Physician emigration, population health and public policies

Alok Bhargava

INTRODUCTION

The consequences of poor access and quality of healthcare services in developing countries are widely recognised by international agencies such as WHO.[1] Moreover, with the HIV/AIDS pandemic wreaking havoc in sub-Saharan Africa, availability of trained physicians is essential for providing antiretroviral treatment to large numbers of individuals.[2] Owing to emigration of physicians and nurses from developing countries, WHO has suggested codes for recruitment of health personnel by developed countries.[3] The biomedical and social science issues surrounding the benefits of healthcare uptake for health outcomes are complex. It is therefore puzzling that Javier Hidalgo in his article[4] dismisses the need for meticulous health policy formulation. Instead, he contrives a 'defence' for the practice of recruitment of healthcare workers by developed countries through a misleading interpretation of the evidence from country-level data presented by Bhargava and Docquier.[5] It would be useful to proceed by outlining some methodological difficulties in investigating the links between physician emigration and population health outcomes.

Some methodological issues in assessing impact of physician emigration on health outcomes

The use of healthcare services is ubiquitous in most societies and is concentrated among pregnant women and infants, children and adults suffering from infectious diseases, and adults with chronic diseases. It is, however, difficult to assess the benefits of timeliness and quality of healthcare services on health outcomes without elaborate data following individuals over several years. Because such data are seldom available, it is necessary to investigate the impact of physician emigration on health outcomes in developing countries using alternative approaches. For example, physician emigration is likely to lead to an attrition of the most qualified personnel thereby lowering quality of services; basic healthcare services may be denied in rural areas where working conditions are unattractive due to a lack of amenities such as electricity.

The evidence on adverse effects of physician emigration on health outcomes is likely to be more apparent in situations such as in the wake of HIV/AIDS epidemic in sub-Saharan Africa where the need for healthcare services is high and availability of physicians is low.[5] Even in such situations, it is important to distinguish between 'micro' studies based on epidemiological data and 'macro' analyses of the averages for countries. In general, biomedical scientists are comfortable with epidemiological studies, whereas social scientists often prefer macro data facilitating the investigation of underlying trends. For the formulation of health policies, both types of studies are useful and it is important to narrow the differences between the approaches.

Assessing the impact of physician emigration on health outcomes using macro data

It would be useful to reappraise Hidalgo's interpretation of the findings of Bhargava and Docquier[5] regarding the effects of physician emigration on adult deaths due to AIDS in sub-Saharan Africa. The longitudinal database for physician emigration for the period 1991–2004 was compiled in response to a report[6] arguing for greater investments in training of health professionals in Africa. Due to the risky working and living conditions for physicians and their families, however, we found support for the hypothesis that higher HIV prevalence was likely to *increase* physician emigration. Thus, more complex schemes such as those subsidising salaries of physicians and nurses are necessary for retaining physicians in Africa.[7]

Hidalgo demonstrates a poor understanding of econometric models in our article[5] especially those containing interactions between explanatory variables. For example, he claims that 'the study also finds that the emigration of physicians is actually *negatively* correlated with adult deaths when less than 3% of the population is infected with HIV'. This is a misrepresentation of our findings. In fact, table 3 contains the results for numbers of deaths due to AIDS from a simple model (Specification 1) where HIV prevalence and physician emigration rates ('medical brain drain') were included without the interaction term; Specification 2 included the interaction between these variables. For the sake of exposition and with variables expressed in natural logarithms (ln), the relevant coefficients from Specifications 1 and 2, respectively, can be summarised as:

$$\ln(\text{Adult deaths due to AIDS}) = 0.542\ln(\text{HIV prevalence}) + 0.095\ln(\text{Medicalbrain drain rate})$$

and

$$\ln(\text{Adult deaths due to AIDS}) = 0.778\ln(\text{HIV prevalence}) - 0.059\ln(\text{Medicalbrain drain rate}) + 0.049[\{\ln(\text{Medical brain drain rate})\} \times \{\ln(\text{HIV prevalence})\}].$$

In Specification 1, coefficients of both explanatory variables were positively and

Correspondence to Professor Alok Bhargava, University of Maryland School of Public Policy, College Park, MD 20742, USA; Bhargava@umd.edu

significantly associated with adult deaths due to AIDS. Thus, for example, doubling of medical brain drain rate predicted a short-run increase of approximately 10% in adult deaths due to AIDS. Because the dynamic model contained previous realisation of the dependent variable as an explanatory variable with an estimated coefficient 0.51, the long-run impact of doubling physician emigration on adult deaths was approximately 20%.

Hidalgo compounds his erroneous interpretations when the interaction term between HIV prevalence and medical brain drain rates was included in Specification 2. In this case, 'net' effect of medical brain drain on adult deaths due to AIDS depends on HIV prevalence rates in countries:

$$\text{Net effect(Medical brain drain rate)} = -0.059 + 0.049 \ln(\text{HIV prevalence})$$

Note that the SE of the net effect depends on estimated variances of the coefficients of medical brain drain rate and its interaction with HIV prevalence, and also on the covariance between the estimated coefficients. Moreover, the net effect needs to be evaluated at certain levels of HIV prevalence rates for the countries. For example, sample means of HIV prevalence rates at the start of the sample (in 1991) and at the midpoint (in 1997) were 2.98 and 6.59, respectively.[5] The net effects evaluated at the means in 1991 and 1997 were, respectively, −0.005 and 0.033. Thus, the net effect at the sample midpoint was *positive*; net effect was very close to 0 (−0.005) when computed at the start of the sample in 1991.

Further, Hidalgo misleadingly claims the possibility of 'spurious correlations between more deaths and emigration rates' in our results. As outlined above, our estimates were not simple correlations but associations based on controlling for HIV prevalence rates in the models. Hidalgo also draws the red herring of 'causality' claiming that such issues cannot be addressed without some type of a 'quasi-natural experiment' design. While many philosophers including Wittgenstein[8] have taken a sceptical view of definitions of 'causality', working definitions have been employed in the statistical literature.[9 10] In our econometric analyses, we modelled the substantive inter-relationships such as the effects of HIV prevalence rates on physician emigration, and the effects of physician emigration on adult deaths due to AIDS and on life expectancy for sub-Saharan African countries. We also investigated alternative scenarios such as of 'reverse causality' between HIV prevalence and physician emigration rates, that is, if higher physician emigration can increase HIV prevalence rates though the data did not support such formulations. Moreover, our models controlled for the unobserved cross-country differences using random effects. Overall, it is misleading for Hidalgo to advocate recruitment of physicians by developed countries based on his misrepresentations of the findings from national averages that typically present an incomplete picture of the underlying phenomena (see below).

Effects of physician emigration on healthcare services and outcomes using micro data

The uptake of healthcare services is often a significant predictor of outcomes such as lower infant death rates[11] and higher child growth[12] in analyses of individual level data from developing countries. Moreover, quality of healthcare staff and services assessed by AIDS patients in South Africa were significant predictors of higher CD4 cell counts and quality of life indices.[2] However, it is not straightforward to investigate the effects of physician emigration in micro settings because a longer time frame is necessary for capturing the impact. For example, longitudinal studies of patients receiving antiretroviral treatment typically extend for 1–2 years due to resource constraints. During the observation period, most patients receive care from a team of physicians so that unless there is a major exodus of physicians, the impact on clinical and quality of life measures is unlikely to be statistically significant.

Further, gradual emigration of physicians over time can lead to attrition of highly qualified personnel and so studies spanning over a decade will be useful for investigating the effects of physician emigration on individual well-being. While such studies would be expensive, an alternative may be to repeat 2-yearly longitudinal studies every 5–10 years. Moreover, the design of short-term epidemiological studies would benefit from including 'macro' variables such as the numbers of unfilled vacancies for medical staff and other measures of healthcare infrastructure inadequacies in the region. The debate surrounding the effects of physician emigration on health outcomes would benefit from integrating the epidemiological evidence from developing countries with the results from analyses of country-level data.

CONCLUDING REMARKS

It is natural to observe greater mobility of labour in a globalised world; work experience in developed countries is beneficial for a large number of professionals including physicians. However, the policy of regularly recruiting physicians from developing countries runs contrary to the ethos of technology transfer, that is, where innovations in agricultural and other technologies are transferred to developing countries without extracting exorbitant 'rents'. Another useful example of technology transfer is that of pharmaceutical companies lowering prices of generic antiretroviral drugs for AIDS patients in developing countries. While countries such as China, India and the Philippines may appear to have an adequate supply of physicians, the situation in rural areas can be appalling due to the poor healthcare infrastructure and difficulties in relocating medical staff and their families. This is especially true in sub-Saharan Africa where the AIDS epidemic is placing excessive stress on healthcare systems.

From a policy perspective, it is unfair for developed countries such as the USA to regularly recruit approximately 25% of medical residents from abroad, while ignoring the plight of underserved populations in developing countries. It would be much simpler to train additional physicians in developed countries where resource constraints are less severe. Moreover, as argued previously,[7] mechanisms need to be devised for compensating developing countries for the medical education of emigrating physicians. For example, based on costs of medical education in the USA, $400 000 at current prices would be a nominal payment for recruiting a physician trained in a developing country. Finally, it is unconscionable for developed countries to actively recruit African physicians without taking into account the negative externalities imposed by luring away the most skilled members responsible for the well-being and lives of the populations.

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