Can Foreign Health Assistance Reduce the Medical Brain Drain?

Yasser Moullan *†

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Abstract

This paper analyses the impact of foreign health aid on the emigration rates of physicians. We use a panel database to investigate the emigration of physicians from 192 source countries to 17 destination countries between 1995 and 2004. First, we investigate the direct impact of health assistance using the generalised method of moments (GMM) and highlight a significant negative effect of foreign health assistance on the medical brain drain. Moreover, we analyse whether this effect of health aid is more effective in a context of good governance. We find that health aid is more effective at reducing physicians' emigration rates when the levels of corruption and inflation are low.

Keywords: International Migration, Physicians Emigration Rates, Foreign Aid, Foreign health assistance.

JEL classification: F22 - F35 - O15 - C23 - I1 - O11.

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†Centre d'Economie de la Sorbonne(CES-CNRS UMR 8174). Université de Paris 1. 106-112 Boulevard de l'Hôpital 75647 Paris Cedex 13, France. Email: Yasser.Moullan@univ-paris1.fr

1 Introduction

In 1965, there were 75 million migrants globally (or 2% of the world population), while in 2000, the number of migrants was around 175 million, which corresponds to 3% of the world population (United Nations (2001)). In developing countries, Docquier et al. (2007) have found that the average emigration between 1990 and 2000 rose from 1.6% to 1.8%. The consequences of globalisation seem to affect trade, capital flows, foreign direct investments but not really migration. However, the structure of international migration has changed quickly over time. The stock of skilled migrants in OECD countries has increased by 64% between 1990 and 2000, whereas the growth of total immigrants in OECD countries was only 23%. During the same period, the proportion of skilled among immigrants has increased from 30% to 35%. Low-income countries (93%) like Sub-Saharan Africa (113%) and small countries (up to 97%) are the most affected by skilled emigration (Docquier et al. (2008)).

The figures on total skilled migration include all occupational categories, such as engineer, professor, computer scientist and biologist. In this study we only focus on physicians. As a form of skilled migration, the emigration of physicians from developing countries to developed countries is an increasing phenomenom. In 2000, foreign-trained practising physicians represented 21.4% of the total workforce of physicians in Australia, 30.4% in United Kingdom and 34.5% in New Zealand (Forcier et al. (2004)). In 2002, 23% of physicians in Canada were trained abroad, and 24% in the US were trained overseas (Astor et al. (2005)). The proportion of physicians in different countries coming from middle-income and low-income countries is not well known due to the lack of data, but, for example, in the USA, 64% of foreign-born physicians are from these regions (Hagopian et al. (2004)).

This phenomenon is of significant importance for OECD countries for several reasons:

- Developed countries face an aging population that is and will continue to be major consumers of health and medical services in the future (OECD (2008a)).
- In OECD countries, a decline in the number of children per woman leads to a reduction in the number of new students in medicine and ultimately to a future reduction in the number of new physicians and new health workers. Moreover, the medical education system in developed countries is unable to create a sufficient number of medical workers given the shortage observed in the medical labour market. As previously mentioned, the "numerus clausus" is fixed and does not take into account the needs of the population for health care and the future replacement of doctors during the next year (OECD (2008a)).

This gap between health demand and health supply has pushed developed countries to host medical workers and to compete with other developed countries for the recruitment of health care workers from all over the world. Because globalisation has increased the interactions between countries, developing countries may face emigration in the health care sector, which in turn may cause an increasing shortage of medical workers in these countries (Cooper (2004) and OECD (2008a)).

The literature on the consequences of health on human development and economic outcomes is well known (Bhargava et al. (2001)). Nevertheless, the impact of this emigration on health outcomes in the source countries is very controversial. By compiling a new dataset on health professional emigration in Sub-Saharan Africa (Clemens and Petterson (2008)), Clemens (2007) found that the emigration of medical doctors does not explain the low staffing of medical workers, particularly in Sub-Saharan Africa.

In contrast, OECD (2008b) and World Health Organisation (2006) have observed that shortages of healthcare professionals in receiving OECD countries drive the immigration of physicians coming from developing countries which explains the low levels of staffing in Africa, for example. Thus, the lower is the number of physicians per 1000 people, the higher is the immigration rate of physicians into OECD countries. Moreover, a survey on physician migration in Pakistan, Nigeria and the Phillipines reveals that more than 50% of respondents agree with that physician emigration has led to an insufficient number of physicians necessary to meet the health care needs of the local population and thus has not helped to build the health system (Astor et al. (2005)).
In the same way, Bhargava and Docquier (2008) find that doubling the emigration of physicians accross African countries leads to an increase of 20% in the death rate due to HIV when the HIV prevalence rate is above 3%. This finding is particularly worrisome for the achievement of the Millenium Development Goals in the health sector. One goal is to reduce the under-five mortality rate by two thirds by 2015, while another focuses on improving maternal health. The last target is to fight against epidemics such as HIV-AIDS, Tuberculosis and Malaria (United Nations (2008)). Thus, professional health care is important to improve the health population and to attain these targets by 2015.

When the international community adopted the Millenium Development Goals in 2000, one of the tools suggested to attain these objectives was to increase the Official Development Assistance (ODA) aimed to developing countries. Significantly, in 2005, the ODA was increased to the threshold of $100 billion. Official Development Assistance, particularly in the health sector, has the goal of increasing infrastructure such as new hospitals, more medicines, treatments and drugs, vaccination programs, prevention campaign and new equipment. However, because the number of health workers, particularly doctors and nurses, is not sufficient, especially in rural and less wealthier areas (Dussault and Franceschini (2006)), access to these health care services remains limited. Increases in the health infrastructure should be accompanied with an increase in health professionals in order to improve the quality of health in developing countries.

One of the possible tools that OECD countries can easily use to manage migration flows involve the incentives tied to the official health aid from donors to recipients countries. In fact, health aid may have a potential impact on health infrastructure, which plays a key role in the improvement of the working conditions for health professionals. Even if theoretical research exists on the link between aid and migration (Gaytan-Fregoso and Lahiri (2000) and Schiff (1994)), due to the lack of data on migration, this question has not been addressed empirically except by Berthélémy et al. (2008). However, this study focuses on general migration, whereas we analyse this correlation specifically in the health sector. Thus, the contribution of this paper is double.

- First, important policy implications are presented with respect to the impact of foreign health assistance on the medical brain drain. Do international migration of labour and foreign aid in the health sector act as complements or substitutes? If they are substitutes, then aid is a great tool to reduce physician emigration by improving medical working conditions, whereas if they are complements, then aid gives incentives to so-called "Southern" physicians to migrate. Our paper estimates empirically the effect of health-related foreign aid on medical brain drain by using a new database on the medical brain drain (Bhargava and Docquier (2008)) that enables panel analysis.
- Second, Burnside and Dollar (2000) and Dollar and Svensson (2000) have noted that foreign aid has no impact on economic growth except in countries in which governance and macroeconomic policies are quite good. Even though our dependent variable is different, our analysis follows this framework and evaluates in which political environnements health aid is more effective in reducing emigration rates.

The paper is organized as follows. Section 2 provides stylised facts on the medical brain drain and aid evolution in the health sector. Section 3 then presents the empirical model. Section 4 presents estimation strategies. Section 5 reports the findings from estimating the generalised method of moment for medical brain drain and health aid, and Section 6 concludes the paper.

2 Data and descriptive statistics

The medical brain drain dataset covers emigration from 192 source countries to 16 OECD destination countries and one non-OECD country from 1991 to 2004. These 16 OECD destination countries include Australia, Austria, Belgium, Canada, Denmark, France, Germany, Ireland, Italy, New Zealand, Norway, Portugal, Sweden, Switzerland, the United Kingdom, and the United States. In a new version of the database, Bhargava and Docquier (2007) added South Africa as a new non-OECD destination country and corrected the emigration rates for the presence or absence of medical schools in the origin countries. Data by country of training is available for the most important destination countries representing 75% of our sample (Bhargava and Docquier (2007)) [1]. Our analysis is based on this updated database and focuses on the time period between 1995 and 2004 [2]. Moreover, because the health aid received by countries may have an impact on migration regardless of the donor, our study focuses exclusively on aggregate health flows by recipient countries[3].

The medical brain drain rate is defined by the following equation:

$$MBD_{i,t} = M_{i,t}/(P_{i,t} + M_{i,t})$$

Note that $M_{i,t}$ is defined as the stock of physicians from country i working abroad at time t , and Pi, t is the number of physicians working in their home country i at time t.

The Official Development Assistance(ODA) database on the health sector is extracted from the Country Reporting System (CRS) database, which is provided by the Development Assistance Committee (DAC) of the Organisation for Economic Co-operation and Development (OECD). Health sector assistance includes assistance to hospitals and clinics, assistance to specialised institutions such as those for tuberculosis, maternal and child care, other medical and dental services, disease and epidemic control, vaccination programmes, nursing, the provision of drugs, health demonstrations, public health administration and medical insurance programmes. In our case, we also include the population sector in our measure of health aid, including programs devoted to the control of sexually transmitted diseases and HIV-AIDS activities such as communication, screening, prevention, treatment and care. Population aid also includes prenatal and perinatal care, including childbirth and the training of medical workers for health service delivery. Henceforth in this paper, we define the foreign aid given to the

[1] Compared with world migration, all these destination countries attract around 44% of all international migrants.
[2] Health aid data is not available before this time.
[3] In addition, bilateral aid is better reported than multilateral aid in health sector, that is why our analysis uses only aggregate bilateral aid.

health and population sectors as health aid.

In our analysis, we focus only on health aid commitments as expressed in constant 2007 dollars rather than disbursements [4]. Moreover, a large part of the CRS database is composed of missing data in the health sector. This may indicate that a donor has not given any health aid in the given period, or that a donor has given health aid but it has not been reported, or that a country registered all health aid given to the recipient country at one time rather than annually reported over the time period. Therefore, these missing data are dropped from the analysis rather than considered as zero health aid. As is common in the foreign aid literature (Boone (1996) and Alesina and Dollar (2000)), our health aid variable is expressed as the average of health aid over the three years prior to the date when emigration occured.

The analysis of the level of medical brain drain and health development aid in recipient countries reveals many interesting figures (see Table 1).

- First, small countries (below 2.5 million people) are most affected by the medical brain drain. For example, in 2004, the average rate of medical brain drain in these countries was around 15%. One possible explanation is that the absorption capacity of these countries is quite limited by their geographic area, and the supply of physicians exceeds the local demand. Thus emigration has been seen as the way to get a job. Medical brain drain is a decreasing function of population level. Concerning health aid, small countries receive more health aid than large countries such as Boone (1996), Alesina and Dollar (2000) and Berthélémy (2003) have found. In our case, countries with small populations receive more than 50% of the total health aid distributed. Even if this distribution is strongly assymetric as compared with large countries, the health aid received by small countries shows a diminishing trend (-17.7% between 1995 and 2004). Around 20% of health aid is given to lower-middle populated countries (population between 2.5 and 10 million), whereas upper-middle countries (population between 10 and 25 million) received 25.4% of health aid. A rebalancing process seems to be taking place, as the amount of health aid received by upper-middle and large countries (over 25 million people) has almost doubled between 1995 and 2004.

[4] Disbursements are underreported as compared to commitments and thus do not provide enough data for an econometric analysis. In addition, their reporting began only in 2002.

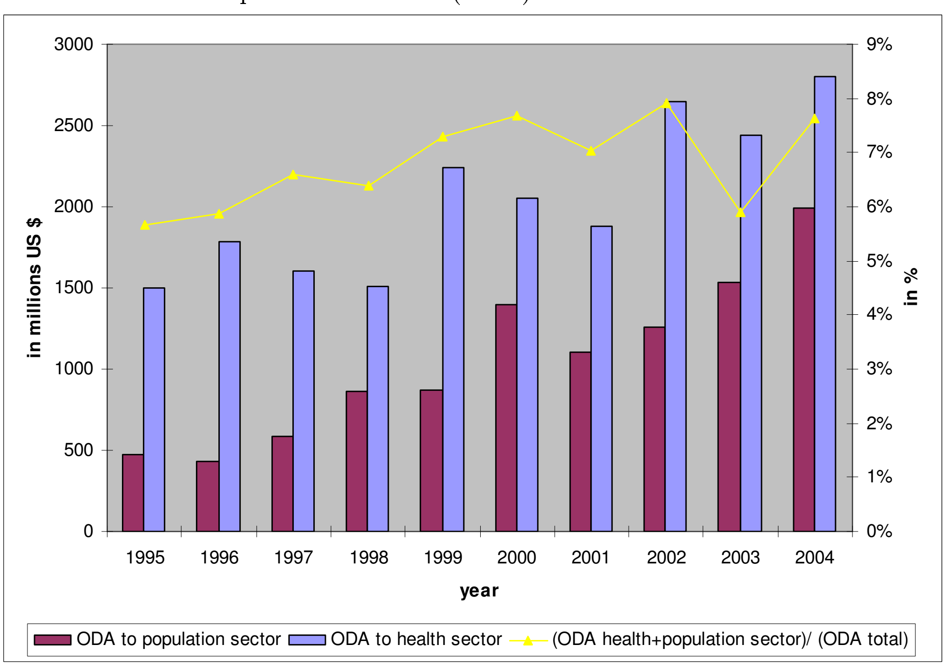
Table 1: Physicians Emigration Rate and Health aid Distribution accross Region Country Group

	1995 Physicians Emigration Rate in (%)	Number Physicians per 1000 people	Health Population ODA per capita constant $ 2007 (%)	2004 Physicians Emigration Rate in (%)	Number Physicians per 1000 people	Health Population ODA per capita constant $ 2007 (%)
Population Size						
small	12,0%	0,88	62,2%	15,1%	0,99	51,2%
lower middle	7,9%	1,50	23,8%	6,8%	1,61	18,9%
upper middle	5,9%	1,52	11,5%	6,5%	1,64	25,4%
large	2,3%	1,35	2,5%	2,5%	1,48	4,5%
Income group						
Low Income	6,2%	0,08	59,0%	7,2%	0,99	66,3%
lower middle income	2,1%	0,78	9,8%	1,6%	1,61	16,0%
upper middle income	3,1%	1,39	29,6%	3,7%	1,64	16,8%
high income	3,8%	1,82	1,7%	3,5%	1,48	1,0%
Geography						
East Asia and Pacific	1,1%	0,65	3,7%	0,9%	0,72	5,4%
Eastern Europe and Central Asia	0,7%	2,95	11,3%	1,7%	2,90	10,5%
Latin America and Carribean	2,4%	1,18	23,7%	4,1%	1,37	8,2%
Middle East and North Africa	5,5%	1,25	23,3%	6,4%	1,52	27,2%
OECD	3,9%	2,64		3,4%	2,94	
South Asia	8,5%	0,27	4,1%	8,4%	0,36	5,5%
Sub-Saharan Africa	16,8%	0,15	34,0%	19,0%	0,16	43,1%

Notes: Author Computations from Bhargava and Docquier (2007) and OCDE CRS database
High Income Countries that receive health aid in our dataset include Antigua and Barbuda, Bahrain, Barbados, Oman, Saudi Arabia, Trinidad and Tobago

- Second, low-income countries face a high emigration rate for health staff. This rate increased from 6.2% in 1995 to 7.2% in 2004. This phenomenom is quite worrisome because it is in this part of the world that the number of physicians per 1,000 people is the lowest at approximately one physician per 1,000 people. Sub-Saharan Africa is the most affected region in the world. For example, in 2004, the number of physicians for 1,000 people was 0.16, but the emigration rate of physicians was equal to 19%. World Health Organisation (2006) stipulates that number of physicians per 1,000 people must be equal to 2.5 to deliver a minimum level of skilled birth attendance and measles immunisation to the population. These huge outflows of health professionals from developing countries can alter the efficiency of the health provision system at the expense of the population, especially the poor rural population (Dussault and Franceschini (2006)). Health aid has the same distribution as the emigration of physicians. Low-income countries are the biggest recipients of health aid. In 2004, they received 66.3% of the total health aid committed. This is good mainly for Sub-Saharan Africa, which is relatively favoured as a recipient for health aid. What it is surprising is the presence of high-income countries among the recipient countries of health aid. These countries includes Carribean islands and Middle Eastern countries that are classified as high-income countries, either due to their low populations or due to the presence of oil resources, but they face many difficulties in their human development processes.

Figure 1: Official Development Assistance (ODA) distribution in health sector 1995-2004



Source: OCDE-CRS Databse

Figure 1 represents the evolution of total Official Development Assistance (ODA) commitment in the health sector. From 1995 to 2004, health aid accounted for a steadily increasing proportion of global ODA (from 6% to 8%) across all sectors (except in 2003). This increasing proportion can be explained by the adoption of the Millenium Development Goals in 2000, which induced donors to increase their amount of foreign aid, particularly the part devoted to education and health, in order to achieve the objectives related to poverty and epidemic reduction in the health sector by 2015. In term of the total volume, health aid increased from 2 billion dollars in 1995 to almost 5 billion dollars in 2004, which represents a huge increase of 150%. The distinction between aid devoted to the health sector and that devoted to the population sector reveals that population aid rose quickly as compared to health aid.

In 1995, aid devoted to the population sector represented one third of the amount of aid devoted to the health sector; in 2004 it attained the level of two thirds. This evolution can be explained by the huge explosion of HIV-AIDS epidemics during these years, particularly in Sub-Saharan Africa, where prevention campaigns and HIV treatments have been heavily financed.

In our study, other data is used as explanatory variables as controls. GDP per capita (PPP) is expressed in constant 2000 dollars. The HIV prevalence rate is expressed in the percentage of the affected population aged between 15-49 years old, and the net secondary school enrollment is expressed in percentages of population. These data are extracted from the 2008 World Development Indicators from the World bank. Data on our dependent variable for physician wages, expressed in terms of average wages in the United States, are provided by International Labour Organization (2005) (see also Freeman and Oostendorp (2000) regarding the Occupational Wage Around the World database (OWW). The corruption variable is extracted from the International Country Risk Guide (ICRG (2004)) database. The corruption index varies from 0 to 6 points, where higher points mean that the level of corruption is low, and lower points mean that corruption is high. This index measures all kinds of bribes related to exchanges control, trade licences, police protection, and favoritism that mixes politics with business. In an extended specification, we use the Law and Order index to measure the strength and impartiality of the judicial system as well as the observance of the law. As before, the higher is the index, the lower is the risk. Finally, trade openess is defined as the sum of exports and imports of goods and services as a share of GDP, and inflation is measured by the consumer price index, which reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services. These last two variables are also extracted from the 2008 World Development Indicators.

Given these facts, health aid and the medical emigration rate seem to be positively correlated, as health aid seems to be higher in the regions that are most affected by physician emigration rates. Nevertheless, these stylised facts must be interpreted with caution for several reasons.

- First, the correlation does not control for other factors such as population and development level. The correlation may be spurious if there is any factor that simultaneously influences emigration and aid in the health sector. For example, Bhargava and Docquier (2008) have underlined the role of HIV-AIDS in medical emigration but it could also affect health aid.
- Second, the apparent positive correlation provides no information on the causality between the variables of medical emigration and health aid. Is health aid influencing the distribution of physician emigration rates, or the reverse?

For this reason, the next section investigates this correlation using different econometric approaches to take these biases into account.

3 The Econometric Model

We analyse the effect of foreign aid in the health sector on the medical brain drain. We follow the specifications of Bhargava and Docquier (2008) by adding foreign health assistance. Our variable of interest, health aid, is the average flow of health aid received by countries over the last 3 years, whereas the dependant variable is the emigration rate of physicians calculated from the stock of physicians' outflows. In order to obtain a model in which the flows of physicians is explained by the flows of health assistance, we transformed the initial model of Bhargava and Docquier (2008) in order to obtain a dependent variable that measures variations in the emigration rate of physicians.

The equation of the model is as follows:

$$Ln(MBD_{it}/MBD_{it-1}) = \alpha_0 + \beta_1 Ln(MBD_{it-1}) + \beta_2 Ln(Physicians - wages/USA - ratio)_{it-1}$$
$$+ \beta_3 Ln(GDP - per - capita)_{it-1} + \beta_4 Ln(School - enrollment - secondary)_{it-1}$$
$$+ \beta_5 Ln(HIV - prevalence - rate)_{it-1} + \beta_6 ln(Aid_{i,t-1,t-3}) + u_{it}$$
(1)

Note that$(_i)$ is the country of origin, and $(_t)$ is the year.

$MBD_{i,t}$ is the emigration rate of physicians from home country (i) at time (t) and $MBD_{i,t-1}$ is the rate at time t-1. In our case, MBD_{it}/MBD_{it-1} expresses the growth of the physician emigration rate between t and t-1, but because we control the initial conditions $MBD_{i,t-1}$, on the right-hand side, the dependent variable captures the change between the rates from time t to t-1. The variable $MBD_{i,t-1}$ can be interpreted as a "catching-up" effect, which is widely used in economic growth models. In other word, the higher is the initial level of migration rate, the lower will be the migration growth rate. Two variables are defined as endogeneous in this model, namely, the initial level of medical brain drain $MBD_{i,t-1}$ and the health aid variable $Aid_{i,t-1_{t-3}}$. This latter variable is the average of aid flow from t-1 to t-3, as commonly used in the aid literature (see Boone (1996) and Alesina and Dollar (2000)).

In order to know whether health aid has different impacts depending on macroeconomic policy or institutional quality, we interact the health aid variable with an index that captures the economic environnement and instutional risk. Burnside and Dollar (1998) and Burnside and Dollar (2000) have established that a good policy environment with low inflation rates, high levels of openness and low governement deficits [5] (or high surplus) is a necessary condition for the effectiveness of aid. In Table 4, we check if this result is valid for health aid. Dollar and Svensson (2000) have shown that the success or failure of structural adjustement programs is strongly related to the quality of institutions involved in a country. We follow these papers by interacting our variable of interest with policy variables (i.e., corruption, law, trade openess and inflation) [6].

The model with the interaction term is similar to the previous one:

$$Ln(MBD_{it}/MBD_{it-1}) = \alpha_0 + \beta_1 Ln(MBD_{it-1}) + \beta_2 Ln(Physicians - wages/USA - ratio)_{it-1}$$
$$+ \beta_3 Ln(GDP - per - capita)_{it-1} + \beta_4 Ln(School - enrollment - secondary)_{it-1}$$
$$+ \beta_5 Ln(HIV - prevalence - rate)_{it-1} + \beta_6 Ln(Aid_{i,t-1,t-3})$$
$$+ \beta_7 Ln(Policy)_{it-1} + \beta_8 [Ln(Aid_{i,t-1,t-3}) * Ln(Policy)_{it-1}] + u_{it} \quad (2)$$

[5] This variable is not adequately reported in WDI 2008, which prevents GMM estimation.
[6] Because of insufficient data on the surplus and deficit variable, we cannot estimate this interaction empirically.

Note that $Ln(Policy)_{it-1}$ represents respectively the level of corruption, the rule of law, the degree of openess and the inflation rate [7]. The corruption index is scaled between 0 and 6. Note that transforming it into logarithmic form would drop the data for which the index is 0. We therefore take the logarithm of (1 + variable) to preserve the same distribution. We have done the same thing for the law and order index [8]. In Equation 2, the interaction term is assumed to be endogenous, as are the initial values of the medical brain drain and the health aid variable.

All variables in all specifications are expressed in logarithmic form and interpreted as elasticities [9].

The error term $u_{i,t}$ in both equations can be decomposed as follows:

$$u_{it} = \delta_i + \eta_t + \nu_{it} \tag{3}$$

Note that δ_i represents the country-specific fixed effect (i) common to all years (t), η_t corresponds to the time-specific fixed effect (t) common to all countries (i), and ν_{it} is the error term, which is assumed to be log-normally distributed.

4 The Econometric Framework

Our study begins with a fixed-effect analysis in which we control for country-specific fixed effects and time dummies . This technique has the advantage that it can control for unobservable characteristics specific to countries that are not included in the estimation. It reduces the potential bias of ommited variables, which are commonly one of many sources of endogeneity problems. Nevertheless, a fixed-effect analysis in the presence of dynamic panels could lead to biased estimation (Nickell (1981)). Arellano and Bond (1991) developed a generalised method of moment in difference, which consists of tranforming the model into the first difference equation and correcting the endogeneous variables by their lagged values. For example, consider the following equation:

$$\begin{aligned} Y_{it} &= \beta_1 Y_{it-1} + \beta_2 X_{it} + u_{it} \\ u_{it} &= \delta_i + \nu_{it} \end{aligned} \tag{4}$$

[7] Because inflation is the growth from t-1 to t, we keep the variable as it is, whereas all other policy variables are lagged by one period because of stocks.

[8] We initially incorporated the population into the estimation; however, it is always insignificant in our estimation, and so we dropped this variable from our model.

[9] We remove the effect of outliers from all estimations by employing the "‘hadimvo"’ process at 5 percent.

Note that Y_{it} is the dependent variable, Y_{it-1} is its lag, X_{it} is the exogeneous variable (possibly including its lagged value), and u_{it} is the error term for the fixed effect δ_i.

Then, the GMM difference transforms this equation by the first difference:

$$Y_{it} - Y_{it-1} = \beta_1[Y_{it-1} - Y_{it-2}] + \beta_2[X_{it} - X_{it-1}] + [u_{it} - u_{it-1}] \tag{5}$$

In the previous equation, the instrument used in this equation was Y_{it-2} because it is correlated with the difference in the dependent variable but not with the difference in the error term. If we replicate the difference over each time period, we obtain the following orthogonality conditions:

$$\begin{aligned} E[Y_{it-l}.(\Delta U_{it})] = 0 \\ \text{-for-}t = 2, ..., T \\ \text{and-}l = 2, ..., t \\ E[(\Delta X_{it}) * (\Delta U_{it})] = 0 \end{aligned} \tag{6}$$

Bond et al. (2001) have noted the problem of weak instruments associated with this method, which led Blundell and R.Bond (1998) and Arellano and Bover (1995) to develop an updated method called the system GMM. It consists of an estimation of the same first-differencing equation presented above and an added level equation in which the instruments are the first differences in the lagged variables. The orthogonality conditions, thus, become

$$E[\Delta Y_{it-1} * (U_{it})] = 0\text{-for-}t = 2, ..., T \tag{7}$$

The validity of the instruments and moment conditions is tested using the Hansen J test and the AR(1) and AR(2) conditions. However, Roodman (2007) underlines the problem of having too many instruments in the GMM estimation. He demonstrates that even if the instruments are individually valid, they can be invalid collectively so that the overidentifying Hansen J Test is insufficient to check the instrument's robusteness. One of solutions is to limit the number of instruments in the analysis such that the number of groups always exceeds the number of instruments. In our paper, we have used the system GMM and controlled for the number of instruments involved in our analysis.

In our system of GMM estimation, we used lags over three years for our endogeneous variable ($MBD_{i,t-1}$ and $Aid_{i,t-1_{t-3}}$) and the exogeneity of other variables as the instruments. We use only lags over two years or one year when we entered the interaction term into the estimation so as to avoid introducing too many instruments.

Finally, the system GMM permits us to resolve the problem of endogenity for health aid without using strictly external instruments, which are hard to find in our case.

5 Empirical Results

In this section, the results obtained through fixed-effect estimation are presented in Table 2, followed by the results based on GMM estimation in Table 3 in order to address endogeneity problem. The impact of health aid could be different according to institutional quality and macroeconomic policy, and so Table 4 presents regression with interaction terms.

5.1 Estimation without interaction terms

Table 2 presents the panel fixed-effect estimation of physician emigration rates (column 1); we then add the health aid variable (column 2). In columns 3 and 4, the level of corruption is added as well as the inflation rate. Then, Table 3 presents the GMM estimation with the same structure.

The initial emigration rate of physicians is robust accross estimations, regardless of the method adopted. This coefficient is, as expected, significant and negative. This variable can be interpreted as a convergence to country specific stationnary equilibrium. The lower the initial emigration rate is, the higher is the growth of the physician rate in the next year. This means that the emigration rate approaches a long-term equilibrium, and the coefficient associated with these variable permits us to calculate the long-term effect of all other explanatory variables. In the first column of Table 3, the initial level of the emigration rate in the health sector, which is endogeneous, is negative but insignificant. In this column, we use the lags over five periods as internal instruments. However, when we introduce health aid as endogeneous in column 2, the convergence become significantly negative at the 10% level with a value of -0.076. It confirms the previous result obtained with fixed-effect estimation that there is really a convergence to country specific stationnary equilibrium between initial emigration rate and growth.

The wage of physicians expressed in terms of the US physician wage is negative and significant at 10%. In other words, a doubling of salaries leads to a 2.3% reduction in the emigration of physicians. Bhargava and Docquier (2008) have found similar results, with an elasticity close to -0.036. This result supports the argument of Harris and Todaro (1970). They stipulate that migration is driven by the differential between origin wage and the expected destination wage. This framework applies to physician migration decisions. More specifically, Astor et al. (2005) developed a questionnaire in which they asked questions about the motivation behind migration decisions for medical doctors. Their analysis is foccused on 5 countries, namely, India, Nigeria, Pakistan, Colombia and the Philippines. Overall, 90.8% of physicians are motivated by the desire for a higher income. Surprisingly, the robustness of this variable is not very high in the GMM estimation (Table 3). This result supports the observation expressed in Vujicic et al. (2004). In fact, they discussed the role of wages in two African countries, namely, Ghana and South Africa. They observed that the wage premium (i.e., the ratio of the destination wage to the origin wage) is about 22 between Ghana and the US but is only 4 for South Africa. They expected that medical worker emigration would be much lower in South Africa than in Ghana. Surprisingly, the percentage of health care professionals who intend to migrate is quite similar (62% in Ghana and 58% in South Africa). Vujicic et al. (2004) conclude that the correlation between the supply of health care workers and the wage ratio is quite small. Thus, policies that consist of increasing the source wage will not reduce the huge wage differential enough to weaken the emigration rate of health professionals.

The GDP per capita in the origin countries has a significant and negative impact on the physician emigration rates. So migration is important in poor regions, typically Sub-Saharan Africa, as we have seen in the descriptive statistics. When the GDP per capita is low, physicians have more incentives to migrate. In the poorest countries, few people have the ability to migrate, both because the cost of migration is too high as well as due to liquidity constraints. However, physicians are an upper socio-professional occupation in developing countries both financially and educationally, and they can easily sustain the migration cost. Moreover, in high-income countries, the working conditions are quite good, for example, because of the presence of sufficient medical drugs, equipment and high quality infrastructure, which discourage physicians from migrating. In the survey from Astor et al. (2005), 74.1% of the respondents wanted access to better techonology and equipment through migration.

The percentage of enrollment in secondary school is positive and significant only at the 10% level. In the context of higher education levels, physicians have more perspective to acquire medical training and education at home or abroad. Nevertheless, in the other GMM estimations in Table 3, its significance level disappears.

Bhargava and Docquier (2008) have shown an impact of HIV prevalence rates on the decision of physicians to migrate. This effect is confirmed in our analysis, in which this variable appears with a robust positive and significant sign. In fact, a high HIV prevalence rate deteriorates the safety of care and creates a high transmission risk for medical staff. Thus, the medical workforce has an additional incentive to migrate. However, the coefficient of the variable differs from that found in Bhargava and Docquier (2008) at 0.08 in that study as compared to 0.024 in our case. This difference can be explained by the dependent variable, which differs between our study and theirs. Here, we explain the change in emigration rates between t and t-1, which has a significant effect on the interpretation of our variable and the size of the coefficient. Moreover, our estimation method is very different from theirs. Here, we consider fixed-effect and GMM estimations, whereas Bhargava and Docquier (2008) used a maximum likelihood estimation with random effects. Finally, their analysis focuses only on Sub-Saharan African countries, whereas our analysis is based on a worldwide dataset. In our case, a doubling of HIV prevalence rate in the short term leads to an increase in the emigration rate between t and t-1 of 2.4%. For long-term equilibria, this effect is close to 50%. In Vujicic et al. (2004), the same emigration rate in South Africa and Ghana would be explained by the high proportion of HIV-infected people. For them, better policies are those that improve the working and living conditions in the developing source countries.

Finally, foreign health aid is introduced in column 2 and appears with a significant positive sign. In other word, a country that is receiving more health aid from donors will see its emigration rate of doctors become more important. This interpretation supports the analysis of Chauvet et al. (2008) which explains the positive correlation between health aid and the physicians emigration rate by the significant proportion of grants given to physicians for specialised training in OECD countries. This type of aid improves the mobility of migrants, particularly physicians. It can change the expectation of physicians at the end of their training, which creates incentives for them to stay in the destination country after their diploma and accelerates the emigration of health workers in the short term. Berthélémy et al. (2008) have found a positive correlation between migration and aid using a bilateral analysis. Foreign aid provides information through development assistance about the labour market integration in host countries and increases the potential wages in origin countries, which can be seen as an additional factor enabling doctors to obtain the cost of migration. This positive effect have to be interpreted with cautious because, with fixed effect estimation, nothing is done to control for endogeneity bias. In column 3 of Table 2, we added the level of corruption; the health aid effect remains positive and significant. In column 4, the inflation rate is introduced at a non-significant level, but health aid loses its significance. Nevertheless, the P-value is close to 10% at approximately 0.101.

Even though the fixed-effect estimation controls for possible misspecifications caused by unobservable factors, it does not control for Nickell's bias (Nickell (1981)) and endogeneity problem in dynamic panels. Endogeneity problem results biased coefficients associated to health aid if reverse causality occurs[10]. In our case, without controlling for endogeneity bias in fixed-effect estimation, the coefficient associated to health aid could be interpreted as the impact of aid on migration in health sector but it could also be the effect of migration on aid in health sector. Indeed, the health-related foreign aid distribution could be influenced by the outflows of physicians in recipient countries. This is what happened when humanitarian crisis is observed in developing countries. Since the causality in our study is very important for interpretation, we have to correct endogeneity bias either by finding new robust instruments or by using GMM system strategy. In our analysis, GMM estimation has been preferred.

With GMM system estimation, the coefficient of health aid is negative and significant, which means that health aid effectively reduces the growth of physician emigrations rather than motivates it. This conclusion is validated by the Hansen J test for the exogeneity of instruments. If we do not control for endogeneity bias, health aid seems to increase the amount of migration, whereas it reduces it when we take this problem into account. Moreover, the GMM estimation is better than fixed-effect estimation, because it also controls for the Nickell bias, since health aid and initial emigration rates are considered as endogeneous, which is our case. The short-term elasticity devoted to health aid is -0.032. An increase of 10% in health aid is associated with a reduction in emigration of around 0.32%. Typically, in the short term, the direct impact of health assistance lies in activities that have an immediate effect such as the furnishing of medical tools or drugs. But in the long term, after the realisation of health infrastructures such as hospitals and clinics, the impact of health assistance can be more important. Known as the convergence estimator, the long-term effect of health aid can be computed at about 0.42. In other words, a doubling of health aid leads to a reduction in the growth of the physician emigration rate of 42% in the long term. All these improvements in working conditions through the financing of medical tools, equipment, or expertise for basic health care are captured by health aid and can be viewed as a good tool for containing the medical brain drain. In columns 3 and 4, the level of corruption and the inflation rate are introduced; they are not significant, but health aid remains significant and negative.

5.2 Estimation with interaction terms

Debates in the literature on foreign aid have foccused on the impact of foreign aid on GDP growth. In the eighties, Mosley et al. (1987) pointed out the ineffectiveness of foreign aid in developing recipient

[10] The potential ommited variable is less problematic in our case because we are in panel estimation which permits to control for fixed country characteristics

countries, concerning the release of the poverty trap and not providing sufficient incentives for the growth process. Foreign aid is also ineffective at increasing investment and improving human development indicators (Boone (1996)). During the nineties, the amount of foreign aid remained constant because of these pessimistic academic results as well as due to new restrictions in budgets and deficits, as European countries were moving towards the adoption of a common currency. Around 2000, many papers found that foreign aid could have a real impact on growth depending on the macroeconomic policies adopted (Burnside and Dollar (2000), Dollar and Easterly (1999)) and the quality of institutions involved in recipient countries (Dollar and Svensson (2000)). Even if the results are debatable, the policy implications of these studies have had a large impact on the distribution of foreign aid. More specifically, in the health sector, Burnside and Dollar (1998) has examined the impact of foreign aid on the child mortality rate. They show that foreign aid reduces mortality rates only in good policy environments. Foreign aid has a negative effect on mortality rates in the presence of low corruption, high property rights, openned trading regimes and macroeconomic stability.

In this section, we try to follow this trend in the literature to explore under which conditions foreign aid devoted to the health sector has more impact on the growth of physician emigration rates.

Table 4 presents GMM estimations with interaction terms for institutional quality and economic performance. In column 1, corruption is introduced and interacted with our health aid variable. The health aid variable loses its significance, while the interaction term with corruption gains significance, although with a higher elasticity. In other words, health aid should be more effective at reducing medical emigration in countries in which the level of corruption is low. This confirms the findings in the literature that indicate that foreign aid is more effective in the presence of a good environment. The coefficient of interaction is higher at -0.09 than the coefficient expressed for health aid only at -0.052. The corruption level has a positive sign, meaning that in regions in which the level of corruption is high, the emigration rates of physicians are low. One of the explanations is that in corrupt countries, it is more difficult to obtain the necessary administrative papers or visas to move.

In columns 2 and 3, we investigate whether health aid is more effective in countries with a strong respect for the rule of law and more openness. This is not the case, and because of the multicolinearity between the health aid variable and its interaction term, the health aid variable itself becomes insignificant.

Finally, in column 4, we tested the same specification but with inflation growth rate. We found evidence that the interaction with health aid and inflation is significantly negative. Nevertheless, the elasticity associated with the inflation interaction (-0.018) is below the coefficient previously associated with health aid (-0.032) and much lower than the interaction with corruption (-0.089). If we compute the long-term effect, it is around 32%, as compared to 42% for the coefficient of health aid without interaction. Thus, we can attribute this fall in aid effectiveness to the presence of high inflation. The evident colinearity between health aid and interaction with inflation causes the coefficient of health aid itself to become unsignificant. Notice that inflation itself becomes positive and significant, meaning that in regions in which the inflation rate increase, the migration decisions of physicians also increase. This analysis confirms that foreign aid in the medical sector should permit a substantial improvement in working conditions and should improve the labour environment of doctors in the long term, primarily in regions in which the levels of corruption and inflation are quite low.

6 Conclusions

The importance of the professional medical staff, in particular physicians, in achieving the Millenium Development Goals in health outcomes is well established. Today, most low-income developing countries suffer from large deficits in the number of professional health workers. The Joint Learning Initiative (JLI), which is a network of global health leaders, have established that a country with less than 2.5 health workers per 1000 people fails to achieve the 80% benchmarks for measles immunisation and for skilled birth attendance (World Health Organisation (2006)). The policy implications for the control of migration and aid flows as well as the linkage between them are very complex and not easy to implement (OCDE (2007)), even in the health sector.

Our analysis tries to investigate the link between foreign aid and migration in the health sector. The health system requires both infrastructure and human resources such as doctors, nurses and others specialists. Health ODA undeniably increases the health capital and infrastructure, it is not clear how aid affects human capital in the health sector. Our study seems to show that foreign health assistance is a good tool for restraining doctor emigration through, probably, the improvement of working conditions. Note that the magnitude of health elasticity is quite high in the long term. So increasing health-related ODA by a small amount could substancially improve the retention of medical health professionals. Health aid can play a major role in these improvements if the amount is regularly distributed. Reducing health aid would be disastrous for the advancement already accomplished during the past several years and for the future achievement of the Millenium Development Goals adopted in 2000 for the health sector. Moreover, the effectiveness of health aid seems to be higher in regions in which the levels of corruption and inflation are quite low. The good governance that is necessary for aid seems to have a powerful effect on the reduction of emigration in the health sector. It would thus be a useful policy to require good government as a precondition for aid.

These findings confirm the efficiency of foreign health aid to weaken the vicious circle of brain drain among physicians when governance is well run.

References

Alesina, A. and D. Dollar (2000). Who gives foreign aid to whom and why? *Journal of Economic Growth* (5), 33–63. 6, 11

Arellano, M. and S. Bond (1991). Some tests of specification for panel data: Monte carlo evidence and an application to employment equations. *Review of Economic Studies 58*(2), 277–97. 12

Arellano, M. and O. Bover (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics 68*(1), 29–51. 13

Astor, A., T. Akhtar, M. A. Matallana, V. Muthuswamy, F. A. Oluwu, V. Tallo, and R. K. Lie (2005). Physician migration: Views from professionals in columbia, nigeria, india, pakistan, and the phillipines. *Social Science and Medecine 61*, 2492–2500. 2, 3, 15

Berthélémy, J. C. (2003). Bilateral donor's aid allocation decisions: A three-dimensional panel analysis. *International Review of Economics and Finance 13*(3), 253–274. 6

Berthélémy, J. C., M. Maurel, and M. Beuran (2008). Aid and migration: Complements or substitutes? 4, 16

Bhargava, A. and F. Docquier (2007). A new panel data set on physicians' emigration rates (1991-2004). *preliminary version*. 5, 7

Bhargava, A. and F. Docquier (2008). Hiv pandemic, medical brain drain, and economic development in sub-saharan africa. *World Bank Economic Review 22*, 345–366. 3, 4, 10, 14, 15, 16

Bhargava, A., D. T. Jamison, L. J. Law, and C. J. Murray (2001). Modeling the effect of health on economic growth. *Journal of Health Economics 20*, 423–440. 3

Blundell, R. and S. R.Bond (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics* (87), 115–143. 13

Bond, S. R., A. Hoeffler, and J. Temple (2001). Gmm estimation of empirical growth models. CEPR Discussion Papers 3048, C.E.P.R. Discussion Papers. 13

Boone, P. (1996). Politics and the effectiveness of foreign aid. *European Economic Review* (40), 289–329. 6, 11, 18

Burnside, C. and D. Dollar (1998, June). Aid, the incentive regime, and poverty reduction. (1937). 11, 18

Burnside, C. and D. Dollar (2000). Aid, policies and growth. *American Economic Review 90*(4), 847–868. 4, 11, 18

Chauvet, L., F. Gubert, and S. Mesple-Somps (2008). Are remittances more effective than aid to improve child health? *Paper prepared for ABCDE Conference*, 1–33. 16

Clemens, M. (2007). Do visas kills? health effects of african health professional emigration. *Center for Global Development* (114). 3

Clemens, M. and G. Petterson (2008). New data on african health professionals abroad. *Human Ressources for Health 6*(1). 3

Cooper, R. A. (2004). Weighing the evidence for expanding physician supply. *Annals of Internal Medicine 141*(9). 3

Docquier, F., O. Lohest, and A. Marfouk (2007). Brain drain in developing countries. *World Bank Economic Review 21*, 193–218. 2

Docquier, F., B. L. Lowell, and A. Marfouk (2008). A gendered assessment of the brain drain. Policy Research Working Paper Series 4613, The World Bank. 2

Dollar, D. and W. Easterly (1999). The search for the key: Aid, investment and policies in africa. *Journal of African Economies 8*(4), 546–77. 18

Dollar, D. and J. Svensson (2000). What explains the success of failure of structural adjustement programmes? *The Economic Journal 110*(466), 894–917. 4, 11, 18

Dussault, G. and M. C. Franceschini (2006). Not enough there, too many here: understanding geographical imbalances in the distribution of th health workforce. *Human Ressources for Health*. 4, 8

Forcier, M. B., S. Simoens, and A. Giuffrida (2004). Impact, regulation and health policy implications of physician migration in oecd countries. *Human Ressources for Health*. 2

Freeman, R. and R. Oostendorp (2000). Wages around the world: Pay across occupations and countries. *NBER* (8058). 9

Gaytan-Fregoso, H. and S. Lahiri (2000). Foreign aid and illegal immigration. *Journal of Development Economics 63*, 515–527. 4

Hagopian, A., M. J. Thompson, M. Fordyce, K. E. Johnson, and L. Hart (2004). The migration of physicians from sub-saharan africa to the united states of america: measures of the african brain drain. *Human Ressources for Health 2*(17). 2

Harris, J. and M. Todaro (1970). Migration, unemployment development: A two-sector analysis. *American Economic Review 60*(1), 126–142. 14

ICRG (2004). A business guide to political risk for international decisions. *Mimeo*. 9

International Labour Organization (2005). Laborsta internet: Occupational wages and hours work. Technical report. 9

Mosley, P., J. Hudson, and S. Horrell (1987). Aid, the public sector and the market in less developed countries. *Economic Journal 97*(387), 616–41. 17

Nickell, S. J. (1981). Biases in dynamic models with fixed effects. *Econometrica 49*(6), 1417–26. 12, 17

OCDE (2007). La cohérence des politiques au service du développement, migrations et pays en développement. *Rapport de l'OCDE, Perspective du Centre de Développement*. 19

OECD (2008a). Démographie du personel de santé: tour d'horizon. *Les personnels de santé dans les pays de l'OCDE, comment résoudre la crise imminente?*, 13–22. 2, 3

OECD (2008b). Mobilité internationale des personnels de santé : Interdépendance et défis d'ordre éthique. *Les personnels de santé dans les pays de l'OCDE, comment résoudre la crise imminente?*, 61–87. 3

Roodman, D. (2007). Too many instruments. Working Papers 125, Center for Global Development. 13

Schiff, M. (1994). How trade, aid, and remittances affect international migration. *World Bank Policy Research* (1376). 4

United Nations (2001). World population prospects, the 2000 revision. *Document de Travail*. 2

United Nations (2008). The millenium development goals report 2008. pp. 1–56. 3

Vujicic, M., P. Zurn, K. Diallo, O. Adams, and M. R. D. Poz (2004). The role of wages in the migration of health care professionals from developing countries. *Human Ressources for Health*. 15, 16

World Health Organisation (2006). World health report:working together for health. Technical report. 3, 8, 19

Table 2: Panel Fixed Effect Estimations for Medical emigration growth rate

	(1) Fixed effect	(2) Fixed effect	(3) Fixed effect	(4) Fixed effect
$Ln(MBD_{it-1})$	-0.056**	-0.162***	-0.135***	-0.240***
	(0.026)	(0.044)	(0.043)	(0.057)
$Ln(Physicians-wages/USA-ratio)_{it-1}$	-0.023*	-0.097**	-0.059	-0.088**
	(0.013)	(0.041)	(0.041)	(0.045)
$Ln(GDP-per-capita)_{it-1}$	-0.088**	0.036	-0.026	0.016
	(0.038)	(0.075)	(0.085)	(0.105)
$Ln(School-enrollment-secondary)_{it-1}$	0.048*	-0.010	0.010	-0.041
	(0.025)	(0.053)	(0.043)	(0.059)
$Ln(HIV-prevalence-rate)_{it-1}$	0.024*	0.010	0.008	-0.008
	(0.013)	(0.031)	(0.033)	(0.036)
$Ln(Aid_{i,t-1t-3})$		0.016*	0.021**	0.016(*)
		(0.009)	(0.009)	(0.010)
$Ln(Low-Corruption)_{it-1}$			0.014	
			(0.036)	
$Ln(Inflation)_{it,t-1}$				-0.008
				(0.006)
Country Fixed effect	YES	YES	YES	YES
Time fixed effect	YES	YES	YES	YES
Constant	0.360	-1.531***	-0.150	-1.800**
	(0.416)	(0.572)	(0.796)	(0.740)
Number of group	85	60	47	55
Observations	897	368	293	305
R-squared	0.27	0.48	0.54	0.57

Notes:(i.)Robust standard errors in parentheses.
(ii.)(*) closed to significant at 10% * significant at 10%; ** significant at 5%; *** significant at 1%.
In all estimation the dependant variable is $Ln(MBD_{it}/MBD_{it-1})$.

Table 3: System GMM Estimation for Medical emigration growth rate

	(1) System GMM	(2) System GMM	(3) System GMM	(4) System GMM
$Ln(MBD_{it-1})$	-0.043	-0.076*	-0.070**	-0.058
	(0.032)	(0.039)	(0.031)	(0.038)
$Ln(Physicians-wages/USA-ratio)_{it-1}$	0.011	0.028	0.013	0.021
	(0.010)	(0.017)	(0.018)	(0.018)
$Ln(GDP-per-capita)_{it-1}$	-0.0293***	-0.051*	-0.077**	-0.070**
	(0.010)	(0.026)	(0.030)	(0.028)
$Ln(School-enrollment-secondary)_{it-1}$	0.046***	0.050	0.046	0.056*
	(0.016)	(0.035)	(0.038)	(0.032)
$Ln(HIV-prevalence-rate)_{it-1}$	0.021***	0.037**	0.035**	0.027*
	(0.007)	(0.017)	(0.017)	(0.014)
$Ln(Aid_{i,t-1t-3})$		-0.032*	-0.052**	-0.044***
		(0.018)	(0.021)	(0.014)
$Ln(Low-Corruption)_{it-1}$			0.075	
			(0.069)	
$Ln(Inflation)_{it,t-1}$				0.001
				(0.008)
Constant	0.059	0.218	0.391	0.426**
	(0.084)	(0.216)	(0.309)	(0.188)
Country Fixed effect	YES	YES	YES	YES
Time Fixed effect	YES	YES	YES	YES
AR(1) Test	0,000	0,006	0,016	0,012
AR(2) Test	0.471	0,818	0,127	0,692
Hansen J Test	0.308	0,605	0,492	0,233
Number of instruments	79	57	48	48
Number of groups	85	60	47	55
Observations	897	368	293	305

Notes:(i.)Robust standard errors in parentheses.
(ii.)* significant at 10%; ** significant at 5%; *** significant at 1%.
In all estimation the dependant variable is $Ln(MBD_{it}/MBD_{it-1})$.

Table 4: System GMM Estimation with Macroeconomic Policy and Institution Quality Interaction Terms for Medical emigration growth rate

	(1) System GMM	(2) System GMM	(3) System GMM	(4) System GMM
$Ln(MBD_{it-1})$	-0.040*	-0.103**	-0.042*	-0.056*
	(0.021)	(0.048)	(0.024)	(0.031)
$Ln(Physicians-wages/USA-ratio)_{it-1}$	0.002	0.038	0.019*	0.022
	(0.011)	(0.023)	(0.011)	(0.017)
$Ln(GDP-per-capita)_{it-1}$	-0.046**	-0.055*	-0.050***	-0.075***
	(0.018)	(0.030)	(0.017)	(0.024)
$Ln(School-enrollment-secondary)_{it-1}$	0.034	0.063	0.045*	0.065**
	(0.025)	(0.043)	(0.024)	(0.027)
$Ln(HIV-prevalence-rate)_{it-1}$	0.024**	0.046**	0.022*	0.031**
	(0.010)	(0.020)	(0.011)	(0.012)
$Ln(Aid_{i,t-1t-3})$	0.087	-0.005	-0.061	-0.012
	(0.064)	(0.040)	(0.095)	(0.019)
$Ln(Low-Corruption)_{it-1}$	0.313**			
	(0.142)			
$Ln(Low-Corruption)_{it-1} * Ln(Aid_{i,t-1t-3})$	-0.089*			
	(0.052)			
$Ln(Law-and-Order)_{it-1}$		0.014		
		(0.053)		
$Ln(Law-and-Order)_{it-1} * Ln(Aid_{i,t-1t-3})$		-0.013		
		(0.022)		
$Ln(Trade-Openess)_{it-1}$			-0.040	
			(0.067)	
$Ln(Trade-Openess)_{it-1} * Ln(Aid_{i,t-1t-3})$			0.011	
			(0.022)	
$Ln(Inflation)_{it,t-1}$				0.051**
				(0.022)
$Ln(Inflation)_{it,t-1} * Ln(Aid_{i,t-1t-3})$				-0.018**
				(0.007)
Constant	-0.136	0.114	0.427	0.350*
	(0.268)	(0.279)	(0.297)	(0.194)
Country Fixed Effect	YES	YES	YES	YES
Time Fixed Effect	YES	YES	YES	YES
AR(1) Test	0,010	0.007	0.005	0,008
AR(2) Test	0,203	0.155	0.922	0,894
Hansen J test	0,484	0.358	0.461	0,322
Number of instruments	49	49	49	49
Number of group(code)	47	60	59	55
Observations	293	343	350	305

Notes:(i.)Robust standard errors in parentheses.
(ii.)* significant at 10%; ** significant at 5%; *** significant at 1%.
In all estimation the dependant variable is $Ln(MBD_{it}/MBD_{it-1})$.