The Journal of Private Enterprise 29(3), 2014, 97–117

Can Economic Freedom Cure Medical Brain Drain?

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Abstract
As a loss of human capital, brain drain is often viewed as a threat to economic development. Medical brain drain is perhaps especially damaging because it exerts both immediate and long-term effects. This paper estimates the determinants of brain drain using flows of medical physicians from 144 countries into 18 mostly developed countries during the 1995–2004 period. Controlling for various socioeconomic and geographic variables, we find that higher economic freedom, a lower share of public health expenditures, and higher health spending per capita tend to attract medical professionals. Our estimates indicate that medical brain drain is responsive to annual changes in economic freedom, health spending per capita, and population aging.

JEL codes: F22, J44, J61
Keywords: economic development, human capital, medical brain drain, physician migration

I. Introduction

Brain drain, a loss of human capital due to the emigration of skilled labor, has received a great deal of attention from scholars and policymakers for a very good reason. Inadequate domestic supply of skilled labor can impede the economic development of a country. Most research so far has focused on the overall level of brain drain. However, Bhargava and Docquier (2007) claim that studying the overall brain drain hides substantial heterogeneity across industry sectors from country to country, citing as examples the emigration of nurses from the Philippines and information technology professionals from India. Mensah (2008) argues that extra attention should be paid to the loss of medical professionals because of their disproportional effects on economic development: the loss of just one trained physician can leave an entire village without access to healthcare in many developing countries. Badwe, Giri, and Latti (2012) argue that medical brain drain is especially harmful for economic development given the strong connection between health and economic growth. While scientific brain drain can slow long-term growth, medical brain drain can lower economic and health outcomes in both the short and long term.

This study analyzes the determinants of medical brain drain using medical physician flows from 144 origin (sending) to 18 destination (receiving) countries over the 1995–2004 period. The key variables of interest in this study are the factors that ought to be pertinent to medical professionals: economic freedom, public share of health spending, and health spending per capita. It could be argued that freer and more private healthcare systems may offer migrating physicians better-paying jobs and benefits compared with more government-controlled healthcare systems. A case study by Phua and Barraclough (2011) finds that a reform of Malaysia's healthcare system has led to a drain of specialized doctors from the public to the private sector. Our findings are generally consistent with this logic and indicate that physician flows are sensitive to changes in economic freedom and health spending per capita, among other factors.

II. Literature Review

MacPhee and Hassan (1990) define brain drain as an outmigration of skilled workers from developing to developed countries. However, Docquier, Lohest, and Marfouk (2007) and Beine, Docquier, and Rapoport (2008) argue for altering the brain drain definition to include the loss of skilled labor from any country, developed or not. More recent papers have moved the focus toward analyzing migrant flows, as opposed to migrant stocks as in older studies, in a gravity-type model (Ashby 2007, 2010; Gubert and Nordman 2009). Gravity models explain bilateral flows between origin and destination countries based on the "distance" between country characteristics. Some gravity models take into account both "push" characteristics of the origin country and "pull" characteristics of the destination country. Push and pull factors may sometimes overlap and include inadequate compensation, poor working conditions, lack of career opportunities, safer environment, political stability, and increased career security (Omaswa 2008; Rutten 2009).

Based on Tiebout's (1956) seminal paper, it could be argued that the same "voting with your feet" logic applies to international migration flows, albeit with more restrictions and higher moving costs. Ashby (2007) asserts that the decision to emigrate is consistent with the utility maximization framework because preferences are manifested through revealed actions such as the decision to emigrate. He argues that individuals will choose to emigrate if their perceived utility from doing so is higher than the perceived utility of not emigrating. Similarly, Douglas (1997) contends that cross-migration rates are indicative of the relative attractiveness of different locations. He argues that idiosyncratic characteristics will cancel themselves out, but the destination attributes, like higher income levels that attract migrants, will be reflected in the migration patterns.

Grubel and Scott (1966), Johnson (1967), Bhagwati and Hamada (1974), and Kwok and Leland (1982) argue that skilled worker emigration is detrimental to the origin country based on the notion that migrants' contributions to the destination economy are greater than their marginal product. Beine, Docquier, and Rapoport (2001) arrive at a similar conclusion, noting that skilled workers possess valuable human capital, which is a significant contributor to long-term economic growth. Docquier and Marfouk (2005) note that skilled worker migration is increasing in importance as the world becomes more integrated.

MacPhee and Hassan (1990) claim that dynamic labor market shortages are responsible for some brain drain experienced by developing countries. Like Sen (1973), they conclude that income may not be a significant determinant of brain drain once other factors have been taken into account. Contrary to MacPhee and Hassan (1990), Gani and Ward's (1995) study of skilled labor migration from Fiji to New Zealand finds that income and various economic incentives are significant determinants of brain drain.

Docquier, Lohest, and Marfouk (2007) and Beine, Docquier, and Rapoport (2008) analyze migration flows between countries during the 1990–2000 period and find that country size, religious fractionalization, political instability, geographic proximity to major OECD countries, and colonial links are among the significant determinants of overall brain drain.

Bhargava and Docquier (2007) recommend that future studies focus on industry-level brain drain because the overall level of brain drain hides dramatic heterogeneity that exists across various industries. In other words, one country may need to focus on curbing scientific brain drain, while another may need to focus on reducing information technology brain drain. This insight would not be possible without industry-level studies.

Mensah (2008) and Badwe, Giri, and Latti (2012) argue that medical brain drain is perhaps the most important type of brain drain because of the wide variety of people who are affected by it. Badwe, Giri, and Latti (2012) note a significant effect of medical brain drain on economic development because of the strong connection between health and economic growth. Yet, the current state of research on medical brain drain is scarce in comparison with the overall brain drain literature.

Rutten (2009), Eastwood et al. (2005), and Clark, Stewart, and Clark (2006) recognize that medical migration has increased worldwide in recent years. Eastwood et al. introduce the idea of an incomplete carousel of medical personnel that does not fully turn: medical personnel move from developing countries to more developed countries and then to higher developed countries, leaving the poorest countries with medical personnel shortages.

Bhargava and Docquier (2008) estimate a macroeconomic model of medical brain drain using a longitudinal panel of 181 countries from 1991 through 2004. They find that lower wages and higher HIV prevalence increase brain drain. Clemens (2007) finds that the outmigration of health workers is unrelated to healthcare outcomes, but Bhargava, Docquier, and Moullan (2011) note that medical outmigration leads to higher disease prevalence.

Brown and Connell (2003) analyze a survey of 251 doctors from Fiji, Samoa, and Tonga. They find that income differentials, home or business ownership, and family ties are important determinants of migration decisions. Similar to Brown and Connell (2003), Gibson and McKenzie (2009) analyze three Pacific island countries in which migrants are defined as having worked or studied abroad after finishing secondary school. They conclude that marginal changes in income or tax rates do not cause migration decisions and that career opportunity is more important to doctors' migration decisions than salary levels.

Much of the reviewed medical brain drain literature is based on survey data from a handful of countries and may not offer systematic conclusions on the determinants of medical migration. The majority of these studies examine the microeconomic determinants of migration decisions because of the individual-level data being gathered through surveys. In contrast, our study examines mostly macroeconomic factors using a large sample of countries in the hope of isolating the systematic determinants of medical brain drain.

III. Data

Our dataset, taken from Bhargava and Docquier (2007), is a longitudinal panel of medical physician flows into 18 destination countries from at most 144 origin countries covering the 1995–2004 period. It contains 2,573 unique country dyads or pairs, amounting to at most 25,730 observations. The dependent variable in this study is the physician immigration rate, calculated as the inflow of physicians into one of the 18 destination countries divided by the origin country's population. Although Bhargava and Docquier's (2007) dataset contains only 18 destination countries, it captures the vast majority of migrating physicians in the world. A migrant is defined as a skilled physician trained in his or her home country. Thus, Bhargava and Docquier's dataset does not account for migrants who left their home country to acquire medical training abroad.

A cursory look at the data reveals that medical migration, as a proportion of the origin country's population, occurs mostly among the 18 developed countries.[1] The two most popular destinations by far for emigrating physicians are the United Kingdom and the United States, the latter being the largest recipient of medical migrants per capita. The United States and Great Britain receive, respectively, about 45 percent and 25 percent of all medical migrants reported in the dataset. This finding may not be surprising considering that many developed countries tend to have similar medical training standards, cultures, languages, and socioeconomic systems, all of which can attract migrating physicians. This migration pattern is consistent with the recent argument made by Docquier, Lohest, and Marfouk (2007) and Beine, Docquier, and Rapoport (2008) that brain drain is relevant for both developing and developed nations. The top ten "exporters" of medical professionals in our sample are, in descending order, Ireland, Iceland, Malta, the Dominican Republic, Jamaica, New Zealand, Lebanon, Canada, Israel, and Australia. We choose the word "exporters" to suggest that the outflow of physicians may not necessarily be detrimental to the origin country if it tends to overproduce them, causing many to emigrate.

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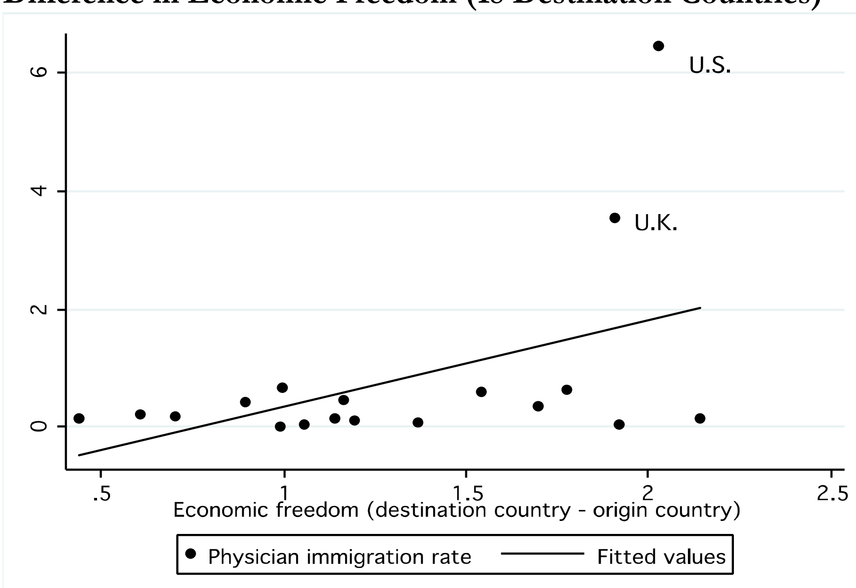
[1] The 18 destination countries are, in alphabetical order: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, New Zealand, Norway, Portugal, South Africa, Sweden, Switzerland, United Kingdom, and United States.

In examining the determinants of medical brain drain, factors pertinent to the medical industry, regulatory environment, and work compensation come to mind as being very important to medical migrants. Therefore, the key variables of interest in this study are economic freedom, public share of health spending, and health spending per capita.

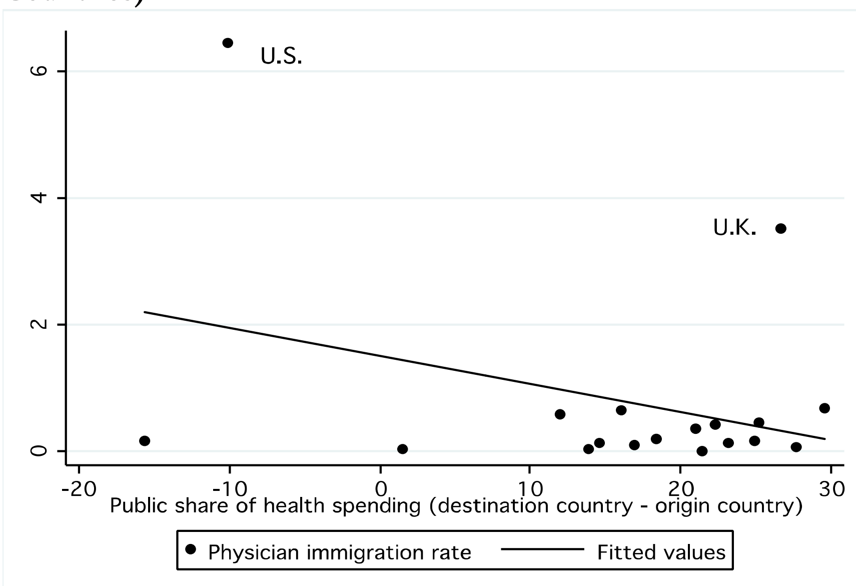
Our measure of economic freedom is a chain-linked economic freedom index from Gwartney, Lawson, and Hall (2012). Higher values of this index indicate lower regulatory burden and taxation, stable monetary policy, secure property rights, and freer international trade. Preliminary analysis of the average immigration rate for the 18 destination countries (Figure 1) suggests a positive relationship between physician immigration rate and economic freedom. Higher economic freedom could mean lower taxes and regulation, higher compensation, better career growth potential and higher pharmaceutical profits. In sum, higher economic freedom is associated with greater economic opportunities (Ashby 2010). These factors can be attractive to medical professionals seeking to emigrate.

Figure 1. Average Physician Immigration Rate and Country Difference in Economic Freedom (18 Destination Countries)



Public share of health expenditures serves as a proxy for the degree of government involvement in the provision of healthcare and the industry's overall structure. Preliminary analysis of the average immigration rate for the 18 destination countries (Figure 2) indicates a negative correlation between physician immigration rate and public share of health spending.

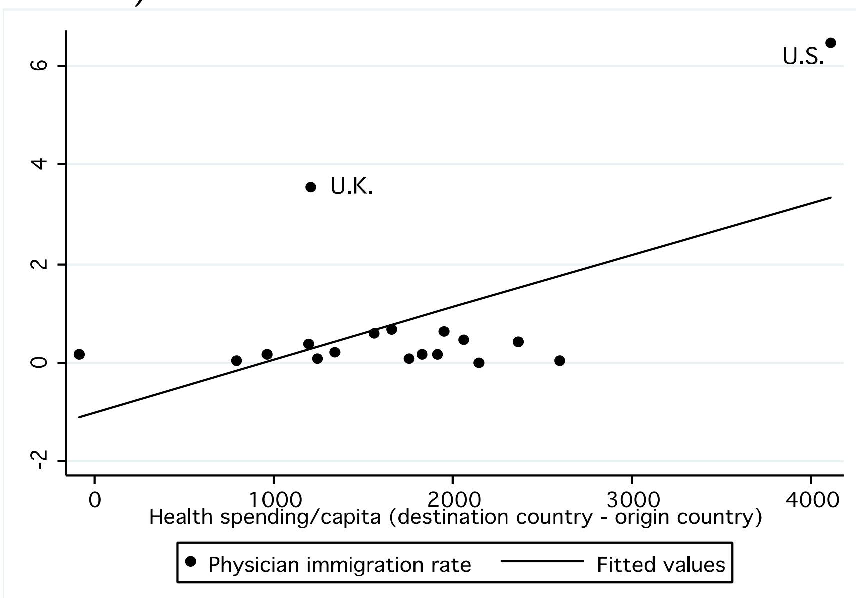
Figure 2. Average Physician Immigration Rate and Country Difference in Public Share of Health Spending (18 Destination Countries)



There could be several reasons for this negative relationship. Dewenter and Malatesta (2001) argue that government-owned firms tend to pursue social and political objectives instead of maximizing profitability. They also claim that public firms tend to have greater labor intensity, meaning more work for same pay as privatized firms. D'Souza and Megginson (1999) find that privatized firms have higher profitability, real sales, and operating efficiency over government-owned firms. The OECD (2010) report asserts that governments care about health outcomes as well as budget sustainability, implying that facilities and equipment might be outdated in many public hospitals. Budgetary pressures may not allow for important upgrades in technology and equipment, providing a higher risk environment for both patients and medical personnel. For these reasons, public healthcare systems, like various other government-owned industries, might be less attractive to medical migrants than private healthcare systems.

Health spending per capita can capture the monetary significance and perhaps sophistication of the healthcare industry. The positive correlation between the average physician immigration rate and health spending per capita observed for the 18 destination countries in Figure 3 supports this notion.

Figure 3. Average Physician Immigration Rate and Country Difference in Health Spending per Capita (18 Destination Countries)



The remaining control variables used in this paper have been suggested by other brain drain studies, notably Gubert and Nordman (2009), and include GDP per capita, share of young and old populations, urban population growth, population density, common border, language, island nation, colonial linkage, and geographic distance between countries. The variable definitions are shown in Table 1 and the summary statistics in Table 2. Most of our variables, with the exception of migration flows and economic freedom, are obtained from the *World Bank Development Indicators*.

Table 1. Variable Definitions

Variable	Definition
Immigration rate$_{(i,j,t)}$	Flow of medical professionals from country *j* into country *i* per 100,000 of country *j* population in year *t*.
Economic freedom$_{(i,j,t)}$$^{+}$	Overall economic freedom index (higher values = fewer regulations) in year *t*.
Economic freedom, Area 1$_{(i,j,t)}$$^{+}$	Size of government (higher values = smaller government) in year *t*.
Economic freedom, Area 2$_{(i,j,t)}$$^{+}$	Legal system and property rights (higher values = more independence and secure private property rights) in year *t*.
Economic freedom, Area 3$_{(i,j,t)}$$^{+}$	Sound money (higher values = tighter money supply) in year *t*.
Economic freedom, Area 4$_{(i,j,t)}$$^{+}$	Free trade (higher values = fewer trade barriers) in year *t*.
Economic freedom, Area 5$_{(i,j,t)}$$^{+}$	Regulations (higher values = fewer regulations) in year *t*.
Public share of health spending$_{(i,j,t)}$$^{+}$	Public health expenditure as a share of total health spending in year *t*.
Health spending per capita$_{(i,j,t)}$$^{+}$	Real total health spending per capita in year *t*.
Ln GDP per capita$_{(i,j,t)}$$^{+}$	Natural log of real GDP per capita in year *t*.
Young population share$_{(i,j,t)}$$^{+}$	Share of population 15–24 years old.
Age dependency ratio$_{(i,j,t)}$$^{+}$	Ratio of people 65 and older to people 15–64 years old.

Urban population growth$_{(i,j,t)}$$^{+}$	Urban population growth in year *t*.
Population density$_{(i,j,t)}$$^{+}$	Population density in year *t*.
Distance$_{(i,j)}$	Thousands of miles between the most populated cities in country *j* and country *i*.
Common border dummy$_{(i,j)}$	Country *j* and country *i* share a common border.
Common language dummy$_{(i,j)}$	Country *j* and country *i* have the same language.
Former colony dummy$_{(i,j)}$	Country *j* and country *i* share a colonial past/link.

$^{+}$ Destination country's (*i*) value minus origin country's (*j*) value in year *t*.

Table 2. Variable Summary Statistics

Variable	Observations	Mean	Std. Dev.	Min./Max.
Immigration rate$_{(i,j,t)}$	25,730	0.79	5.71	0/209.91
Economic freedom$_{(i,j,t)}$$^{+}$	19,250	1.31	1.20	-2.33/5.45
Economic freedom, Area 1$_{(i,j,t)}$$^{+}$	11,532	-1.07	2.08	-6.61/6
Economic freedom, Area 2$_{(i,j,t)}$$^{+}$	11,478	2.70	2.12	-3.73/8.38
Economic freedom, Area 3$_{(i,j,t)}$$^{+}$	11,550	1.81	1.99	-3.39/9.83
Economic freedom, Area 4$_{(i,j,t)}$$^{+}$	11,298	1.73	1.65	-2.96/8.44
Economic freedom, Area 5$_{(i,j,t)}$$^{+}$	11,550	1.03	1.30	-3.87/6
Public share of health spending$_{(i,j,t)}$$^{+}$	25,730	16.11	23.58	-56.91/86.93
Health spending per capita$_{(i,j,t)}$$^{+}$	25,550	1,702	1,264	-5,209/5,889
Ln GDP per capita$_{(i,j,t)}$$^{+}$	24,653	2.37	1.70	-2.75/6.38
Young population share$_{(i,j,t)}$$^{+}$	25,730	-4.65	4.48	-16.84/21.71
Age dependency ratio$_{(i,j,t)}$$^{+}$	25,550	-15.39	18.65	-69.62/28.87
Urban population growth$_{(i,j,t)}$$^{+}$	25,730	-1.18	2.18	-19.75/6.67
Population density$_{(i,j,t)}$$^{+}$	24,845	-58.24	521	-6,230/343
Common border dummy$_{(i,j)}$	25,730	0.02	0.14	0/1
Former colony dummy$_{(i,j)}$	25,730	0.04	0.19	0/1
Common language dummy$_{(i,j)}$	25,730	0.13	0.34	0/1
Distance$_{(i,j)}$	25,730	7.15	4.4	0.6/19.6

$^{+}$ Destination country's (*i*) value minus origin country's (*j*) value in year *t*.

Missing values for some of the countries effectively shrink our dataset to a total of 1,925 usable dyads or 17,886 observations, depending on the choice of control variables. For fear of losing too many observations and shrinking our dataset even more, we have considered but decided not to include other control variables with missing values. For example, we wanted to include compensation or salary data for medical personnel, but were unable to find a consistent measure for many countries in our sample.

IV. The Empirical Model and Estimates

The baseline empirical model in this paper is loosely based on Gubert and Nordman's (2009) dyadic gravity model:

$$(1)\ Y_{i,j,t} = a + X_{i,j,t}\beta + \varepsilon_{i,j,t}.$$

Where Y is the physician immigration rate into country i from country j in year t, a is the constant, X is a vector of regressors summarized in Tables 1 and 2, and ε is the error term. In contrast to Gubert and Nordman, many of the regressors in X are measured as the difference between the destination (*i*) and origin (*j*) countries. This approach eliminates the need to include both destination and origin variables (i.e., the push and pull factors) and allows for a straightforward interpretation of the difference in variables as the socioeconomic "distance" between the two countries in a dyad. For example, a positive coefficient for a regressor implies that a rise in the destination country's value relative to the origin country increases the inflow of medical physicians. We expect to find a positive coefficient for economic freedom (greater relative freedom in destination countries implies higher medical immigration), a negative coefficient for the share of public health spending (a greater relative role of government in the destination healthcare market discourages medical immigration), and a positive coefficient for health spending per capita (a relatively richer destination market attracts more medical migrants).

We estimate the model in equation (1) using OLS with two-way (country and year) fixed effects. The pooled OLS and the random-effects models are discarded in favor of the fixed-effects model based on the results from the Hausman test. When specifying the within fixed-effects dimension, we face three viable alternatives: destination country, dyadic, or country of origin fixed effects. Given 18 destination and at most 144 origin countries, the destination country fixed effects are too few and the dyadic fixed effects might be too many. When fitting the fixed-effects model using the least squares dummy variable (LSDV) estimator, we have discovered that it drops a large proportion of the dyadic dummies due to multicollinearity.[2] This makes us question the reliability of the dyadic fixed-effects estimator due to its failure to account for unobserved heterogeneity with an incomplete dummy set. Therefore, we estimate the OLS-LSDV model with year (*t*) and country of origin (*j*) fixed effects (dummies) instead of dyadic fixed effects.

The OLS regression estimates with heteroskedasticity-robust standard errors are shown in Table 3. Several results are noteworthy. First, the explanatory power of the fixed-effects model is rather low (R-squared=0.19) despite all of the regressors being statistically

[2] We suspect that many dyadic fixed effects (i.e., dummy variables) are highly collinear with each other because they capture essentially the same unobserved characteristics for an origin country that forms 18 pairs with mostly developed destination countries. If unobserved differences between these dyads are not significant because the same country exports to the 18 receiving nations, then the dyadic dummies are likely to suffer from multicollinearity, forcing the estimator to drop many of them.

significant. Second, the key variables of interest are generally statistically significant and have the expected signs. Namely, economic freedom is positive and statistically significant. Its positive coefficient implies that a rise in the economic freedom of the destination relative to the origin country attracts more medical physicians. The share of public health spending has a negative and statistically significant effect on physician immigration. Health spending per capita is also significant and has a positive coefficient, which implies that a rise in healthcare spending in the destination relative to the origin country increases the immigration of physicians. To give the reader an idea about the analytical significance of these results, we compute and report in parentheses the elasticity of medical brain drain with respect to the key variables of interest: economic freedom (1.12), share of public health spending (-0.31), and health spending per capita (2.4). These estimates indicate that physician flows are somewhat responsive to changes in economic freedom and health spending per capita. Our calculations also indicate that physician flows are rather responsive to changes in the share of young and old populations.

Table 3. Determinants of Medical Brain Drain

	All Countries	Developing Countries	Developed Countries
Economic freedom$_{(i,j,t)}$$^{+}$	0.85***	0.6***	3.37***
	(0.08)	(0.06)	(0.6)
Public share of health spending$_{(i,j,t)}$$^{+}$	-0.02***	-0.02***	0.004
	(0.004)	(0.004)	(0.02)
Health spending per capita$_{(i,j,t)}$$^{+}$	0.001***	0.001***	0.002***
	(0.0001)	(0.0001)	(0.0004)
Log GDP per capita$_{(i,j,t)}$$^{+}$	-0.37**	-0.62***	-0.72
	(0.17)	(0.16)	(0.6)
Young population share$_{(i,j,t)}$$^{+}$	0.15***	0.11***	0.53***
	(0.03)	(0.02)	(0.18)
Age dependency ratio$_{(i,j,t)}$$^{+}$	0.07***	0.05***	0.27***
	(0.01)	(0.01)	(0.04)
Urban population growth$_{(i,j,t)}$$^{+}$	-0.09***	-0.06**	-0.5**
	(0.03)	(0.02)	(0.24)
Population density$_{(i,j,t)}$$^{+}$	-0.001***	-0.002***	0.004
	(0.0004)	(0.0004)	(0.002)
Common border dummy$_{(i,j)}$	2.94***	-0.19	4.95***
	(0.93)	(0.26)	(1.72)
Former colony dummy$_{(i,j)}$	4.5***	2.94***	10.1***
	(0.57)	(0.43)	(2.31)
Common language dummy$_{(i,j)}$	0.7***	0.4***	0.6
	(0.13)	(0.12)	(0.87)
Distance$_{(i,j)}$	-0.1***	-0.1***	-0.2***
	(0.01)	(0.01)	(0.04)
Constant	0.9***	1.2***	2.1***
	(0.2)	(0.3)	(0.5)
Observations	17,886	15,156	2,730
Adjusted R-squared	0.196	0.183	0.261

Notes: Dataset is an annual (*t*) panel of country dyads (pairs): 18 developed destination countries (*i*) and 144 origin countries (*j*) from 1995 to 2004. However, some observations are lost due to missing values. Dependent variable is physician immigration rate (inflow into destination country divided by origin country's population in 100,000s). $^{+}$ These variables are measured as the difference between destination and origin countries' values. Robust standard errors are in parentheses. Significance levels: ***, **, and * denote 1%, 5%, and 10%, respectively. Coefficients for country and year fixed effects are not reported.

The geographic and demographic variables in the same OLS model are statistically significant and have the expected signs. In contrast, GDP per capita is negative and statistically significant. Perhaps this counterintuitive finding is the result of a strong correlation between GDP and some other variables in the model. The variance inflation factors (VIF) test in Table 4 indicates that the independent variables in the model do not exhibit alarming levels of multicollinearity (all values are below the critical threshold of 10). However, GDP per capita is strongly correlated (pairwise correlation coefficient > 0.6) with age dependency, share of young population, healthcare spending per capita, and economic freedom.

Table 4. Variance Inflation Factors (VIF) Test

Variable	**VIF**	**1/VIF**
Log GDP per capita$_{(i,j,t)}{}^{+}$	6.83	0.146416
Young population share$_{(i,j,t)}{}^{+}$	3.27	0.306023
Age dependency ratio$_{(i,j,t)}{}^{+}$	3.06	0.327072
Health spending per capita$_{(i,j,t)}{}^{+}$	2.92	0.342087
Public share of health spending$_{(i,j,t)}{}^{+}$	2.13	0.469740
Economic freedom$_{(i,j,t)}{}^{+}$	1.96	0.511370
Urban population growth$_{(i,j,t)}{}^{+}$	1.83	0.547687
Common language dummy$_{(i,j)}$	1.26	0.792893
Population density$_{(i,j,t)}{}^{+}$	1.18	0.845318
Former colony dummy$_{(i,j)}$	1.15	0.870086
Common border dummy$_{(i,j)}$	1.12	0.895738
Distance$_{(i,j)}$	1.10	0.905827
Mean VIF	**2.32**	

$^{+}$ Destination country's (i) value minus origin country's (j) value in year t.

A careful reader will note that the United States and the United Kingdom, being by far the largest recipients of medical migrants, may skew the regression estimates. To correct for the potential bias that these two popular destinations might exert on the estimates, we propose two alternative solutions. In the first case, we fit the OLS model to a sample of developed countries only and then to a sample of developing countries only. These results are shown in Table 3 and they reveal that economic freedom, along with health spending, is positive and statistically significant in both samples, but the share of public health spending is negative and significant only in the developing country sample. In the second case, we estimate the median and robust regression models. The median regression with year and origin fixed effects yields highly significant coefficients with the expected signs for all three variables of interest (economic freedom, share of public health spending, and health spending per capita). The robust regression with year and origin fixed effects also yields highly significant coefficients with the expected signs for economic freedom and share of public health spending, but no significant coefficient for health spending per capita. These estimates (available from the authors upon request) are largely in agreement with the original findings.

In a separate set of regressions in Table 5 we also examine the effect of five main subcomponents of economic freedom on physician flows. All five economic freedom subcomponents are positive and statistically significant, although their coefficient estimates are lower than for the overall index of economic freedom in Table 3. The estimates for the remaining variables in these five regressions are very similar to the first OLS results in Table 3.

Table 5. Medical Brain Drain and Five Components of Economic Freedom

	Area 1	Area 2	Area 3	Area 4	Area 5
Economic freedom$_{(i,j,t)}{}^{+}$	0.41***	0.23***	0.1**	0.33***	0.58***
	(0.05)	(0.06)	(0.05)	(0.07)	(0.08)
Public share of health spending$_{(i,j,t)}{}^{+}$	-0.01**	-0.03***	-0.03***	-0.04***	-0.02***
	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)
Health spending per capita$_{(i,j,t)}{}^{+}$	0.001***	0.001***	0.001***	0.001***	0.001***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Log GDP per capita$_{(i,j,t)}{}^{+}$	0.2	-0.01	0.19	0.11	-0.43*
	(0.25)	(0.24)	(0.26)	(0.26)	(0.24)
Young population share$_{(i,j,t)}{}^{+}$	0.17***	0.21***	0.22***	0.22***	0.15***
	(0.03)	(0.04)	(0.04)	(0.04)	(0.03)
Age dependency ratio$_{(i,j,t)}{}^{+}$	0.09***	0.06***	0.06***	0.07***	0.04***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Urban population growth$_{(i,j,t)}{}^{+}$	-0.2***	-0.1*	-0.1***	-0.2***	-0.2***
	(0.05)	(0.05)	(0.05)	(0.06)	(0.05)
Population density$_{(i,j,t)}{}^{+}$	-0.001**	-0.0002	-0.001	-0.001**	-0.0004
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Common border dummy$_{(i,j)}$	3.9***	3.7***	3.7***	3.7***	3.9***
	(1.38)	(1.37)	(1.37)	(1.37)	(1.39)
Former colony dummy$_{(i,j)}$	5.25***	5.28***	5.26***	5.4***	5.14***
	(0.86)	(0.87)	(0.87)	(0.9)	(0.86)
Common language dummy$_{(i,j)}$	0.76***	1.15***	1.18***	1.23***	0.85***
	(0.19)	(0.18)	(0.18)	(0.19)	(0.19)
Distance$_{(i,j)}$	-0.1***	-0.1***	-0.1***	-0.1***	-0.1***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Constant	1.7***	1.0***	0.8**	0.7**	1.2***
	(0.3)	(0.3)	(0.31)	(0.3)	(0.3)
Observations	11,218	11,170	11,234	11,000	11,234
Adjusted R-squared	0.197	0.193	0.192	0.194	0.196

Notes: Dataset is an annual (*t*) panel of country dyads (pairs): 18 developed destination countries (*i*) and at most 144 origin countries (*j*) from 1995 to 2004. However, some observations are lost due to missing values. Dependent variable is physician immigration rate (inflow into destination country divided by origin country's population in 100,000s). + These variables are measured as the difference between destination and origin countries' values. Robust standard errors are in parentheses. Significance levels: ***, **, and * denote 1%, 5%, and 10%, respectively. Coefficients for country and year fixed effects are not reported.

As an additional robustness check, we estimate a dynamic system GMM model, which treats our key variables of interest as endogenous (i.e., variables that depend on the past realizations of the error term). A dynamic system GMM uses lagged values and first-differences of the endogenous variables as their instruments and lagged dependent variables to control for temporal dependence, which is very strong in our sample. The GMM model yields qualitatively similar estimates for the three main variables of interest (results available from the authors upon request).

V. Conclusion

We analyze the emigration of medical physicians from 144 origin countries into 18 destination countries, most of which are developed nations. We find that flows of medical professionals are sensitive to country differences in economic freedom and health spending per capita, among other factors. The five main subcomponents of the economic freedom index all have a significant positive effect on the inflow of physicians as well. We also find that countries with a rising share of public health expenditures tend to experience higher medical brain drain, *ceteris paribus*, but the elasticity of this response is rather small.

Our findings shed light on the less studied but very important component of brain drain: the loss of medical professionals. Previous research suggests that medical brain drain is a serious hindrance to economic growth in both the short and long run, especially for developing countries. However, a large portion of medical professionals move from one developed country to another. If some countries tend to produce a surplus of medical talent, then an outflow of these professionals may not necessarily represent harmful brain drain. Yet, more empirical work is needed to understand such a scarcely researched topic as medical migration.

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