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Migration of Highly Skilled Labor & the New Economics of Brain Drain

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Ahmed Driouchi,
Institute of Economic Analysis & Prospective Studies (IEAPS),
Al Akhawayn University, Ifrane (AUI), Morocco,

Cristina Trandas-Boboc,
Laboratory of Economics, Orléans (LEO),
University of Orléans, France,
&
Nada Zouag,
IEAPS, AUI, Morocco

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Abstract

The issue of migration of skilled labor has generated increasing interest among scientists and policymakers over the last twenty years, generating a. series of economic publications. These have been the sources of different views and positions that have fed debates and policies concerning mainly developing countries. These debates have considered the migration of skilled labor as a major loss of abilities and knowledge from developing economies. A clearly critical approach has dominated international, regional and national debates, asserting that human capital trained in developing economies for internal purposes of development, can be transferred to developed countries at almost no charge. However, most recent papers introduce more optimistic views about the impact of skilled labor migration on developing economies through introducing new economic models that support the brain gain that accompanies the brain drain. But, while these new views have contributed to putting an end to the pessimistic ones that prevailed earlier, there is not a final position with regard to the magnitude of the dissymmetric benefits between source and destination countries. Furthermore, most of the new economics of skilled labor migration has not been extensively tested empirically.

This report is an additional contribution to the large body of literature developed in the area of economics of skilled labor migration. It focuses on two major points in this area: the determinants of migration; and its likely impacts on developing economies. Within the framework of the new economics of skilled labor migration, this report attempts to empirically test the relevance of some components of the most recent new economic models of skilled labor migration. Using available data from international organizations (World Bank, OECD, UNESCO) and others, it tests hypotheses using both regression analysis and economic simulations. It then identifies directions of empirical results for larger policy discussions. The theoretical models that have been given priority in these empirical investigations are mainly those of Beine & al, Stark (2005) & al, N. Duc Thanh (2004) and M. Schiff (2005). A major focus has been placed on the models suggested by Duc Thanh (2004) where useful specifications of the functional forms were made. This selected framework uses the similarities that have been observed between this model and that of Stark and Schiff.

The empirical results obtained confirm the importance of several factors in skilled labour migration: relative wage levels; the availability of better opportunities such as jobs; the importance of living conditions; and the existence of more attractive working conditions in destination countries relative to source economies. Skilled labor from developing countries is also attracted to the North by the more transparent economies and promising processes of knowledge creation and diffusion located there. This movement is facilitated by the growing openness of world economies, as indicated by the components of the index of economic freedom. These determinants appear to have had larger roles in explaining the stocks and flows of emigrants from different countries and especially from developing economies. They have appeared to have stronger explanatory power, especially during more recent years, because of the limited job availability for graduates and for skilled labor in particular. Limited democratization and the slow growth of market openness have often helped accelerate the emigration process. Transparency and the expectation of better living conditions have also facilitated the emigration of young educated people from Southern to Northern economies. The overall environmental factors surrounding developed economies have certainly accelerated emigration of skilled labor. These factors include: current and prospective endogenous demography; the continuous need for further knowledge and competitiveness; and specific demand for special skills such as in the area of health care (population aging, special needs in relation to shortage of medical workers). The estimated equations confirm the importance of all the economic, social and political variables that are behind the observed migration trends. Previous findings have identified additional factors that relate to language and proximity.

Concerning the estimation of the impacts of skilled labor migration for both developed and developing economies, the specifications have followed the Beine, Stark and Duc Thanh models with special emphasis placed on this latter. Given the dynamic nature of Beine's model and with the limits on the available time series, significant empirical results are obtained and tests of Beine's propositions achieved. The regressions results using the subcomponent of the knowledge economic index have shown the significant effects of both domestic education and the attractiveness of foreign relative wages as major determinants of the level of knowledge added by the tertiary sector in each economy. In the sense of these estimations, it becomes clear that any economy is subject to two major opposite forces. On the one hand, the relative share of investment in education positively affects human capital formation in any country, but with higher impact in developing economies. On the other hand, there is the magnitude of the relative wages that negatively affects the performance of developing economies as measured by the subcomponent of the knowledge economic index. These results have been first confirmed through regression analysis. They have also been used to confirm the specification of the theoretical model of Duc Thanh. Since the model depends on a coefficient that sets the levels of investment in higher education and on relative wages applied by foreign countries, different simulations have been built. The levels of relative wages have been applied to the USA, EU, Canada and Australian destinations besides an average destination. These simulations have helped understand that the magnitude of the technological coefficient affects the level of emigration under different probabilities of emigration. Under low levels of accumulation of human capital, low probabilities of departure exist with rapid impacts on the depletion of human capital. Higher levels of technology as in developed economies lead to higher probabilities of departure with lesser depletion of the human capital formation. Both types of countries show a brain gain followed by a brain drain, but developing economies experience only limited brain gains relative to developed economies.

These preliminary findings suggest that local, national, regional and international economic policies consider the new theoretical and empirical trends shown so far by economic research. The existence of brain gain is definitely an important input to be considered in economic policies and related debates. Investments in education, especially in the tertiary sector, besides policy actions related to the promotion of the private sector and the mobilization of networks of emigrants, are important means for enhancing the level of optimization of migration benefits in each country and especially those in the South. An economy that strategically aims to accelerate knowledge production, acquisition and use is likely to be generating new engines of growth that account also for the inclusion of former emigrants besides the retention of newly produced human skills.

1. Objectives and Organization of the Report

This report looks at the determinants and impacts of the migration of skilled labor from developing (South) to developed economies (North). In the absence of cross-section data about individual and group choices, only aggregate secondary and incomplete data can be used to understand and assess the overall determinants and impacts of the migration of skilled labor. The available publications related to the migration of skilled labor with its relationship to economic and social development show the diversity and richness of the material developed so far. The accumulated knowledge focuses on the perception and loss of qualification at the source of emigration with emphasis on the potential gains transferred to destinations. It also insists on the perceptions related to the educational and training costs invested at the origin and to the experience accumulated by the emigrant, mainly when public budgets and expenditures are involved. The overall direct and indirect benefits and costs that are related to the processes of emigration of skilled labor have also constituted important components in the economic literature. Finally, it can be derived from the accumulated knowledge that the higher intensity of emigration of skilled labor from the same given sources has shown a large body of reports and publications indicating the directions of losses and gains between developing and developed economies especially in the era of globalization and increased competitiveness and where knowledge is the most important driver (Driouchi & al, 2006).

This report starts with a comprehensive literature review about the determinants and the impacts of the migration of skilled labor. This is followed by a description of the methods and data used to assess both the determinants and the impacts using some selected models. The results obtained are then submitted before tackling their discussion with the implied economic policy issues.

2. Review of Literature on Migration of Skilled Labor

Different approaches to migration have been identified and different assessments have been developed. These approaches are mainly based on the relationship between developing and developed countries with the possibilities of enhancing the likely benefits that can be obtained from this migration. In relation to this, some authors have considered the brain drain to be negative for developing economies while others have been more in favor of negotiated solutions as gains are observed to occur to source countries. The latter literature is now progressively shaping international and national policies.

2.1. Determinants of skilled workers' migration

The rate of skilled workers' migration (brain drain) continued to increase prompting a search for the causes of this migration. They are identified by the International Organization for Migration (IOM) as driving forces from both developed and developing economies. The technological revolution played an important role in increasing the rate of migrants to countries where information and communication technologies are abundant, thus demanding highly skilled workers. Globalization has also played an important role in encouraging developed economies to attract the workforce of developing countries. Moreover, the decrease in population added to the developed countries' shortage of skilled workers, accelerating migration towards some sectors such as health care.

The large body of reports developed by the International Labor Office has been useful in understanding a series of economic, social and policy issues related to human migration in general and to skilled labor in particular. Report 44 by Lindsay Lowell and Allan Findlay

(2002) underlines the absence of databases that directly deal with high skilled labor migration. Report 73 by Gloria Moreno-Fontes Chammartin & Fernando Cantù-Bazaldùa (2005) has set out some prospects for migration in the context of the enlargement of the European Union. The prospect for skilled labor migration is high as workers are supposed to settle where their productivity and wages are higher. The factors behind this high prospect include income gaps, social and network systems and the attractiveness of the educational system in Europe.
The existing literature recognizes that the "brain drain" is another aspect of international mobility that worries researchers and political leaders, from the North and the South, and emphasizes the idea of cooperation between labor transmitting and labor receiving countries. The effect of asymmetric information was introduced by Kwok and Leland and commented by Katz and Stark. Asymmetric information in the labor market is, according to Kwok and Leland, the reason behind the brain drain in less developed countries. Since employers abroad are better informed about workers' productivity than domestically, they offer better wages which make skilled employees prefer to stay abroad. However, under alternative scenarios of asymmetric information, less skilled workers migrate from less developed countries more than highly skilled labor. Depending on which side the information is present (rich or poorer country), asymmetric information tend to encourage migration. From the side of a poorer country (for example Taiwan), the asymmetric information may support low-skilled workers' migration. From the rich country side (for example USA), asymmetric information might cause the migration of highly skilled workers (Katz & Stark, 1984).
In their reply to this, Kwok and Leland found that the example of Katz and Stark is another result of their research: skilled workers will stay in their home country while less skilled workers might migrate, if reverse information asymmetries exist (if the poorer country can better screen its workers than the rich one). When sufficient wage differential is available, emigration of the least talented workers can occur but will often be partial. Migration and government policies affecting mobility can then be discussed in relation to informational asymmetries and relative wages (Kwok & Leland, 1984).

2.2. Effects of Brain Drain on the welfare and growth of source countries

The issue of knowing whether skilled migration is detrimental to the welfare of the populations in the countries of emigration has engaged, for a long time, wide debates in the development literature. These debates include both those that emphasize the negative effects of brain drain and those that consider the existence of positive gains to source countries.

The work concerning the international emigration of skilled labor force, considered as talent drain from the least developed economies towards the most developed, had rather unanimously advanced following the idea that *brain drain is unfavorable to the development of the source economy* (Bhagwati & Hamada, 1974). The principal arguments justifying this situation are related to different types of externalities, induced by the migration of human capital, which are imposed on the remaining population. Bhagwati and Hamada (1974, 1982) show that the emigration of the most skilled labor force generates a tax externality associated with a distortion of the optimal tax system on two levels. On the one hand, knowing that the most skilled agents are better remunerated, government loses in terms of tax income due to its agents' drain, which affects the potential size of revenue redistribution. In the same way, the investment in terms of education and training represents major costs for developing countries which cannot receive benefits in return since the migration of skilled labor takes place.
Bhagwati and Dellalfar (1973) proposed a tax on professional emigrants' income for an approximate period of their ten first years in the host country. This tax is supposed to be collected by UNDP and distributed in the countries of origin. However, there are administrative problems associated with tax collection, the problem of non-benevolent developing governments, and the extent to which a brain drain tax should be integrated in the

tax system of the country of origin. To avoid these problems, a small tax on the incomes of citizens living abroad was considered as a possible approach in collecting a brain drain tax (Wilson, 2005).
Bhagwati and Partington (1976) and Bhagwati (1976) discuss the feasibility of the tax on residents' income in the host country. This tax cannot be gathered by all developed countries (different political systems and constitutions) but might be collected by developing countries through a multilateral treaty. Maynard (1976) criticized the depth of analysis of Bhagwati and co-authors regarding the definition of developed and developing countries, the definition of equity in terms of distributing resources, the compensation principle (10% tax for 10 years), the over-production of professional and technical personnel by underdeveloped economies, and the efficiency of the international redistributive mechanism (free riders, efficient use of funds).
Blandy (1968) constructed a model through which he assessed the brain drain phenomenon. He found that migration is multidirectional (not only into North America) and is a complex movement attached to political, economic and educational development processes. Two conditions should hold to conclude that brain drain exists. The first condition is when the migration of highly skilled workers is growing more rapidly than the number of highly skilled labor in the home country. The second is when the difference between these rates of increase is greater than the difference between the rates of increase of migration as a whole and the economically active population as a whole.
According to the endogenous growth theory, the migration of competencies imposes an externality whose origin lies in the reduction of local human capital stock available for present and future generations. This implies a negative effect on the income of workers who didn't emigrate or on the growth rate of the source country. Moreover, qualified work is an instrumental factor in attracting foreign investments (Fujita et al. 1999) as well as in the capacity of assimilation and absorption of technological externalities or for the success of foreign technologies adoption (Benhabib and Spiegel, 1994).
Furthermore, within the framework of the new theory of endogenous growth, the human capital drain is unfavorable to development (Miyagiwa, 1991; Haque and Kim, 1995) since the loss in human capital resulting from skilled workers emigration decreases productivity and income per-capita. Miyagiwa (1991) for example, shows that in the presence of increasing outputs from education, the emigration of very skilled workers can decrease the income of workers with intermediate skills whether these latter migrate or not. Under certain conditions, this author shows that the national income of the source country can be lower than that which would prevail in the absence of migration. Thus, the brain drain was identified as a serious problem against which policies had to and could act. Haque and Kim (1995) think that education policy is the answer. Since educated people are more likely to emigrate, in an open economy, then education should focus in primary and secondary levels. Even though remittances counterbalance the effects of brain drain, Haque and Kim (1995) found that these remittances have a negative effect on the growth of the home country.
Using the simple economic model of labor demand and supply, Mishra (2006) assessed the quantity of welfare loss that results from labor movement both when external effects do not exist and when they do. When external effects of labor migration are not taken into consideration, the emigration loss is the surplus resulting from the difference between the cost of employing the workers who migrate and the value of their marginal product. This welfare loss is due to the cost imposed on those who were left behind. Accounting for external effects, Mishra (2006) found that the loss from skilled labor migration is greater than without external effects.

Very recently, the models and analyses related to the negative impact of human capital migration gave way slowly to models and studies aiming at the identification of potential transmission channels through which migration as well as the possible money transfers associated with it could constitute a considerable *source of income for the development process of the source country*.

The new literature tries to show that potential net positive effects on human capital accumulation and growth can be associated with human capital migration. Consequently, the unfavourable effect of the exodus of competencies can be reversed. Therefore, the expression “Brain Drain” becomes “Brain Gain”. In this new literature, it is suggested that the brain gain could be associated with the inciting impact created by the migration prospect on the size of human capital formation in an environment of uncertainty. According to Mountford (1997), the migration possibility, even if temporary, might enhance the average level of productivity of the source economy in a permanent way. The general idea is that, in poor economies, the net yield of human capital tends to be limited, thus inhibiting the incentives to invest in education and training. However, open economies offering migration possibilities make the human capital acquisition more attractive since wages of skilled workers are higher in developed countries. This can lead to an increase of the medium level of human capital in the remaining population according to Beine et al. (2002). In this new literature, in a context of uncertainty and heterogeneous individual aptitudes, two brain drain effects are highlighted: a natural incentive effect to human capital formation, and a drain effect which appears with the effective departure of the economy’s talents. So, the human capital migration can be globally beneficial to the country of origin, when the first inciting effect dominates the drain effect by compensating for the negative direct impact of the brain drain on the human capital stock of the considered country.

A survey of the empirical and theoretical literature, done by Docquier and Rapoport (2005), on skilled migration effects on developing countries stated that the level of development for a country is inversely related to its optimal rate of migration. Furthermore, education policy strengthens the possibility of a beneficial brain drain, given that education is partly publicly financed through education subsidies. The fiscal adjustments to the brain drain can lead to tradeoffs between efficiency and social justice. That is why Bhagwati’s tax can represent more benefits for the sending countries when investments in education are liquidity constrained (Docquier & Rapoport, 2005).

Grubel and Scott (1966) already said that if the human capital migration is a social cost in the short run, it is possible that this cost can, under certain conditions, be largely compensated in the long run through the transfers’ potential, and the beneficial impacts emanating from the professional networks gained abroad. There are two ways of carrying out the ‘brain gain’: either through the return of migrants to their country of origin (return option), or through their mobilization by associating them remotely to the development of their country of origin (network of experts’ option). The return option was successfully carried out in various newly industrialized countries such as Singapore, Taiwan, Hong Kong and Korea. The theoretical results of the new literature thus corroborate the argument of Grubel and Scott (1966), and suggest that the impact of emigration on the source countries could be rather positive. Consequently, in terms of economic policies, these works quite naturally encourage developing countries to open their borders, and to authorize migration in order to maximize its positive effects.

Oded Stark also brought another perception of the brain drain. Since the familial and capitalist production functions are imperfect substitutes, migrant children might provide a positive role in the economy. An agricultural family that decides to move from “familial production” to “capitalist production” faces two constraints: “investment capital” constraint and risk constraint. The family tries to find solutions to the market imperfections it faces by driving the most suitable family member to rural-urban migration. This migration diminishes risks, given that the urban work is independent of agricultural production. Children are seen to yield different utilities: consumption, income, and status, security & insurance. However the role of

the migrants is to cause technological change by increasing income. Education allows such a scenario, given that farmers use the educational system to prepare their children for migration. The total utility from children is increased when specialization by children in the different utilities production exist. A social-welfare implication arises given that private optimal behavior (family) doesn't differ from the social optimal behavior (Stark, 1981).
In his review of "The Migration of Labor", Todaro (1991) emphasized Stark's belief that migration is initiated by family decisions. Stark believes that migrants are driven by the wage differential, expected income and other factors and that migration is the result of incomplete and imperfect markets. Korner (1992), who has done the same review, presented Stark's findings according to which, the individual-family cooperation and the markets' mode of functioning are the causes of migration. The latter occurs when a group of people, determined to rationally allocate common resources, make economic decisions. So, migration is seen as a way to alleviate risks and is due to national and international market imperfections as well as institutional distortions. Stark also connects migration to information regimes, risks, remittances and economic performance of the migrants (Korner, 1992). In addition, Molho also identified from Stark's "Migration of Labor" that many factors, such as highly imperfect markets in rural areas, credit access constraints, and risks and hazards, drive small farming families to send their most eligible member to urban areas or, in a more general sense, to migrate. The remittances sent by the migrant can alleviate risks related to new investments (in technology for farm production). Stark studied the role of relative deprivation as well as that of information asymmetries when employers are faced with workers whose skill level is undetermined. Concerning the theme "Planning with migration", Stark found out that government efforts to decrease labor movements were unsuccessful and that this phenomenon might be beneficial in a social framework. The economic performance of migrants depends on migrants' characteristics, on informational asymmetries driving the migrant to take self-employment risks and to save in case of return migration (Molho, 1992).
Stark also identified the effect of one migrant altruistic relation with his family members or social group on his allocations and wellbeing and estimated the impact of the timing of intergenerational transfers of allocations on the recipients' human capital formation. Stark found that the altruistic behavior of the migrant and his family can be driven from self-interest since the actual transfers of the migrant to his family might influence future transfers from his own children (Todaro, 1997).
In another paper, Galor and Stark found that the probability of return migration affects migrant's savings and economic performance. Compared with the native-born, migrants' savings can increase even with a small return probability (a decrease of the migrant's wage). The model adopted by these two authors defines saving patterns between the migrants and the native-born. Therefore, the higher the probability of return migration, the higher is the level of savings. As a consequence of the possibility of return migration, migrants save more than the native-born. If return migration does not take place, migrants' wealth outweighs the wealth of the native-born (Galor & Stark, 1990). This relationship between the possibility of return migration and the migrants' saving behavior can explain the migrants/native-born performance: if return migration doesn't occur, the migrants' performance will be superior to the native-born one. Also, migrants with a positive probability of return will have higher mean incomes than the native-born, but if they decide to transfer some of their savings as remittances, the migrants/native-born differential will decrease. Migrants contribute more to capital formation in the source country compared with the native-born. That is why country policies should keep the return probability higher than 0 (Galor & Stark, 1990).
Starting from a sample of 50 countries, Beine et al. (2002), who brought an innovation to the brain drain literature with their empirical results, show that the rate of emigration of the most skilled positively and significantly influences human capital accumulation and growth. Most countries that are positively affected by the brain drain combine both low levels of human

capital and low emigration rates for the highly educated. Negative growth countries appear in countries where 20% and up of the highly educated migrate and/or where up to 5% of the total population are highly educated. Both winner and loser countries exist, but the proportion of winners includes the largest countries in terms of demographic size (80% of the total population of the sample). Empirical studies showed that at an aggregate level, brain drain is not anymore seen as extractor of the most valuable human resources from poor countries, but needs a better understanding of the conditions and causes of negative brain drain. An extension for this research could include, in addition to education, remittances and business networks' creation.
However, Faini does not validate this result in his study. He did not find convincing proof about the bias that skilled migration in destination countries can benefit home economies, especially because of the globalization process that is harmful to poor countries. He also stated that a more liberal skilled migration policy can have an unfavorable effect on tertiary enrollment which contradicts the possible increase in the return to secondary education. Thus, return migration does not necessarily have an evident beneficial impact. Therefore, policy makers are expected to strengthen multilateral trade systems and limit the repetition of financial crises in emerging economies (Faini, 2003).
Schiff (2005) minimizes the size of the brain gain and its effect on growth and welfare compared with the new brain drain literature. The size is smaller because of heterogeneity, unskilled migration, uncertainty, brain waste and general equilibrium effects. The brain gain is smaller (or negative) with limited impact on welfare and growth. He shows that brain drain exceeds brain gain in constant state and agrees with contributors to the early brain drain literature, who viewed brain drain as a trigger of loss for the home country. The author agrees with the new brain drain literature on one point related to the most severe brain drain cases where the net brain gain is negative (Schiff, 2005).
According to Stark (2002), the decision to under-invest in costly human capital formation may be reached if individual productivity is fostered by the average level of human capital in addition to his own human capital (in a closed economy), and thus affects social welfare. Migration can allow the formation of human capital at a socially desirable level. Besides, acquiring skills enhances the chances of having high skills rewarded. Grubel and Scott didn't refer to the relationship between migration and welfare gain for the non-migrants even though they mentioned that emigration should be encouraged given that the emigrant improves his own income and that those who remain behind are not affected by the migrant's departure (Stark, 2002). He also demonstrates both results of the prospect of migration: brain drain and brain gain and he found that a good migration policy can lead to welfare gain for all workers.
The debate that turned over the advantages and costs of skilled migration resulted in many analyses. It should be recognized that this kind of migration is costly in terms of the country of origin's finances and economy.

3. Methods of Investigation

These methods are mainly those that helped assess respectively the determinants and the impacts of skilled labor migration. Besides the theoretical grounds on which each investigation has been conducted, the empirical models used are respectively based on regression analysis and simulations. The data are mainly aggregates from a variety of sources.

3.1. Factors that could explain Emigration of skilled labor

The available reports and publications show that there are many factors that could explain the emigration of skilled labor to other destinations. The number of these factors is recognized to have increased with globalization and with the development of competitiveness through knowledge and ownership of skills. The liberalization and openness of economies relative to the period of government intervention are also among the factors that contributed most to the enlargement of the set of likely explanatory variables that are behind emigration. In this context, subsets of current variables are provided in reports and publications.

Relative to the levels of variables in the source countries, the likely factors include the expected monetary gains, the living conditions, the working conditions, the state of human rights, the accessibility to the emigration costs, and the accessibility to information, quicker promotion and acquisition of social status with easier access to networks and to professional support. Furthermore, the absence of jobs and decent occupations in the source country leads automatically skilled labor workers to search for opportunities elsewhere.

3.2. Models used to Assess Impacts

The models adopted in the measurement of skilled labor migration impact on source and destination countries, in terms of human capital formation and growth, are divided into theoretical and empirical studies.

The model presented by Beine, Docquier and Rapoport (2002) is an empirical assessment of the growth effects on home countries of skilled labor migration. Beine et al. used Carrington and Detragiache data (1998) concerning the emigration rates at three educational levels for a set of 50 developing countries. The results of this empirical study showed that brain drain can be beneficial as well as disadvantageous for the source countries. In addition, given that it is possible for brain drain to generate benefits for the source country, it is necessary to expand studies to means other than education.

From the Beine et al. model, the higher the personal ability of an individual, the lower is the cost of achieving the minimal education threshold, which also depends on other country-specific variables affecting human capital. In this model, the education investments in a given country can explain a higher initial level of human capital inherited by the following generation. The human capital growth rate equation shows two effects: the brain effect and the drain effect. Two equations are then used to estimate the global effect of the brain drain and to evaluate the expected growth effect of a marginal increase in the migration probability (Beine et al., 2003)**.**

Stark et al. consider that migration is assumed to have no cost of movement. In that case, the function of the expected net earnings of the workers in the sending country equals gross earnings given the probability of migration minus the costs of capital formation. For any m between 0 and 1, the level of human capital in an open economy setting exceeds that of a closed economy setting, but it is below the level of human capital in the destination country (Stark et al., 2005).

Nguyen Duc Thanh (2004) presents a theoretical model including the heterogeneity of workers' talents. The accumulation of human capital stock depends on the human capital investment expenditure and talent (The human capital formation function). The higher the probability of emigration π, the less is the human capital accumulation: 'Emigration Trap' meaning that emigration constraints always result in a net brain drain effect. The optimal emigration probability is achieved when the economy maximizes its domestic human capital stock at a given probability after which the country starts to lose its human capital (N. Duc Thanh, 2004).

Maurice Schiff (2005) presents other results focusing on the size of the brain gain that is smaller than the results presented in the other new brain drain literature, and thus the effects on growth and welfare are lower.

3.3. Description of data used

Different databases are used to assess the impact of skilled labor migration on the sending country as well as on destinations. The indices of skilled labor migration are taken from the most recent OECD database. There are five indices used: The highly skilled expatriation rate according to the Cohen and Soto database for the population of 15 and over (EM1), the highly skilled expatriation rate according to Barro and Lee database for the population of 15 and plus (EM2), the average of EM1 and EM2 (EM3), the emigration rate by country of birth - total population (EM4), and the emigration rates by country of birth for the population of 15 and plus (EM5).

Knowledge and socio-economic data are obtained from other databases and sources. The corruption perception index (CPI) is published by Transparency International. It is a composite index based on the corruption data in experts' surveys. The Index of Economic Freedom (IEF) is available at the Heritage Foundation. It measures how much a country is economically free by assessing its trade policy, government fiscal burden, intervention of government in the economy, monetary policy, capital flows and foreign investments, banking and finance, wages and prices, property rights, regulation and informal market activity (Heritage Foundation, 2006). The Knowledge Economy index (KEI) is obtained from the World Bank Institute. The KEI measures the degree of acquisition, creation, use and access to knowledge. It sums up indicators related to a country's economic incentive regimes, its innovation ability, its education system, and its information infrastructures. The Gross Domestic Product Index (GDPI) is a measure of the per capita level of income resources accessed by all the individuals in a given country. It was computed by IEAPS by normalizing the per capita GDP data and serves as a reasonable indicator of a country's wealth. The GDP is published in the Human Development Report 2005 by UNDP. The Human Development Index (HDI), also published by UNDP, measures the average achievements in a country in terms of a long and healthy life, knowledge and a decent standard of living.

Labor market variables including employment information are taken from the World Bank database, the index of tertiary education as a subcomponent of the education index included in the knowledge economic index is published by the World Bank Institute (2006). The investment per capita in higher education is measured by the expenditure per student devoted to tertiary education as percentage of GDP per capita (World Bank database, 2005). The relative wage in different immigration economies (ω) is measured by relative GDP per capita (World Bank database, 2005). International Monetary Fund (IMF) database was also used.

The highly skilled expatriation rate according to Cohen and Soto database for the population of 15 and plus (EM1), the highly skilled expatriation rate according to Barro and Lee database for the population of 15 and plus (EM2), the average of EM1 and EM2 (EM3).

3.4. Empirical results

Assessment of Determinants of Skilled Labor Migration

All countries in the sample show results that link positively KEI and HDI, IEF and GDPI but the second regression indicates negative correlation between IEF and CPI. These results are consistent with the definition and the scales of each of the indices used in these regressions. Regarding the emigration rates as measured respectively by EM1, EM2 and EM3, they appear in each regression to be negatively related to both IEF and KEI meaning that the increase (decrease) in IEF leads to less (more) emigration or that the openness of the economy implies more incentives to emigrate. At the same time, increases (decreases) in KEI imply less (more) emigration. But the emigration rate is under the double effects of KEI and IEF. Given the three other relationships, the emigration rate is statistically assumed to decrease (increase) with the increase (decrease) of the human development index and with the increase of the corruption perception index. These results may be interpreted as saying that emigration increases with low human development and with corruption.

Table 1: Emigration explained by economic, social and political variables (All countries in the sample)

All countries in the sample	Obs.	R²
$\underset{(-9.74)}{KEI = -4.13} + \underset{(20.63)}{12.05}\, HDI$	110	0.80
$IEF = \underset{(51.08)}{3.96} - \underset{(-15.06)}{0.24}\, CPI$	110	0.68
$HDI = \underset{(26.56)}{0.34} + \underset{(31.58)}{0.74}\, GDPI$	110	0.90
$EM1 = \underset{(5.15)}{0.79} - \underset{(-5.07)}{0.05}\, KEI - \underset{(-3.41)}{0.14}\, IEF$	92	0.226
$EM2 = \underset{(6.03)}{0.57} - \underset{(-3.55)}{0.04}\, KEI - \underset{(-2.22)}{0.09}\, IEF$	97	0.128
$EM3 = \underset{(4.09)}{0.53} - \underset{(-3.90)}{0.03}\, KEI - \underset{(-2.57)}{0.09}\, IEF$	110	0.127

These results are better confirmed with the sample of developed economies for each of the dependent variables measuring emigration with weaker relationship between emigration rates and KEI.

Table 2: Emigration explained by economic, social and political variables (Developed Countries)

Developed countries	Obs.	R²
$KEI = \underset{(-3.23)}{-15.91} + \underset{(4.93)}{25.89}\, HDI$	25	0.51
$IEF = \underset{(10.85)}{3.32} - \underset{(-4.20)}{0.16}\, CPI$	25	0.43
$HDI = \underset{(16.60)}{0.68} + \underset{(6.26)}{0.31}\, GDPI$	25	0.63
$EM1 = \underset{(3.13)}{0.86} - \underset{(-2.46)}{0.06}\, KEI - \underset{(-3.00)}{0.13}\, IEF$	22	0.334
$EM2 = \underset{(4.03)}{0.82} - \underset{(-2.69)}{0.05}\, KEI - \underset{(-4.45)}{0.14}\, IEF$	24	0.492
$EM3 = \underset{(2.98)}{0.57} - \underset{(-1.94)}{0.04}\, KEI - \underset{(-3.19)}{0.10}\, IEF$	25	0.321

Similar directions are observed among developing countries but with stronger relationships between the emigration rates, IEF and KEI.

Table 3: Emigration explained by economic, social and political variables (Developing Countries)

Developing countries	Obs.	R²
$KEI = \underset{(-5.49)}{-2.15} + \underset{(13.87)}{8.34}\, HDI$	85	0.70
$IEF = \underset{(30.78)}{4.05} - \underset{(-6.97)}{0.27}\, CPI$	85	0.37
$HDI = \underset{(19.72)}{0.32} + \underset{(20.99)}{0.80}\, GDPI$	85	0.84
$EM1 = \underset{(4.40)}{0.80} - \underset{(-3.03)}{0.05}\, KEI - \underset{(-2.92)}{0.14}\, IEF$	70	0.16
$EM2 = \underset{(2.74)}{0.54} - \underset{(-2.38)}{0.04}\, KEI - \underset{(-1.57)}{0.08}\, IEF$	73	0.076
$EM3 = \underset{(3.41)}{0.53} - \underset{(-2.49)}{0.03}\, KEI - \underset{(-2.11)}{0.09}\, IEF$	85	0.081

MENA Countries observe the same directions, also with weaker relationships between emigration rates and KEI.

Table 4: Emigration explained by economic, social and political variables (MENA Countries)

MENA countries	Obs.	R²
$KEI = \underset{(-3.31)}{-6.39} + \underset{(5.47)}{14.22} HDI$	12	0.75
$IEF = \underset{(8.17)}{4.12} - \underset{(-2.27)}{0.27} CPI$	12	0.34
$HDI = \underset{(9.09)}{0.40} + \underset{(7.93)}{0.64} GDPI$	12	0.86
$EM1 = \underset{(2.68)}{0.75} GDPI - \underset{(-2.08)}{0.04} KEI$	9	0.56
$EM2 = \underset{(3.02)}{0.28} GDPI - \underset{(-1.77)}{0.02} KEI$	11	0.79
$EM3 = \underset{(3.22)}{0.13} - \underset{(-1.52)}{0.014} KEI$	12	0.19

The overall results obtained show how economic (GDPI, IEF), social (HDI) and political variables (CPI) can explain the directions and magnitude of emigration from a given country. They clearly indicate that bad economic, social and political conditions explain the emigration as measured by the special two measures of skilled labor and their average.

Others results are based on comparisons of the determinants of both the total emigration rate and that of skilled labor. These results confirm again the roles of the economic, social and political determinants as shown in the first set of regressions. Throughout these estimations of new determinants of skilled labor migration, it can be said that the new indices for knowledge, corruption perception and openness of the economy have been useful in capturing important information that appears to be useful explaining the emigration rates and mainly those related to skilled labor. Besides these results, the previous studies have shown that the incentives provided by destination countries with even special fiscal policies, are also important drivers of emigration. Furthermore, the factors related to distance, proximity, language and the existence of colonial or historical ties with destination countries are also important factors that can explain the pull of skills from developing economies.

Impact Assessment of Skilled Labor Migration

The literature on skilled migration and the implications on human capital formation and growth rate are almost exclusively theoretical. The studies of Beine et al. (2001 and 2003) are empirical evaluations of the growth effects of the brain drain for the source countries of migrants. This paper uses the results of Beine et al. and applies this model to a set of 64 developing countries taking only the variables affecting human capital formation and growth rate.

Hence, using the growth effect of a marginal increase in the migration probability and proposition 1, we continue with the estimation of the parameters from the two-equation system above. The estimation results are given in the following table.

Table 5: Econometric estimations of Beine & al Model

	Developing countries	R²	n
Estimated equation: human capital *m'=(1+m)/(0.65+m²)*	$\Delta H_{1990/2000} + d_H H_{1990} = \underset{(5.049)}{0.269}\, m'_{1990} - \underset{(-3.259)}{0.469}\, HDI_{1995} + \underset{(1.640)}{0.021}\, ASEExp_{2000}$	0.696	62
Estimated equation: GDP growth	$GDPgrowth_{2000} = \underset{(4.679)}{5.011}\, hum_{2000} - \underset{(-4.029)}{1.692}\, hum^3_{2000}$	0.680	64

Based on the conditions imposed by the theoretical model, the different values defined above are calculated and applied to the situation of each country. The corresponding results that allow the knowledge of the overall impact of emigration are introduced below for a sub-sample of countries. A more detailed list of results is presented in the appendix. Again, most of Beine's & al results are confirmed and brain gains take place for all developing countries but only few countries do not benefit from increased emigration. The models of Stark & al and of N. Duc Thanh will provide further detailed results.

Tests using the Stark et al Model

The main task here is to test the relevance of the Stark et al model through mainly the basic decision rule (equation 6 in the paper) that is $\tilde{\vartheta}^{S*} = \frac{m(\beta^D - \beta^S) + \beta^S}{k} - 1$. The variables β^D and β^S are labor productivities considering the USA as a reference country (International Labor Organization, 2006) and k is relative education expenditures (Public spending on education as % of GDP) over the educational expenditures of the USA (World Bank Data, 2006). The variable $\tilde{\vartheta}^{S*}$ is the level of human capital calculated using the Stark et al. model; KEI and KEIEducation are respectively the knowledge economic index and the index of education as a component of the knowledge economic index.

Table 6: Tests using Stark's and al, Model

Equations (developing countries)	R²	n
$KEI_{2003/04} = \underset{(4.862)}{0.417}\, \tilde{\vartheta}_1^{S*}$	0.507	24
$KEI_{2003/04} = \underset{(4.652)}{0.353}\, \tilde{\vartheta}_2^{S*}$	0.485	24
$KEIEducation_{2003/04} = \underset{(4.983)}{0.436}\, \tilde{\vartheta}_1^{S*}$	0.519	24
$KEIEducation_{2003/04} = \underset{(4.676)}{0.366}\, \tilde{\vartheta}_2^{S*}$	0.487	24
$KEI_{2003/04} = \underset{(15.827)}{21.159}\, \beta^S$	0.916	24
$KEI_{2003/04} = \underset{(10.628)}{4.743}\, \beta^D$	0.831	24

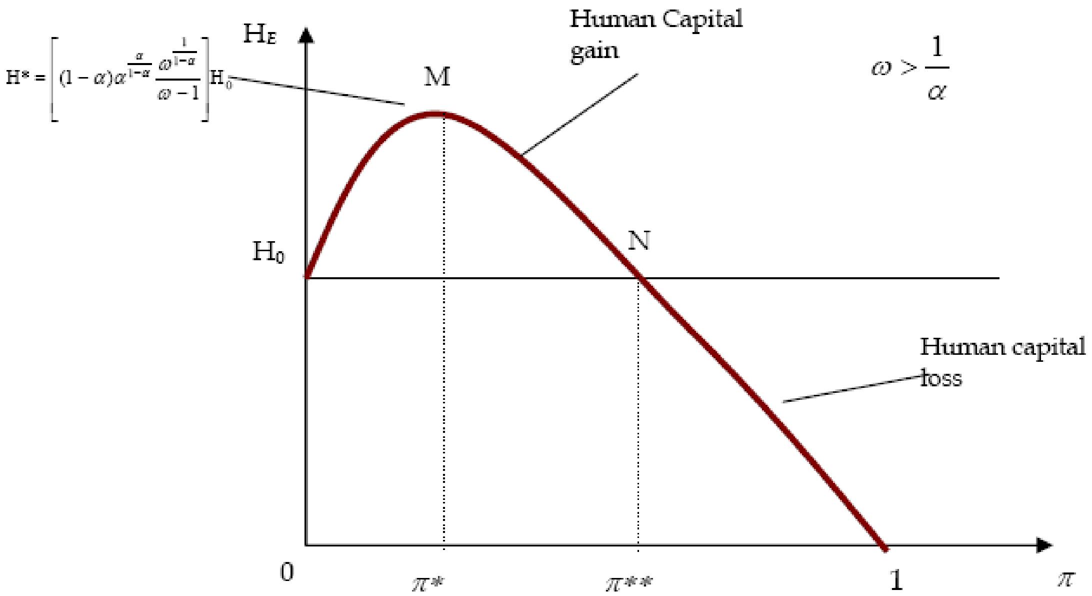
These results show that labor productivity in developed and developing economies are related to the exogenous index of human capital as it is represented by KEI. This latter is also positively correlated with the calculated level of human capital using Stark's decision rule (equation 6 in Stark's & al, 2005).

Some figures represent the optimal level of human capital ($\tilde{\vartheta}^{S*}$) given different probabilities of migration (m), when the countries of destination are, first, the northern countries and second, the Middle Eastern. The tables of estimation for those results, following Stark's et al. model, are included in the appendix.

N. Duc Thanh model (Heterogeneous Talents and Optimal Emigration, 2004)

The following figure reproduced from the paper by the author (page 9) shows how the consideration of heterogeneous skills leads to an overall human capital formation that varies with the levels of migration probabilities. The major conditions underlying this model are that relative wages in the destination and source countries are higher than one and that this wage ratio is higher than the inverse of the technical coefficient of the cost of education function ($1/\alpha)<\omega$). It shows also that when emigration is absent, the level Ho can be achieved. There are gains (brain gains) realized after reaching the level of migration π^* that maximizes the level of human capital. Above this latter probability value, losses start to occur in the source country. An equivalent level equal to Ho is attained (N) when emigration attains the value π^{**}. The level of capital is then definitely decreasing (brain drain) between π^{**} and 1.

Figure1: Representation of the trends in human capital gain given different values of the probability of emigration



Source: Duc Thanh, Nguyen. Heterogeneous Talent and Optimal Emigration- A contribution to the new economics of the brain drain, Sept. 2004, p: 9.

In order to visualize the meaningfulness of this model, different simulations using different values for α, ω and π are first considered. Based on the empirical data available mainly for ω and the migration rate, H/H_0 is calculated for each developing country that is in the sample. The last step is to test for the existence of a relationship that could validate the N. Duc Thanh model. This is realized in two stages that are based on the introduction of the index of tertiary education enrollment as included in the knowledge economic index, Keied, (World Bank Institute, 2006), the investment per capita in higher education measured by the expenditure per student, tertiary as % of GDP per capita, c, (World Bank Database) and the ratio of country GDP, ω, which is equal to the ratio of GDP of the country of destination on the GDP of the source country (World Bank Database, 2005). This ratio is larger than 1 as required in the model. Stage 1 gives the results of the regression analysis of the logarithm of Keied as a function of the logarithm of c, while stage 2 represents the regressions of H/H_0 on the logarithm of Keied. The results of both stages are presented in the following tables.

Table 7: Result of the regression analysis of Keied on c for the developing economies when the average destination is Considered

Developing countries (Average Destination)	*n*	*R²*
$\ln(Keied_{2003/04}) = \underset{(8.94)}{3.60} - \underset{(-6.19)}{0.61}\ln(c)$	25	0.625
$\ln(Keied_{2003/04}) = \underset{(11.78)}{3.51} - \underset{(-3.76)}{0.35}\ln(c) - \underset{(-4.49)}{0.34}\ln(\omega)$	25	0.804

The above results show how the subcomponent of KEI as a measure of human capital is explained by expenditures on education which are measured as a share of GDP that is less than one (First equation) and is also explained by the relative wage variable that is higher than one (Second equation). It is worth observing that the coefficient of education expenditures is positive (negative here because c is less than 1), while the one on ln (ω) is negative. This leads to considering that human capital formation in relation to skilled labor (tertiary education) is related to the cost of human capital formation and to the relative wages of destination countries relative to the source of emigration.

Table 8: Test using N. Duc Thanh model (selection of the best regressions)

Equations (Average Destination)	α	R²	n
$\frac{H}{H_0} = \underset{(16.32)}{3.36} - \underset{(-8.08)}{0.42}Keied_{2003/04}$	0.34	0.547	56
$\frac{H}{H_0} = \underset{(13.07)}{5.42} - \underset{(-7.66)}{0.80}Keied_{2003/04}$	0.4	0.521	56
$\frac{H}{H_0} = \underset{(9.17)}{16.12} - \underset{(-6.46)}{2.87}Keied_{2003/04}$	0.5	0.436	56
$\frac{H}{H_0} = \underset{(6.42)}{114.42} - \underset{(-4.98)}{22.51}Keied_{2003/04}$	0.61	0.315	56

Based on the above regressions (other regressions are in the appendix), it appears that the technical coefficient is around 0.34 and 0.61. With this remark two scenarios can be established for the set of sending countries included in the sample with the average destination. Figures representing the pattern of the human capital for every sending country are introduced in the appendix.

These preliminary empirical results lead to considering the theoretical models suggested by Beine & al, Stark & al (2005) and Nguyen (2004). The latter models are based on the abilities and skills as the building block to the overall economic frameworks suggested. The second model has suggested a special specification that is based on the expenditures on education and heterogeneous talents.

Sources of Overestimation as in M. Schiff (2005)

The sources of overestimation of brain gains exist as they originates from brain waste, negative brain gain, risk aversion behavior and general equilibrium effects. The brain waste occurs when the skilled emigrant occupies positions that require lower levels of skills implying that the person is undervalued both on wage and knowledge accumulation. The negative brain drain takes place when receiving countries prefer to employ lower skills or unskilled emigrants implying that the positive expected effects on education in the source countries become limited or negative. In case, the above models are considered to account for aversion to risks, the human capital accumulation of knowledge and the brain gains are reduced by at least by a fraction of the variance of gains in case of constant absolute aversion. Expenditures on education are the other component that can lower the overall gains because of the difficulties under the limited and same level of resources to increase the budget for education without affecting the other sectors.

4. Discussion of Results & Policy Implications

The major results attained in this report relate to the determinants and impacts of skilled labor migration. The determinants appear to be those that have been largely described in the previous sources and documents. They all relate to the large differential in income, in living conditions, in access and use of knowledge, in freedom and transparency as well as the availability of decent jobs and occupations. The implications are those that relate to a loss of flows of human skills but with lesser negative impacts on developing economies. These economies can still have access to remittances, foreign direct investments and other means that enhance the possibilities offered. Investment in education appears to exhibit promising positive effects if accompanied with larger access to local, national and international sources of knowledge. These processes are likely to generate new development opportunities that can be accelerated by the attraction of foreign investments, relocation of firms, promotion of new enterprises and then the expansion of the engine of growth. All these factors favor the attractiveness of the economy and accelerate the partial or permanent return of skilled labor. But, they are medium and long term issues that should be raised in relation to the intensification of emigration from South to North. The factors of intensification can be related to the larger negative impacts of climatic changes with their direct effects on economies that are mainly based on agriculture and natural resources with limited focus on industries and services. The impacts of such dependencies on natural resources could enlarge differences in income and living conditions between developed and developing countries if the current trends were maintained. These enlarged differences can be major sources for the intensification of emigration to developed countries, starting with skilled labor. Bu, as it can be seen from the results above, there are short run types of niches that can create new conditions in the developing world. Developing economies still have possibilities of engaging in a new dynamics that can increase the benefits from migration if new measures are attempted and reforms accelerated in different areas that include mainly educational reforms, promotion of knowledge and the lack of generalization of access to both knowledge and education.

4.1. Acceleration of reforms in education

Almost all developing countries are pursuing reforms of their education system. These reforms are targeting higher education and also the secondary and primary levels in order to ensure an overall change that aims at enhancing the overall performance of the education system. But, these reforms require higher public expenditures that can either increase the overall levels of public budgets or decrease the shares of expenditures that can be devoted to other sectors. Furthermore, these reforms should ensure a higher level of performance of the skilled labor to be expected. This higher level of performance should be measured in relation to the international levels attained elsewhere. It should also ensure, besides the quality, the quantity of skilled workers including those that may migrate. The increasing involvement of the private sector in education with the development of accreditation and incentives to ensure more choices helps lower the budgetary burden on government operational and investment budgets. Since the public sector is not the sole employer and when the private sector cannot ensure employment for most of the graduates, this implies that current and future generations with and without experience may choose to migrate. Otherwise, a dynamic private sector will generate more opportunities to attract large shares of the graduates. But, the high quality of education may be viewed as a source of competitiveness that will help increase foreign direct investments and thus the overall performance of the economy. This is what is happening in India, China and Taiwan. At the same time, developed countries will keep targeting skilled labor from the developing world through direct and indirect incentives (EU, Canada, USA and Australia).

This means that the reform of the educational system can be an important source of skilled labor for both developed and developing economies and that there is an optimal level under which graduates and experienced workers will choose to stay and an optimal level above which they will emigrate. This threshold may be lowered with the development of the private sector in developing economies.

While some developing economies have attempted reforming their overall education, others have placed more emphasis on the education of engineers and scientists. This can be seen as a short cut towards creating better conditions for attracting foreign companies and foreign direct investments. But, it is not clear that this short cut leads to sustainable performances. Further comparisons and empirical investigations are needed to understand the appropriateness of this approach.

4.2. Promotion of Knowledge

While this sector is directly related to higher education, its outcomes are also important in promoting knowledge that is directly used and applied by the economy. Foreign direct investments, off-shoring and relocation require continuous efforts for monitoring costs of both raw material and substitutes besides labor productivity. The creation of local enterprises can use imported processes (franchises, others) but can also provide new local processes that can also be exported. Thus the research sector at both public and private levels can play an important role including the attraction and retention of skilled labor.

The importance of the driving role of knowledge has been confirmed in a recent empirical study (Driouchi & al, 2006) using the Cobb-Douglas model specification, where average GDP indices for 56 countries for the periods 1996 – 1998 and 1999-2001 were regressed on the Knowledge Economic Index (KEI) as independent variable. The regressions start with 1995 KEI in order to test both immediate and delayed effects of the knowledge diffusion. All the countries in the study show a positive statistically significant result at 5% confidence interval between the KEI and the GDP index. This finding encourages developing countries to concentrate their efforts toward the expansion of their knowledge base in order to enhance economic performance and to improve their competitiveness.

Regarding the impact of each of the four individual components of the KEI (the economic incentive regime, innovation, education, and information infrastructure) on GDP other regressions were established. As shown below there is evidence of a strong positive correlation between information infrastructure in the Asian, G7 and European countries, but less so for economic incentives and education. Starting in 1999, the innovation variable became significant for Asian and other developing countries. This result suggests that the more developed countries have already captured the initial gains from the creation of a high quality educational system and research network. Likewise through participation in the World Trade Organization (WTO) and to a lesser extent the European Union, there has been a reduction in trade barriers, reduced tariffs, increased competition, and expanded intellectual property rights protection. Consequently investments in information infrastructure stimulate economic performance through efficient financial systems and flexible labor markets that increase productivity and reduce cost. For the foreseeable future the developed countries will continue benefit by continuing to enhance their information infrastructure with Information and Communication Technologies (ICT) which, at the same time, strengthens their national innovation systems.

As confirmed in the above study, there is strong evidence of a positive correlation between the aggregate Knowledge Economy Index and the GDP per capita. This implies that the output or the performance of an economy is positively impacted by the existing knowledge base and by both public and private policies undertaken to expand this base. The significance of the policy related issues has prompted other researchers to consider the relationship between knowledge and national economic performance. In a recent study by the World Bank Institute (WBI), Dahlman found that increasing the knowledge base measured by the change in aggregate KEI can have an exponential increase a country's GDP (Dahlman, 2002).

Empirical studies of the United States economy emphasize the combined effect of physical, human, and knowledge capital to explain the differences in regional and national economic growth. For example, a recent study (Moomaw et. al, 1999) found that when physical and human capital is taken separately to measure the influence on growth, the results are positive, but not statistically significant. However, when all the forms of capital (physical, human, and knowledge) are included, the results are positive and significant. Specifically, the output elasticity of this broader concept of capital when considered within a Cobb-Douglas framework is 0.485. This means that a change of 1% in capital results in an increase of 0.485% in the level of economic output (Moomaw et. al, 1999).

4.3. Generalized Access to Choices in Education, Knowledge and Migration

As clearly stated in various recent reports of international organizations and particularly in the report of the Global Commission on International Migrations (GIM), "Governments and employers should jointly review current barriers to the mobility of highly educated personnel, with a view to removing those which are unnecessarily hindering economic competitiveness" (GIM, 2005). This same report identifies the dilemma that has existed between private enterprises and governments. While enterprises have recognized the necessity of international deployment of talents, policy makers have been constraining this process. According to this same source, the ten world largest corporations employ more than three million workers without consideration of national origin. This is related to the important contributions of foreign workers to corporate and global competitiveness. The report recommends that emigration of skilled labor be regarded as a choice provided to professionals and that this approach be shared by governments. Given the strong link between migration, education and knowledge, it is also important that access and freedom of choice be generalized at all the environmental conditions in source countries, starting with education and knowledge.

The mechanisms for providing access to education and to knowledge that are prevailing in developing economies do implicitly exhibit discrimination among potential beneficiaries and users. This implicit discrimination concerns directly the above sectors but is indirectly at the origin of dissymmetry in access to other basic social and economic services that include health care and other components of decent living conditions. These indirect effects do not favor, in return, the access to education and to knowledge. This implies that the major constraint resides in this implicit discrimination and its indirect and induced effects. All developing countries have had elites that have been contributing to both development and have been emigrating elsewhere. Both the stocks and the annual flows of these elites are very limited. Some individuals and groups have been largely contributing to different components of worldwide development but these elites can be seen as exceptions. This is the era where every individual could be a member of a largely educated national society; and can contribute when necessary to international development including through emigration. Natural and "laissez faire" selection cannot any more be the driver for the valuation of human resources. Means to reduce school drop outs and instruments to be more inclusive are more than necessary in this exercise of knowledge generalization. All jobs are the same and all the skills are needed to ensure development with a humane dimension. Under these conditions, individuals and groups can have larger choices and larger capacities to exercise and implement their choices including the decisions to emigrate, stay or return to the source country.

5. Conclusion

It is expected that globalization and world development will increase rates of emigration from developing (South) to developed (North) economies unless growth and prosperity take place in most countries of the South. Even under the optimistic scenario of further growth and development in the South, individuals and groups enjoy freedom of mobility if they have larger opportunities to choose from.
Within this context, skilled labor migration takes place and generates consequently higher benefits for individuals, groups and communities, but also for both the source and destination countries. The benefits for the source countries are monetary but also non monetary as they are expressed under direct and indirect benefits of emigration. Remittances are not the only benefits but knowledge, experience and the direct impacts on the enhancement of education and research in the source country are major sources of gains. This type of emigration was previously considered to be a brain drain but the new economics on migration has identified that is a brain gain.
The two objectives of this report were to reveal the determinants of skilled labor migration and to assess empirically the impacts of this migration from the available and accessible data. The large existing literature on the different dimensions of skilled labor migration has helped set a selection of the theoretical grounds needed for the empirical assessments. Some previous studies have also helped in the identification of the determinants. For the impact assessment, the models selected are within the generation of the new economics of skilled labor migration. The models of Beine &al, Stark & al and Nguyen as well as that of M. Schiff have been explicit both theoretically and possible databases identified for the empirical estimations.
The results obtained have confirmed the relevance of a series of variables that are related to economic, social and political dimensions of the economies. Much of the time, these variables are represented as differences between the situation in developed and developing economies. Some of the recently established indices such as those related to knowledge, corruption perception and openness of the economy have been useful in the estimation of the determinants of skilled labor migration.
Concerning the impacts, each of the above models explaining the existence of brain gains throughout the sample of developing economies is retained. This brain gain is mainly represented as a stock of human capital that can vary depending on the emigration rate. It is also empirically related to the situation prevailing in the source economy. The newly established indices,especially the knowledge economic index and some of its components, have been instrumental in testing the relevance of the Stark & al and Nguyen models.
The policy implied by the above results would include the promotion of development in each source country with an emphasis on education and knowledge, with freedom of access to these domains, as well as emigration as a choice.

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APPENDIX

Table 1: Estimates of the emigration rate (EM1) using GDP, HDI, KEI, CPI, EFI and other variables

Variables	Estimators	R^2	Significance	Country group
Dependent :EM1 Independent : GDP_{2003}, HDI_{2003}	$EM_1 = e^{1.021 GDP_{2003}} e^{\frac{1.142}{HDI_{2003}}}$	0.853	All coefficients are significant with a probability of 99% The model is validated with a probability of 99%	All countries (90 countries)
	$EM_1 = e^{1.762 GDP_{2003}} e^{\frac{1.051}{HDI_{2003}}}$	0.869	All coefficients are significant with a probability of 99% The model is validated with a probability of 99%	Developing countries (68 countries)
Dependent :EM1 Independent : KEI_{2003}, HDI_{2003}	$EM_1 = e^{\frac{0.895}{KEI_{2003}}} e^{\frac{6.772}{HDI_{2003}}}$	0.827	The coefficients are not significant The model is validated with a probability of 99%	Developed countries (22 countries)
Dependent :EM1 Independent : CPI_{2004}, GDP_{2003}	$EM_1 = e^{\frac{5.428}{CPI_{2004}}} e^{1.358 GDP_{2003}}$	0.813	All coefficients are significant with a probability of 99% The model is validated with a probability of 99%	All countries (90 countries)
	$EM_1 = e^{\frac{1.252}{CPI_{2004}}} e^{1.921 GDP_{2003}}$	0.816	The coefficient of CPI_{2004} is significant with a probability of 95% and the coefficient of GDP_{2003} is significant with a probability of 99%. The model is validated with a probability of 99%	Developed countries (22 countries)
	$EM_1 = e^{\frac{5.268}{CPI_{2004}}} e^{1.566 GDP_{2003}}$	0.815	All coefficients are significant with a probability of 99% The model is validated with a probability of 99%	Developing countries (68 countries)
Dependent :EM1 Independent : KEI_{2003}, GDP_{2003}, EFI_{2003}	$EM_1 = e^{\frac{0.975}{KEI_{2003}}} e^{0.843 GDP_{2003}} e^{0.481 EFI_{2003}}$	0.827	The coefficient of KEI_{2003} and GDP_{2003} are significant with a probability of 95% and the coefficient of EFI_{2003} is significant with a probability of 99%. The model is validated with a probability of 99%	All countries (80 countries)
	$EM_1 = e^{\frac{50.021}{KEI_{2003}}} e^{-1.348 GDP_{2003}} e^{-1.507 EFI_{2003}}$	0.859	The coefficient of KEI_{2003} and EFI_{2003} are significant with a probability of 95% and the coefficient of GDP_{2003} is not significant. The model is validated with a probability of 99%	Developed countries (22 countries)

Dependent :EM_4 Independent : EFI_{2003}, HDI_{2003}, KEI_{2003}	$EM_4 = -1.757 EFI_{2003} + 14.198 HDI_{2003} - 0.063 KEI_{2003}^2$	0.485	The coefficients of EFI_{2003} and HDI are significant with a probability of 99% and the coefficient of KEI_{2003}^2 is significant with probability of 90%. The model is validated with a probability of 99%	All countries (89 countries)
	$EM_4 = -7.524 EFI_{2003} + 45.122 HDI_{2003} - 0.309 KEI_{2003}^2$	0.711	The coefficients of EFI_{2003} and KEI_{2003}^2 are significant with a probability of 95% and the coefficient of HDI_{2003} is significant with probability of 99%. The model is validated with a probability of 99%	Developed countries (24 countries)
Dependent :EM_4 Independent : HDI_{2003}, GDP_{2003}, EFI_{2003}	$EM_4 = 16.213 HDI_{2003}^2 - 11.379 GDP_{2003}^2 - 0.162 EFI_{2003}^2$	0.429	The coefficients of EFI_{2003}^2 and GDP_{2003}^2 are significant with a probability of 90% and the coefficient of HDI_{2003}^2 is significant with probability of 99%. The model is validated with a probability of 99%	All countries (103 countries)
	$EM_4 = 16.314 HDI_{2003}^2 - 10.193 GDP_{2003}^2 - 0.552 EFI_{2003}^2$	0.635	The coefficients are not significant. The model is validated with a probability of 99%	Developed countries (24 countries)
	$EM_4 = 12.715 HDI_{2003}^2 - 2.868 GDP_{2003}^2 - 0.152 EFI_{2003}^2$	0.397	The coefficients of EFI_{2003}^2 and GDP_{2003}^2 are not significant and the coefficient of HDI_{2003}^2 is significant with probability of 95%. The model is validated with a probability of 99%	Developing countries (79 countries)
Dependent :EM_4 Independent : KEI_{2003}, CPI_{2004}, HDI_{2003}, EFI_{2003}	$EM_4 = -0.109 KEI_{2003}^2 + 2.31 \ln(CPI_{2004}) + 10.735 HDI_{2003}^2 - 0.307 EFI_{2003}^2$	0.491	The coefficients of EFI_{2003}^2 and KEI_{2003}^2 are significant with a probability of 95%, the coefficient of HDI_{2003}^2 is significant with probability of 99% and the coefficient of $\ln(CPI_{2004})$ is significant with a probability of 90%. The model is validated with a probability of 99%	All countries (89 countries)
	$EM_4 = -0.383 KEI_{2003}^2 + 3.164 \ln(CPI_{2004}) + 36.833 HDI_{2003}^2 - 1.604 EFI_{2003}^2$	0.71	The coefficient of KEI_{2003}^2 is significant with a probability of 95%, the coefficients of HDI_{2003}^2 and EFI_{2003}^2 are significant with probability of 90% and the coefficient of $\ln(CPI_{2004})$ is not significant. The model is validated with a probability of 99%	Developed countries (24 countries)
	$EM_4 = -0.012 KEI_{2003}^2 + 1.834 \ln(CPI_{2004}) + 7.209 HDI_{2003}^2 - 0.228 EFI_{2003}^2$	0.435	The coefficients of HDI_{2003}^2 and EFI_{2003}^2 are significant with probability of 90% and the coefficients of KEI_{2003}^2 and $\ln(CPI_{2004})$ are not significant. The model is validated with a probability of 99%	Developing countries (65 countries)

Table 2: Evaluation of the Beneficial Brain Drain Effect (Cohen and Soto, 2001) from the first 15 non OECD countries both with lowest and highest Value s.

Developing country	HDI 1995	HDI 2000	KEI 1995	ASE Exp.	GDP gr. 2000	m (CS 2001)	humi 2000	humi 1990	Hi 1990	Hi 2000	Hi transf	m'	PSI	PSI (m=0)	Hi0	Hi0 (1-Hi0)	Deriv-Psi	Benef BD	Net gr. Effc	mi= EM5	Hi(1-Hi)/ (1-mi)	Benef. M Inc
Brazil	0.75	0.78	4.62	4.84	4.50	0.02	0.43	0.27	0.28	0.44	0.19	1.56	0.17	0.17	0.41	0.24	1.46	Benef.	2.04	0.44	0.44	true
Myanmar						0.02						1.56	0.42	0.41	0.41	0.24	1.46	Benef.		0.19		
Indonesia / Kenya	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Benef.	[illegible]	[illegible]	[illegible]	true
Thailand / Burundi	[illegible]		4.96	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Benef.	[illegible]	[illegible]	[illegible]	[illegible]
Bangladesh / Sierra Leone	0.45	0.51	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Benef.	[illegible]	[illegible]	[illegible]	true
Paraguay	0.74	0.75	3.17	3.47	-0.30	0.02	0.46	0.25	0.25	0.47	0.24	1.57	0.15	0.14	0.37	0.23	1.44	Benef.	2.12	0.61	0.64	true
Nepal	0.47	0.50	2.00	2.07	6.45	0.02	0.47	0.14	0.14	0.49	0.36	1.57	0.25	0.24	0.37	0.23	1.44	Benef.	2.19	0.18	0.31	true
India	0.55	0.58	2.79	3.35	3.92	0.03	0.61	0.15	0.16	0.62	0.48	1.58	0.24	0.23	0.37	0.23	1.39	Benef.	2.66	0.28	0.33	true
Bolivia	0.64	0.67	3.78	5.53	2.37	0.03	0.51	0.29	0.30	0.52	0.25	1.58	0.24	0.23	0.50	0.25	1.39	Benef.	2.33	1.44	-0.57	true
China	0.68		2.85	2.03	7.94	0.03	0.48	0.23	0.23	0.49	0.28	1.59	0.15	0.14	0.34	0.23	1.38	Benef.	2.22	0.20	0.31	true
Jordan	0.71	0.74	4.04	5.61	3.88	0.03	0.56	0.27	0.29	0.57	0.32	1.59	0.21	0.20	0.46	0.25	1.38	Benef.	2.50	2.05	-0.23	true
Venezuela	0.77	0.77	4.78	5.01	3.21	0.03	0.60	0.25	0.26	0.61	0.37	1.59	0.17	0.16	0.39	0.24	1.38	Benef.	2.64	1.41	-0.58	true
Costa Rica	0.81	0.83	5.88	5.07	1.66	0.04	0.45	0.38	0.40	0.47	0.11	1.60	0.16	0.14	0.50	0.25	1.34	Benef.	2.10	2.80	-0.14	true
Syria	0.67	0.69	2.36	2.60	2.50	0.04	0.44	0.22	0.23	0.46	0.25	1.60	0.17	0.15	0.36	0.23	1.32	Benef.	2.07	1.30	-0.84	true
Egypt	0.61		3.82	4.41	5.12	0.04	0.59	0.20	0.21	0.60	0.41	1.60	0.24	0.22	0.41	0.24	1.32	Benef.	2.61	0.72	0.85	true
Guyana	0.69	0.71		3.30	-0.70	0.83	0.44	0.32	0.84	0.88	0.12	1.37	0.12	0.16	0.92	0.08	-0.95	Benef.	2.07	36.48	0.00	false
Jamaica	0.72	0.73	5.09	6.84	0.79	0.82	0.43	0.32	0.76	0.83	0.15	1.38	0.17	0.22	0.90	0.09	-0.95	Benef.	2.01	30.60	0.00	false
Haiti	0.45		0.86	1.59	1.12	0.79	0.39	0.38	0.74	0.80	0.13	1.41	0.20	0.24	0.90	0.09	-0.96	Benef.	1.85	8.79	-0.02	false
Trinidad and Tobago	0.79	0.80		3.44	4.78	0.76	0.51	0.33	0.69	0.83	0.21	1.43	0.09	0.12	0.74	0.19	-0.96	Benef.	2.33	22.13	-0.01	false
Fiji	0.74			4.86	-7.99	0.62	0.43	0.28	0.54	0.67	0.18	1.57	0.18	0.17	0.65	0.23	-0.91	Benef.	2.02	17.81	-0.01	false
Angola			0.32	4.40	2.12	0.54	0.17	0.05	0.05	0.23	0.19	1.64	0.53	0.51	0.55	0.25	-0.81	Benef.	0.84	2.85	-0.10	false
Cyprus						0.53						1.64	0.44	0.41	0.41	0.24	-0.80	Benef.		19.28		
Mauritius	0.75	0.78	4.97	3.25	8.02	0.53	0.29	0.16	0.35	0.48	0.16	1.64	0.16	0.13	0.45	0.25	-0.80	Benef.	1.41	9.33	-0.03	false
Mozambique	0.33	0.36	0.52	3.69	1.60	0.47	0.18	0.03	0.03	0.28	0.25	1.69	0.38	0.34	0.37	0.23	-0.68	Benef.	0.88	0.82	1.16	false
Ghana	0.53	0.56	1.60	4.43	3.70	0.45	0.44	0.16	0.24	0.60	0.38	1.70	0.30	0.26	0.47	0.25	-0.63	Benef.	2.06	1.47	-0.51	false
Tanzania	0.42	0.42	1.04	3.40	5.07	0.42	0.51	0.13	0.15	0.55	0.41	1.72	0.34	0.29	0.42	0.24	-0.53	Benef.	2.34	0.37	0.40	false
Uganda	0.41	0.47	1.18	2.19	3.50	0.36	0.46	0.12	0.19	0.57	0.40	1.74	0.32	0.27	0.44	0.25	-0.34	Benef.	2.15	0.68	0.75	false

Table 3: Evaluation of the Beneficial Brain Drain Effect (Barro and Lee, 2000) from the first 15 non OECD countries both with lowest and highest Values.

Developing country	HDI 1995	HDI 2000	KEI 1995	ASE Exp.	GDP gr. 2000	m (BL 2000)	humi 2000	humi 1990	Hi 1990	Hi 2000	Hi transf	m'	PSI	PSI (m=0)	Hi0	Hi0 (1-Hi0)	Deriv-Psi	Benef BD	Net gr. Effc	mi= EM5	Hi(1-Hi)/ (1-mi)	Benef. M Inc
Brazil	0.75	0.78	4.62	4.84	4.50	0.01	0.43	0.27	0.28	0.44	0.19	1.56	0.17	0.17	0.41	0.24	1.48	Benef.	2.04	0.44	0.44	true
Thailand	0.75		4.96	3.45	4.31	0.01	0.45	0.24	0.25	0.45	0.23	1.56	0.14	0.14	0.36	0.23	1.47	Benef.	2.08	0.59	0.60	true
Indonesia	0.66	0.68	3.23	0.65	4.77	0.02	0.46	0.17	0.17	0.47	0.31	1.56	0.12	0.12	0.27	0.20	1.47	Benef.	2.15	0.21	0.31	true
Paraguay	0.74	0.75	3.17	3.47	-0.30	0.02	0.46	0.25	0.25	0.47	0.24	1.57	0.15	0.14	0.37	0.23	1.45	Benef.	2.12	0.61	0.64	true
Argentina	0.83	0.86	5.99	3.20	-0.52	0.02	0.48	0.29	0.30	0.49	0.22	1.57	0.10	0.09	0.36	0.23	1.45	Benef.	2.23	1.15	-1.65	true
China	0.68		2.85	2.03	7.94	0.02	0.48	0.23	0.23	0.49	0.28	1.57	0.15	0.14	0.34	0.23	1.42	Benef.	2.22	0.20	0.31	true
Myanmar						0.02						1.57	0.42	0.41	0.41	0.24	1.42	Benef.		0.19		
Peru	0.73		4.13	2.60	3.13	0.03	0.47	0.35	0.36	0.48	0.16	1.58	0.13	0.12	0.45	0.25	1.41	Benef.	2.18	2.31	-0.19	true
Nepal	0.47	0.50	2.00	2.07	6.45	0.03	0.47	0.14	0.14	0.49	0.36	1.58	0.25	0.24	0.37	0.23	1.40	Benef.	2.19	0.18	0.31	true
Bangladesh	0.45	0.51	0.82	1.71	5.94	0.03	0.36	0.17	0.17	0.37	0.22	1.58	0.25	0.24	0.39	0.24	1.39	Benef.	1.74	0.35	0.36	true
Bolivia	0.64	0.67	3.78	5.53	2.37	0.03	0.51	0.29	0.30	0.52	0.25	1.58	0.24	0.23	0.50	0.25	1.39	Benef.	2.33	1.44	-0.57	true
India	0.55	0.58	2.79	3.35	3.92	0.03	0.61	0.15	0.16	0.62	0.48	1.59	0.24	0.23	0.37	0.23	1.37	Benef.	2.66	0.28	0.33	true
Egypt	0.61		3.82	4.41	5.12	0.03	0.59	0.20	0.21	0.60	0.41	1.59	0.23	0.22	0.41	0.24	1.37	Benef.	2.61	0.72	0.85	true
Venezuela	0.77	0.77	4.78	5.01	3.21	0.04	0.60	0.25	0.26	0.61	0.37	1.59	0.17	0.16	0.39	0.24	1.36	Benef.	2.64	1.41	-0.58	true
Swaziland	0.60	0.53	8.80	6.50	2.55	0.04	0.56	0.22	0.22	0.56	0.37	1.59	0.28	0.27	0.46	0.25	1.36	Benef.	2.51	0.34	0.37	true
Guyana	0.69	0.71		3.30	-0.70	0.77	0.44	0.32	0.84	0.88	0.12	1.43	0.13	0.16	0.92	0.08	-0.96	Benef.	2.07	36.48	0.00	false
Jamaica	0.72	0.73	5.09	6.84	0.79	0.73	0.43	0.32	0.76	0.83	0.15	1.47	0.20	0.22	0.90	0.09	-0.96	Benef.	2.01	30.60	0.00	false
Guinea-Bissau	0.34	0.35		2.67	7.50	0.70	0.14	0.03	0.03	0.18	0.15	1.49	0.30	0.31	0.34	0.22	-0.95	Benef.	0.71	3.62	-0.06	false
Haiti	0.45		0.86	1.59	1.12	0.68	0.39	0.38	0.74	0.80	0.13	1.51	0.23	0.24	0.90	0.09	-0.95	Benef.	1.85	8.79	-0.02	false
Trinidad and Tobago	0.79	0.80		3.44	4.78	0.66	0.51	0.33	0.69	0.83	0.21	1.53	0.11	0.12	0.74	0.19	-0.94	Benef.	2.33	22.13	-0.01	false
Mozambique	0.33	0.36	0.52	3.69	1.60	0.52	0.18	0.03	0.03	0.28	0.25	1.65	0.37	0.34	0.37	0.23	-0.78	Benef.	0.88	0.82	1.16	false
Mauritius	0.75	0.78	4.97	3.25	8.02	0.50	0.29	0.16	0.35	0.48	0.16	1.67	0.17	0.13	0.45	0.25	-0.74	Benef.	1.41	9.33	-0.03	false
Barbados	0.85	0.88	4.92			0.47	0.43	0.33	0.60	0.68	0.14	1.69	0.05	0.01	0.55	0.25	-0.68	Benef.	2.03	29.45	-0.01	false
Fiji	0.74			4.86	-7.99	0.43	0.43	0.28	0.54	0.67	0.18	1.71	0.22	0.17	0.65	0.23	-0.56	Benef.	2.02	17.81	-0.01	false
Gambia	0.42	0.46			5.60	0.42	0.20	0.20	0.56	0.41	-0.09	1.72	0.26	0.21	0.72	0.20	-0.55	Benef.	1.01	2.58	-0.15	false
Congo	0.53				7.90	0.34	0.41	0.12	0.13	0.47	0.35	1.75	0.22	0.16	0.28	0.20	-0.24	Benef.	1.92	3.53	-0.10	false
Sierra Leone			1.09	1.07	6.96	0.32	0.50	0.18	0.25	0.68	0.46	1.75	0.49	0.44	0.66	0.22	-0.18	Benef.	2.31	1.42	-0.51	true
Ghana	0.53	0.56	1.60	4.43	3.70	0.31	0.44	0.16	0.24	0.60	0.38	1.76	0.32	0.26	0.47	0.25	-0.13	Benef.	2.06	1.47	-0.51	true
Kenya	0.52	0.50	1.79	6.12	-0.24	0.28	0.45	0.12	0.20	0.57	0.39	1.76	0.36	0.30	0.47	0.25	0.03	Benef.	2.09	1.13	-1.95	true
Cyprus						0.26						1.76	0.47	0.41	0.41	0.24	0.12	Benef.		19.28		

Table 4: Evaluation of the Beneficial Brain Drain Effect (using $d_h = 0.1$)

Developing country	HDI 1995	KEI 1995	ASEExp	GDP growth 2000	EM1 1990	humi 2000	Hi 1990	Hi 2000	Hi transf= Δhi+ dh*hilag	m'	PSI	PSI (m=0)	$\tilde{H}_i$	$\tilde{H}_i(1-\tilde{H}_i)$	deriv-psi	Benef Brain Drain	Net growth effect	mi= EM5	Hi(1-Hi)/ (1-mi)	Benef mig incr
Bangladesh	0.45	0.82	1.71	5.94	0.02	0.36	0.17	0.37	0.22	1.57	0.25	0.24	0.39	0.24	1.44	Benef.	1.74	0.35	0.36	true
Benin	0.40	1.70	2.71	5.80	0.07	0.53	0.14	0.56	0.43	1.64	0.31	0.29	0.41	0.24	1.16	Benef.	2.39	0.41	0.42	true
Burkina Faso	0.31	0.98	1.38	2.15	0.02	0.30	0.11	0.31	0.21	1.56	0.30	0.30	0.39	0.24	1.47	Benef.	1.46	0.14	0.25	true
Cameroon	0.49	1.34	2.32	4.20	0.13	0.50	0.14	0.54	0.42	1.70	0.27	0.23	0.36	0.23	0.83	Benef.	2.28	0.65	0.71	true
Côte d'Ivoire	0.43	1.30	4.54	-2.30	0.03	0.31	0.12	0.32	0.21	1.58	0.32	0.31	0.42	0.24	1.40	Benef.	1.49	0.69	0.71	true
Ethiopia	0.32	0.76	2.70	5.44	0.08	0.49	0.23	0.51	0.31	1.65	0.35	0.32	0.52	0.25	1.12	Benef.	2.24	0.36	0.39	true
Ghana	0.53	1.60	4.43	3.70	0.38	0.44	0.24	0.60	0.38	1.74	0.31	0.26	0.47	0.25	-0.39	Benef.	2.06	1.47	-0.51	true
Haiti	0.45	0.86	1.59	1.12	0.79	0.39	0.74	0.80	0.13	1.41	0.20	0.24	0.90	0.09	-0.96	Benef.	1.85	8.79	-0.02	false
India	0.55	2.79	3.35	3.92	0.03	0.61	0.16	0.62	0.48	1.58	0.24	0.23	0.37	0.23	1.40	Benef.	2.66	0.28	0.33	true
Kenya	0.52	1.79	6.12	-0.24	0.43	0.45	0.20	0.57	0.39	1.71	0.34	0.30	0.47	0.25	-0.56	Benef.	2.09	1.13	-1.95	true
Madagascar	0.46	0.84	1.84	4.80	0.06	0.43	0.16	0.45	0.31	1.62	0.26	0.24	0.38	0.24	1.25	Benef.	2.04	0.87	1.86	false
Malawi	0.41	1.80	3.83	1.67	0.17	0.43	0.15	0.48	0.35	1.72	0.35	0.30	0.43	0.25	0.62	Benef.	2.03	0.26	0.34	true
Mozambique	0.33	0.52	3.69	1.60	0.27	0.18	0.03	0.28	0.25	1.76	0.40	0.34	0.37	0.23	0.09	Benef.	0.88	0.82	1.16	false
Nepal	0.47	2.00	2.07	6.45	0.02	0.47	0.14	0.49	0.36	1.57	0.25	0.24	0.37	0.23	1.45	Benef.	2.19	0.18	0.31	true
Nicaragua	0.64	2.17	2.64	4.29	0.30	0.39	0.45	0.47	0.06	1.76	0.23	0.17	0.58	0.24	-0.06	Benef.	1.83	6.96	-0.04	false
Nigeria	0.42	1.63	0.80	3.78	0.08	0.65	0.11	0.68	0.58	1.65	0.26	0.23	0.33	0.22	1.12	Benef.	2.79	0.36	0.34	true
Pakistan	0.49	1.81	2.39	4.43	0.07	0.39	0.18	0.42	0.26	1.63	0.26	0.23	0.39	0.24	1.18	Benef.	1.84	0.80	1.22	false
Senegal	0.42	1.77	3.44	5.60	0.12	0.17	0.09	0.20	0.12	1.69	0.33	0.29	0.37	0.23	0.88	Benef.	0.83	2.44	-0.11	true
Sudan	0.47	0.65	0.86	8.30	0.05	0.52	0.19	0.54	0.37	1.61	0.23	0.21	0.38	0.24	1.28	Benef.	2.37	0.22	0.32	true
Tanzania	0.42	1.04	3.40	5.07	0.12	0.51	0.15	0.55	0.41	1.68	0.33	0.29	0.42	0.24	0.92	Benef.	2.34	0.37	0.40	true
Uganda	0.41	1.18	2.19	3.50	0.44	0.46	0.19	0.57	0.40	1.71	0.31	0.27	0.44	0.25	-0.60	Benef.	2.15	0.68	0.75	false
Zambia	0.42	2.72	1.99	3.47	0.17	0.49	0.18	0.53	0.37	1.72	0.31	0.26	0.42	0.24	0.63	Benef.	2.24	0.64	0.69	false
Zimbabwe	0.59	2.97	7.47	-4.88	0.08	0.55	0.16	0.58	0.44	1.64	0.32	0.29	0.44	0.25	1.15	Benef.	2.47	1.09	-2.63	true
Algeria	0.67	2.04	4.50	2.40	0.07	0.14	0.05	0.15	0.11	1.64	0.22	0.19	0.23	0.18	1.17	Benef.	0.70	6.17	-0.03	true
Bolivia	0.64	3.78	5.53	2.37	0.06	0.51	0.30	0.52	0.25	1.63	0.26	0.23	0.50	0.25	1.21	Benef.	2.33	1.44	-0.57	true
Brazil	0.75	4.62	4.84	4.50	0.02	0.43	0.28	0.44	0.19	1.56	0.17	0.17	0.41	0.24	1.47	Benef.	2.04	0.44	0.44	true
Bulgaria	0.78	6.08	3.15	5.80	0.04	0.16	0.21	0.17	-0.02	1.59	0.13	0.11	0.30	0.21	1.35	Benef.	0.81	8.01	-0.02	true
China	0.68	2.85	2.03	7.94	0.03	0.48	0.23	0.49	0.28	1.58	0.15	0.14	0.34	0.23	1.39	Benef.	2.22	0.20	0.31	true
Colombia	0.75	4.47	3.13	2.81	0.09	0.42	0.44	0.44	0.05	1.66	0.16	0.13	0.52	0.25	1.06	Benef.	1.97	2.34	-0.18	true
Dominican Republic	0.70	3.39	2.10	7.75	0.18	0.27	0.44	0.32	-0.08	1.73	0.18	0.13	0.53	0.25	0.54	Benef.	1.30	11.04	-0.02	true
Ecuador	0.73	3.44	3.17	2.33	0.06	0.28	0.44	0.30	-0.10	1.62	0.16	0.14	0.54	0.25	1.26	Benef.	1.37	5.66	-0.05	true
Egypt	0.61	3.82	4.41	5.12	0.06	0.59	0.21	0.60	0.41	1.62	0.24	0.22	0.41	0.24	1.24	Benef.	2.61	0.72	0.85	true
El Salvador	0.69	3.76	2.18	1.97	0.33	0.19	0.45	0.25	-0.15	1.75	0.19	0.14	0.54	0.25	-0.20	Benef.	0.95	17.09	-0.01	false
Guatemala	0.62	1.70	1.52	3.33	0.20	0.19	0.31	0.24	-0.05	1.74	0.21	0.16	0.44	0.25	0.42	Benef.	0.94	6.89	-0.03	true

Developing country	HDI 1995	KEI 1995	ASEExp	GDP growth 2000	EM1 1990	humi 2000	Hi 1990	Hi 2000	Hi transf= Δhi+ dh*hilag	m'	PSI	PSI (m=0)	$\tilde{H}_i$	$\tilde{H}_i(1-\tilde{H}_i)$	deriv-psi	Benef Brain Drain	Net growth effect	mi= EM5	Hi(1-Hi)/ (1-mi)	Benef mig incr
Honduras	0.64	2.93	3.48	4.79	0.22	0.24	0.44	0.29	-0.11	1.75	0.24	0.19	0.59	0.24	0.32	Benef.	1.17	6.72	-0.04	true
Indonesia	0.66	3.23	0.65	4.77	0.04	0.46	0.17	0.47	0.31	1.60	0.13	0.12	0.27	0.20	1.34	Benef.	2.15	0.21	0.31	true
Iran	0.69	2.99	3.19	5.37	0.25	0.59	0.27	0.62	0.38	1.75	0.21	0.16	0.40	0.24	0.16	Benef.	2.59	1.43	-0.54	true
Jamaica	0.72	5.09	6.84	0.79	0.85	0.43	0.76	0.83	0.15	1.35	0.17	0.22	0.90	0.09	-0.94	Benef.	2.01	30.60	0.00	false
Jordan	0.71	4.04	5.61	3.88	0.09	0.56	0.29	0.57	0.32	1.65	0.23	0.20	0.46	0.25	1.09	Benef.	2.50	2.05	-0.23	true
Morocco	0.58	2.93	4.72	0.87	0.22	0.13	0.12	0.15	0.04	1.75	0.30	0.24	0.35	0.23	0.35	Benef.	0.64	7.23	-0.02	true
Paraguay	0.74	3.17	3.47	-0.30	0.04	0.46	0.25	0.47	0.24	1.59	0.15	0.14	0.37	0.23	1.36	Benef.	2.12	0.61	0.64	true
Peru	0.73	4.13	2.60	3.13	0.06	0.47	0.36	0.48	0.16	1.62	0.15	0.12	0.45	0.25	1.25	Benef.	2.18	2.31	-0.19	true
Philippines	0.74	4.18	2.91	4.01	0.13	0.67	0.21	0.70	0.51	1.69	0.17	0.13	0.32	0.22	0.84	Benef.	2.85	3.81	-0.07	true
Romania	0.77	5.34	3.32	1.64	0.09	0.31	0.27	0.34	0.10	1.66	0.16	0.12	0.37	0.23	1.06	Benef.	1.52	3.61	-0.09	true
Sri Lanka	0.73	3.34	2.65	6.00	0.29	0.40	0.27	0.48	0.24	1.76	0.19	0.13	0.37	0.23	-0.01	Benef.	1.88	2.24	-0.20	true
Swaziland	0.60	8.80	6.50	2.55	0.00	0.56	0.22	0.56	0.37	1.54	0.27	0.27	0.46	0.25	1.53	Benef.	2.51	0.34	0.37	true
Syrian Arab Republic	0.67	2.36	2.60	2.50	0.07	0.44	0.23	0.46	0.25	1.63	0.18	0.15	0.36	0.23	1.18	Benef.	2.07	1.30	-0.84	true
Thailand	0.75	4.96	3.45	4.31	0.02	0.45	0.25	0.45	0.23	1.57	0.14	0.14	0.36	0.23	1.42	Benef.	2.08	0.59	0.60	true
Tunisia	0.70	3.41	6.63	4.71	0.18	0.15	0.11	0.17	0.07	1.73	0.28	0.23	0.32	0.22	0.56	Benef.	0.74	5.86	-0.03	true
Argentina	0.83	5.99	3.20	-0.52	0.04	0.48	0.30	0.49	0.22	1.59	0.10	0.09	0.36	0.23	1.36	Benef.	2.23	1.15	-1.65	true
Botswana	0.66	4.07	7.80	3.43	0.02	0.34	0.12	0.35	0.24	1.57	0.28	0.27	0.38	0.23	1.43	Benef.	1.63	0.44	0.40	true
Chile	0.82	6.19	3.41	5.38	0.07	0.47	0.33	0.49	0.19	1.63	0.13	0.10	0.40	0.24	1.19	Benef.	2.20	1.84	-0.30	true
Costa Rica	0.81	5.88	5.07	1.66	0.08	0.45	0.40	0.47	0.11	1.65	0.17	0.14	0.50	0.25	1.11	Benef.	2.10	2.80	-0.14	true
Hungary	0.81	6.73	4.58	5.15	0.14	0.39	0.29	0.43	0.17	1.71	0.17	0.13	0.39	0.24	0.76	Benef.	1.86	3.60	-0.09	true
Malaysia	0.76	5.38	4.26	8.30	0.25	0.59	0.19	0.62	0.45	1.75	0.20	0.15	0.32	0.22	0.19	Benef.	2.62	1.35	-0.67	true
Mauritius	0.75	4.97	3.25	8.02	0.65	0.29	0.35	0.48	0.16	1.54	0.13	0.13	0.45	0.25	-0.93	Benef.	1.41	9.33	-0.03	false
Mexico	0.78	5.17	4.53	6.86	0.11	0.14	0.31	0.17	-0.11	1.67	0.18	0.14	0.42	0.24	0.97	Benef.	0.72	11.33	-0.01	true
Poland	0.82	6.38	5.06	4.00	0.14	0.40	0.28	0.43	0.18	1.71	0.18	0.14	0.39	0.24	0.76	Benef.	1.88	3.93	-0.08	true
South Africa	0.74	5.73	6.94	3.08	0.10	0.63	0.22	0.64	0.45	1.67	0.25	0.21	0.41	0.24	1.02	Benef.	2.72	1.14	-1.58	true
Turkey	0.71	5.20	3.17	7.22	0.08	0.09	0.12	0.09	-0.01	1.65	0.18	0.15	0.25	0.19	1.11	Benef.	0.44	3.98	-0.03	true
Uruguay	0.82	6.24	3.03	-1.27	0.07	0.41	0.36	0.43	0.11	1.63	0.12	0.09	0.41	0.24	1.18	Benef.	1.95	2.89	-0.13	true
Venezuela	0.77	4.78	5.01	3.21	0.04	0.60	0.26	0.61	0.37	1.59	0.17	0.16	0.39	0.24	1.35	Benef.	2.64	1.41	-0.58	true

ASEExp: Adjusted savings: education expenditure (% of GNI) 2000

d_h = 0.1

m' = (1+m)/ (0.65 + m²)

Deriv-PSIzero = 1.538

Table 5: Evaluation of the Beneficial Brain Drain Effect (using $d_h = 0.05$)

Developing country	HDI 1995	KEI 1995	ASE Exp.	GDP growth 2000	EM1 1990	humi 2000	Hi 1990	Hi 2000	Hi transf= Δhi+ dh*hilag	m'	PSI	PSI (m=0)	$\tilde{H}_i$	$\tilde{H}_i(1-\tilde{H}_i)$	deriv-psi	Benef Brain Drain	Net grwth effect	mi= EM5	Hi(1-Hi)/ (1-mi)	Benef mig incr
Bangladesh	0.45	0.82	1.71	5.94	0.02	0.36	0.17	0.37	0.21	1.57	0.25	0.24	0.40	0.24	1.44	Benef.	1.74	0.35	0.36	true
Benin	0.40	1.70	2.71	5.80	0.07	0.53	0.14	0.56	0.42	1.64	0.31	0.29	0.42	0.24	1.16	Benef.	2.39	0.41	0.42	true
Burkina Faso	0.31	0.98	1.38	2.15	0.02	0.30	0.11	0.31	0.21	1.56	0.30	0.30	0.40	0.24	1.47	Benef.	1.46	0.14	0.25	true
Cameroon	0.49	1.34	2.32	4.20	0.13	0.50	0.14	0.54	0.41	1.70	0.27	0.23	0.36	0.23	0.83	Benef.	2.28	0.65	0.71	true
Côte d'Ivoire	0.43	1.30	4.54	-2.30	0.03	0.31	0.12	0.32	0.21	1.58	0.32	0.31	0.42	0.24	1.40	Benef.	1.49	0.69	0.71	true
Ethiopia	0.32	0.76	2.70	5.44	0.08	0.49	0.23	0.51	0.30	1.65	0.35	0.32	0.53	0.25	1.12	Benef.	2.24	0.36	0.39	true
Ghana	0.53	1.60	4.43	3.70	0.38	0.44	0.24	0.60	0.37	1.74	0.31	0.26	0.49	0.25	-0.39	Benef.	2.06	1.47	-0.51	true
Haiti	0.45	0.86	1.59	1.12	0.79	0.39	0.74	0.80	0.09	1.41	0.20	0.24	0.94	0.06	-0.96	Benef.	1.85	8.79	-0.02	false
India	0.55	2.79	3.35	3.92	0.03	0.61	0.16	0.62	0.47	1.58	0.24	0.23	0.38	0.23	1.40	Benef.	2.66	0.28	0.33	true
Kenya	0.52	1.79	6.12	-0.24	0.43	0.45	0.20	0.57	0.38	1.71	0.34	0.30	0.48	0.25	-0.56	Benef.	2.09	1.13	-1.95	true
Madagascar	0.46	0.84	1.84	4.80	0.06	0.43	0.16	0.45	0.30	1.62	0.26	0.24	0.39	0.24	1.25	Benef.	2.04	0.87	1.86	false
Malawi	0.41	1.80	3.83	1.67	0.17	0.43	0.15	0.48	0.35	1.72	0.35	0.30	0.44	0.25	0.62	Benef.	2.03	0.26	0.34	true
Mozambique	0.33	0.52	3.69	1.60	0.27	0.18	0.03	0.28	0.25	1.76	0.40	0.34	0.37	0.23	0.09	Benef.	0.88	0.82	1.16	false
Nepal	0.47	2.00	2.07	6.45	0.02	0.47	0.14	0.49	0.35	1.57	0.25	0.24	0.37	0.23	1.45	Benef.	2.19	0.18	0.31	true
Nicaragua	0.64	2.17	2.64	4.29	0.30	0.39	0.45	0.47	0.04	1.76	0.23	0.17	0.60	0.24	-0.06	Benef.	1.83	6.96	-0.04	false
Nigeria	0.42	1.63	0.80	3.78	0.08	0.65	0.11	0.68	0.57	1.65	0.26	0.23	0.34	0.22	1.12	Benef.	2.79	0.36	0.34	true
Pakistan	0.49	1.81	2.39	4.43	0.07	0.39	0.18	0.42	0.25	1.63	0.26	0.23	0.40	0.24	1.18	Benef.	1.84	0.80	1.22	false
Senegal	0.42	1.77	3.44	5.60	0.12	0.17	0.09	0.20	0.11	1.69	0.33	0.29	0.37	0.23	0.88	Benef.	0.83	2.44	-0.11	true
Sudan	0.47	0.65	0.86	8.30	0.05	0.52	0.19	0.54	0.36	1.61	0.23	0.21	0.39	0.24	1.28	Benef.	2.37	0.22	0.32	true
Tanzania	0.42	1.04	3.40	5.07	0.12	0.51	0.15	0.55	0.40	1.68	0.33	0.29	0.43	0.24	0.92	Benef.	2.34	0.37	0.40	true
Uganda	0.41	1.18	2.19	3.50	0.44	0.46	0.19	0.57	0.39	1.71	0.31	0.27	0.45	0.25	-0.60	Benef.	2.15	0.68	0.75	false
Zambia	0.42	2.72	1.99	3.47	0.17	0.49	0.18	0.53	0.36	1.72	0.31	0.26	0.42	0.24	0.63	Benef.	2.24	0.64	0.69	false
Zimbabwe	0.59	2.97	7.47	-4.88	0.08	0.55	0.16	0.58	0.43	1.64	0.32	0.29	0.45	0.25	1.15	Benef.	2.47	1.09	-2.63	true
Algeria	0.67	2.04	4.50	2.40	0.07	0.14	0.05	0.15	0.11	1.64	0.22	0.19	0.24	0.18	1.17	Benef.	0.70	6.17	-0.03	true
Bolivia	0.64	3.78	5.53	2.37	0.06	0.51	0.30	0.52	0.24	1.63	0.26	0.23	0.52	0.25	1.21	Benef.	2.33	1.44	-0.57	true
Brazil	0.75	4.62	4.84	4.50	0.02	0.43	0.28	0.44	0.18	1.56	0.17	0.17	0.43	0.24	1.47	Benef.	2.04	0.44	0.44	true
Bulgaria	0.78	6.08	3.15	5.80	0.04	0.16	0.21	0.17	-0.03	1.59	0.13	0.11	0.31	0.22	1.35	Benef.	0.81	8.01	-0.02	true
China	0.68	2.85	2.03	7.94	0.03	0.48	0.23	0.49	0.27	1.58	0.15	0.14	0.36	0.23	1.39	Benef.	2.22	0.20	0.31	true
Colombia	0.75	4.47	3.13	2.81	0.09	0.42	0.44	0.44	0.03	1.66	0.16	0.13	0.54	0.25	1.06	Benef.	1.97	2.34	-0.18	true
Dominican Republic	0.70	3.39	2.10	7.75	0.18	0.27	0.44	0.32	-0.10	1.73	0.18	0.13	0.55	0.25	0.54	Benef.	1.30	11.04	-0.02	true
Ecuador	0.73	3.44	3.17	2.33	0.06	0.28	0.44	0.30	-0.12	1.62	0.16	0.14	0.56	0.25	1.26	Benef.	1.37	5.66	-0.05	true
Egypt	0.61	3.82	4.41	5.12	0.06	0.59	0.21	0.60	0.40	1.62	0.24	0.22	0.42	0.24	1.24	Benef.	2.61	0.72	0.85	true
El Salvador	0.69	3.76	2.18	1.97	0.33	0.19	0.45	0.25	-0.17	1.75	0.19	0.14	0.57	0.25	-0.20	Benef.	0.95	17.09	-0.01	false

Developing country	HDI 1995	KEI 1995	ASE Exp.	GDP growth 2000	EM1 1990	humi 2000	Hi 1990	Hi 2000	Hi transf= Δhi+ dh*hilag	m'	PSI	PSI (m=0)	$\tilde{H}_i$	$\tilde{H}_i(1-\tilde{H}_i)$	deriv-psi	Benef Brain Drain	Net grwth effect	mi= EM5	Hi(1-Hi)/ (1-mi)	Benef mig incr
Guatemala	0.62	1.70	1.52	3.33	0.20	0.19	0.31	0.24	-0.06	1.74	0.21	0.16	0.45	0.25	0.42	Benef.	0.94	6.89	-0.03	true
Honduras	0.64	2.93	3.48	4.79	0.22	0.24	0.44	0.29	-0.13	1.75	0.24	0.19	0.61	0.24	0.32	Benef.	1.17	6.72	-0.04	true
Indonesia	0.66	3.23	0.65	4.77	0.04	0.46	0.17	0.47	0.30	1.60	0.13	0.12	0.28	0.20	1.34	Benef.	2.15	0.21	0.31	true
Iran	0.69	2.99	3.19	5.37	0.25	0.59	0.27	0.62	0.37	1.75	0.21	0.16	0.41	0.24	0.16	Benef.	2.59	1.43	-0.54	true
Jamaica	0.72	5.09	6.84	0.79	0.85	0.43	0.76	0.83	0.12	1.35	0.17	0.22	0.94	0.06	-0.94	Benef.	2.01	30.60	0.00	false
Jordan	0.71	4.04	5.61	3.88	0.09	0.56	0.29	0.57	0.30	1.65	0.23	0.20	0.47	0.25	1.09	Benef.	2.50	2.05	-0.23	true
Morocco	0.58	2.93	4.72	0.87	0.22	0.13	0.12	0.15	0.04	1.75	0.30	0.24	0.36	0.23	0.35	Benef.	0.64	7.23	-0.02	true
Paraguay	0.74	3.17	3.47	-0.30	0.04	0.46	0.25	0.47	0.23	1.59	0.15	0.14	0.38	0.24	1.36	Benef.	2.12	0.61	0.64	true
Peru	0.73	4.13	2.60	3.13	0.06	0.47	0.36	0.48	0.14	1.62	0.15	0.12	0.46	0.25	1.25	Benef.	2.18	2.31	-0.19	true
Philippines	0.74	4.18	2.91	4.01	0.13	0.67	0.21	0.70	0.50	1.69	0.17	0.13	0.33	0.22	0.84	Benef.	2.85	3.81	-0.07	true
Romania	0.77	5.34	3.32	1.64	0.09	0.31	0.27	0.34	0.08	1.66	0.16	0.12	0.38	0.24	1.06	Benef.	1.52	3.61	-0.09	true
Sri Lanka	0.73	3.34	2.65	6.00	0.29	0.40	0.27	0.48	0.23	1.76	0.19	0.13	0.38	0.24	-0.01	Benef.	1.88	2.24	-0.20	true
Swaziland	0.60	8.80	6.50	2.55	0.00	0.56	0.22	0.56	0.36	1.54	0.27	0.27	0.47	0.25	1.53	Benef.	2.51	0.34	0.37	true
Syrian Arab Republic	0.67	2.36	2.60	2.50	0.07	0.44	0.23	0.46	0.24	1.63	0.18	0.15	0.38	0.23	1.18	Benef.	2.07	1.30	-0.84	true
Thailand	0.75	4.96	3.45	4.31	0.02	0.45	0.25	0.45	0.22	1.57	0.14	0.14	0.37	0.23	1.42	Benef.	2.08	0.59	0.60	true
Tunisia	0.70	3.41	6.63	4.71	0.18	0.15	0.11	0.17	0.06	1.73	0.28	0.23	0.33	0.22	0.56	Benef.	0.74	5.86	-0.03	true
Argentina	0.83	5.99	3.20	-0.52	0.04	0.48	0.30	0.49	0.21	1.59	0.10	0.09	0.37	0.23	1.36	Benef.	2.23	1.15	-1.65	true
Botswana	0.66	4.07	7.80	3.43	0.02	0.34	0.12	0.35	0.23	1.57	0.28	0.27	0.38	0.24	1.43	Benef.	1.63	0.44	0.40	true
Chile	0.82	6.19	3.41	5.38	0.07	0.47	0.33	0.49	0.18	1.63	0.13	0.10	0.42	0.24	1.19	Benef.	2.20	1.84	-0.30	true
Costa Rica	0.81	5.88	5.07	1.66	0.08	0.45	0.40	0.47	0.09	1.65	0.17	0.14	0.52	0.25	1.11	Benef.	2.10	2.80	-0.14	true
Hungary	0.81	6.73	4.58	5.15	0.14	0.39	0.29	0.43	0.15	1.71	0.17	0.13	0.40	0.24	0.76	Benef.	1.86	3.60	-0.09	true
Malaysia	0.76	5.38	4.26	8.30	0.25	0.59	0.19	0.62	0.44	1.75	0.20	0.15	0.33	0.22	0.19	Benef.	2.62	1.35	-0.67	true
Mauritius	0.75	4.97	3.25	8.02	0.65	0.29	0.35	0.48	0.15	1.54	0.13	0.13	0.47	0.25	-0.93	Benef.	1.41	9.33	-0.03	false
Mexico	0.78	5.17	4.53	6.86	0.11	0.14	0.31	0.17	-0.13	1.67	0.18	0.14	0.43	0.25	0.97	Benef.	0.72	11.33	-0.01	true
Poland	0.82	6.38	5.06	4.00	0.14	0.40	0.28	0.43	0.16	1.71	0.18	0.14	0.40	0.24	0.76	Benef.	1.88	3.93	-0.08	true
South Africa	0.74	5.73	6.94	3.08	0.10	0.63	0.22	0.64	0.44	1.67	0.25	0.21	0.42	0.24	1.02	Benef.	2.72	1.14	-1.58	true
Turkey	0.71	5.20	3.17	7.22	0.08	0.09	0.12	0.09	-0.02	1.65	0.18	0.15	0.26	0.19	1.11	Benef.	0.44	3.98	-0.03	true
Uruguay	0.82	6.24	3.03	-1.27	0.07	0.41	0.36	0.43	0.10	1.63	0.12	0.09	0.43	0.25	1.18	Benef.	1.95	2.89	-0.13	true
Venezuela	0.77	4.78	5.01	3.21	0.04	0.60	0.26	0.61	0.36	1.59	0.17	0.16	0.41	0.24	1.35	Benef.	2.64	1.41	-0.58	true

ASEExp: Adjusted savings: education expenditure (% of GNI) 2000

$d_h = 0.05$

$m' = (1+m)/ (0.65 + m^2)$

Deriv-PSIzero = 1.538

Table 6: Optimal level of human capital when the destination country is the Average Northern Countries

$\tilde{\vartheta}^{s*}$ (Average Northern Countries)						
	Northern Countries (Destination)					
m	0	0.1	0.33	0.5	0.75	1
Albania	6.01	7.817	11.972	15.044	19.560	24.077
Algeria	-0.20	0.195	1.096	1.762	2.741	3.739
Azerbaijan	2.85	4.727	9.038	12.224	16.909	21.686
Bangladesh	1.14	4.004	10.584	15.447	22.599	29.989
Brazil	4.71	5.831	8.402	10.302	13.096	15.853
Bulgaria	5.90	7.208	10.216	12.439	15.708	18.929
China	5.25	8.047	14.477	19.230	26.219	33.331
Colombia	3.66	4.582	6.714	8.289	10.606	12.894
Côte d'Ivoire	0.09	1.545	4.892	7.366	11.005	14.765
Ecuador	17.69	23.027	35.297	44.366	57.704	71.094
Ethiopia	-0.55	0.857	4.099	6.496	10.021	13.680
Georgia	7.01	9.396	14.888	18.948	24.918	30.921
Ghana	0.12	1.745	5.475	8.231	12.286	16.478
India	1.30	2.804	6.258	8.811	12.565	16.413
Indonesia	11.92	17.349	29.839	39.070	52.646	66.439
Iran	3.73	4.731	7.024	8.719	11.211	13.680
Jordan	3.41	4.406	6.702	8.399	10.894	13.376
Kenya	-0.55	0.403	2.586	4.200	6.573	9.033
Malaysia	3.10	3.568	4.645	5.441	6.612	7.722
Mexico	4.48	5.275	7.109	8.464	10.457	12.386
Morocco	0.88	1.794	3.885	5.431	7.705	10.022
Pakistan	5.26	8.256	15.137	20.224	27.705	35.328
Peru	4.51	6.341	10.557	13.673	18.256	22.882
Philippines	2.57	4.457	8.794	12.000	16.714	21.529
Romania	3.67	5.225	8.796	11.436	15.318	19.236
Russian Federation	5.12	6.366	9.227	11.342	14.452	17.528
Serbia & Monte-negro	3.29	5.026	9.014	11.962	16.297	20.697
South Africa	2.21	3.264	5.680	7.465	10.091	12.740
Tajikistan	1.49	3.808	9.141	13.083	18.880	24.850
Tanzania	-0.08	3.113	10.449	15.871	23.845	32.124
Thailand	3.26	4.251	6.540	8.232	10.720	13.198
Ukraine	1.58	2.629	5.054	6.847	9.482	12.158
Vietnam	0.63	2.090	5.440	7.916	11.557	15.306
Yemen	0.58	1.158	2.496	3.486	4.941	6.414

Table 7: Standard Deviation of the optimal level of human capital for the Average Northern Countries as Destination

$\tilde{\vartheta}^{s*}$ (Standard Deviation)					
	Northern Countries (Destination)				
m	0.1	0.33	0.5	0.75	1
Albania	0.453	1.496	2.267	3.400	4.534
Algeria	0.085	0.282	0.427	0.640	0.902
Azerbaijan	0.409	1.348	2.043	3.064	4.317
Bangladesh	0.556	1.835	2.780	4.170	6.213
Brazil	0.305	1.008	1.527	2.290	2.974
Bulgaria	0.361	1.192	1.806	2.709	3.507
China	0.618	2.041	3.092	4.639	6.494
Colombia	0.252	0.831	1.259	1.888	2.455
Côte d'Ivoire	0.283	0.933	1.414	2.121	3.161
Ecuador	1.303	4.298	6.513	9.769	13.152
Ethiopia	0.263	0.868	1.315	1.972	3.006
Georgia	0.577	1.903	2.883	4.324	5.845
Ghana	0.314	1.035	1.568	2.351	3.514
India	0.313	1.033	1.566	2.349	3.378
Indonesia	1.215	4.011	6.077	9.115	12.698
Iran	0.266	0.877	1.329	1.994	2.607
Jordan	0.260	0.859	1.301	1.951	2.570
Kenya	0.180	0.593	0.899	1.349	2.038
Malaysia	0.159	0.524	0.794	1.191	1.474
Mexico	0.243	0.802	1.216	1.824	2.303
Morocco	0.198	0.655	0.992	1.489	2.096
Pakistan	0.654	2.159	3.271	4.907	6.905
Peru	0.431	1.422	2.155	3.233	4.414
Philippines	0.406	1.338	2.028	3.041	4.312
Romania	0.365	1.205	1.826	2.739	3.740
Russian Federation	0.336	1.108	1.678	2.517	3.280
Serbia & Monte-negro	0.391	1.291	1.956	2.933	4.073
South Africa	0.248	0.818	1.240	1.860	2.536
Tajikistan	0.464	1.532	2.321	3.482	5.109
Tanzania	0.593	1.958	2.967	4.450	6.792
Thailand	0.257	0.848	1.284	1.927	2.545
Ukraine	0.237	0.783	1.186	1.779	2.473
Vietnam	0.293	0.966	1.464	2.197	3.216
Yemen	0.134	0.441	0.669	1.003	1.382

Table 8: Optimal level of human capital

$\tilde{\vartheta}^{S*}$ (Average Middle East)						
	Middle East					
m	0	0.1	0.33	0.5	0.75	1
Albania	6.01	6.710	8.318	9.507	11.255	13.003
Algeria	-0.20	-0.014	0.408	0.719	1.178	1.636
Azerbaijan	2.85	3.729	5.745	7.235	9.426	11.617
Bahrain	6.84	7.769	9.917	11.504	13.838	16.171
Brazil	4.71	5.086	5.941	6.573	7.502	8.431
Bulgaria	5.90	6.325	7.304	8.028	9.092	10.156
China	5.25	6.536	9.492	11.677	14.889	18.102
Colombia	3.66	3.967	4.685	5.215	5.995	6.774
Côte d'Ivoire	0.09	0.854	2.613	3.912	5.824	7.735
Ecuador	17.69	19.846	24.799	28.460	33.844	39.229
Ethiopia	-0.55	0.214	1.980	3.285	5.204	7.122
Georgia	7.01	7.988	10.242	11.907	14.357	16.806
Ghana	0.12	0.979	2.948	4.403	6.543	8.683
India	1.30	2.039	3.734	4.987	6.829	8.671
Indonesia	11.92	14.380	20.043	24.228	30.383	36.537
Iran	3.73	4.082	4.881	5.472	6.341	7.210
Jordan	3.41	3.771	4.605	5.222	6.129	7.036
Kenya	-0.55	-0.036	1.137	2.004	3.279	4.554
Malaysia	3.10	3.180	3.365	3.502	3.703	3.904
Mexico	4.48	4.682	5.149	5.494	6.002	6.510
Morocco	0.88	1.309	2.286	3.007	4.069	5.131
Pakistan	5.26	6.658	9.864	12.235	15.720	19.206
Peru	4.51	5.288	7.083	8.410	10.361	12.312
Philippines	2.57	3.466	5.526	7.048	9.286	11.525
Romania	3.67	4.333	5.852	6.976	8.628	10.280
Russian Federation	5.12	5.546	6.522	7.243	8.305	9.366
Serbia & Montenegro	3.29	4.070	5.862	7.186	9.133	11.080
South Africa	2.21	2.659	3.681	4.437	5.548	6.660
Tajikistan	1.49	2.674	5.400	7.414	10.376	13.338
Tanzania	-0.08	1.664	5.666	8.625	12.976	17.327
Thailand	3.26	3.624	4.470	5.095	6.014	6.934
Ukraine	1.58	2.050	3.143	3.950	5.138	6.325
Vietnam	0.63	1.375	3.080	4.340	6.193	8.045
Yemen	0.58	0.831	1.419	1.853	2.491	3.130

Table 9: Standard Deviation of the optimal level of human capital for the ME

$\tilde{\vartheta}^{S*}$ (Standard deviation, Middle East, ME)					
	Middle East				
m	0.1	0.33	0.5	0.75	1
Albania	0.222	0.732	1.108	1.663	2.217
Algeria	0.042	0.138	0.209	0.313	0.417
Azerbaijan	0.200	0.659	0.999	1.498	1.997
Bahrain	0.272	0.897	1.359	2.039	2.718
Brazil	0.149	0.493	0.747	1.120	1.493
Bulgaria	0.177	0.583	0.883	1.325	1.766
China	0.302	0.998	1.512	2.268	3.024
Colombia	0.123	0.406	0.615	0.923	1.231
Côte d'Ivoire	0.138	0.456	0.691	1.037	1.383
Ecuador	0.637	2.102	3.184	4.776	6.369
Ethiopia	0.129	0.424	0.643	0.964	1.286
Georgia	0.282	0.930	1.409	2.114	2.819
Ghana	0.153	0.506	0.766	1.150	1.533
India	0.153	0.505	0.766	1.148	1.531
Indonesia	0.594	1.961	2.971	4.457	5.943
Iran	0.130	0.429	0.650	0.975	1.300
Jordan	0.127	0.420	0.636	0.954	1.272
Kenya	0.088	0.290	0.440	0.659	0.879
Malaysia	0.078	0.256	0.388	0.582	0.776
Mexico	0.119	0.392	0.594	0.892	1.189
Morocco	0.097	0.320	0.485	0.728	0.971
Pakistan	0.320	1.056	1.599	2.399	3.199
Peru	0.211	0.695	1.054	1.581	2.107
Philippines	0.198	0.654	0.991	1.487	1.983
Romania	0.179	0.589	0.893	1.339	1.786
Russian Federation	0.164	0.542	0.820	1.231	1.641
Serbia & Montenegro	0.191	0.631	0.956	1.434	1.912
South Africa	0.121	0.400	0.606	0.909	1.213
Tajikistan	0.227	0.749	1.135	1.702	2.270
Tanzania	0.290	0.957	1.451	2.176	2.901
Thailand	0.126	0.414	0.628	0.942	1.256
Ukraine	0.116	0.383	0.580	0.870	1.160
Vietnam	0.143	0.473	0.716	1.074	1.432
Yemen	0.065	0.216	0.327	0.490	0.654

Figures 1: Trends in H/H_0 for source countries when the average reference countries is the country of destination (α =0.1)

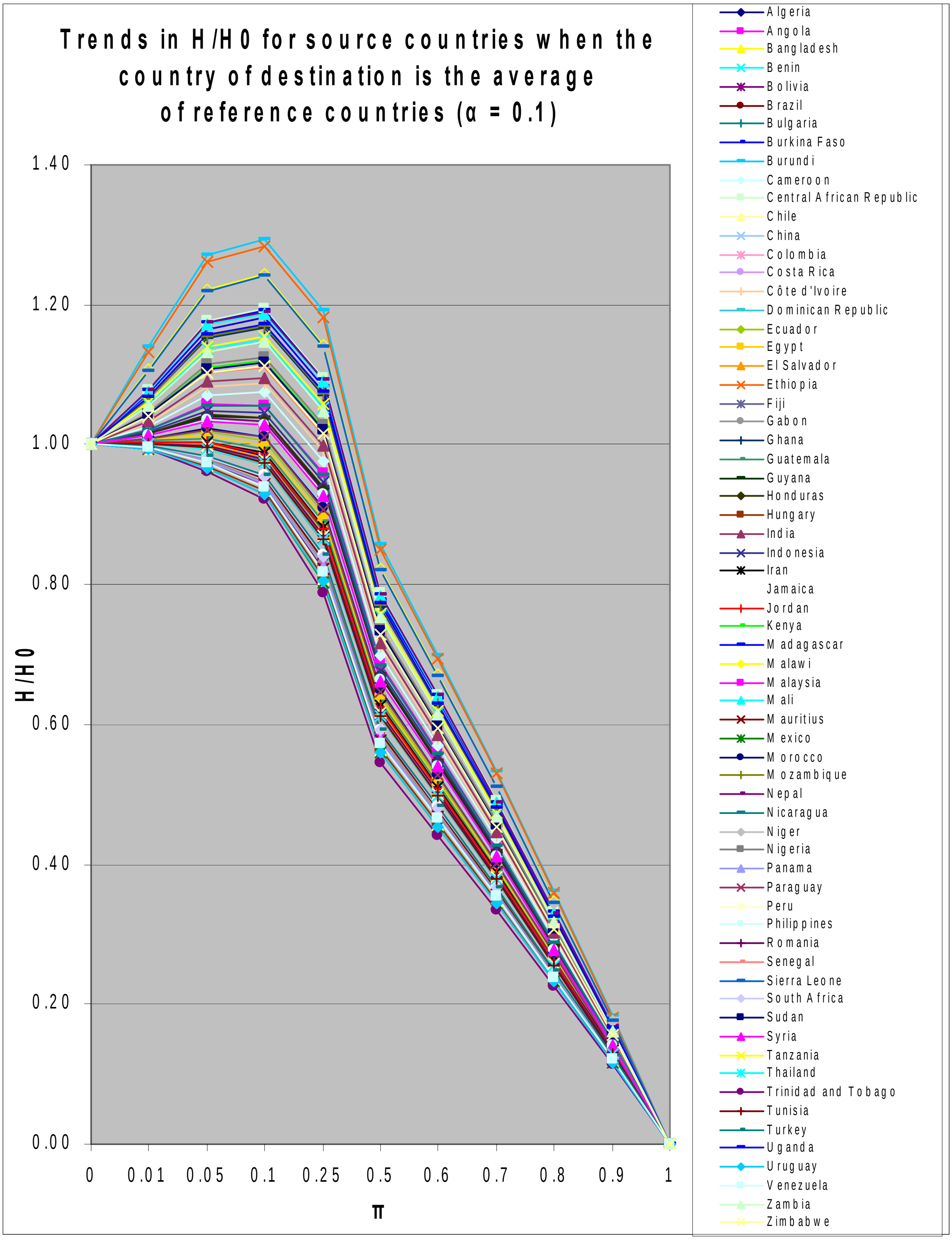

Figure 2: Trends in H/H_0 for source countries when the average reference countries is the country of destination (α =0.2)

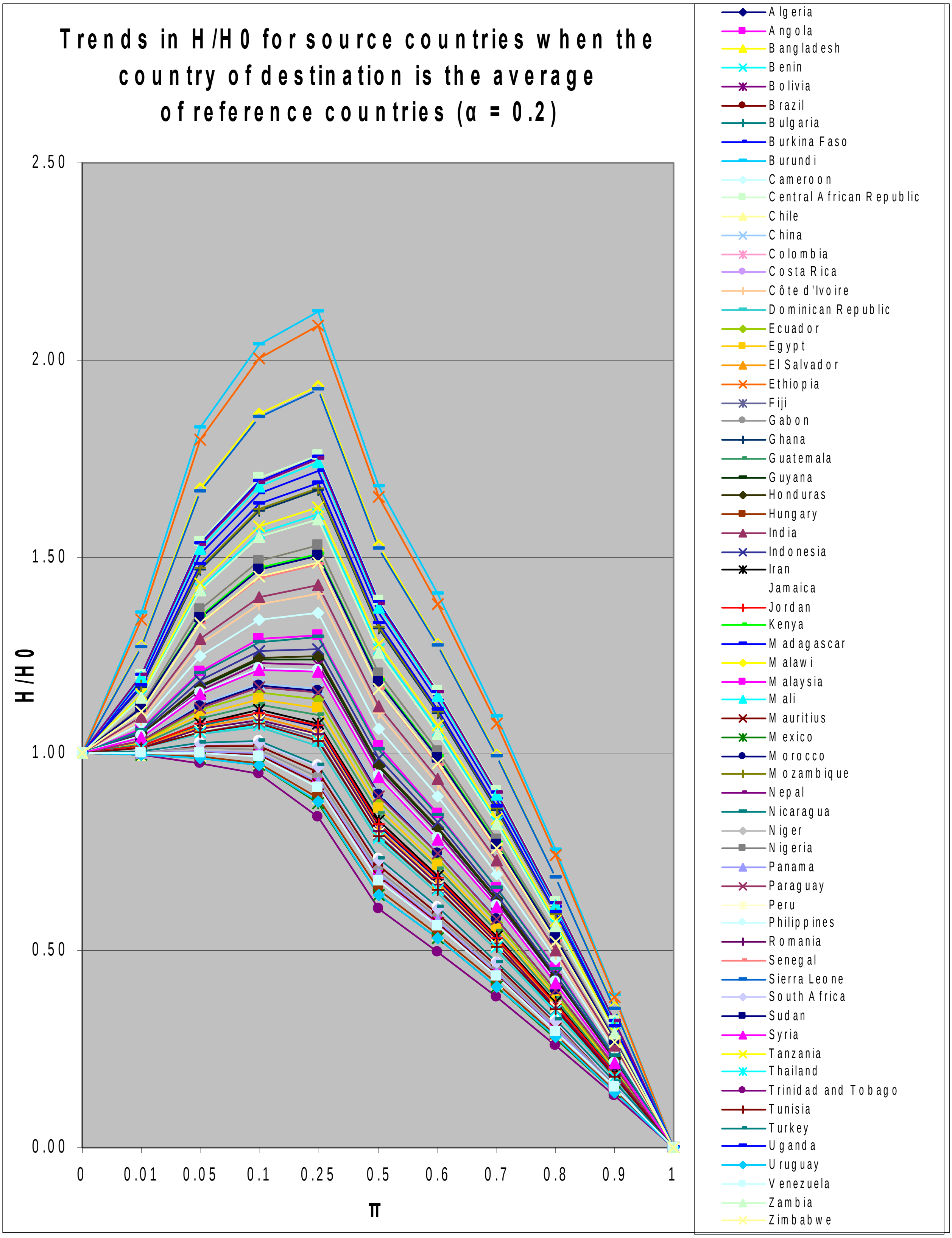

Figure 3: Trends in H/H_0 for source countries when the average reference countries is the country of destination (α =0.3)

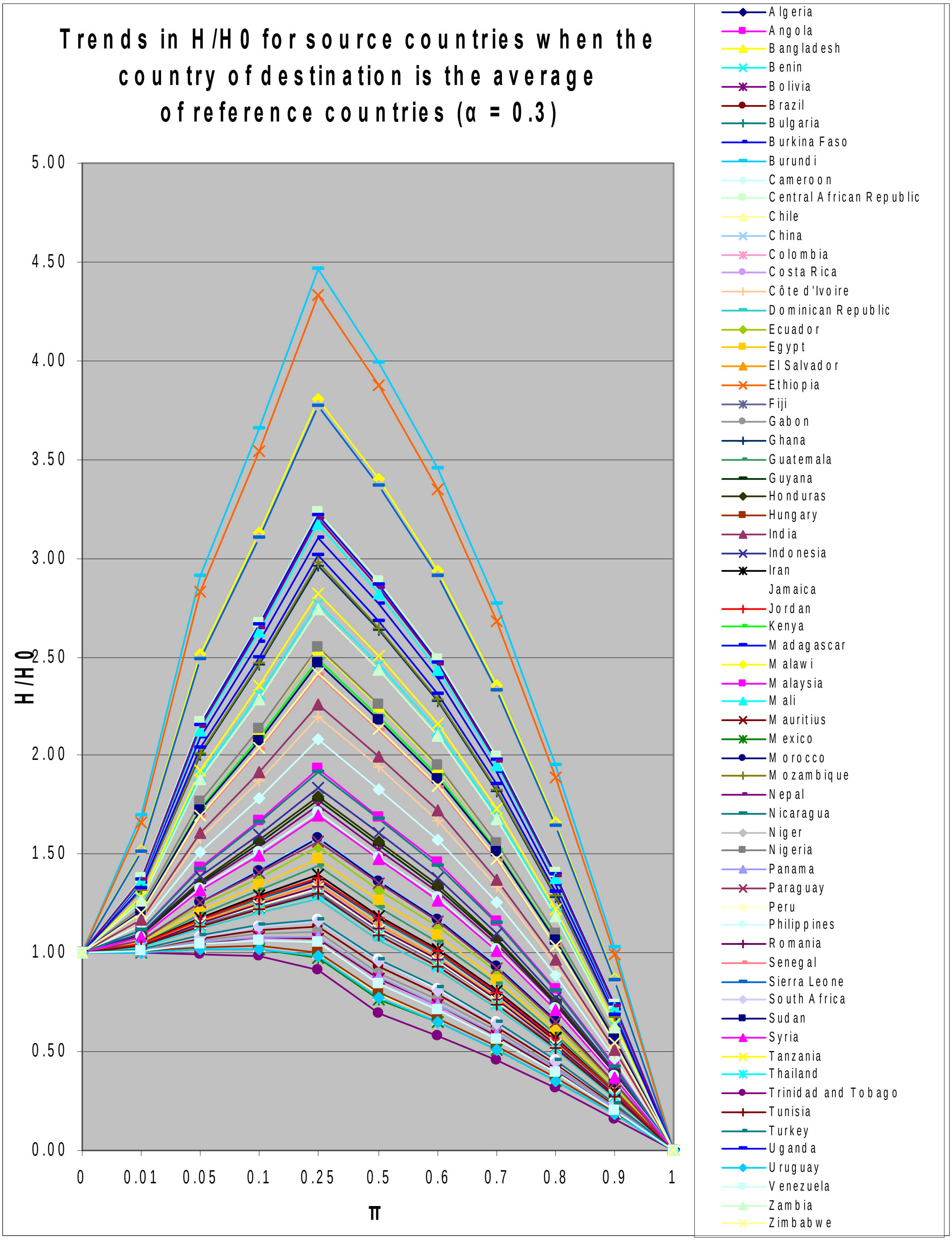

Figure 4: Trends in H/H_0 for source countries when the average reference countries is the country of destination (α =0.4)

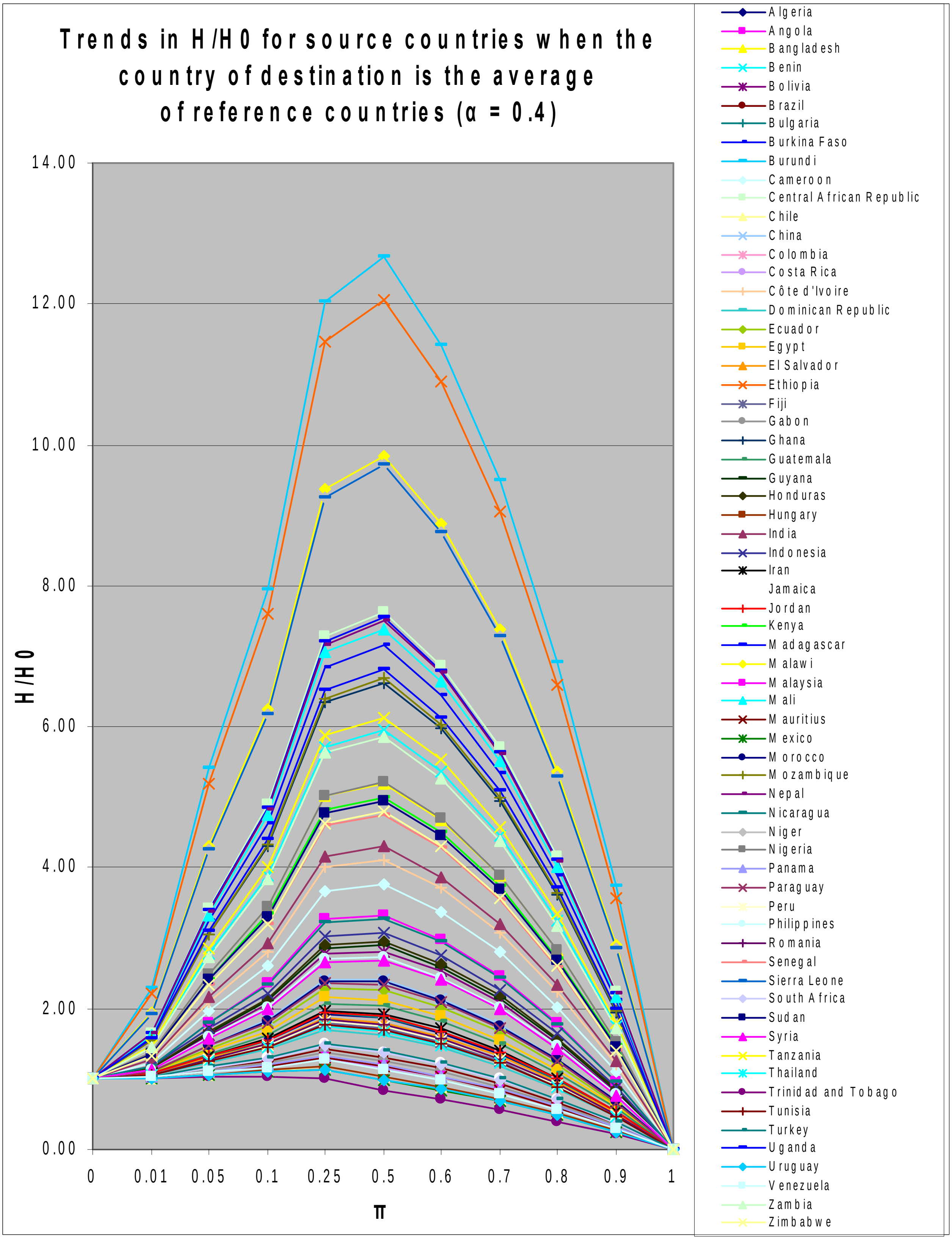

Figure 5: Trends in H/H_0 for source countries when the average reference countries is the country of destination (α =0.5)

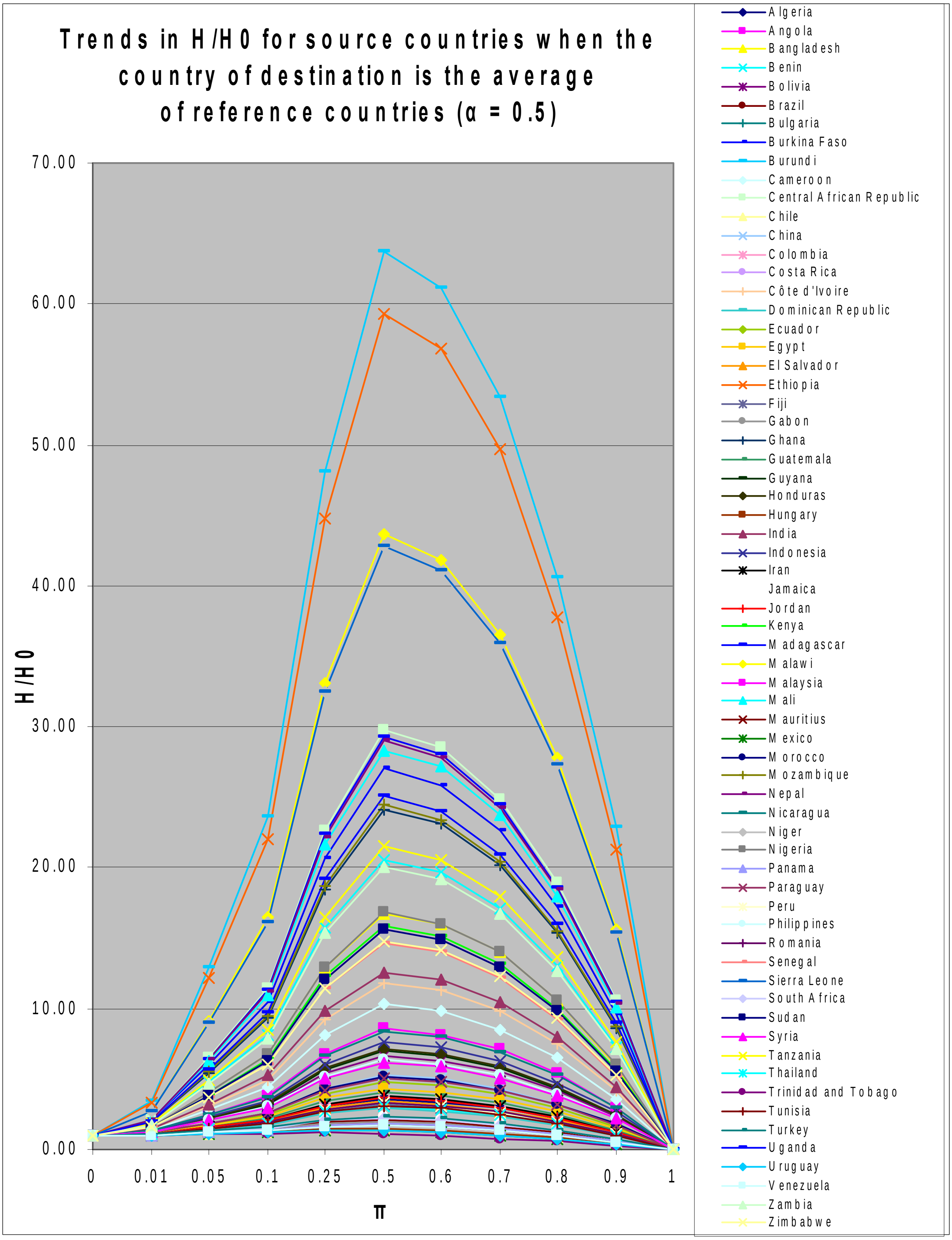

Figure 6: Trends in H/H_0 for source countries when the average reference countries is the country of destination (α =0.6)

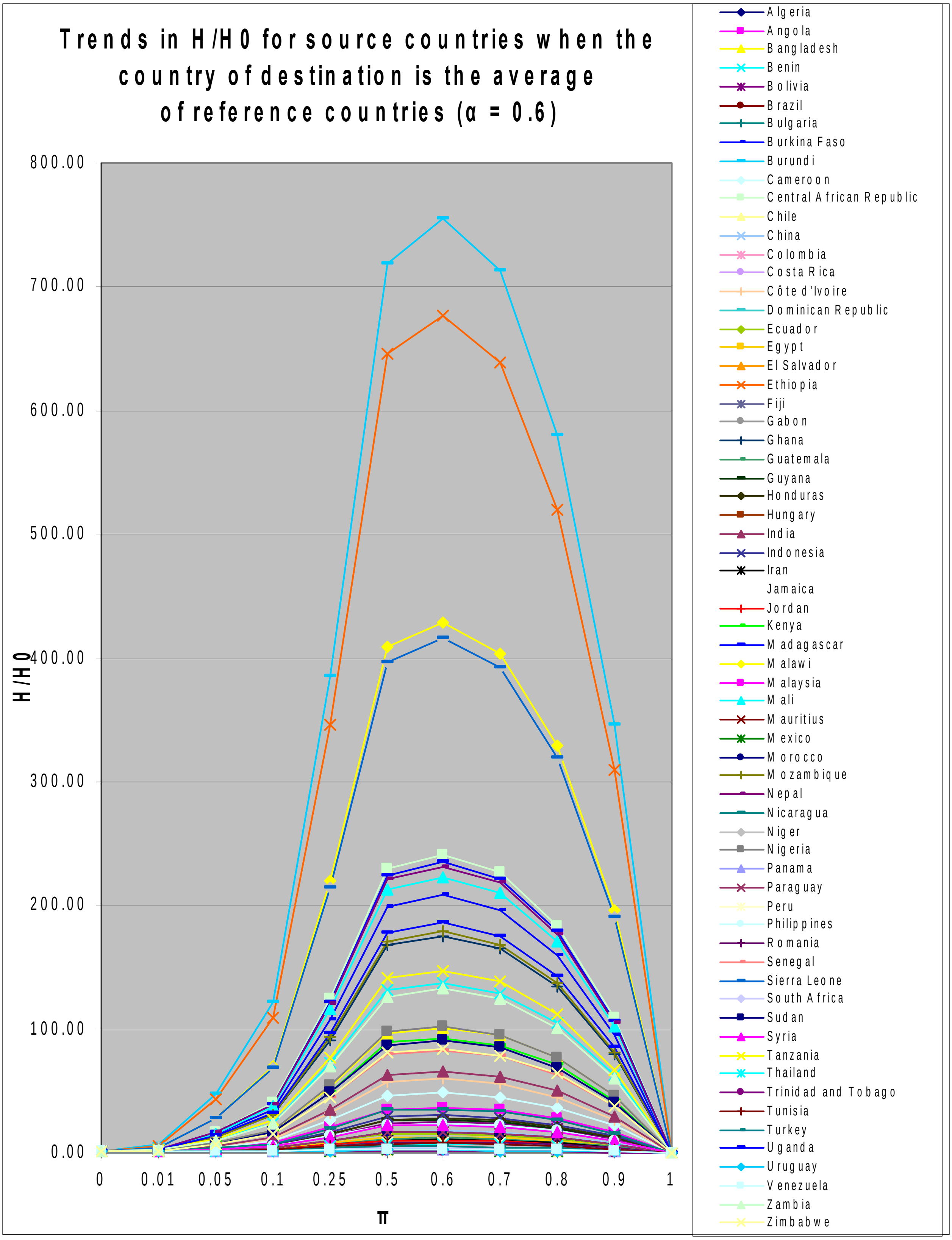

Table 10: Trends in Human Capital Level given different α

Country	π	H/H0								
		α = 0.1	α = 0.2	α = 0.28	α = 0.3	α = 0.4	α = 0.5	α = 0.6	α = 0.7	α = 0.8
Algeria	0.18	0.93	1.10	1.29	1.36	1.79	2.65	4.78	12.72	90.18
Angola	0.54	0.64	0.96	1.43	1.61	3.21	8.48	36.38	411.65	52712.56
Bangladesh	0.02	1.08	1.21	1.37	1.42	1.74	2.32	3.58	7.34	30.96
Benin	0.10	1.15	1.55	2.10	2.28	3.82	7.85	23.13	140.11	5139.21
Bolivia	0.03	1.03	1.12	1.21	1.24	1.43	1.74	2.33	3.78	10.02
Brazil	0.02	0.99	1.01	1.03	1.03	1.07	1.12	1.19	1.33	1.65
Bulgaria	0.06	1.00	1.09	1.18	1.21	1.39	1.70	2.29	3.76	10.18
Burkina Faso	0.14	1.17	1.72	2.53	2.82	5.48	13.86	55.71	566.33	58527.49
Burundi	0.35	1.07	2.00	3.73	4.46	13.00	58.14	549.69	23236.47	41521893.56
Cameroon	0.20	1.02	1.38	1.87	2.03	3.41	7.03	20.84	127.39	4758.75
Central African Republic	0.26	1.08	1.75	2.83	3.25	7.40	23.44	132.21	2363.20	755004.94
Chile	0.08	0.95	0.98	1.02	1.03	1.10	1.21	1.39	1.74	2.75
China	0.03	1.02	1.10	1.18	1.20	1.35	1.61	2.07	3.16	7.38
Colombia	0.00	1.00	1.00	1.00	1.00	1.01	1.01	1.01	1.02	1.04
Costa Rica	0.04	0.98	1.01	1.03	1.04	1.09	1.16	1.27	1.48	2.02
Côte d'Ivoire	0.10	1.09	1.38	1.74	1.86	2.79	4.90	11.43	46.85	786.96
Dominican Republic	0.13	0.95	1.07	0.56	1.24	1.50	1.97	2.98	5.89	23.12
Ecuador	0.07	1.02	1.13	1.20	1.30	1.56	2.02	2.98	5.67	20.58
Egypt	0.05	1.01	1.09	1.26	1.20	1.37	1.63	2.14	3.34	8.20
El Salvador	0.16	0.94	1.09	1.18	1.32	1.71	2.43	4.14	10.07	59.53
Ethiopia	0.21	1.22	2.10	1.27	4.25	10.86	40.37	289.41	7712.85	5477818.11
Fiji	0.62	0.48	0.63	3.64	0.91	1.48	2.92	8.09	44.23	1320.53
Gabon	0.25	0.83	0.94	0.84	1.10	1.37	1.86	2.93	6.26	28.53
Ghana	0.46	0.83	1.40	1.07	2.75	6.79	23.99	159.37	3741.69	2062553.71
Guatemala	0.11	0.99	1.13	2.37	1.34	1.68	2.31	3.72	8.25	40.48
Guyana	0.83	0.24	0.37	1.29	0.65	1.36	3.83	18.14	242.50	43348.22
Honduras	0.12	1.03	1.26	0.57	1.63	2.31	3.74	7.73	25.92	291.11
Hungary	0.10	0.94	0.98	1.54	1.04	1.12	1.24	1.46	1.90	3.24
India	0.03	1.07	1.22	1.02	1.44	1.79	2.43	3.86	8.31	38.56
Indonesia	0.02	1.03	1.09	1.39	1.18	1.31	1.52	1.89	2.72	5.64
Iran	0.18	0.94	1.11	1.16	1.38	1.84	2.75	5.04	13.80	103.68
Jamaica	0.82	0.22	0.29	1.31	0.41	0.66	1.26	3.31	16.68	423.07
Jordan	0.03	1.01	1.06	0.38	1.12	1.22	1.37	1.63	2.18	3.90
Kenya	0.36	0.91	1.40	1.11	2.46	5.19	14.77	70.93	969.76	181268.79
Madagascar	0.13	1.18	1.74	2.17	2.86	5.53	13.97	55.99	566.44	57968.87
Malawi	0.18	1.21	1.95	2.56	3.63	8.28	26.31	149.00	2681.15	868189.78
Malaysia	0.08	0.96	1.00	3.16	1.07	1.16	1.30	1.54	2.06	3.65
Mali	0.20	1.14	1.76	1.05	3.08	6.49	18.44	88.41	1204.84	223755.50
Mauritius	0.53	0.54	0.65	2.72	0.82	1.13	1.76	3.42	10.35	94.74
Mexico	0.06	0.96	0.99	0.78	1.02	1.06	1.13	1.24	1.44	1.95
Morocco	0.19	0.96	1.18	1.01	1.56	2.24	3.74	8.06	28.95	373.94
Mozambique	0.47	0.81	1.38	1.46	2.73	6.80	24.38	165.66	4037.94	2399007.53
Nepal	0.02	1.13	1.34	2.34	1.69	2.28	3.49	6.60	19.09	159.48
Nicaragua	0.15	1.03	1.32	1.60	1.80	2.74	4.92	11.86	51.38	963.89
Niger	0.11	1.24	1.86	1.68	3.15	6.33	16.84	73.05	842.92	112240.01
Nigeria	0.08	1.13	1.46	2.80	2.04	3.18	5.94	15.11	71.73	1616.09
Panama	0.13	0.92	0.99	1.89	1.09	1.24	1.48	1.94	3.04	7.44
Paraguay	0.02	1.02	1.06	1.07	1.13	1.22	1.36	1.61	2.12	3.69
Peru	0.06	1.00	1.06	1.11	1.16	1.30	1.53	1.95	2.91	6.51
Philippines	0.17	1.00	1.24	1.14	1.65	2.40	4.08	9.03	33.90	477.92
Romania	0.09	0.98	1.08	1.55	1.23	1.44	1.82	2.56	4.56	14.37
Senegal	0.29	0.98	1.45	1.19	2.42	4.76	12.29	50.95	545.38	62495.29
Sierra Leone	0.33	1.04	1.83	2.16	3.78	9.93	38.37	291.39	8548.74	7357801.77
South Africa	0.10	0.95	1.03	3.22	1.13	1.29	1.55	2.03	3.19	7.89
Sudan	0.07	1.12	1.40	1.11	1.86	2.73	4.67	10.43	39.88	582.69

Country	π	H/H0								
		α = 0.1	α = 0.2	α = 0.28	α = 0.3	α = 0.4	α = 0.5	α = 0.6	α = 0.7	α = 0.8
Syria	0.04	1.03	1.14	1.75	1.29	1.52	1.92	2.72	4.88	15.62
Tanzania	0.42	0.87	1.43	1.25	2.71	6.36	21.01	126.28	2508.48	989848.27
Thailand	0.02	1.00	1.03	2.35	1.06	1.11	1.18	1.30	1.53	2.10
Trinidad and Tobago	0.76	0.27	0.31	1.05	0.37	0.47	0.66	1.09	2.54	13.70
Tunisia	0.21	0.89	1.05	0.36	1.30	1.71	2.53	4.55	12.07	84.99
Turkey	0.05	0.98	1.03	1.24	1.09	1.18	1.31	1.54	2.02	3.46
Uganda	0.37	0.95	1.57	1.07	2.98	7.04	23.45	142.55	2885.28	1182072.38
Uruguay	0.11	0.92	0.97	2.58	1.02	1.11	1.23	1.45	1.90	3.27
Venezuela	0.04	0.98	1.00	1.01	1.03	1.07	1.13	1.22	1.39	1.80
Zambia	0.26	1.04	1.59	1.03	2.74	5.66	15.58	71.28	898.29	142671.26
Zimbabwe	0.06	1.11	1.37	2.43	1.78	2.55	4.20	8.87	30.86	373.70