups are subsidized. The allocation of the subsidy to both skill groups allows for a technological enhancement in the skilled group and, at the same time, prevents the technological gap in the unskilled group from a substantial increase.

Our model is based on a number of strong assumptions. Thus, further research may be directed to relaxing some of these assumptions. In particular, we assume a constant and exogenous skill composition of the new population cohort in the home country. Introducing an individual schooling decision would allow for human capital upgrading in the home country and would thus create a source of economic growth beside temporary migration. All the above would affect the skill premium in the home country and would change migration patterns in the two skill groups.

We have also assumed that the technology utilized in two countries is the same. If we change the technological parameters ($\alpha \neq \beta$) and assume that the technology of the foreign country is more skilled-labor-intensive, and the technology of the home country is more unskilled-labor- intensive, then we would end up with different returns to skills in the two countries and, consequently, with different migration patterns.

The model predicts a negative selection of migrants with respect to skills. This finding is not in line with the statistical evidence. We may modify the model in order to account for predominantly positive selection observed in the data, for instance, by introducing policy restrictions or costs of resettlement.

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3.7 Appendix

3.7.1 The individual optimization problem

The individual optimization problem is solved backwards. Conditional on having emigrated at period t, an individual with skill i and immigration costs M_k will be indifferent between remaining in the foreign country and returning home when:

$$\frac{W_{u,t+1}^F}{M_{u,k}} = (1 + E_{u,t+1})W_{u,t+1}^H,$$

$$\frac{W_{s,t+1}^F}{M_{s,k}} = (1 + E_{s,t+1})W_{s,t+1}^H.$$

The threshold values for the immigration costs, at which an individual is indifferent between permanent immigration and return migration are:

$$\bar{M}_{u,t+1} = \frac{1}{1+E_{u,t+1}}\frac{W_{u,t+1}^F}{W_{u,t+1}^H},$$

$$\bar{M}_{s,t+1} = \frac{1}{1+E_{s,t+1}}\frac{W_{s,t+1}^F}{W_{s,t+1}^H},$$

where $\bar{M}_{u,t+1}$ and $\bar{M}_{s,t+1}$ are the costs' thresholds for the permanent immigration in the unskilled and skilled groups respectively.

The first period optimization problem represents a comparison of net benefits of the sedentary population with gains from either temporary or permanent immigration:

$$W_{i,t}^H + W_{i,t+1}^H \geq max\{T.M.; P.M\},$$

Temporary migrants have a larger value of the immigration costs thresholds compared to permanent immigrants; thus, the costs of permanent migrants represent a subset of costs of temporary migrants. The first period optimization problem yields the following thresholds:

$$\tilde{M}_{u,t} = \frac{W_{u,t}^F}{W_{u,t}^H - E_{u,t+1}W_{u,t+1}^H},$$

$$\tilde{M}_{s,t} = \frac{W_{s,t}^F}{W_{s,t}^H - E_{s,t+1}W_{s,t+1}^H}.$$

The threshold values of the immigration costs partition the population of the home country into three categories with respect to migration status.

3.7.2 The Case of Subsidized Return Migration

The individual optimization problem is solved in a similar way as in the previous subsection. We end up with the following pairs of thresholds $\{\tilde{M}_{i,t}^*, \bar{M}_{i,t}^*\}$, for $i \in \{u, s\}$:

$$\tilde{M}_u^* = \frac{T^*(\lambda_F^*)^{1-\alpha}}{(\lambda_H^*)^{1-\alpha}\left(1 + [1 - (1 + \gamma_u^*)(1 + E(T_u^*))](1 + g)\right)}, \tag{129}$$

$$\bar{M}_u^* = \frac{T^*(\lambda_F^*)^{1-\alpha}}{(\lambda_H^*)^{1-\alpha}(1 + \gamma_u^*)(1 + E(T_u^*))}, \tag{130}$$

$$\tilde{M}_s^* = \frac{T^*(\lambda_F^*)^{-\alpha}}{(\lambda_H^*)^{-\alpha}\left(1 + [1 - (1 + \gamma_s^*)(1 + E(T_s^*))](1 + g)\right.}, \tag{131}$$

$$\bar{M}_s^* = \frac{T^*(\lambda_F^*)^{-\alpha}}{(\lambda_H^*)^{-\alpha}(1 + \gamma_s^*)(1 + E(T_s^*))}. \tag{132}$$

TABLES

Table 1.1 Educational sorting of return migrants

Source country	Return rates from the U.S.			Return rates from Spain		
	Low	Middle	High	Low	Middle	High
Argentina	4.2	3.1	4.4	6.5	3.1	9.6
Brazil	16	6	11.3	9.3	3.7	25.2
Chile	13.6	6.4	5.7	19.6	13.2	29.8
Mexico	4.3	1.6	5	12.9	6.3	24.8
Jamaica*	13.4	4.8	13	N/A	N/A	N/A
Colombia *	1.3	0.92	0.94	N/A	N/A	N/A
Ghana*	1.2	0.6	0.9	N/A	N/A	N/A
Macedonia *	1	0.7	3	N/A	N/A	N/A
Vietnam *	0.95	0.84	1.87	N/A	N/A	N/A

Sources and notes: Return migration rates are taken from OECD(2009). The return rate is calculated as a fraction of the returned population with educational attainment i in the total stock of emigrants from the same source country with the same educational level i, where $i \in$ {low, middle, high}.

*For the countries in the lower part of the table we use return ratios instead of return rates. The return ratio is calculated as a fraction of two shares – share of returnees with educational attainment i in the total number of return migrants in the numerator and share of immigrants with educational attainment i in the total number of immigrants with the same educational attainment i. We consider emigration and return migration from all destinations, including the US. The return ratios are calculated by the authors using data from the Development on the Move Project (DotM, 2010).

Table 1.2 Labor supply and returns to schooling, 2000

Countries	Relative skill supply		Returns to schooling		Relative returns (USA/Home)	
	L_0/L_1	L_1/L_2	SP_1 (W_1/W_0)	SP_2/SP_1 (W_2/W_1)	SP^F_1/SP^H_1	SP^F_2/SP^H_2
Source countries						
Argentina	2.22	6.30	0.448	0.449	0.67	0.89
Brazil	4.95	3.00	0.827	0.826	0.36	0.26
Chile	1.7	3.7	0.619	0.897	0.48	0.32
Mexico	4.97	1.46	0.578	0.468	0.52	0.67
Vietnam	11.01	5.47	0.52	0.68	0.58	0.51
Macedonia	1.76	2.26	0.497	0.701	0.60	0.52
Colombia	3.90	1.97	0.458	0.691	0.66	0.57
Jamaica	2.20	3.54	na	na	na	na
Fiji	0.84	7.70	na	na	na	na
Ghana	6.60	26.20	na	na	na	na
Destination countries						
USA	0.3	1.4	**0.3**	**0.6**	--	--
Spain	3.5	0.7	0.33	0.42	--	--

Sources: Docquier & Marfouk (2006); Goldin & Katz (2007); Manacorda, Sanchez-Paramo & Schady(2005).

Notes: L_0, L_1, and L_2 stand for the shares of the resident population of age 25-64 with primary, secondary and tertiary education respectively. Returns to schooling represent log wage differentials between two educational attainments.

Table 1.3 Educational structure of the population and emigration rates, 2000

Country	Resident population			Emigration rates OECD, %			Emigration rates USA, %			Emigration rates Spain, %		
	L	M	H	L	M	H	L	M	H	L	M	H
Source countries												
Argentina	65.7	29.6	4.7	0.49	1.58	2.78	0.20	0.44	1.49	0.13	0.81	0.56
Brazil	78.7	15.9	5.3	0.17	1.14	2.05	0.05	0.33	1.11	0.01	0.11	0.07
Chile	53.3	37.2	9.5	0.93	1.63	6.02	0.30	0.48	2.59	0.04	0.253	0.249
Mexico	74	14.9	10.2	13.95	7.02	15.47	13.9	6.9	15.0	0.01	0.04	0.10
Colombia	72.1	18.5	9.4	1.11	4.09	10.38	0.81	2.31	8.21	0.19	1.47	0.79
Jamaica	63.1	28.7	8.1	23.46	25.97	84.69	0.13	0.19	0.59	na	na	na
Macedonia	54.9	31.2	13.8	16.50	10.88	29.38	0.08	0.49	8.80	1.51	0.63	0.20
Vietnam	90.3	8.2	1.5	1.67	5.09	26.99	1.00	3.16	18.47	0.01	0.09	0.04
Fiji	42.6	50.8	6.6	11.73	15.07	62.75	3.21	4.32	11.71	2.66	4.83	26.92
Ghana	86.4	13.1	0.5	0.89	2.20	44.68	0.12	0.64	21.88	0.20	0.90	11.66
Destination countries												
USA	15.9	53.5	30.6	1.3	0.2	0.5	-	-	-	0.013	0.006	0.008
Spain	63.6	24.3	12.1	2.2	2.1	4.2	0.09	0.28	1.12	-	-	-

Sources: Barro & Lee, 2010; Docquier & Marfouk, 2006; Education at a Glance (2001), (2002).

Notes: Emigration rates stand for the fraction of emigrants from a particular source country with educational attainment i in the total stock of the resident population of the source country with the same educational attainment i, where $i \in \{low, middle, high\}$. Unless the destination is specified (USA or Spain), emigrants departing to all OECD destinations are considered.

Table 1.4 U.S. immigration policy

Skill group	Admission categories	Status adjustment	Return migration
	Temporary non-immigrant admissions		
Low-educated	**1) H-2 type**: Temporary and seasonal workers • H-2A: agricultural • H-2B: non-agricultural Annual quota: 66,000 for H-2B Unlimited admission under H-2A **Maximum duration**: 1 year **Prolongation**: up to 3 years **Educational requirement**: None **Employer requirements**: US employer **Change of employer**: not allowed	**No** direct status adjustment Permanent residence permit: **- Employment sponsorship** Do not qualify for any of 4 preference categories. **- Family sponsorship** (Relative of US citizen or legal immigrant)	Completion of the contract (seasonal or temporary work); Loss of the employment contract; Exceeding maximum duration of stay (3 years)
Middle-educated	**1) H-2 type**: Temporary and seasonal workers (Same as for low-educated) **2) Diversification program** (Green Card lottery) **Annual quota: 55,000** **Status**: legal immigrant **Duration**: 10 years **Educational requirement**: high school degree and two years of experience **Employer requirement**: none	**No** direct status adjustment Specific for middle-skilled Apply for naturalization after **5 years** of uninterrupted stay in the US Restrictions: restricted list of the source countries	Same reasons as for low educated under H-2 admissions. Loss of immigrant status if a person remains outside USA longer than 2 months per year
Highly educated	**1) H-2 type** Same as in two previous skill groups **2) H-1B type** **Annual quota: 85,000** **Maximum duration:** 3 years **Prolongation:** up to 3 years **Educational requirement**: B.A. degree or higher **Origin:** restricted list of countries **3) O type:** People with extraordinary abilities **4) Diversification program**	All limitations of **H-2** admission as in other skill groups **Direct status adjustment under H-1B** admission Restrictions: 4 **preference categories** **Direct status adjustment** under O type admission Naturalization after 5 years	Same reasons as for low educated under H-2 admissions. Long waiting period for status adjustment for immigrants from particular preference categories (E3) and from the overrepresented source countries.

Source: Papademetrious, Meissner & Rosenblum (2009).

Table 2.1 Reasons for return migration

Reasons	Vietnam	Colombia	Ghana	Fiji	Macedonia
Personal and family circumstances	24 %	51 %	36%	32 %	32 %
Homesickness/failure	26 %	23 %	31%	14 %	20 %
Policy restrictions	12 %	7 %	22%	14 %	9 %
End of a contract	31 %	11 %	2.6 %	36 %	19 %
Economic motives	6 %	8 %	8 %	3.9 %	19.5 %
Return schemes	1 %	0 %	0.4 %	0.1 %	0.5 %
No of observations	**509**	**370**	**317**	**532**	346

Source: Calculations of the author using the data from the Development on the Move Project (DotM, 2010).

Table 2.2 Empirical studies on the experience premium

Study	Sample of return migrants	Source Country	Survey period	Experience premium (EP)	Selection on observables	Selection on unobservables
Co, Gang & Yun (2000)	167	Hungary	1993-1994	Statistically significant EP <u>for females:</u> • All destinations – 40 % • OECD countries – 67 %	Return migrants are -More educated -Older -From the capital	Positive selection for males and negative selection for females
Coulon & Piracha (2005)	204	**Albania**	1998-1999	Statistically significant EP: 59% - 69 %	Return migrants are -Less educated -Younger -More likely male -From urban localities	Negative selection
Epstein & Radu (2009)	1100	Romania	2005	Statistically significant EP <u>for males</u> – 25 % • For self-employed – 50 % • For highly skilled – 35 %	Return migrants are -More educated -Younger -More likely males	Negative but weak (insignificant) selection
Barrett & Goggin (2010)	6216	**Ireland**	2006	Statistically significant EP: 7 % -Primary education: 13 % -Secondary education: 5 % -Tertiary education: 10 %	Return migrants -Older -More likely females -More educated	No selection
Lacuesta (2006)	1800	**Mexico**	2000	Statistically significant EP: 7-10 %	Return migrants are -Less educated -Fewer years of domestic experience	Selection is negative
Reinhard & Thom (2008)	2448	**Mexico**	1987-2007	Statistically significant EP: 2.8 %	Return migrants -Less educated -Fewer years of experience	Negative selection
Iara (2006)	145	13 **EU** countries	2003	Statistically significant EP: 30 %	Return migrants are -Older -More educated	Positive selection
Hazans (2008)	469	Latvia	2006-2007	EP : on average 15 % male: 20 %; female: 6 %	Return migrants are -More likely male -Younger -More educated -Kin abroad	No selection
Vreyer, Gubert, & Robilliard (2010)	3594	WAEMU countries	2001-2002	EP: return from non-OECD (30%); return from OECD (70%)	Return migrants are -Older -More likely males -Married -More educated	Significant negative selection

Table 2.3 Structure of the final sample

Observations	Total sample	SP	SP usable	RM	RM usable	AM
Recent migrants (last 5 years)	4580	3833	2791	205	133	542
Migrants (total)	5049	3833	2791	485	357	731

Notes: We use the following notations: **SP** – sedentary population; **RM** – return migrants; **AM** – absent migrants. Usable observations are those with available data on monthly earnings.

Table 2.4 Raw earnings (monthly, in 2008 US dollars)

Earnings	Non-migrants	Return Migrants (Total)	Diff (%)	Return Migrants (Recent)	Diff (%)
Total sample	127.6	215.9	**69.2*****	203.8	**59.7*****
Individual characteristics					
Males	144.7	220.5	52.4**	191.1	32.1
Females	107.9	201.9	**87.1*****	223.3	**106.9****
Primary EA	103.3	146.2	41.5***	134.2	29.9*
Secondary EA	125.2	157.3	25.6	204.4	63.2
Tertiary EA	216.0	377.5	**74.8****	346.6	**60.5*****
Job particulars					
Self-employed	109.9	167.1	52.0**	213.2	**93.3****
Wage workers	141.8	250.1	**76.4*****	188.4	32.9**
State enterprises	141.7	264.3	**86.5*****	272.9	**92.6*****
Private enterprises	124.0	206.1	66.2***	194.8	57.1**
Agriculture	55.3	64.6	16.8	62.1	12.3
Processing	126.2	317.2	**151.3****	260.8	**106.6***
Elec/gaz	148.5	237.6	60.0***	226.6	52.6***
Trade	127.0	225.2	**77.3*****	233.9	**84.2****
Construction	159.2	192.0	20.6	126.2	-20.7
Government	119.0	211.1	**77.4*****	151.5	27.3***
Locality					
Urban	144.3	256.4	**77.7*****	225.6	56.3**
Rural	91.1	120.7	32.5***	153.3	**68.3*****
Mekong Delta	108.7	123.3	13.4	98.2	-9.7
North CC	73.9	133.2	80.2***	99.2	34.2
Red Delta River	102.9	188.9	83.6***	152.6	48.3
South CC	110.8	158.8	43.3***	153.5	38.5**
South East Region	155.2	284.7	**83.4*****	304.6	**96.3*****
OECD	127.6	266.4	**108.7*****	289.8	**127.1*****
Non-OECD	127.6	145.9	14.3	118.3	-7.3
No. of obs.	2769	357	--	133	--

Notes: Significance codes *, **, *** stand for 1 %, 5 %, and 10 % levels of significance respectively. The exchange rates for the Vietnamese Dong are taken from the IMF International Financial Statistics database.

Table 2.5 Profiles of the sedentary population and return migrants (Descriptive statistics)

Variable	Non-migrants	Return migrants (Total)	Diff (RM-SP)	Return migrant (Recent)	Diff (RM-SP)
Individual characteristics					
Age	39.2	39.6	0.4	37.9	-1.3
Male	0.54	0.75	0.21***	0.61	0.07
Primary EA	0.52	0.35	-0.17***	0.48	-0.04
Secondary EA	0.33	0.37	0.04	0.29	-0.04
Tertiary EA	0.15	0.28	0.13***	0.23	0.08
Household characteristics					
Married[§]	0.75	0.51	-0.24***	0.58	-0.13**
Adult males (share)[§]	0.40	0.33	-0.07**	0.35	-0.05
Parent[§]	0.36	0.44	0.08**	0.46	0.10
Kin abroad[§]	0.04	0.17	-0.13***	0.29	0.25**
Locality					
Urban	0.69	0.70	0.01	0.70	0.01
Mekong Delta	0.19	0.08	-0.11***	0.15	-0.04
North CC	0.04	0.15	0.11***	0.21	0.17***
Red Delta	0.24	0.31	0.07*	0.12	0.12***
South CC	0.06	0.03	-0.03***	0.06	-0.01
South-East	0.47	0.42	-0.05	0.46	-0.01
Job particulars					
Self-employed	0.47	0.42	-0.05	0.57	0.1
State firm	0.20	0.17	-0.03	0.11	-0.09*
Agriculture	0.16	0.14	-0.02	0.18	0.02
Processing	0.16	0.25	0.09*	0.19	0.03
Trade	0.21	0.19	-0.02	0.33	0.12
Construction	0.06	0.07	0.01	0.09	0.03
Government	0.07	0.01	-0.06***	0.01	-0.06***
No. of obs.	2769	357	**---**	133	---

[§] Time-specific household characteristics: for migrants - state before departure; for non-migrants – current state at the survey date. *Notes:* Significance codes   *, **, *** stand for 1 %, 5 %, and 10 % levels of significance respectively. All statistics represent weighted group averages.

Table 2.6 OLS Estimation Results (Benchmark case)

Variable	(1) OLS	(1) WLS	(2) OLS	(2) WLS
Personal characteristics				
Return migrant	**0.203***	**0.289***	**0.446***	**0.494***
	(0.04)	(0.08)	**(0.09)**	(0.16)
Age	0.085***	0.105***	0.086***	0.105***
	(0.01)	(0.02)	(0.09)	(0.02)
Age^2	-0.001***	-0.001***	-0.001***	-0.001***
	(0.0001)	(0.0002)	(0.0001)	(0.0002)
Male	0.169***	0.167***	0.169***	0.167***
	(0.03)	(0.06)	(0.03)	(0.06)
Primary Education (PE)	-0.716***	-0.592***	-0.695***	-0.589***
	(0.04)	(0.11)	(0.04)	(0.11)
Secondary Education (SE)	-0.569***	-0.456***	-0.513***	-0.452***
	(0.04)	(0.11)	(0.04)	(0.11)
Return migrant*PE	--	--	-0.192*	-0.252
			(0.11)	(0.18)
Return migrant*SE	--	--	-0.436***	-0.314
			(0.11)	(0.21)
Self-employed	-0.037	-0.101	-0.035	-0.101
	(0.034)	(0.08)	(0.03)	(0.08)
Locality characteristics				
Urban	0.142***	0.072	0.136***	0.077
	(0.03)	(0.06)	(0.03)	(0.06)
Mekong Delta River	-0.099**	-0.180**	-0.099**	-0.180**
	(0.04)	(0.08)	(0.04)	(0.08)
Red Delta River	-0.321***	-0.225***	-0.326***	-0.225***
	(0.04)	(0.87)	(0.04)	(0.07)
North Central Costal	-0.432***	-0.310***	-0.435***	-0.309***
	(0.05)	(0.09)	(0.05)	(0.09)
South Central Costal	-0.242***	-0.197***	-0.243***	-0.196***
	(0.04)	(0.07)	(0.04)	(0.07)
Constant	2.883***	2.372***	2.837***	2.370***
	(0.18)	(0.45)	(0.18)	(0.45)
Industry dummies (18 industries with agriculture as a base category)				
R^2	**0.43**	**0.38**	**0.43**	**0.38**
No. of observations	**3102**	**3102**	**3102**	**3102**

Notes: In the parentheses, we report heteroskedasticity-robust standard errors for OLS estimates and linearized standard errors for WLS estimates. Significance codes *, **, *** stand for 1 %, 5 %, and 10 % levels of significance respectively.

Table 2.7 The experience premium variation w/r to educational attainment (Benchmark)

Education	OLS	Between group diff.	Males	Females	WLS	Between group diff.	Males	Females
				Total pool of return migrants				
Primary	**25.5*****	--	27.2***	14.6	**24.2*****	--	19.4**	39.8***
Secondary	**1.1**	-24.4***	5.6	-3.1	**18.1**	-6.1	3.9	50.2*
Tertiary	**44.6*****	43.4***	41.0***	69.4***	**49.4*****	31.1	50.5***	63.8***

Notes: Significance codes   *, **, *** stand for 1 %, 5 %, and 10 % levels of significance respectively.

Table 2.8.1 Treatment effect model: Decision rule

Variables	Treatreg (weighted) MLE	Treatreg (unweighted) MLE	Treatreg (unweighted) TSLS
Migration decision rule (Marginal effects)			
Migration experience			
Age	-.0008***	-.010***	-.010***
	(.00004)	(.0025)	(.0025)
Male	.005***	.087***	.095***
	(.001)	(.009)	(.009)
Primary Education	-.002 *	-.021*	-.023*
	(.001)	(.012)	(.012)
Secondary Education	-.001	-.015	-.013
	(.0008)	(.010)	(.010)
Kin abroad	.013*	-.085***	-.085***
	(.007)	(.008)	(.007)
Share of male adults	-.008***	-.155***	-.151***
	(.002)	(.022)	(.022)
Parent	-.003***	-.028***	-.028***
	(.001)	(.008)	(.008)
Urban	.0005	-.013	-.015
	(.0007)	(.009)	(.009)
Mekong Delta River	-.002***	-.006	-.004
	(.001)	(.01)	(.013)
Red Delta River	.002	.039***	.038**
	(0.001)	(.015)	(.015)
North Central Costal	.007***	.051**	.047**
	(.002)	(.02)	(.019)
South Central Costal	-.001	.003	.0002
	(0.001)	(.014)	(.014)

Notes: Significance codes *, **, *** stand for 1 %, 5 %, and 10 % levels of significance respectively.
All variables for return migrants are in their state at the moment of departure.

Table 2.8.2 Treatment effect model: Outcome equation

Variables	(1) Treatreg (weighted)	(2) Treatreg (weighted)	(2) Treatreg MLE (unweighted)	(3) Treatreg TSLS (unweighted)
Outcome equation Log(Earnings)				
Mig. exp.	**.344****	**.519****	**.521*****	**.530*****
	(.166)	(.226)	(.104)	(.121)
Age	.107***	.107***	.081***	.087***
	(.023)	(.023)	(.008)	(.01)
Age2	-.001***	-.001***	-.001***	-.001***
	(.0003)	(.0003)	(.0001)	(.00002)
Male	.168***	.168***	.136***	.135***
	(.060)	(.060)	(.029)	(.030)
Primary EA	-.585 ***	-.582 ***	-.704***	-.704***
	(.111)	(.112)	(.048)	(.048)
Secondary EA	-.451 ***	-.447 ***	-.559***	-.560***
	(.113)	(.109)	(.046)	(.05)
Mig_exp*PE	--	-.244	--	--
		(.192)		
Mig_exp*SE	--	-.314	--	--
		(.135)		
Urban	.070	.070	.147***	.149***
	(.656)	(.656)	(.031)	(.032)
Self-employed	-.099	-.099	-.045	-.042
	(.079)	(.079)	(.035)	(0.034)
Kin abroad	.118***	.118***	.098***	.100***
	(.041)	(.041)	(.029)	(.030)
Married	-.019	-.019	.086**	.086**
	(.078)	(.078)	(.035)	(.035)
Mekong Delta River	-.181**	-.181**	-.118***	-.119***
	(.080)	(.080)	(.048)	(.045)
Red Delta River	-.222***	-.222***	-.360***	-.362***
	(.080)	(.080)	(.043)	(.043)
North Central Costal	-.321***	-.319***	-.475***	-.477***
	(.092)	(.092)	(.050)	(.050)
South Central Costal	-.199***	-.199***	-.262***	-.263***
	(.068)	(.068)	(.044)	(.044)
Constant	2.34***	2.33***	2.84***	2.84***
	(.491)	(.491)	(.176)	(.178)
Industry dummies (18 industries with agriculture as a base category)				
rho	-.047		-26.3***	-27.1***
F-statistics	21.7		--	--

Table 2.9 Profiles of return and absent migrants (Descriptive statistics)

Characteristics	Return migrants (Total)	Absent migrants (Total)	Diff (RM-AM)	Return migrants (Recent)	Absent migrants (Recent)	Diff (RM-AM)
Personal characteristics						
Age	34.1	29.7	4.4***	36.6	30.3	6.3***
Male	0.60	0.56	0.04	0.53	0.55	-0.02
Primary education	0.39	0.34	0.05	0.43	0.35	0.08
Secondary education	0.34	0.47	-0.13***	0.33	0.48	-0.15**
Tertiary education	0.28	0.19	0.09*	0.23	0.17	0.06
Household particulars						
Share of adult males	0.31	0.35	-0.04	0.33	0.35	-0.02
Mig exp. of HH members	0.16	0.15	0.005	0.21	0.19	0.03
Kin in destination	0.35	0.52	-0.17***	0.35	0.45	-0.1
Parent in the HH	0.40	0.69	-0.29***	0.48	0.69	-0.21***
Siblings in the HH	0.47	1.20	-0.73***	0.72	1.22	-0.49***
Employment particulars						
Employed	0.78	0.58	0.20***	0.79	0.60	0.19***
Self-employed	0.27	0.28	-0.01	0.35	0.28	0.07
Prearranged job in destination	0.56	0.43	0.13**	0.54	0.47	0.07
OECD	0.61	0.73	-0.12***	0.53	0.70	-0.17***
Agriculture	0.12	0.07	0.05**	0.15	0.08	0.07**
Processing	0.18	0.11	0.06*	0.15	0.11	0.04
Trade	0.15	0.11	0.04	0.12	0.11	0.01
Government	0.03	0.01	0.02	0.02	0.01	0.01
Health	0.002	0.02	-0.01*	0.002	0.02	-0.01*
Services	0.01	0.05	-0.04***	0.01	0.06	-0.05***
Science	0.03	0.002	0.02**	0.01	0.001	0.009
Education	0.03	0.01	0.02	0.03	0.01	0.02
Transportation	0.01	0.04	-0.03	0.02	0.04	-0.02
Construction	0.04	0.02	0.02	0.07	0.03	0.04
Location characteristics						
Urban	0.72	0.73	-0.01	0.68	0.71	-0.03
Mekong Delta	0.09	0.11	-0.02	0.14	0.11	0.03
Red Delta River	0.28	0.27	0.01	0.19	0.26	-0.07
North CC	0.12	0.20	-0.08***	0.15	0.22	-0.07*
South CC	0.02	0.06	-0.04***	0.04	0.06	-0.02*
South East Region	0.48	0.36	0.12**	0.48	0.35	0.13*
No. of observations	**510**	**553**	**--**	**277**	**459**	**--**

Notes: Significance codes   *, **, *** stand for 1 %, 5 %, and 10 % levels of significance respectively.
 All variables are in the state as at the moment of departure. HH stands for the household.

Table 2.10 Univariate probits: Same information set

Variable	Separate probits (Weighted)		Separate probits (Unweighted)	
	Migration Decision	**Return Decision**	**Migration Decision**	**Return Decision**
Age	-.128***	.035	-.131***	.036
	(.023)	(.041)	(.015)	(.026)
Age^2	.001***	-.0007	.001***	-.0007*
	(.0002)	(.0005)	(.0001)	(.0004)
Male	.215***	.553***	.497***	.587***
	(.081)	(.153)	(.055)	(.099)
Primary Education	-.183	-.271	-.121	-.334**
	(.113)	(.225)	(.081)	(.47)
Secondary Education	-.015	-.303	-.073	-.526***
	(.113)	(.202)	(.079)	(.139)
Kin abroad	.637***	.143	-.775***	-.527***
	(.089)	(.203)	(.061)	(.133)
Share of male adults	-.769***	-.542	-1.586***	-.224
	(.284)	(.397)	(.149)	(.230)
Parent in HH	.106	-.850***	.074	-.655***
	(.094)	(.156)	(.062)	(.106)
Urban	.245***	-.139	.021	-.186*
	(.079)	(.148)	(.060)	(.103)
Mekong Delta River	-.076	-.297	-.155	.468**
Red Delta River	.289**	-.098	.307***	.018
North Central Coastal	.802***	-.405*	.340***	-.016
South Central Coastal	.109	-.579***	.122	-.411**
Constant	.583	-.279	2.64***	-.099
No. of observations	**3656**	**910**	**3656**	**910**

Notes: Significance codes *, **, *** stand for 1 %, 5 %, and 10 % levels of significance respectively**.**
All variables are time-dependent, in particular, reflect the situation at the moment of departure.

Table 2.11.1 Univariate and bivariate probits: Different information sets (weighted)

Variable	Bivariate probit		Univariate probits	
	Migration Decision	Return Decision	Migration Decision	Return Decision
Age	-.126***	-.012	-.128***	-.025**
	(.023)	(.013)	(.023)	(.011)
Male	.193**	.432***	.215***	.464***
	(.081)	(.164)	(.081)	(.167)
Primary Education	-.193*	-.439	-.183	-.544**
	(.116)	(.249)	(.113)	(.242)
Secondary Education	-.021	-.367*	-.015	-.416*
	(.114)	(.218)	(.113)	(.221)
Kin abroad	.618***	---	.637***	---
	(.091)		(.089)	
Share of male adults	-.725***	---	-.769***	---
	(.282)		(.284)	
Parent in HH	.096	-.577***	.106	-.504***
	(.095)	(.167)	(.094)	(.181)
Urban	.251***	---	.245***	.340*
	(.079)		(.079)	(.175)
Mekong Delta River	-.078	-.301	-.076	-.377
	(.103)	(.268)	(.103)	(.299)
Red Delta River	.269**	-.529***	.289**	-.412*
	(.089)	(.186)	(.108)	(.213)
North Central Costal	.758***	-1.134***	.802***	-.812***
	(.110)	(.233)	(.109)	(.253)
South Central Costal	.059	-.626***	.109	-.691***
	(.091)	(.219)	(.091)	(.231)
OECD destination	---	-.355**	---	-.460***
		(.157)		(.169)
Kin in destination	---	-.527***	---	-.512***
		(.161)		(.183)
Arranged job in destination	---	.323**	---	.376**
		(.163)		(.182)
Employed at departure	---	.917***	---	.956***
		(.175)		(.192)
Constant	.533	1.51***	.538	-.633
Rho		-0.483*	---	
		(0.218)		
F-statistics		11.07	26.05	10.86
No. of observations	3598	910	3598	910

Notes: Significance codes   *, **, *** stand for 1 %, 5 %, and 10 % levels of significance respectively.
All variables for migrants are taken in their state as at the moment of emigration.

Table 2.11.2 Univariate and bivariate probits: Different information sets (unweighted)

Variable	Bivariate probit		Univariate probits	
	Migration Decision	Return Decision	Migration Decision	Return Decision
Age	-.050***	-.010	-.131***	-.025***
	(.003)	(.009)	(.015)	(0.007)
Male	.449***	.366***	.497***	0.477***
	(.056)	(.127)	(.055)	(0.111)
Primary Education	-.105	-.531***	-.121	-.592***
	(.080)	(.167)	(.081)	(0.171)
Secondary Education	. 108	-.629***	-.073	-0.638**
	(.079)	(.152)	(.079)	(0.159)
Kin abroad	-.771***	---	-.775***	---
	(.062)		(.061)	
Share of male adults	-1.445***	---	-1.586***	---
	(.151)		(.149)	
Parent in HH	.100	-.389***	.074	-.401***
	(.107)	(.131)	(.062)	(.137)
Urban	.015		.021	.171
	(.060)		(.060)	(.121)
Mekong Delta River	-.162	.395**	-.155	.348
	(.096)	(.201)	(.095)	(.212)
Red Delta River	.267***	-.348**	.307***	-.263
	(.081)	(.162)	(.081)	(.169)
North Central Costal	.304***	-.476***	.340***	-.396**
	(.095)	(.182)	(.094)	(.190)
South Central Costal	.057	-.532***	.122	-.524**
	(.089)	(.202)	(.089)	(.214)
OECD destination	---	-.346***	---	-.369***
		(.109)		(0.114)
Kin in destination	---	-.692***	---	-.749***
		(.120)		(0.119)
Arranged job in destination	---	.282**	---	.304**
		(.117)		(123)
Employed at departure	---	.801***	---	.864***
		(.140)		(.141)
Constant	1.17***	.984***	2.64	.903**
Rho		-.437**		---
		(.167)		
No. of observations	3598	910	3598	910

Notes: Significance codes   *, **, *** stand for 1 %, 5 %, and 10 % levels of significance respectively**.**
All variables for migrants are taken in their state as at the moment of emigration.

Table 2.12 Model with two selection-correction terms

Variable	(1)	(2)
	OLS	OLS
Log(Earnings)	(weighted)	(unweighted)
Personal characteristics		
Return migrant	**.889**	**.717***
	(.686)	**(.221)**
Age	.069***	.067***
	(.016)	(.007)
Age^2	-.001***	-.001***
	(.0001)	(.0001)
Male	.159***	.165***
	(.062)	(.027)
Primary Education (PE)	-.567***	-.716***
	(.110)	(.047)
Secondary Education (SE)	-.445***	-.570***
	(.108)	(.046)
Self-employed	-.078	-.024
	(.079)	(.034)
Kin abroad	0.125***	.023***
	(0.03)	(.029)
Married	0.108***	.094***
	(0.03)	(.035)
Locality characteristics		
Urban	.079	.139***
	(.065)	(.032)
Mekong Delta River	-.171***	-0.111**
	(0.05)	(0.05)
Red Delta River	-.386***	-0.392***
	(0.04)	(0.04)
North Central Costal	-.495***	-0.498***
	(0.05)	(0.05)
South Central Costal	-.279***	-0.277***
	(0.04)	(0.04)
Constant	2.98***	2.681***
λ_1 (emigration)	-.256	-.208**
	(. 296)	(.089)
λ_2 (return)	.136	.075
	(.158)	(.078)
Industry dummies (18 industries with agriculture as a base category)		
R^2	**0.37**	**0.44**
No. of observations	**3102**	**3102**

Table 3.1 Studies on return migration and economic growth

Study	Labor Skill Heterogeneity	Human capital accumulation	Growth channel	Sources of Brain gain	Policy	Return decision	What drives the result
Stark, Helmenstein, Prskawetz (1997)	Low-skill vs. high-skill labor	Schooling in home country before departure	Average level of human capital in the economy	Incentive hypothesis	No policy restriction	Foreign employers learn the true productivity in the second period	Large share of low-skill workers in occupation (alpha); small immigration costs; larger relative returns to schooling (foreign/home); smaller difference in the costs of schooling between groups
Dos Santos & Postel-Vinay (2004)	Homogeneous skills	Schooling in home country and foreign work experience	Higher productivity of returnees and knowledge diffusion	Incentive channel and on-the-job training	Immigration policy: temporary and permanent admissions	Temporary admission	Optimal share of temporary visa admissions that deploy growth: positive function of experience premium, number of admissions, returns to schooling and economic growth of the foreign country
Dos Santos & Postel-Vinay (2003)	Homogeneous skills	Foreign work experience	Higher productivity of returnees and knowledge diffusion	On-the-job training	No policy restriction	Experience premium	Technological gap b/w home and foreign countries, positive function of experience premium, exogenous growth rate of foreign country
Mayr & Peri (2008)	The entire skill distribution	Schooling in home country and foreign work experience	Lager average stock of human capital	Incentive channel and on-the-job training	Immigration policy: uncertain migration probability	Experience premium	Larger return rates among the skilled migrants; a larger experience premium

Table 3.2 Migration patterns in the balanced growth path

Benchmark parameter values

a	b	φ	g	α	ψ	z^F_u
50	2	0.4	0.02	0.3	1	0.5

	Middle-income	Low-income
	$z^H_u = 0.7$	$z^H_u = 0.9$
Migration patterns		
Emigration rate (skilled)	0.241	0.210
Return rate (skilled)	0.340	0.370
Emigration rate (unskilled)	0.328	0.459
Return rate (unskilled)	0.279	0.217
Technological gap		
Overall (T)	2.181	2.182
Skilled labor (T_S)	2.276	2.428
Unskilled labor (T_U)	1.975	1.701
Output gap		
Output gap (Y^F/Y^H)	3.568	7.393
Relative output per capita $(Y^F/N^F)/(Y^H/N^H)$	2.649	4.539
Relative National Income*	1.372	1.610
Wage gap		
Skilled labor (W^F_s/W^H_s)	1.747	1.249
Unskilled labor (W^F_u/W^H_u)	3.658	8.011
Skill premium (W^H_s/W^H_u)	4.891	15.96
Skill premium (W^F_s/W^F_u)	2.333	2.333
Experience premium		
Skilled returnees (E_s)	0.389	0.426
Unskilled returnees (E_u)	0.313	0.237

Notes: *Relative national income is calculated as the following: $Y^F/[Y^H+(N_u+N_u)W^F_u+(N_s+N_s)W^F_s]$

Table 3.3 Endogenous wage subsidy (θ=0.01)

$z^H_u = 0.7$; $z^F_u = 0.5$; $\alpha = 0.3$

ν	0	0.3	0.5	0.8	1
Migration patterns					
Emigration rate (skilled)	0.234	0.238	0.242	0.248	0.253
Return rate (skilled)	0.346	0.378	0.396	0.420	0.433
Wage subsidy (γ_s)	**0**	**0.057**	**0.092**	**0.137**	**0.165**
Emigration rate (unskilled)	0.368	0.350	0.339	0.323	0.313
Return rate (unskilled)	0.423	0.394	0.370	0.326	0.288
Wage subsidy (γ_u)	**0.262**	**0.205**	**0.159**	**0.074**	**0**
Technological gap					
Overall (T)	2.034	1.968	1.940	1.924	1.934
Skilled labor (T_S)	2.304	2.148	2.065	1.961	1.901
Unskilled labor (T_U)	1.520	1.604	1.678	1.841	2.016
Output gap					
Overall gap (Y^F/Y^H)	3.322	3.201	3.151	3.122	3.142
Relative output per capita $(Y^F/N^F)/(Y^H/N^H)$	2.454	2.385	2.358	2.347	2.366
Relative national income*	1.339	1.329	1.325	1.322	1.323
Wage gap					
Skilled labor (W^F_s/W^H_s)	1.638	1.580	1.555	1.536	1.542
Unskilled labor (W^F_u/W^H_u)	3.367	3.285	3.256	3.252	3.284
Skill premium (W^H_s/W^H_u)	4.826	4.882	4.917	4.968	5.001
Skill premium (W^F_s/W^F_u)	2.333	2.333	2.333	2.333	2.333
Experience premium					
Skilled returnees (E_s)	0.396	0.357	0.336	0.309	0.293
Unskilled returnees (E_u)	0.182	0.208	0.230	0.276	0.324

Notes: *Relative national income is calculated as the following: $Y^F/[Y^H+(N_u+N_u)W^F_u+(N_s+N_s)W^F_s]$

Table 3.4 Endogenous wage subsidy ($\theta=0.01$)

$z^H_u = 0.9$; $z^F_u = 0.5$; $\alpha = 0.3$

ν	0	0.3	0.5	0.8	1
Migration patterns					
Emigration rate (skilled)	0.206	0.209	0.213	0.218	0.223
Return rate (skilled)	0.375	0.408	0.427	0.454	0.468
Wage subsidy (γ_s)	**0**	**0.061**	**0.098**	**0.147**	**0.176**
Emigration rate (unskilled)	0.496	0.478	0.466	0.449	0.439
Return rate (unskilled)	0.335	0.311	0.291	0.256	0.225
Wage subsidy (γ_u)	**0.210**	**0.165**	**0.128**	**0.059**	**0**
Technological gap					
Overall (T)	2.068	1.987	1.950	1.917	1.914
Skilled sector (T_S)	2.451	2.274	2.180	2.063	1.996
Unskilled sector (T_U)	1.391	1.450	1.503	1.616	1.736
Output gap					
Overall gap (Y^F/Y^H)	6.997	6.687	6.545	6.423	6.414
Relative output per capita (Y^F/N^F)/(Y^H/N^H)	4.276	4.147	4.091	4.051	4.058
Relative national income*	1.599	1.599	1.598	1.595	1.592
Wage gap					
Skilled labor (W^F_s/W^H_s)	1.188	1.136	1.112	1.089	1.085
Unskilled labor (W^F_u/W^H_u)	7.536	7.323	7.233	7.178	7.194
Skill premium (W^H_s/W^H_u)	14.79	15.03	15.18	15.36	15.46
Skill premium (W^F_s/W^F_u)	2.333	2.333	2.333	2.333	2.333
Experience premium					
Skilled returnees (E_s)	0.431	0.389	0.366	0.336	0.318
Unskilled returnees (E_u)	0.141	0.160	0.177	0.212	0.247

Notes: *Relative national income is calculated as the following: $Y^F/[Y^H+(N_u+N_u)W^F_u+(N_s+N_s)W^F_s]$

## Re-emigration rates from the US after 5 years of residence (2005)
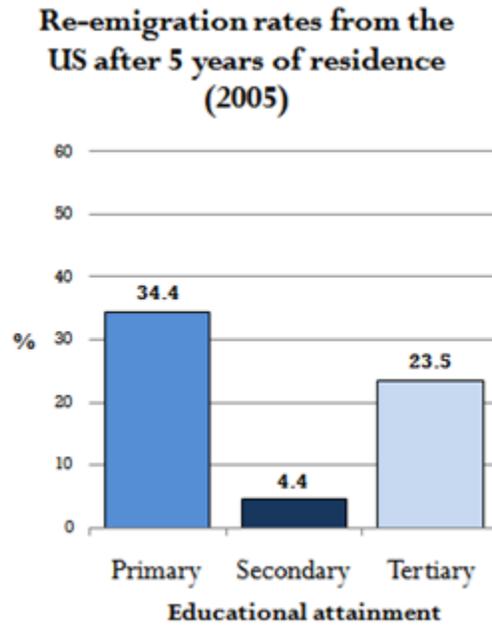
Figure 1.1 Aggregate re-emigration rates from the US in 2005.
Source: OECD International Migration Outlook (2009).
Notes: Re-emigration rates among males who entered the US in 2000 at the age of 35-64.

Return from USA (2000)

Return from Spain (2000)
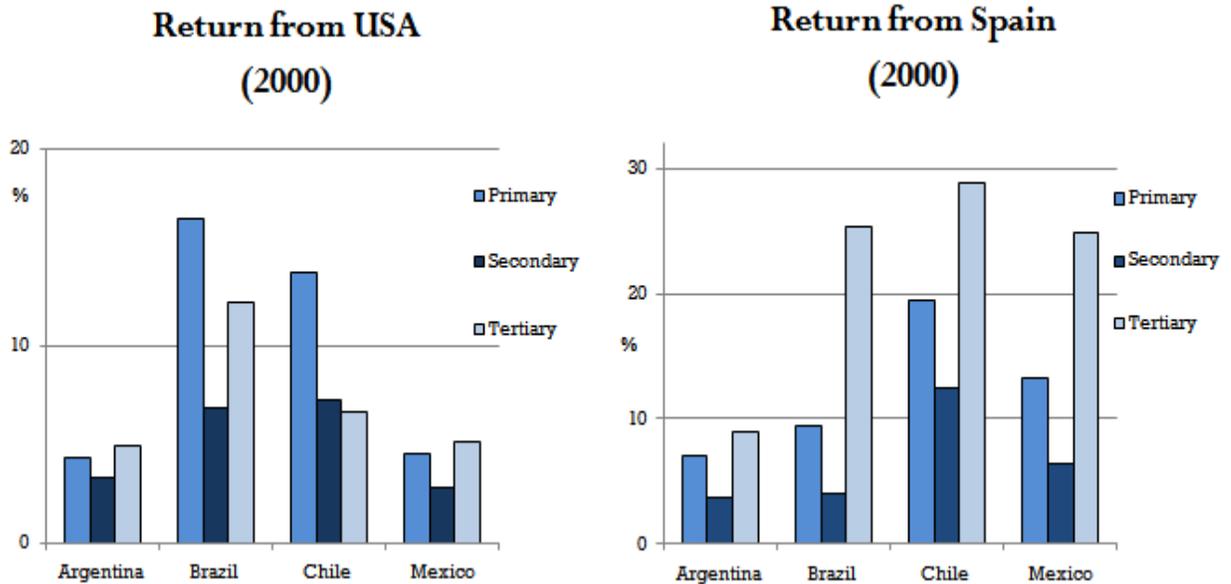
Figures 1.2a and 1.2b. Return migration rates by educational attainment

Source: OECD International Migration Outlook (2009). Notes: return migration rates for males of age 25-64. Return rates stand for the fraction of return migrants with education *i* in the total stock of the immigrant population from the same source country with the same educational attainment *i*, where *i* ={low, middle, high}.
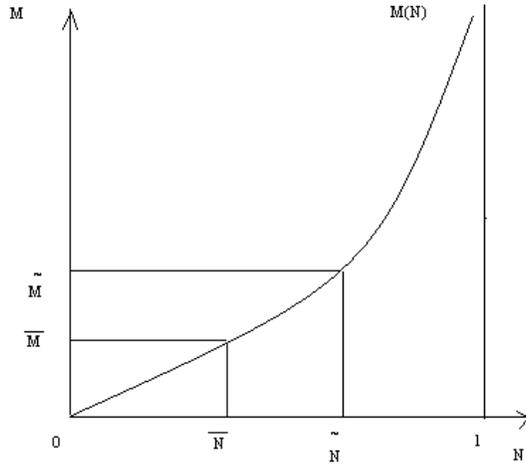
Figure 1.3. The distribution of immigration costs (M) within the educational group i.
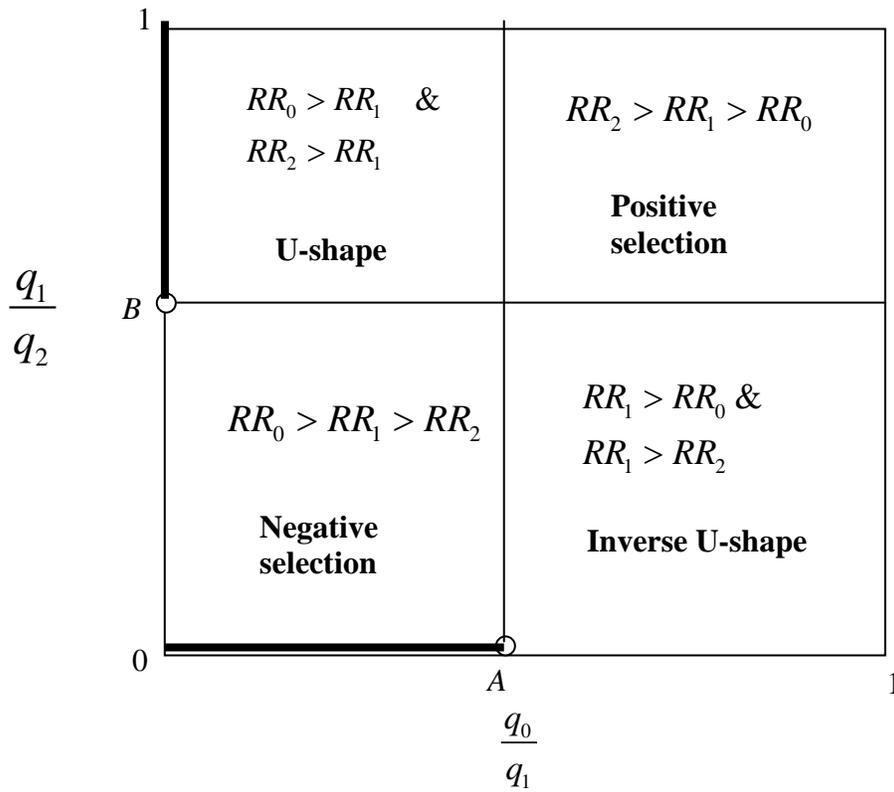
Figure 1.4 Patters of selection of return migrants

Notes: Values of A and B are given by the following equations

$$A = \left(1 - \frac{2(E-1)}{\dfrac{\mu^F}{\mu^H} \dfrac{SP_1^F}{SP_1^H} - (2-E)}\right)\left(1 + \frac{2(E-1)}{\dfrac{\mu^F}{\mu^H} - E)}\right) \quad \& \quad B = \left(1 - \frac{2(E-1)}{\dfrac{\mu^F}{\mu^H} \dfrac{SP_2^F}{SP_2^H} - (2-E)}\right)\left(1 + \frac{2(E-1)}{\dfrac{\mu^F}{\mu^H} \dfrac{SP_1^F}{SP_1^H} - E)}\right)$$
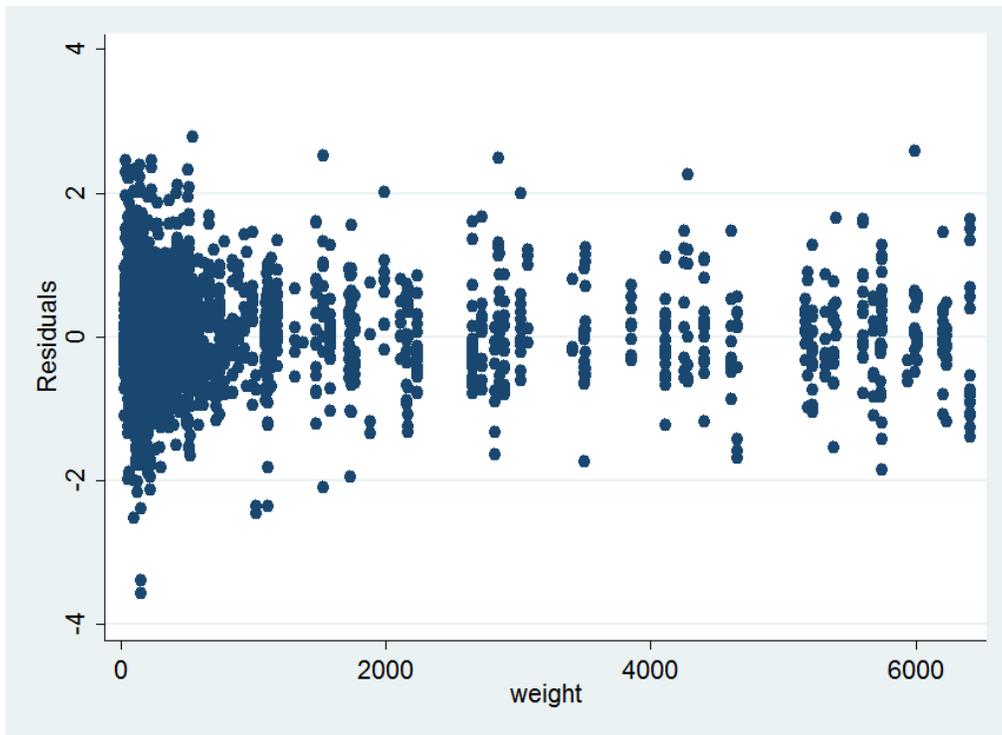
Figure 2.1 OLS Residuals vs. Sampling Weights (benchmark case)
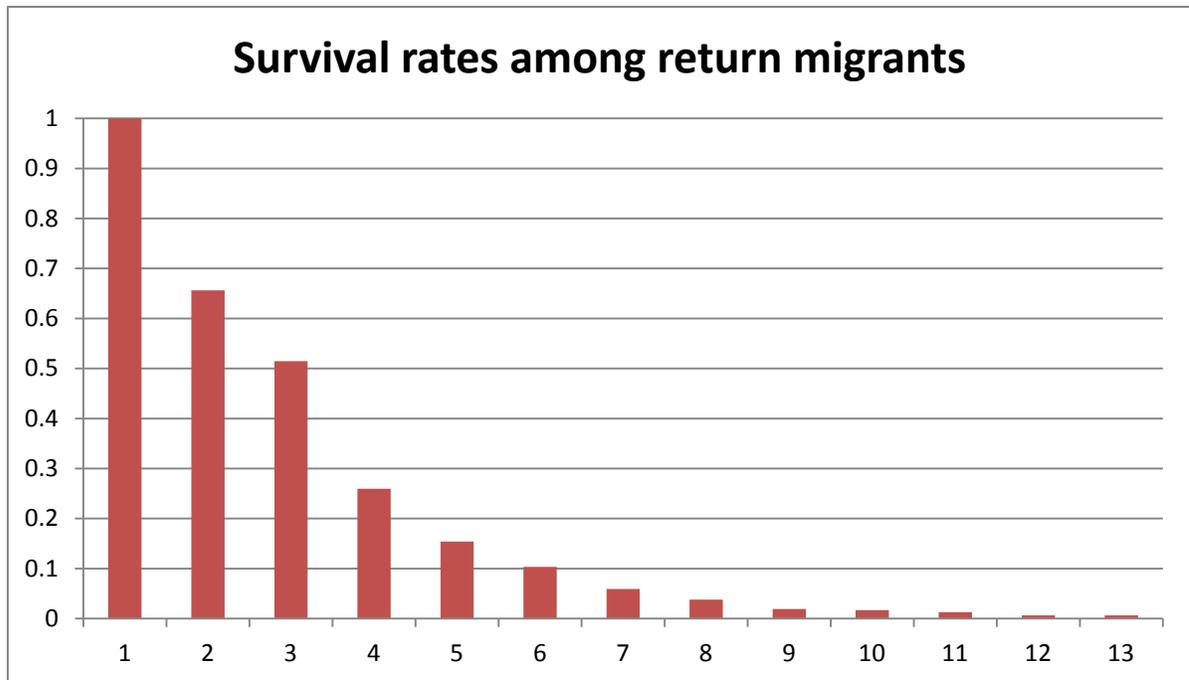
Figure 2.2 Survival rates after *i*th year of emigration

Notes: Horizontal axis measure years since emigration to destination; Vertical axis measure percentage of migrants who remain abroad after certain number of years.
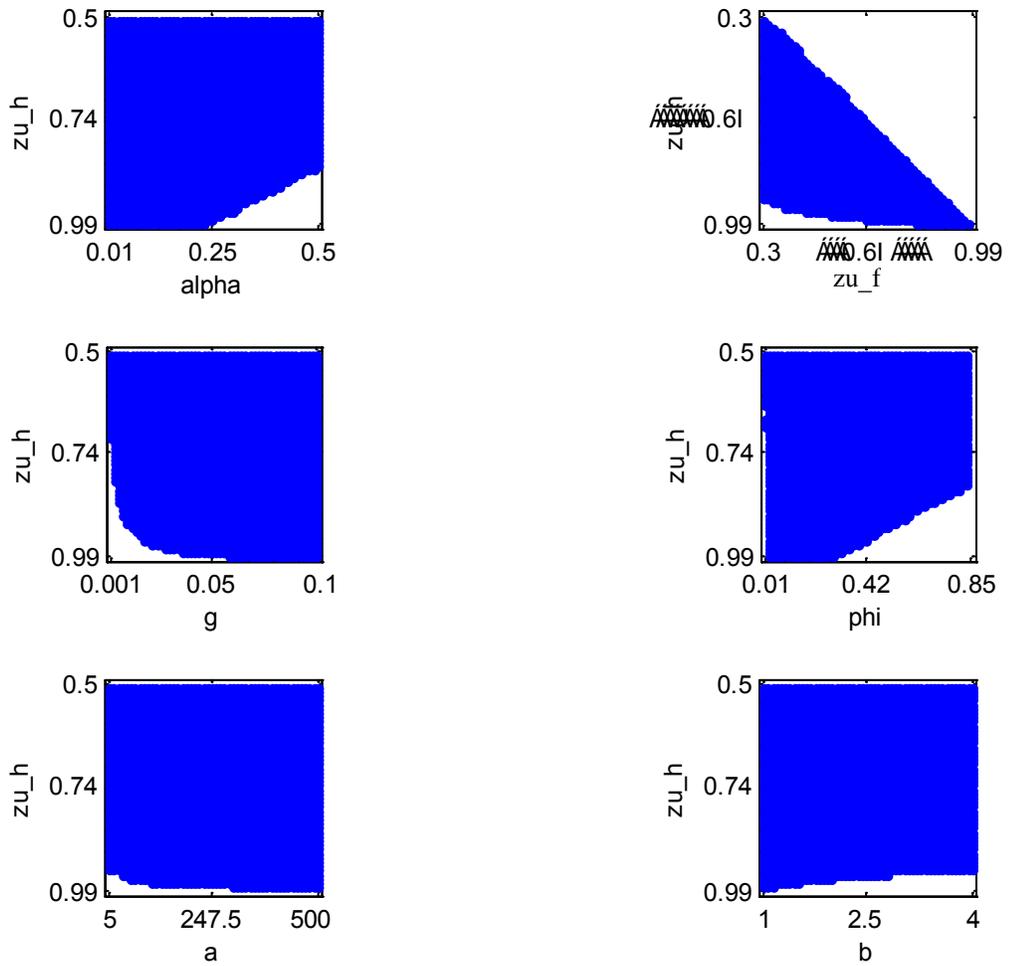
Figure 3.1 Parameter ranges for Result 1
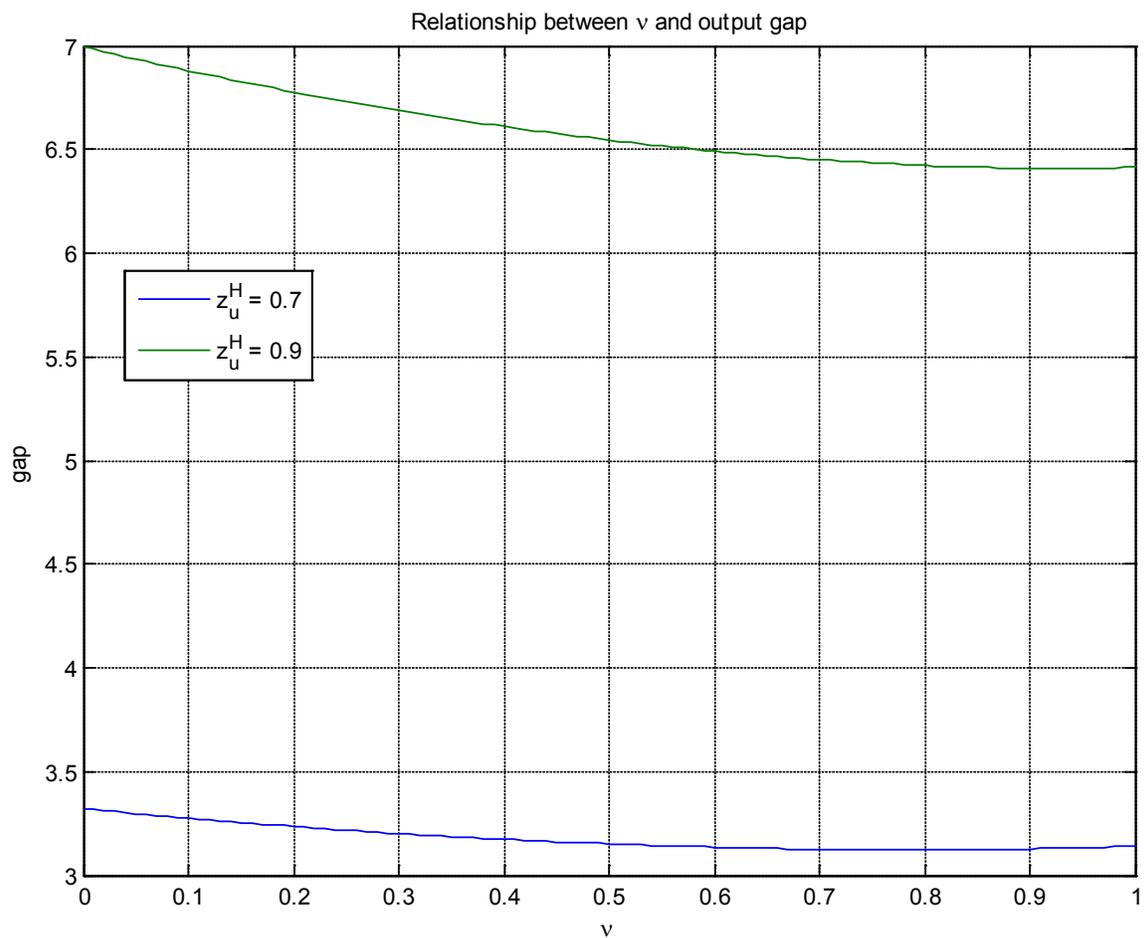
Figure 3.2 Subsidy allocation (θ=0.01)

Note: The figure depicts the values of the overall technological gap Y^F/Y^H. Alternative measures of the output gap yield similar patterns.
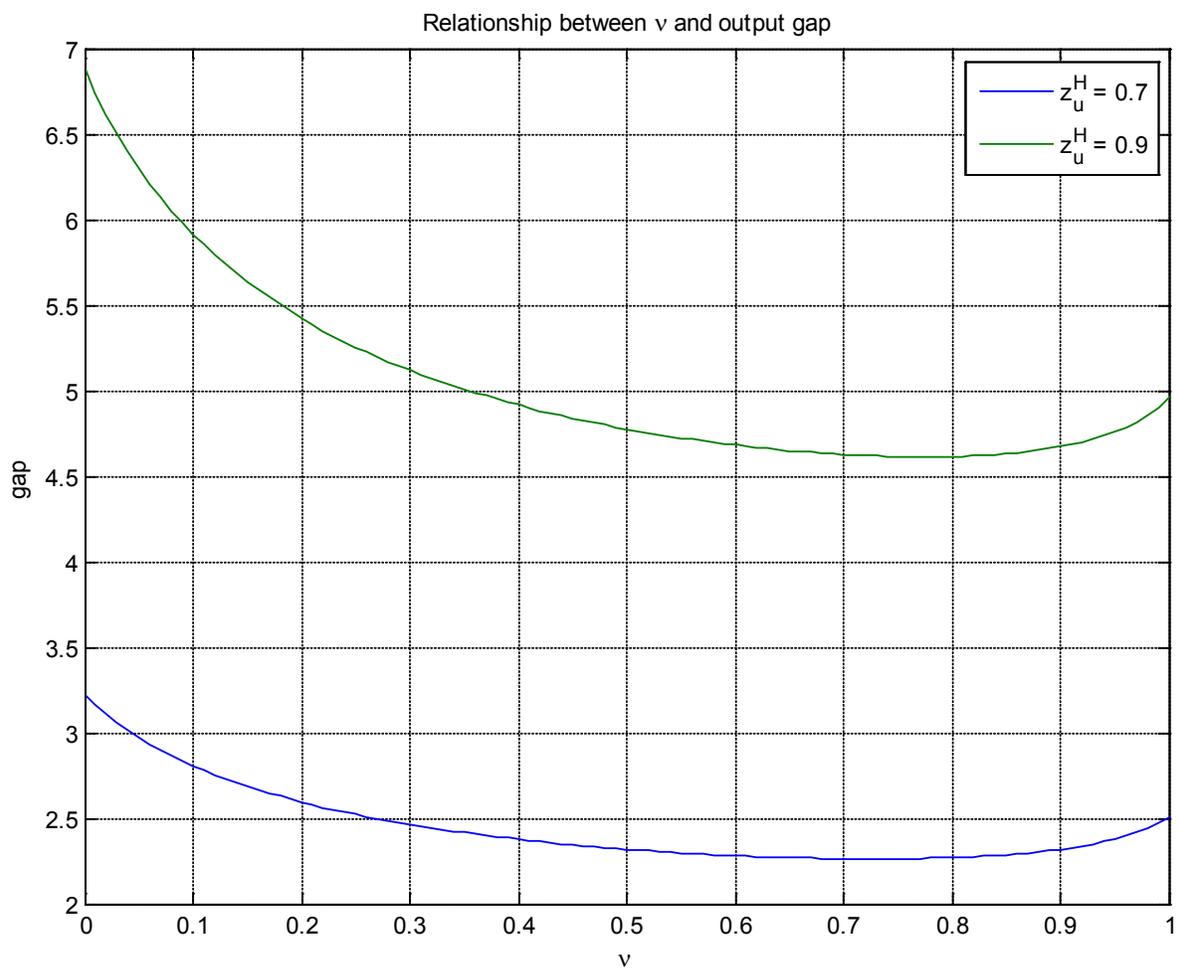
Figure 3.3 Subsidy allocation ($\theta=0.1$)

Note: The figure depicts the values of the overall technological gap Y^F/Y^H. Alternative measures of the output gap yield similar patterns.
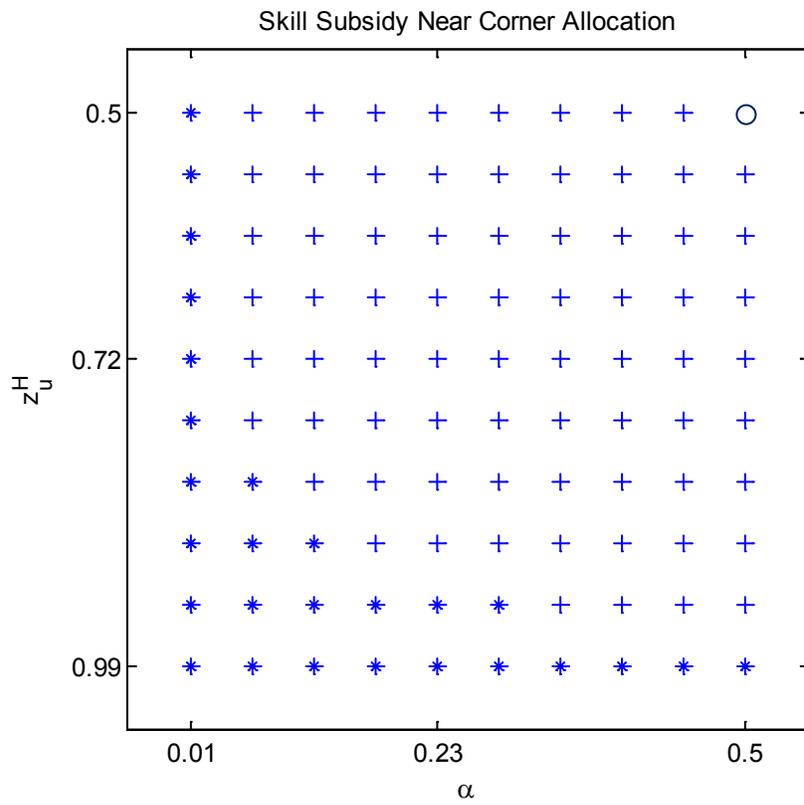
Figure 3.4 Corner subsidy allocation scenarios

Notes: * Corner allocation: $\upsilon=1$
+ Mixed allocation**: $\frac{1}{2} < \upsilon < 1$
o Mixed allocation: $\upsilon \leq \frac{1}{2}$