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Understanding Geographical Imbalances in the
Health Workforce**

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For Public Service or Money:

Understanding Geographical Imbalances in the Health Workforce

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Abstract

Geographical imbalances in the health workforce have been a consistent feature of nearly all health systems, and especially in developing countries. In this paper we investigate the willingness to work in a rural area among final year nursing and medical students in Ethiopia. Analyzing data obtained from contingent valuation questions, we find that household consumption and the student's motivation to help the poor, which is our proxy for intrinsic motivation, are the main determinants of willingness to work in a rural area. We investigate who is willing to help the poor and find that women are significantly more likely than men. Other variables, including a rich set of psychosocial characteristics, are not significant. Finally, we carry out some simulations on how much it would cost to make the entire cohort of starting nurses and doctors choose to take up a rural post.

JEL classification: D1, J22, J64

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There is an obvious difference between rural and urban postings. Working in rural areas involves helping the poor... in urban areas, one can learn, have more income, have good schools for one's children.

Health worker in Ethiopia

1. Introduction

Health services depend critically on the size, skills, and commitment of the health workforce. Human resources have been a long-standing policy concern in both developed and developing countries. A number of recent reports have pointed out that human resources comprise a fundamental constraint to improving health outcomes and reaching the Millennium Development Goals (Joint Learning Initiative, 2004; USAID, 2003; 2002; World Bank, 2004a). While human resource challenges take many dimensions—shortages, geographic imbalances, international migration, low skills and inappropriate skills mix, poor performance and low motivation, etc.—this paper focuses on the specific issue of geographical imbalances. Geographic imbalances in the health workforce have been a persistent feature of nearly all health systems. Given the obvious relationship between the number of health workers and the capacity to deliver services—both in terms of volume and quality, the distribution of health professionals has implications for equity in access to health services. But the distribution of health professionals is also an efficiency issue: the under-provision of cost-effective interventions in some areas implies that overall health outcomes could be improved through a reallocation of resources.

Our analysis is based on a survey of final year nursing and medical students in Ethiopia. The survey included detailed questions on student background and characteristics, the use of contingent valuation methods to elicit monetary valuations of different types jobs in the health sector, and survey-based and experimental approaches to measuring intrinsic motivation. Together, these data shed new light on the factors that influence the willingness to work in rural areas among a new cohort of health workers.

Ultimately, the difficulties in attracting and retaining staff in rural facilities are rooted in the preferences and choices of health professionals. Evidence from various countries suggest that, while financial rewards are important, they are not the only consideration. In choosing where to work, other considerations come into play, including training opportunities, career development prospects, living conditions, workload, colleagues and working conditions, and social, family and security considerations, security concerns, etc. (Hays, Veitch, Cheers, & Crossland, 1997; Kamien, 1998; Lindelow, Serneels, & Lemma, 2005; Peters, Yazbeck, Sharma, Ramana, Pritchett, & Wagstaff, 2002; Shields, 2004). Hence, the general preference for work in urban and affluent areas is not surprising. Work in rural areas is often associated with reduced access to training, limited professional interaction with peers, reduced exposure to technical sophistication, heavy responsibilities and workload, social isolation, poor social services, and, in some cases, limited opportunities for income-generation through a second job or other economic activity.

Countries have enlisted a wide range of strategies to redress geographical imbalances in the health workforce. The most direct approach—often referred to as compulsory service or bonding—is to mandate service on specific facilities or locations. This also ensures that public resources invested in the training of health professionals are recouped.² But this *dirigiste* approach has proven difficult to manage and enforce in practice. Many schemes have suffered from corruption and favoritism, and the possibilities for well connected or better-off individuals to bypass the scheme has undermined their legitimacy (Lindelow, Serneels, & Lemma, 2005; Wibulpolprasert & Pengpaibon, 2003). But even if these management problems can be overcome, compulsory service may render the health professions less attractive, with potential long term implications for the workforce. In Indonesia, Sepowski (2004) found that health professionals who *choose* to work in a rural or underserved area, rather than doing so as part of a contractual obligation, are more likely to stay long-term.

A less direct, but arguably more efficient approach is to rely on economic—financial or non-financial—incentives. These incentives may take many forms, ranging from rural allowances or bonuses, subsidized housing, access to promotion or specialist training,

² For example, Thailand used compulsory service linked to scholarships for many years, with severe fines for breach of contract (Wibulpolprasert, 1999). A similar approach has been used in Indonesia, South Africa, and some former socialist countries. As discussed further below, Ethiopia also has a bonding system in place.

choice of jobs, etc. Although the use of economic incentives is commonplace, experience shows that providing financial incentives on their own often has limited impact, and can be very expensive (Anderson & Rosenberg, 1990; Nigenda, 1997; Sempowski, 2004).

In recognition of these limitations, some countries have pursued strategies which recognize that health workers (or potential recruits to the health profession) are not homogeneous, and that preferences concerning rural and urban postings are malleable. They argue that due to differences in background, education, personality, and other factors, health workers differ in their views on the relative desirability of urban and rural postings. For example, the US (Rabinowitz, Diamond, Markham, & Hazelwood, 1999), Australia (Easterbrook, Godwin, Wilson, Hodgetts, Brown, Pong et al., 1999; Rolfe, Pearson, O'Connell, & Dickinson, 1995), Thailand (Wibulpolprasert & Pengpaibon, 2003), and Indonesia (Chomitz, Setiadi, Azwar, Ismail, & Widiyarti, 1998) make special efforts to recruit students with a strong commitment to rural service, and aim to expose students to work in rural areas through job rotation. Experience shows that students recruited from rural areas are more likely to return to rural areas, and that they are more responsive to incentives that encourage working in a rural area (Chomitz, Setiadi, Azwar et al., 1998; Kristiansen & Forde, 1992; Laven & Wilkinson, 2003).

Although of considerable interest, international experiences with strategies to redress geographical workforce imbalances provides limited operational guidance. What level of financial incentives is needed to convince health workers to accept rural postings? What is the relative importance of different individual characteristics on the willingness to accept a rural job? The existing literature has little to offer with respect to these questions. In trying to fill this gap, we have to address two methodological questions.

First, how can we elicit information about monetary valuations? In seeking to understand the labour market choice of health workers and their willingness to work in a rural area, it is natural to look at actual choices. This has been the approach of a number of studies (Bolduc, Fortin, & Fournier, 1996; Hurley, 1990; Kristiansen & Forde, 1992). Yet, the approach has important limitations. In many cases the

government plays an important role in the allocation of health workers, and actual salaries do not reflect personal valuations. In addition, there is usually limited variation in the actual compensation of health workers, especially when the public sector dominates health service provision. Finally, even when there is a market, or the possibility of creating one, market prices or wages will not reflect non-pecuniary benefits, like access to training etc. Situations such as these have led researchers to rely on contingent valuation and other stated preference methods. The use of contingent valuation has a long tradition in economics, going back to Ciriacy-Wantrup (1947) and Schelling (1968). Its aim is to place a monetary value on a good for which there is no market and, therefore, demand is unobservable. Although contingent valuation methods have been used extensively in areas such as environmental policy (Lockwood, 1998)³, its use in the field of human resources in health is rare.⁴ One important exception is the study by Chomitz et al. (Chomitz, Setiadi, Azwar et al., 1998), which uses a stated-preference approach to elicit information about the preferences of medical students in Indonesia. They find that moderately remote areas can be staffed using modest cash incentives, but that financial incentives would be prohibitively expensive for staffing very remote facilities. They also find that doctors who were recruited to medical school from the Outer Islands of Indonesia are more willing to serve in remote areas than their counterparts from Java, and that they required a lower financial incentive to accept a remote posting.

Second, while past studies have focused on individual characteristics such as rural background, education, age, and gender, they have not addressed the role of individual motivation and personal norms. Yet, different strands of the literature indicate that such factors may have an important effect on career choice. Deci (1975) was one of the first to recognize the role of professional commitment, or intrinsic motivation, while Dixit (1997; 2001) and Wilson (1989) emphasize its role in organizations and its importance for public service delivery. Benabou and Tirole (2003) also attribute a central role to

³ Typical examples can be found in environmental economics: without a monetary value of pollution it is impossible to implement, for instance, Pigouvian taxes or find the optimal level of pollution; the cost-benefit analysis of a new park requires some monetary value for it; payment of restitutions by Exxon following the Exxon Valdes oil spill implies the knowledge of the valuation of the negative environmental effect of the spill.

⁴ Some studies have used contingent valuation methods to assess willingness to pay for health services (Donaldson, Shackley, & Abdalla, 1997; Luchini, Protiere, & Moatti, 2003; Mataria, Donaldson, Luchini, & Moatti, 2004).

intrinsic motivation and contrast it with motivation triggered by extrinsic incentives.⁵ Studies applied to the health sector also underline the importance of worker motivation (see Franco, Bennett, & Kanfer, 2002a). In recognition of these findings, we will analyze and discuss the effect of individual motivation on the willingness to work in a rural area.

The remainder of the paper is organized as follows. Section 2 presents the basic characteristics of the data, how we collected the contingent valuation data and details of the survey. Section 3 discusses the econometric strategy, while section 4 reports the results. In section 5 we discuss the policy implications and carry out a simulation exercise. Section 6 concludes.

2. The Ethiopian Context and the Cohort Survey

The cohort survey was implemented in Ethiopia, a country with some of the worst health outcomes in the world.⁶ With the majority of the population living in rural areas (83% in 2002, World Bank, 2004b), and with substantial urban-rural disparities in living standards - the Household Income and Expenditure Survey (2000) indicates that average annual household expenditure in urban areas is almost twice that in rural areas CSA (2001) - the health challenges are particularly severe in the rural areas. Endeavours to meet these challenges are hampered by the limited nature of health resources. Public spending is very low: in a recent report per capita health expenditures are estimated at around 4 USD or 25 USD PPP, which is significantly lower than the Sub-Saharan Africa average of 42 USD or 89 USD PPP.⁷ Moreover, Ethiopia not only has a very low number of health workers per capita - on average 11 nurses and 2

⁵ They define intrinsic motivation as the desire to perform a task for its own sake, while extrinsic motivation refers to rewards that are contingent on behaviour or outcomes. Their work can be seen as a refinement of Kreps (1997), who suggested that in many cases what is referred to as intrinsic incentives may in fact be workers' response fuzzy extrinsic motivators, such as fears of discharge, although he also acknowledged an important role for 'genuine' intrinsic motivation

⁶ Respiratory infection, diarrhea, malnutrition, and malaria contribute to high levels of infant and child mortality (estimated at 113 and 171 respectively for 2002, below regional averages for Sub-Saharan Africa) (UNICEF, 2003). Limited access to family planning and maternity care, as well as poor quality of these services also contribute to high levels of maternal mortality. For a detailed discussion of health outcomes and the Ethiopian health system more broadly, see World Bank (World Bank, 2004b).

⁷ This is the estimated average for the nineties World Bank(2004b).

Physicians per 100,000 inhabitants, which is low even for African standards - but also a distribution of health workers that is biased towards urban areas.⁸

Health workers in Ethiopia face a labour market with specific characteristics. Most important is the central role of the government. Wages are set by policy makers and therefore may not reflect the market value of labour. The government also plays a direct role in the allocation of health workers.⁹ Students who have been funded by the government – which is the vast majority - have an obligation to serve time working for the funding government agency (regional or federal) and are randomly allocated to posts through a lottery, with those funded by a regional government allocated to a post in that region.¹⁰ Although the allocated job cannot be changed in principle, we find evidence that students bend the rules.¹¹ Only after having served the obligatory term in a government facility can health workers receive a release certificate from the public sector. This certificate is legally required to work in the private health sector. Private facilities at the clinic level are now common place, but only in urban areas. In general, the Ethiopian health sector is dominated by the public sector - except for the pharmacies and drug shops.¹²

Our analysis is based on a survey with final year nursing and medical students in their last year of study. The sample includes 219 nursing and 90 medical students, sampled from eight clinical nursing schools and three medical faculties all over the country.¹³ The nursing students were in the final year of their training while the medical students

⁸ There are no detailed figures available for the urban – rural distribution, but from partial analysis it is clear that the distribution is biased in favour of urban areas (see World Bank, 2004b,p. 100). Data from the survey used in this paper suggests indeed that 67% of nursing students and 92% of doctors prefer to work in an urban area in the long term. In the context of Ethiopia this implies a strong preference for Addis Ababa.

⁹ The role of the public sector, both for wage setting and in the allocation of health workers also motivate the use contingent valuation in the Ethiopian context.

¹⁰ Students from private schools formally do not have an obligation. But private for profit schools are a very new phenomenon (Only one school is listed to transfer from pre-accreditation to full license; the school is part of this sample- all the others remain pre-accredited), and students from non-profit schools often participate in the lottery.

¹¹ Close to sixty percent state that they can get their first posting changed; about seventy percent will swap their posting, and over twenty percent would consider to pay for a swap. None of these activities are legal.

¹² Seventy-one percent of hospitals, 94 % of health centers, 82 % percent of health stations and all health posts are currently run by the government. In contrast 80% of pharmacies, drug shops and rural drug vendors are privately owned.

¹³Details on the sampling strategy are provided in the appendix. We focus on clinical nurses and midwives who attended 2 years of nursing school.

were about to enter their internship. Our sample of medical students represents 49% of the 2003/4 cohort, while our sample of nursing students represents an estimated 16% of the 2003/4 cohort. The statistical analysis is based on data from three sources: (i) a self-administered (supervised) questionnaire which included contingent valuation questions; (ii) a medical knowledge test; and, (iii) data from two behavioural games.¹⁴ As set out in the introduction, two major challenges are to measure the willingness to work in a rural area and individual motivation. In the remainder of this section, we focus on the contingent valuation questions and the measurement of motivation.

In the past there has been controversy over how to measure contingent valuations properly.¹⁵ For this reason a committee of experts, appointed by the National Oceanic and Atmospheric Administration (NOAA), following the Exxon Valdes incidence, was asked to produce a report on best practice for reliable contingent valuation.¹⁶ The basic conclusions of the NOAA Committee can be summarized as follows: (i) use probability sampling; (ii) avoid mail surveys; (iii) interview people in a place that is related to the question analyzed in the contingent valuation survey; (iv) formulate the question in a specific and realistic context; and (v) use closed-end questions or a variant thereof. In writing our instruments we follow NOAA recommendations as close as possible. First, although the schools are selected by convenience sampling, the students in each school were selected randomly. Second, the questionnaires were administered in the schools, and were filled out in the presence of members of the team. Third, the contingent valuation question was specific and the context was realistic. The salary of reference is the actual salary of health workers when they start their career. In addition since students are close to their graduation, it is very likely that they have already thought about the issue before participating in the survey. Finally, since the sample size is small we use a "payment card" type of question.¹⁷ The question is the following:

¹⁴ Detailed information on the survey and the survey instruments can be found in Serneels et al (2005).

¹⁵ Diamond and Hausman (1994) argue that contingent valuation responses are often not consistent with economic theory. However, as pointed out by Hanemann (1994), most of these criticisms are the consequence of an improperly designed survey.

¹⁶ The committee was co-chaired by Arrow and Solow and included Leamer, Portney, Radner and Schuman. Portney (1994) presents a complete description of the basic recommendations of the NOAA Committee.

¹⁷ Contingent valuation questions can take three basic forms: open-ended, closed-ended (also called referendum) and "payment card". The typical open-end question take the form "What is the most you would be willing to pay for ...?". However, experimental evidence has shown that this formulation has a high hypothetical bias (Harrison, 2002). Closed-ended questions ask individuals for their willingness to pay a particular amount of money (x dollars). In general respondents are presented with a random value and have to answer yes or no. If there is only one question, this is called a single-bound closed-ended

*Imagine that when you finish your studies you get two jobs as a health worker in the public sector, one in Addis Ababa and one in a rural area 500 km from Addis Ababa. Both contracts are for at least 3 years. Your monthly salary for the job in Addis Ababa would be 700 Birr. Which job would you choose if your monthly salary for the rural job would be \$ amount.*¹⁸

This question is repeated for a range of salaries, with \$ taking the value of 600, 700, 800, 900, 1000 and 1200 respectively, and is asked both for a rural (200 km from Addis Ababa) and remote postings (500 km from Addis Ababa). For medical students the basic salaries are 1200, 1300, 1500, 1700, 1900 and 2100. Figure 1 plots the cumulative distribution for the contingent valuation of the choice of rural versus urban posting for alternative wages for nurses. As expected the cumulative distribution for a rural post (200 km from Addis Ababa) dominates the distribution for a remote post (500 km away from Addis Ababa). Focusing on the contingent valuation wages for the remote area, 500km from Addis Ababa, the graph illustrates that at the current monthly wage of 700 Birr, about one third of the starting nurses are willing to work in a remote area. As the rural wage increases, the number of nurses willing to work in a remote area rises, but not in a linear way. Beyond 1,000 Birr, marginal take up decreases. Figure 2 plots the density function of the reservation wage to work in a rural area for nursing and medical students separately. The distribution for nurses is bimodal, that for medical students heavily skewed to the left.¹⁹

Another methodological challenge concerns the measurement of personal motivation. Although it has received increasing attention from a theoretical point of view, there is no clear agreement on how to measure it. Even when we focus on health work, the multi dimensional nature of motivation implies difficulties to agree on a compact measure (see Franco, Bennett, & Kanfer, 2002b). With this in mind, we take a pragmatic approach focusing on the context of the medical profession and rural posting.

question. More sophisticated versions use a follow up question phrased in the same terms but offering a higher (or lower) amount depending on the answer of the individual (this is called double bound) (Alberini, 1995; Cameron & Quiggin, 1994). The "payment card" goes one step further and asks the individual to answer yes or no for a list of different amounts.

¹⁸ One Birr is approximately 0.125 USD.

¹⁹ The validity of the reservation wages obtained from contingent valuation is supported by two additional results. To capture the long term preference and expectation of the students with respect to urban or rural posting, we asked two more questions: whether the long term preference is to work in an urban or rural area; and what they think their employment situation will be in five years. The answers to both questions are highly correlated with the reservation wages obtained from contingent valuation with as correlation coefficients -0.43 and -0.83 respectively.

In this context we expect the motivation to help the poor – equivalent to healing the most severely ill patients since health and income poverty are strongly related - to play an important role.²⁰ The variable we use is based on a pre-coded survey question about the relative importance of different job attributes. All listed attributes are at least partially driven by extrinsic motivation (career concerns, salary, etc.), with the exception of ‘opportunity to help the poor’. The intrinsic motivation variable is then constructed as a dummy variable indicating that ‘opportunity to help the poor’ is ranked highest. Because our analysis indicates that this variable is an important determinant of willingness to work in a rural area, we also look at what determines an individual’s willingness to serve the poor and endeavour to explore the extent to which it might be possible to influence such motivations.

3. Econometric methods

The econometric analysis of contingent valuation data depends on the chosen formulation of the question. The choice between closed-ended questions or "payment cards" depends on several factors. Because of its specific nature closed-ended questionnaires "eat up" a lot of data. Since the identification of an effect rests on the random amounts offered to different individuals, one needs a large sample to achieve statistically significant effects. For similar reasons, the results are more likely to be misleading when a single closed-ended question approach is applied to a small sample.²¹

When an open ended question is used, the result is usually analyzed by regressing the contingent valuation on a set of explanatory variables using OLS. We will use this approach as a benchmark. To analyze the answers from closed ended questions, researchers initially used to run a simple logit or probit model where the explanatory variable was the offer, or the log of the offer. However Cameron and James (1987) show that there is an important difference between the traditional logit/probit model

²⁰ Agreement on the importance of this norm is of course best reflected in the Hippocratic Oath: ‘treat the sick to the best of one’s ability’.

²¹ Cameron and Huppert (Cameron & Huppert, 1991) use a simulation to generate single closed-ended responses from a "payment card" questionnaire. They conclude that the results from single threshold open-ended questions are substantially different from the ones obtained from using all the information from the "payment card". Their evidence suggests that if using a single closed ended question, a very large sample is required to achieve the level of accuracy obtained by the "payment card" method.

and the dichotomous choice generated by a closed-ended questionnaire. In particular, while in the traditional logit (probit), the β 's and the σ cannot be identified separately, this is possible in the statistical model generated by the closed-ended contingent valuation model. The reason is the following. Imagine that we ask individuals to report their willingness to pay an amount of taxes T in order to enjoy a new national park. If they accept to pay that amount then $I = 1$. Otherwise $I = 0$. Then

$$I_i = 1 \Rightarrow \Pr(T_i^* > T_i | x_i) \quad (1.1)$$

where T_i^* is the unobserved upper limit of the willingness-to-pay of individual i . The willingness to pay is function of some variables which we can group under x_i .

$$T_i^* = x_i' \beta + u_i \quad (1.2)$$

where u_i follows a normal distribution. By the usual reasoning in probit models then

$$\Pr(T_i^* > T_i | x_i) = \Pr(x_i' \beta + u_i > T_i) = \Pr\left[\frac{u_i}{\sigma} > \frac{T_i - x_i' \beta}{\sigma}\right] = 1 - \Phi\left[\frac{T_i - x_i' \beta}{\sigma}\right] \quad (1.3)$$

Since T_i is the value of the offer, we can identify the parameter of T_i as $-1 / \sigma$ and the parameters of the x 's as β / σ . Since invariance is one of the properties of the ML estimator we can transform the coefficients to obtain the parameters we are interested in. The calculation of the standard deviation of the parameters β is a little more convoluted. There are basically two alternative approaches: either one can estimate a simple probit and use the Delta method to calculate the standard error of the transformed coefficients; or one can program the likelihood function and use a non-linear maximization routine to obtain estimates of β and the standard deviation σ ²².

Below we develop a framework for analyzing our particular case. For each row in the payment card – or each salary w_l , the individual can choose between accepting the offer to go to a rural post, $rp = 1$, or not accepting the offer, $rp = 0$. Assuming that the

²²Depending on the nonlinear optimization one can use the evaluation of the Hessian or the evaluation of the product of the gradients as a consistent estimator of the information matrix.

indirect utility function is $v(rp, w; x)$ where w is the salary offered and x represents other variables that shift the function. For nurses, who have reference salary of 700, we therefore get

$$\Pr(rp = 1 | x) = \Pr(v(1, w_1; x) - v(0, 700; x) > \zeta_0 - \zeta_1) = F(-\Delta v) = F(\Delta w; \beta) \quad (1.4)$$

Where ζ_0 and ζ_1 are error terms. For simplicity we further assume that the function reflecting the difference in indirect utility has a log-linear specification,

$$\Delta v = \delta \ln(\Delta w) + x' \beta \quad (1.5)$$

where x includes variables like age, education, income, etc. However in the payment card type of question an individual can choose the threshold that represents an offer exceeding the reservation salary from many different options. Therefore the probability that the willingness to accept the offer lies in the interval $[w_m, w_{m+1})$ is given by

$$\begin{aligned} \Pr(rp_m = 1) &= \Pr(v(1, w_m; x) - v(0, 700; x) > \zeta_0 - \zeta_1) - \Pr(v(1, w_{m-1}; x) - v(0, 700; x) > \zeta_0 - \zeta_1) \\ &= F(w_m; \beta) - F(w_{m-1}; \beta) \end{aligned} \quad (1.6)$$

When we do this for each row (salary), we get a recursive probit model. The parameters of this model can be estimated using maximum likelihood, where the log-likelihood function is

$$\ln L(\delta, \beta) = \sum_{i=1}^N \left\{ I_i^0 [F(w_1; \delta, \beta)] + \sum_{m=2}^{M-1} I_i^m [F(w_{m+1}; \beta) - F(w_m; \beta)] + I_i^M [1 - F(w_M; \delta, \beta)] \right\} \quad (1.7)$$

With the indicator variable I_i^m taking the value 1 if individual i accepts salary m but not salary $m-1$. The advantage of this estimation method is that it uses all the information provided by the "payment cards" and thus gives more robust results, and robustness can be verified since σ is estimated individually.

