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HOW TO MAKE RURAL JOBS MORE ATTRACTIVE TO HEALTH WORKERS. FINDINGS FROM A DISCRETE CHOICE EXPERIMENT IN TANZANIA

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How to make rural jobs more attractive to health workers. Findings from a discrete choice experiment in Tanzania.*

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Abstract

The geographical imbalance of the health workforce in Tanzania represents a serious problem when it comes to delivering crucial health services to a large share of the population. This study provides new quantitative information about how to make jobs in rural areas more attractive to newly educated clinical officers. A unique data set stemming from a discrete choice experiment with clinical officer finalists in Tanzania is applied. The results show that offering continuing education after a certain period of service is one of the most powerful recruitment instruments the authorities have available. Increased salaries and hardship allowances will also substantially increase recruitment in rural areas. Offers of decent housing and good infrastructure, including the provision of equipment, will increase recruitment to rural remote areas but not as much as higher wages and offers of education. Women are less responsive to pecuniary incentives and are more concerned with factors that directly allow them to do a good job, while those with parents living in a remote rural area are generally less responsive to the proposed policies. When the willingness to help other people is a strong motivating force, policies that improve the conditions for helping people appear particularly effective.

JEL classification: C25, I18, J33

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1. Introduction

Human resources for health (HRH) are perhaps the single most important input to the health sector in low-income countries (Hongoro and McPake, 2004), and the shortage of health personnel and poor health worker performance together are one of the most pressing problems in these countries (Chen et al., 2004). Recent reports have pointed out that human resources comprise a fundamental constraint to improving health outcomes and reaching Millennium Development Goals (Joint Learning Initiative, 2004) (World Bank, 2004). It has further been stated that the lack of personnel with relevant skills forms a threat to the success of recent global initiatives such as the Global Fund to Fight AIDS, Tuberculosis and Malaria, as well as other programmes intended for up-scaling health services to reach the Millennium Development Goals (Wyss, 2004).

The most comprehensive overview of the available evidence on the HRH situation in Tanzania (Dominick and Kurowski, 2005) identifies a geographical imbalance as one of five main HRH problems, and identifies severe information gaps in this area. What appears to be clear from 2001/2002 census data is that the number of health workers per capita in Tanzania declined by 40% in the period from 1994/95 to 2001/02 (Kurowski, 2004), with medical cadres reduced from 34.8 per 100,000 population to 25.3 per 100,000 in the same period, mostly because of population growth. Another report (Joint Learning Initiative, 2004) states that there are only 0.02 physicians per 1000 population in Tanzania. This number is very low, even when compared with neighbouring countries like Uganda and Malawi. There is also large variation across districts: in Dar es Salaam, there are 0.14 doctors and specialists per thousand, while in Ruvuma there are only 0.004 per thousand. Similar patterns are found for other medical cadres (Kurowski, 2004). The line dividing districts with a relatively high number of staff from those with few staff can be drawn between rural and urban districts (Wyss, 2004). This emerging picture of difficulties in attracting health workers to rural districts is confirmed elsewhere, where the shortage of clinical officers and assistant medical officers relative to the staffing norm is calculated to be around 70% (McKinsey&Company, 2004).

According to Dominick and Kurowski (2005), the migration rates from rural to urban districts are unknown, and so a thorough analysis of the causes of this geographical imbalance is lacking. Overall, evidence on staff morale, satisfaction and motivation is scarce. More

specifically, there is little evidence on what is the most effective policy for encouraging Tanzanian health personnel to work in rural and rural remote districts. Lack of this evidence makes prioritizing between different policies aimed at correcting any geographical imbalance difficult and arbitrary, and the consequences of incorrectly allocating scarce resources may be severe (Bewley, 1995) (Fehr and Falk, 2002).

This study seeks to identify some aspects of the choice of work among Tanzanian health workers. The aim is to understand more about the preference structure of Tanzanian health workers and to answer the following question: what are the most important determinants for health workers appraising the possibility of working and living in different parts of Tanzania? Furthermore, the government and health authorities of Tanzania need more information about the possible effects of policy interventions aimed at recruiting more health workers to rural and remote areas. An important goal of the study is thus to shed light on the effect of different policies on the probability of choosing employment in a rural remote district.

Most information currently available on the willingness of health personnel to work in rural districts in Tanzania is from qualitative research. While these give valuable insight into complex and important issues, they provide little operational guidance for policy makers, for whom this paper will provide much-needed quantitative measures. Sixty per cent of Tanzanian clinical officer[1] (CO) finalists participated in an extensive discrete choice experiment (DCE) used to identify their preference structure. Although DCEs have become a common method of identifying preferences in health economics, few attempts at applying DCEs to health personnel in developing countries have been undertaken. Chomitz et al. (1998) made use of a variant of a stated preference method with doctors in Indonesia, Mangham (2006) conducted a DCE of nurses in Malawi, and another DCE has recently been conducted in Ethiopia (Hanson and Jack, 2007). However, as far as the authors are aware, the preference structure of Tanzanian health personnel has not been identified using a DCE or similar quantitative exercise. In addition, the preferences of mid-cadres[2] (like COs) have never been investigated properly. Mid-cadres represent a large and important share of the health workforce in Tanzania (some 9.5%. compared with 1.1% for medical doctors

[1] A clinical officer is a role somewhere between a nurse and a medical doctor. They have more or less the same amount of education as nurses, but their training is more clinically oriented. In fact, clinical officers often function as medical doctors in rural areas.
[2] Mid-cadres are between nurses and medical doctors. They are mostly clinical officers and assistant medical officers.

(Kurowski, 2004)), and it is COs who form the backbone of the clinical workforce. This pattern is similar to many other developing countries. Their university qualifications are not often recognized in developed countries, and as result, these cadres are more likely to stay in their home country than other cadres (medical doctors and nurses). It is thus important and relevant to study the preferences of these groups.

The remainder of the paper is structured as follows. Section 2 gives a brief overview of the literature on the preferences of health personnel in developing countries. The focus is particularly on the empirical literature and on how different preferences affect the willingness to work in rural areas. Section 3 presents the data and method, while Section 4 specifies the econometric model and the estimations. Section 5 discusses the results, and Section 6 concludes.

2. Incentives identified in the empirical literature

Pecuniary incentives, like higher salaries or hardship allowances for health workers stationed in rural districts, can help make rural jobs more attractive. A number of financial incentive schemes have been suggested, and it is often found that financial incentives have a positive effect on the willingness to work in rural areas; see, for instance, (Chomitz et al., 1998), (Serneels et al., 2005), (Kristiansen and Forde, 1992). The size of this effect, however, varies across schemes, countries and cadres.

Several empirical studies also identify important non-pecuniary motivation factors. For instance, Vujicic et al. (2004) show that non-pecuniary incentives, like the provision of housing and the prospect of an opportunity to upgrade qualifications, are important reasons for wishing to migrate (Vujicic et al., 2004). Moreover, financial incentives have, in some cases, limited effects compared with non-financial incentives when it comes to self-esteem and job satisfaction (Kingma, 2003). Opportunities for educational upgrading, career development and colleagues in the work place are other motivating factors that have been found to be important when health workers decide where to work (Serneels et al., 2005) (Chomitz et al., 1998). Another suggestion is that the lack of equipment, supplies and appropriate facilities can act as a deterrent for health professionals accepting positions in rural and under-served areas. This is a primary factor given by medical students for not practicing in rural Pakistan (Zaidi, 1996). The study by Serneels et al. (2005), among others, investigates

the assumption of social preferences as important decision factors. They found that the students' motivation to help the poor, as a proxy for their intrinsic motivation, was one of two main determinants of willingness to work in a rural area in Ethiopia.

Drawing on existing research, there is also reason to believe that background variables and other personal characteristics can be important explanatory variables. Gender, family income, talent, education level and the regional base of the family are all variables that are likely to affect each individual's willingness (and hence motivation) to work in rural districts. The influence of individual characteristics on the willingness to work in rural districts is particularly well documented. For example, Chomitz et al. (1998) show that the premium needed to make Indonesian health workers move to rural districts was substantially lower for students from rural districts than for students originally from Jakarta. A Japanese study also found that rural doctors were more likely to remain in practice in rural areas if they had a rural background, and men were much more likely to remain in rural practice than women (Matsumoto et al., 2005). This finding is supported by a study where it was observed that women are less likely to accept rural posts and that they are accordingly underrepresented in rural areas (Doescher et al., 2000).

One suggested reason for women being less likely to move to rural districts is that there are fewer job opportunities for spouses and insufficient education opportunities for children (Dussault and Franceschini, 2006). Thus, the presence of family members in rural and remote areas increases the probability that an individual will consider these areas for the establishment of their practice (Dussault and Franceschini, 2006). In general, growing up in a rural community has been associated with a higher probability of practicing in rural areas (British Columbia Medical Association, 1998). That is, family matters in various ways: nurses in Malawi are more likely to work in rural districts if decent housing is offered (Mangham, 2006), and household consumption is one of the two most important determinants for the willingness to work in rural districts in Ethiopia (Serneels et al., 2005). Finally, age also sometimes matters: younger individuals typically have fewer family responsibilities and are more prepared to move or migrate (Chomitz et al., 1998) (Serneels et al., 2005).

3. Data and the discrete choice experiment

3.1 Data

In general, we wish to study the preferences of Tanzanian health personnel for different job attributes, but we are particularly interested in what appear to be important determinants for choosing employment in a rural remote district. However, there is little natural variation in revealed preferences: wages are more or less the same throughout Tanzania, at least for those working in public health facilities, and there is a problem of vacant positions in rural districts. It was therefore necessary to collect data exclusively for this study. Thus, an extensive survey was administered to more than 300 final-year students training to be COs. COs were chosen because of their ability to do much of the practical work of a physician, and because they often function as physicians in rural districts. A discrete choice experiment (DCE) formed the main part of the survey, though we also collected demographics and other background characteristics of the health workers, like gender, age, rural background, etc., to control for personal characteristics.

As preparation for developing the survey, a series of in-depth interviews were conducted with CO finalists in Kibaha and Sengerema in March 2007. The interviews, which were conducted in either English or Swahili depending on the student's preference, were semi-structured and concentrated around positive and negative aspects of living and working in rural areas. We also asked what the students thought could attract them and their friends to rural areas.

The quantitative data were collected during the autumn of 2007. Participation in the research was voluntary, and the participants were not compensated in any way. Some 320 CO finalists (around 60% of all CO finalists in Tanzania) from 10 randomly selected schools[3] participated in the DCE. All finalists in the selected schools were invited to participate. The data were mostly collected during school time, on the school premises. This largely explains the response rate of around 96%, which is unusually high for a DCE. Questionnaires that were not completed or were filled out by respondents from countries other than Tanzania were excluded from the sample, so the final sample used in the analysis comprised 296 respondents. Appendix A.1 provides summary statistics for the sample (not commented upon here).

[3] Appendix A.2 provides a list of the schools and a description of the selection procedure.

3.2 The discrete choice experiment

The respondents were asked to make choices between two alternative jobs. These jobs were constructed as bundles of seven different attributes with different levels. The choice makers are assumed to have their own values of each of the seven attributes and to be able to make trade-offs between them. The extant empirical work—see, for instance, (Zaidi, 1996), (Ramachandran et al., 2005), (Mangham, 2006), (Manongi et al., 2006), (Serneels et al., 2005), (Kurowski, 2004), (Kingma, 2003), (Heyes, 2005), (Hanson and Jack, 2007), (Gauri, 2001), (Dussault and Franceschini, 2006), (Chomitz et al., 1998)—as well as economic and psychological theory played a valuable role in developing these attributes and their levels. A large number of important potential attributes were identified, but in order to restrict the complexity of the job alternatives, it was also necessary to restrict the number of attributes. The choice models applied in the analysis rely on the assumption that responders are able to make trade-offs between attributes and their levels in order to maximize utility. If the choice alternatives become too complex, there is a risk of people adopting other decision heuristics or lexicographic decision rules (Witt et al., 2008) (Scott, 2002)[4]. The literature is inconclusive on the number of attributes that should be included, but somewhere between three and seven is normal in health economics (Ryan and Gerard, 2003), (Witt et al., 2008), (Scott, 2002). In this study, seven attributes are included. In this way, the job alternatives are not too complex while at the same time giving a relatively complete description of the job. In making the final decisions about which attributes to include and the levels to give, the in-depth interviews proved vital.

The following seven attributes[5] were ultimately included.

1) Working location
2) Salary and allowances
3) Possibilities of further education
4) Workload
5) Offer of decent housing

[4] In order to investigate whether the respondents had really been able to make trade-offs between the various attributes, we interviewed 20 students, two at each location. In the interviews, we asked them to explain how they made the choices. The interviews were very reassuring in indicating that all interview subjects had understood the task and made appropriate trade-offs.

[5] Appendix A.3 describes the attributes and their levels in detail.

6) Availability of equipment and drugs at the institution

7) Infrastructure

A D-efficient computerized design allowing for interaction effects was applied in order to make the hypothetical jobs and combine them into choice pairs. The design is programmed to give an efficient combination of orthogonality, level balance and minimum overlap. This resulted in a design with 32 choices between pairs of jobs. The 32 choice sets were randomly divided into two blocks in order not to exhaust the respondents. Each respondent thus made 16 binary choices. In addition, there were two versions of each block, where the order of choices was varied in order to correct for the effects of learning, exhaustion or tiredness that could be present[6]. The DCE was tested in a pilot with 30 students at the Kilosa Clinical Officer Training Centre; as a result, the formulation of some of the attribute levels was changed. Moreover, some of the questions were reformulated. Appendix A.4 provides an example of a choice set and a copy of the instructions given to the respondents.

4. Specification of the econometric model and estimations

4.1 The choice model

The underlying assumption of this analysis is that health workers have a complete ranking of jobs with varying attribute levels. This ranking is given by their preferences for the attributes and their respective levels. As rational economic individuals, the health workers maximize utility given their preferences for different job attributes; that is, they will always choose the alternative that best matches their preferences. The preferences are influenced by the background characteristics of the individual such as gender, religion, etc.

Our point of departure in the analysis of the data is a logit model consistent with McFadden`s choice model (McFadden, 1974). The basis of the logit model is the concept of utility maximization. The decision maker, *n*, assumed to be a rational economic individual, faces a choice among *J* (in our case 2, which gives us a standard logit model) alternatives, and he/she will choose alternative *i* over alternative *j* if and only if $U_{ni} \geq U_{nj}$.

[6] Including person-specific fixed effects did not alter the results.

The utility that decision maker *n* receives from alternative *j* is given by:

$$U_{nj} = V_{nj} + \varepsilon_{nj}, \forall j.$$

However, the utility is not directly observable. The researcher can observe V_{nj}, sometimes referred to as the representative utility, while ε_{nj} is unobservable and treated as random. It is assumed that ε_{nj} is a distributed IID extreme value.

The logit choice probabilities (the probability of choosing alternative *i* over alternative *j*), following McFadden (1974), are given by:

$$\begin{aligned} P_{ni} &= \Pr(V_{ni} + \varepsilon_{ni} > V_{nj} + \varepsilon_{nj} \forall j \neq i) \\ &= \Pr(\varepsilon_{nj} < \varepsilon_{ni} + V_{ni} - V_{nj} \forall j \neq i) \end{aligned}.$$

The representative utility, V_{nj} is specified to be linear in parameters:

$$V_{nj} = \beta' x_{nj}$$

x_{nj} is a vector of observed variables relating to alternative *j*. Because ε_{ni} is not given, the choice probability is the integral of $P_{ni}|\varepsilon_{ni}$ over all values of ε_{ni} weighted by its density. The logit probability of choosing alternative *i* rather than alternative *j* thus becomes:

$$P_{ni} = \frac{e^{\beta' x_{ni}}}{\sum e^{\beta' x_{nj}}}$$

The random utility model outlined here is concerned with the utility of one alternative compared with another. Thus, in practice, the preferences for one alternative over another are estimated.

The parameters and their estimated coefficients can only give information about the direction and significance of the effect by changing the levels of one attribute, all other things being equal. For policy makers (and normally economists), however, the most interesting analysis is

one that offers opportunities for the valuation and comparison of different policies. We therefore use the regression results to calculate willingness to pay (WTP) and policy impact measures.

4.2 Willingness to pay

In order to calculate the WTP for job attributes, it is convenient to think of the wage variable as continuous. Assuming that the contribution of the wage to utility is quadratic, the regression model will be:

$$U = \beta_1 wage + \beta_2 wage^2 + \beta_3 education6years + \beta_4 education4years + \beta_5 education2years + \beta_6 districthq + \beta_7 regionalhq + \beta_8 DSM + \beta_9 house + \beta_{10} workload + \beta_{11} equipment + \beta_{12} \inf rastructure + C$$

All variables refer to the attributes described in Section 3.2 and Appendix A.3. A dummy is constructed for each level of the attributes, except for the wage variable, which is treated as continuous because of technicalities. Because the wage variable is continuous and quadratic, the willingness to sacrifice wages to get a higher level of another job attribute is a function of the wage, given by the following equation:

$$WTP(educationafter6years) = -\frac{\partial U / \partial education6years}{\partial U / \partial wage} = -\frac{\beta_3}{\beta_1 + 2\beta_2 wage}.$$

This WTP measure is calculated for all wage levels, but we only report that for the lowest wage level as best reflecting the current circumstances. We calculate the p-values and standard errors using the delta method.

4.3 Policy impact

We can consider the change in the probability of taking the baseline job[7] due to a change of the level in one of the job attributes as the impact of a policy that changes the level of this attribute. When calculating this impact, we let the wage variable be continuous and quadratic, like the WTP calculation. The regression model thus appears as that outlined for the WTP

[7] The lowest levels of the attributes are the baseline levels, while the dummies in the regression indicate the higher levels. Thus, the baseline job is that job with the lowest level of all attributes.

model. The change in the probability of taking the baseline job because of a change in one of the job attributes—say, if we raise the salary to 350,000 Tanzanian shillings (TSH) per month—is then (as long as all other attributes remain equal) given by:

$$P_{wage=350} - P_{wage=200} = \frac{e^{\beta_1*350+\beta_2*350\text{^}2}}{e^{\beta_1*200+\beta_2*200\text{^}2} + e^{\beta_1*350+\beta_2*350\text{^}2}} - \frac{e^{\beta_1*200+\beta_2*200\text{^}2}}{e^{\beta_1*200+\beta_2*200\text{^}2} + e^{\beta_1*350+\beta_2*350\text{^}2}}.$$

Again, we calculate the standard errors and 95% confidence intervals using the delta method.

4.4 Dominant preferences

WTP measures and other marginal effects can be overestimated if the respondents have dominant preferences for any of the attributes (Scott, 2002). For each attribute and each respondent, we have thus checked whether *all* the chosen alternatives have a higher level of the attribute in question, or put differently, that the respondent always chose the alternative with the highest level of the attribute. If not, the respondent is said not to have dominant preferences. In general, there were extremely few dominant preferences. The only dominant preferences found in the data set were from two respondents who had dominant preferences for infrastructure. As these respondents were trading off other attributes they were not excluded from the data set.

5. Results & discussion

Appendix A.5 presents the regression results. However, for policy purposes, the most interesting feature of the econometric analysis is the marginal analysis. That is, what happens to the probability of taking a job in a rural district when there is a change in a job attribute? Moreover, which policies will be most effective in increasing the probability of Tanzanian health personnel taking a job in rural districts? Two different methods that potentially help answer these questions are applied. First, the WTP—or rather the willingness to sacrifice some salary and allowances to get a higher level of one of the other attributes—is estimated and presented in Section 5.1. Second, Section 5.2 investigates and presents the change in the probability of taking a job in a remote area resulting from increasing the levels of the other job attributes. From earlier empirical research in this area, we may expect various subgroups to react differently to different policies. As a result, we repeat the exercise for different subgroups and give the results in Sections 5.2.1, 5.2.2 and 5.2.3.

5.1 Willingness to pay

Table 1 shows the results of the WTP calculation. These measures explain how much of the salary a newly qualified CO is willing to sacrifice, given that he/she has a salary of 200,000 TSH per month[8].

On average, the CO finalists are willing to give up 306,166 TSH per month to obtain the possibility of more education after two years of service in place of the base level of no education. The measure gives us a clear indication about the importance of getting more education as soon as possible. A closer examination supports this impression. On average, the CO finalists are willing to pay 96,796 TSH in order to obtain education after six years of service in place of no further education opportunities. When the time of service before education is reduced to four years, we see that they are willing to sacrifice another 96,316 TSH of salary every month. However, it is when the time of service is reduced by another two years that we see the strongest effect: the CO finalists are then willing to sacrifice an extra 113,054 TSH per month. In-depth interviews done with CO finalists in March 2007 largely confirm that they are eager to gain more knowledge and to begin building their careers.

[Table 1 about here]

In terms of location, there is an average willingness to sacrifice 57,151 TSH per month to work in the district headquarters rather than a remote area. Alternatively, in order to work in a rural remote place rather than the district headquarters, 57,151 TSH would have to be added to the salary every month. This is relatively intuitive, as the district headquarters, although it may be small, can offer a number of services and a very different working environment from that found in remote areas. Compared with the WTP for education possibilities, this measure is quite small. The WTP for a job in the regional headquarters is insignificant and very small. It is then likely that there are forces pushing the decision in opposite directions: in district headquarters, as well as remote areas, COs do more or less everything, gaining much experience and working relatively autonomously as clinicians. However, in the regional headquarters, the health facilities are generally better equipped than in remote areas. The data

[8] This is the most realistic WTP measure as the starting wage for public clinical officers is presently just above 200,000 TSH. The WTP can also be calculated for other wage levels. The general pattern is that people are willing to pay more (and have to be compensated more for negative policies) when they have higher salaries.

are inconclusive on the relative strength of these opposing forces. In contrast, students have to be compensated with 82,171 TSH per month to take a job in Dar es Salaam as against a remote area[9].

Most research from other countries has documented that the more central a job, the more it is preferred by the various types of health workers. However, one study has actually found a similar pattern: nurses participating in a DCE in Malawi preferred, on average, to work in small towns rather than large cities (Mangham, 2006). Another study also found a similar pattern among female medical and nurse students in Indonesia: they preferred to do their internship in cities other than the capital, Jakarta (Chomitz et al., 1998). None of these studies, however, provided an explanation for these findings. Again, the in-depth interviews with students before and after the DCE was conducted, may provide some insights. For instance, several students were apprehensive that if they took a job in Dar es Salaam, they would not be allowed to do 'fun' and interesting things. As there is a lower shortage of labour in Dar es Salaam, and given that the workforce there is more educated than in other places in the country, newly trained COs are afraid that they will lose their autonomy and be given few challenging tasks and too little responsibility. Costs of living are likely to be a particular concern to young people who are on the verge of settling, and Dar es Salaam is considered more expensive than other urban or semi-urban areas. However, it is worth noting from Table 1 that respondents value both good infrastructure and education opportunities more than they dislike Dar es Salaam. Thus, our observation that they have to be compensated does not necessarily contradict the general empirical pattern of an inflow of people and health workers to Dar es Salaam. In general, the students are not very concerned with the location of their job compared with other features like education possibilities, the equipment situation at the health institution and infrastructure.

On average, the respondents were willing to reduce their monthly salary by 190,348 TSH if they could have a job in an area with decent infrastructure[10]. Equipment did not appear to be as important as general infrastructure, but they were willing to pay 110,972 TSH per month in order to work in an institution with sufficient equipment and drugs compared with one without them. Finally, housing has been proposed as an alternative means of compensating

[9] This is a real economic result, not merely a consequence of the way in which the statistical software treats zero values.
[10] Defined as 'mobile coverage, electricity and water'.

and attracting health workers, but it appears that this is not very highly valued among CO finalists. While they are willing to pay a certain amount of their salary (57,288 TSH) to get a house, compared with education and the prerequisites needed to do their job as taught, the offer of a house appears to mean little.

Although the preference for workload is not significant, it is worthwhile noting that it is negative as this reflects what quite often arose in the in-depth interviews; namely, that a high workload at this stage of their career is valuable because it gives more experience. Thus, not all newly qualified COs are deterred by jobs with a heavy workload. On the contrary, some seek it in order to gain more experience.

In sum, the WTP analysis tells us that the possibility of more education is by far the most valued feature of a job when measured by the amount of salary one is willing to give up in order to get a higher level of another attribute. Other factors that more directly concern the ability to do a good job, like infrastructure and sufficient equipment, are also very important. Offers of decent housing and location appear not to be as important for the next generation of COs. However, a policy that aims at offering housing is likely to have a positive effect, though on a relatively small scale.

5.2 Policy impact

By differentiating the probability function with respect to changes in job attributes, we can forecast the *effectiveness of different policies*. The point of departure is a job in a remote area[11] where the salary is 200,000 TSH, no education is offered, no house is offered, the workload is relatively high, there is little and/or outdated equipment, and the infrastructure is poor. This may appear as a worst-case scenario, but the reality is that it is rather close to many rural remote areas in Tanzania. Table 2 presents the general effectiveness of the policies.

[Table 2 about here]

Although increased salaries are often the first thing that springs to mind when thinking about ways to increase recruitment to rural areas, this measure alone may not be the most efficient way to recruit more health workers to rural districts. Increasing the monthly starting salary up

[11] Defined as ‘a 3-hour (or more) bus ride from the district headquarters’.

to 650,000 TSH will surprisingly not have the strongest effect on the probability of taking a job in a remote area as it increases the probability by 62 percentage points. However, such a policy would be extremely expensive, certainly from day one. Increasing the wages slightly less, to 500,000 TSH per month also appears to be an effective measure, as it increases the probability of taking the remote job by 47 percentage points. Finally, increasing wages to 350,000 TSH per month will increase the probability of taking a remote job by 26 percentage points. These results show that while the regulation of salary and allowances is a powerful instrument, this instrument becomes less effective as salaries increase. That is, raising wages to 350,000 TSH increases the probability of taking a remote job by 26 percentage points, and raising it by another 150,000 to 500,000 TSH increases the probability by 21 percentage points, but increasing it by another 150,000 to 650,000 TSH increases the probability by only 18 percentage points. If wage increases are the chosen policy, it may be better, after raising wages to a certain level, to include policies other than increasing wages further.

To offer possibilities for further education after two years of service may be another policy instrument for authorities. This proves to be the second most effective policy as it increases the probability of taking a remote job by 52 percentage points if the education offer is after two years of service. In comparison, providing education opportunities after 4 and 6 years of service increases the respective probability of taking a rural job by only 35 and 18 percentage points. A policy where further education or upgrading of qualifications follows a certain period of service in a rural area could thus also form a well-aimed instrument for correcting the geographical imbalance of the health workforce. This kind of policy can also be convenient as it postpones costs. Better access to education may also provide positive externalities, unless the health workers then become attractive to other countries and other working locations. The policy of promising more education after a certain time of service has a catch, and that is the question of whether the health workers will trust the authorities when they make such promises. Several of the respondents responded in the in-depth interviews that although the offer sounded tempting, they were not sure whether they could afford to trust this promise. The authorities will thus have to provide some kind of commitment in advance for this policy to be credible.

Investing in infrastructure is another way to make rural remote areas more attractive (and in some ways, less remote) not only for health workers but also for entrepreneurs, public servants and other service providers. Our analysis shows that if the authorities provided

decent basic infrastructure, the probability of taking a remote job would increase by 34 percentage points. The remaining policy instruments follow according to their effect on the probability of taking a job in a remote area: supplying the health institution with a sufficient amount of equipment and drugs (21 percentage points) and offering decent houses to health workers (11 percentage points).

In general, the marginal effects are quite substantial and the standard errors are relatively small, so we can expect to see positive effects from any of the suggested policies. There is one exception; namely, the policy of decreasing workload. There may be several reasons why this policy does not give a significant effect. Furthermore, because the result is not merely statistical, there must be an underlying economic reason. As discussed earlier, students did not appear to agree on whether a reduction in workload was a good or bad thing. Some respondents wanted experience and welcomed a high workload, while others wanted to have time to do things apart from their official job and were sceptical about the benefits of high workloads. Another thing that makes it difficult to obtain a clear effect from reducing workloads is that there is not a clear understanding, among either students or authorities, on what the present level of workload actually is in remote areas.

5.2.1 Impact depending on gender

Table 3 displays the impact of policies (changes in probabilities) for different subgroups. Separate regressions are run, and the probabilities are calculated for each subgroup. The second and third columns of Table 3 show the respective results for male and female respondents. As shown, women tend to be significantly less responsive to pecuniary incentives: increasing salaries to 650,000 had a lower effect on females than on males. Increasing salaries over a certain level would thus be less effective in attracting female COs to rural remote places. Women are also more concerned with infrastructure and the resource situation in a potential work place than their male counterparts: good infrastructure, the offer of a house and sufficient equipment contributes more positively to their utility (and hence their probability of taking the job). Another interesting pattern is also worth noting in that women appear to be more patient when it comes to how much they value the opportunity of getting education after 6 years compared with after 2 years. Male respondents have a much steeper response curve to education than females: they value education opportunities after 6 years less than the female respondents, and after 2 years significantly higher than the female respondents.

[Table 3 about here]

5.2.2 Impact depending on rural remote background

There are also significant differences between the preferences of students with parents living in rural (remote) areas and other students, as shown in the fourth and fifth columns of Table 3. Students with parents living in rural remote areas are significantly less responsive to pecuniary incentives at all levels. They are also significantly less responsive to an offer of education after two years of service, although the difference between the groups is not great. Furthermore, there are significant differences in the effects from improving the equipment and drug situation at the health facilities and the infrastructure in the area. Those with a rural background are generally less responsive to these attributes. This reflects a general (but not always significant) pattern that students with parents living in remote areas generally value all job attributes less than other students. All policies related to changing the level of job attributes will thus have less effect on these particular COs. It is likely, however, that this group is already more likely to take jobs in rural remote places, which may to some extent explain why these students are less responsive to incentives.

5.2.3 Impact depending on willingness to help people

Intrinsic motivation, or to be exact, its proxy in the form of a willingness to help the poor, has been found to be one of the most successful variables in explaining the willingness to work in rural areas (Serneels et al., 2005). This finding is little tested in similar empirical studies from developing countries. Our survey allowed us to check whether students who were found to be very willing to help other people react to incentives differently from other students. A dummy variable that measures willingness to help other people was constructed on the basis of *total* agreement to *all* of the following three statements: 1) “I feel good when I can help other people, even if it means I have to work very hard”; 2) “The general satisfaction coming from helping other people is the same no matter what I get paid”; and 3) “As long as I receive the minimum public salary for COs, I am willing to work where most needed in order to help as many as possible”. The sixth and seventh columns in Table 3 present the estimated regressions for these subgroups (those very willing and those not so willing to help other people), respectively.

First, we can see that those who are motivated by being able to help other people are much less responsive to pecuniary incentives, particularly when salaries increase to over 350,000

TSH per month. This reflects a general pattern: finalists who are very willing to help are also generally less responsive to incentives. However, there is one attribute that this group is very concerned with; namely, the equipment and drugs available at the heath facility. They are substantially and significantly more responsive to a policy of providing sufficient equipment and drugs than their counterparts. This makes sense as the provision of equipment and drugs is an important prerequisite for helping people. Second, while the other subgroups keep more or less the same ranking of incentives/policies as the average, the subgroup of people very willing to help others have a slightly different ranking. The most important differences are that they are more responsive to obtaining opportunities for more education after 2 years than to a monthly wage of 650,000 TSH, and that they more highly value sufficient equipment and drugs. Equipping health facilities properly and ensuring a sufficient amount of drugs may thus attract more newly qualified COs who are very motivated to help other people.

6. Concluding comments

When discussing the geographical imbalance of the health workforce, it is common to refer to rural and rural remote areas with a bundle of negative associations. Our results underline that it is important to bear in mind that it is not necessarily the geographical location per se that hinders COs from taking jobs in rural areas but rather poor infrastructure and the fear of falling behind in professional development. In practice, this is important because it means that policies to correct the imbalance not only have to be compensating but also can aim to change the prerequisites in rural areas. However, this analysis focuses on the preference structure for a certain type of medical cadre at a particular stage of his/her career. In this phase, it is very important to obtain as much experience as possible and to become well educated (i.e., to obtain a higher grade than CO). Generalizations to other cadres and to COs who have come further along in their careers may be misleading and difficult as their preferences are likely to be quite different from those analysed here.

A problem with stated preference data, like the data drawn from surveys, is that respondents will not have to demonstrate their willingness to take different jobs; e.g., actually to work in rural districts. Unfortunately, there is not much to do about this when there are no data on revealed preferences. When stating their preferences, respondents will also have incentives to manipulate the results of the analysis. However, we sought to avoid this problem by using a DCE. A final warning: this analysis deals with the effect of different policy measures, not the costs of implementing them. For any government with budget constraints, it would be

advisable to do a thorough analysis of the net gain (loss) from implementing different measures before concluding what is the most efficient thing to do.

References

Bewley, T. (1995). A depressed labor market as explained by participants. *American Economic Review, Papers and Proceedings* 85, 250-254.

British Columbia Medical Association (1998). Attracting and Retaining Physicians in Rural British Columbia. Vancouver: Report from The BCMA Rural Issues Commitee.

Chen, L., Evans, T., Anand, S., Boufford, J. I., Brown, H., Chowdhury, M., Cueto, M., Dare, L., Dussault, G., Elzinga, G., Fee, E., Habte, D., Hanvoravongchai, P., Jacobs, M., Kurowski, C., Michael, S., Pablos-Mendez, A., Sewankambo, N., Solimano, G., Stilwell, B., Waal, A. d. and Wibulpolprasert, S. (2004). Human resources for health: overcoming the crisis. In *Lancet*, Vol. 364. 1984-90.

Chomitz, K. M., Setiadi, G., Azwar, A., Ismail, N. and Widiyarti (1998). What Do Doctors Want? Developing Incentives for Doctors to Serve in Indonesia's Rural and Remote Areas.: The World Bank.

Doescher, M., Ellsbury, K. and Hart, L. (2000). The distribution of rural female generalist physicians in the United States. *Journal of Rural Health* 16, 111-118.

Dominick, A. and Kurowski, C. (2005). Human Resources for Health - an Appraisal of the Status Quo in Tanzania Mainland.

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

Fehr, E. and Falk, A. (2002). Psychological foundations for incentives. *European Economic Review* 46, 687-724.

Gauri, V. (2001). Are Incentives Everything? Payment Mechanisms for Health Care Providers in Developing Countries. The World Bank.

Hanson, K. and Jack, W. (2007). Health worker preferences for job attributes in Ethiopia: Results from a discrete choice experiment.

Heyes, A. (2005). The economics of vocation or *why is a badly paid nurse a good nurse*? *Journal of Health Economics* 24, 561-569.

Hongoro, C. and McPake, B. (2004). How to bridge the gap in human resources for health. *Lancet* 364, 1451-1456.

Joint Learning Initiative (2004). Human Resources for Health: Overcoming the Crisis. Harvard University Press.

Kingma, M. (2003). Economic incentive in community nursing: attraction, rejection or indifference? *Human Resources for Health* 1.

Kristiansen, I. S. and Forde, O. H. (1992). Medical specialist's choice of location: the role of geographical attachment in Norway. *Soc Sci Med* 34, 57-62.

Kurowski, C., K. Wyss, S. Abdulla, N. Yémadji, A. Mills (2004). Human resources for health: Requirements and availability in the context of scaling-up priority interventions in low-income countries. Case studies from Tanzania and Chad.: London School of Hygiene and Tropical Medicine.

Mangham, L. (2006). Adressing the Human Resource Crisis in Malawi's Health Sector: Employment preferences of public sector registered nurses in Malawi. *ESAU Working Paper Series*.

Manongi, R. N., Marchant, T. C. and Bygbjerg, C. I. (2006). Improving motivation among primary health care workers in Tanzania: a health worker perspective. *Human Resources for Health* 4.

Matsumoto, M., Okayama, M., Inoue, K. and Kajii, E. (2005). Factors associated with rural doctors' intention to continue a rural career: A survey of 3072 doctors in Japan *Australian Journal of Rural Health* 13, 219-225.

McFadden, D. (1974). Conditional logit analysis of qualitative choice behavior. In *Frontiers in Econometrics*(Ed, Zarembka, P.). New York: Academic Press, 105-142.
McKinsey&Company (2004). Acting Now to Overcome Tanzania's Greatest Health Challenge; Addressing the Gap in Human Resources for Health.
Ramachandran, V., Pal, M., Jain, S., Shekar, S. and Sharma, J. (2005). Teacher Motivation in India. Educational Resource Unit. India.
Ryan, M. and Gerard, K. (2003). Using discrete choice experiments to value health care: current practice and future prospects *Applied Health Economics and Policy Analysis* 2, 55-64.
Scott, A. (2002). Identifying and analysing dominant preferences in discrete choice experiments: An application in health care. *Journal of Economic Psychology* 23, 383-398.
Serneels, P., Lindelow, M., Garcia-Montalvo, J. and Barr, A. (2005). For Public Service or Money: Understanding Geographical Imbalances in the Health Workforce. The World Bank.
Vujicic, M., Zurn, P., Diallo, K., Adams, O. and Poz, M. D. (2004). The role of wages in the migration of health care professionals from developing countries. . *Human resources for Health* 2.
Witt, J., Scott, A. and Osborne, R. H. (2008). Designing choice experiments with many attributes. An application to setting priorities for orthopaedic waiting lists. *Health Economics* Forthcoming, published online in Wiley InterScience.
World Bank (2004). The millennium development goals for health: rising to the challenges. Washington DC.
Wyss, K. (2004). An approach to classifying human resources constraints to attaining health related Millennium Development Goals. *Human Resources for Health* 2.
Zaidi, A. (1996). Why medical students will not practice in rural areas: evidence from a survey. *Social Science and Medicine* 22, 527-533.

Table 1

Willingness to pay given a wage of 200,000 TSH per month*

Variable	Willingness to pay**	Lower level of 95% conf. interval	Upper level of 95% conf. interval
Education after 6 years of service	96,796	41,237	152,356
Education after 4 years of service	193,112	130,718	255,505
Education after 2 years of service	306,166	207,475	404,857
District headquarters	57,151	15,988	98,314
Regional headquarters	5,755	–28,356	39,866
Dar es Salaam	–82,171	–129,533	–34,809
Housing provided	57,288	25,926	88,651
Reduced workload	–16,430	–42,630	9,770
Sufficient equipment	110,972	71,886	150,058
Infrastructure	190,348	129,515	251,181
Number of observations	9342		
LR Chi^2 (13)	1627.86		
Prob > Chi^2	0.0000		
Pseudo R^2	0.2514		

* Estimated with the wage attribute as a continuous and quadratic variable.

****** TSH per month.

Table 2

Changes in probabilities, the whole sample*

Change from base line	Change in probability	Standard error	P > |z|
Wage 350,000 TSH	.261	.0274	0.000
Wage 500,000 TSH	.468	.0271	0.000
Wage 650,000 TSH	.618	.0211	0.000
Education after 6 years of service	.179	.0453	0.000
Education after 4 years of service	.346	.0336	0.000
Education after 2 years of service	.517	.0253	0.000
Housing provided	.107	.0245	0.000
Reduced workload	–.031	.0242	0.204
Sufficient equipment	.205	.0208	0.000
Infrastructure	.342	.0169	0.000
Number of observations	9342		
LR Chi^2 (13)	1627.86		
Prob > Chi^2	0.0000		
Pseudo R^2	0.2514		

* Estimated with the wage attribute as a continuous and quadratic variable.

Table 3

Changes in probabilities, subgroups*

Variable	Male	Female	Rural remote background	Not rural remote background	Very much willing to help	Not so much willing to help
Wage 350,000 TSH	**.277*** ** (.0342)	**.248*** ** (.0469)	**.173*** ** (.0462) §	**.306*** ** (0346) §	**.174*** ** (.0589)	**.283*** ** (.0313)
Wage 500,000 TSH	**.498*** ** (.0333)	**.437*** ** (.0475)	**.364*** ** (.0485) §	**.520*** ** (.0333) §	**.341*** ** (.0626) §	**.501*** ** (.0304) §
Wage 650,000 TSH	**.656*** ** (.0251) §	**.570*** ** (.0378) §	**.551*** ** (.0386) §	**.652*** ** (.0255) §	**.493*** ** (.0550) §	**.651*** ** (.0226) §
Education after 6 years of service	**.152*** ** (.0578)	**.229*** ** (.0744)	**.206*** ** (.0735)	**.167*** ** (.0586)	**.120** (.0991)	**.191*** ** (.0517)
Education after 4 years of service	**.363*** ** (.0422)	**.315*** ** (.0574)	**.290*** ** (.0567)	**.389*** ** (.0423)	**.195*** ** (.0754) §	**.394*** ** (.0377) §
Education after 2 years of service	**.559*** ** (.0303) §	**.449*** ** (.0455) §	**.473*** ** (.0444) §	**.543*** ** (.0311) §	**.510*** ** (.0531)	**.526*** ** (.0288)
Decent housing offered	**.085*** ** (.0312) §	**.165*** ** (.0403) §	**.099** ** (.0402)	**.122*** ** (.0313)	**.094*** (.0518)	**.108*** ** (0281)
Normal workload	**–.028** (.0305)	**–.030** (.0412)	**–.030** (.0393)	**–.021** (.0312)	**.020** (.0515)	**–.047*** (.0275)
Sufficient equipment	**.169*** ** (.0263) §	**.273*** ** (.0345) §	**.136*** ** (.0351) §	**.248*** ** (.0263) §	**.310*** ** (.0422) §	**.173*** ** (.0242) §
Decent infrastructure	**.314*** ** (.0218) §	**.407*** ** (.0273) §	**.269*** ** (.0291) §	**.385*** ** (.0211) §	**.318*** ** (.0366)	**.352*** ** (.0193)
Number of observations	5986	3324	3062	6176	1974	7336
LR chi2 (13)	1061.54	614.54	398.86	1250.44	298.79	1355.32
Prob > chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2	.2558	.2667	.1879	.2921	.2184	.2665

* Changes in probability are in bold. Asterisks indicate the statistical significance at the * 10% level, ** 5% level, and *** 1% level. Standard errors are in brackets. A regression is run for each subgroup. The differences between the preferences of subgroups that are statistically significant are indicated by §. Note that the total number of observations may vary with the groups examined. For example, when analysing the differences between the preferences of men and women, observations where the respondent has failed to answer the question of gender are removed from the sample, while when analysing the preferences of students with a rural remote background versus other students, those who have failed to answer are also removed from the sample. The same applies when analysing students with or without a strong motivation to help people. The variation in results is negligible.

Appendix

Table A.1

Summary statistics of respondents*

Variable	Mean	Std. dev	Min.	Max.
Sex (male = 0, female = 1)	.358	.4795	0	1
Age	30.762	8.7983	20	59
Rural remote background	.336	.4722	0	1
Help others 1	1.355	.7639	1	5
Help others 2	2.465	1.4195	1	5
Help others 3	2.369	1.3936	1	5
Help others index	.209	.4068	0	1

*Rural background (yes = 1, no = 0): parents live in a rural remote area (a 3-hour or more bus ride from the district headquarters).

Help others 1: "I feel good when I can help people, even if it means I have to work very hard". 1 = strongly agree – 5 = strongly disagree.

Help others 2: "The general satisfaction coming from helping other people is the same no matter what I get paid". 1 = strongly agree – 5 = strongly disagree.

Help others 3: "As long as I receive the minimum public salary for COs, I am willing to work where it is most needed in order to help as many as possible". 1 = strongly agree – 5 = strongly disagree.

Help others index: Index indicating whether a respondent has the value 1 on *all* of the three variables: help others 1, help others 2 and help others 3. Very much willing to help = 1, not so much willing to help = 0.

Table A.2

List of schools in the sample and description of sampling procedure

School
Kibaha Clinical Officer Training Centre
Lindi Clinical Officer Training Centre
Lushoto Clinical Officer Training Centre
Machame Clinical Officer Training Centre
Mafinga Clinical Officer Training Centre
Masasi Clinical Officer Training Centre
Mtwara Clinical Officer Training Centre
Musoma Clinical Officer Training Centre
Mvumi Clinical Officer Training Centre
Sengerema Clinical Officer Training Centre

Selection procedure: Ten schools were drawn randomly from 18 clinical officer-training centres. Two of the drawn schools were excluded because of logistical problems (they were very remote and difficult to reach at the planned time for data collection, and they had very few students), and two more schools were drawn from the total sample.

Table A.3

The attributes and their levels*

Attributes	Salary and allowances	Education opportunities/ possibility of upgrading qualifications:	Location	Availability of equipment & drugs	Workload	Housing	Infrastructure
Level 1	650,000 TSH per month	Education offered after 2 years of service.	Dar es Salaam	Sufficient	Normal: nearly enough time to complete duties. One hour of extra work per day.	Decent house is provided.	The place has mobile coverage, electricity & water.
Level 2	500,000 TSH per month	Education offered after 4 years of service.	Regional headquarters	Insufficient	Heavy: barely enough time to complete duties. Three hours of extra work per day.	No house is provided.	The place has unreliable mobile coverage, no electricity or water.
Level 3	350,000 TSH per month	Education offered after 6 years of service.	District headquarters				
Level 4	200,000 TSH per month	No education offered.	A 3-hour or more bus ride from the district headquarters				

* For practicality, the ‘salary & allowances’ attribute is referred to as a wage.

A.4

Description of the choice-making task

The students were presented with the following instructions. In addition to having the instructions on a paper in front of them, these were read out loud by the research assistant, and clarifying answers to questions from the respondents were given in both English and Swahili.

You will in the following be presented with a number of jobs, two at the time. The jobs are supposed to illustrate the working situation in Tanzania today and some possible improvements. However, the jobs are hypothetical constructions and you are not supposed to evaluate how realistic they may be, just how much you like/dislike them.

Each job will consist of different levels of the following elements.

1) *Location*
2) *Workload*
3) *Infrastructure*
4) *Salary & allowances (note that we refer to the total sum of salary AND allowances)*
5) *Housing*
6) *Education opportunities/possibilities of upgrading qualifications*
7) *Availability of equipment and drugs*

For each pair of jobs you are presented with, you are asked to decide **which of the alternatives you will take given your current circumstances**. Please use only the information you are given about the jobs to evaluate them. Several aspects of a job may not be mentioned, but it is important that you evaluate only those aspects of a job that are described in the questionnaire.

Let us consider an example of the exercise.

Job A						
Availability of equipment & drugs:	Housing:	Education opportunities/ possibility of upgrading qualifications:	Workload:	Infrastructure:	Salary and allowances:	Location:
Sufficient	No house is provided.	Education offered after 6 years of service.	Normal: Nearly enough time to complete duties. One hour of extra work per day.	The place has mobile coverage, electricity and water.	350,000 TSH per month	Regional headquarters

Job B						
Availability of equipment & drugs:	Housing:	Education opportunities/ possibility of upgrading qualifications:	Workload:	Infrastructure:	Salary and allowances:	Location:
Insufficient	A decent house is provided.	Education offered after 2 years of service.	Heavy; barely enough time to complete duties. Three hours of extra work per day.	The place has unreliable mobile coverage, no electricity or water.	500,000 TSH per month	A 3-hour or more bus ride from the district headquarters

Considering your current situation, which of the two jobs would you take?

Job A: ☐ **Job B:** ☒

Now it is time to begin the real exercise! If you have any questions while working with it, please do not hesitate to ask the supervising interviewer for help!

Table A.5

Preferences for job attributes*

Variable	Coefficient	Standard error	P > |z|
Wage 350,000 TSH	.302	.0771	0.000
Wage 500,000 TSH	1.079	.0711	0.000
Wage 650,000 TSH	1.313	.0731	0.000
Education after 6 years of service	.316	.0938	0.001
Education after 4 years of service	.716	.0753	0.000
Education after 2 years of service	1.085	.0702	0.000
District headquarters	.216	.0723	0.003
Regional headquarters	.068	.0663	0.305
Dar es Salaam	–.246	.0780	0.002
Housing provided	.200	.0500	0.000
Reduced workload	–.053	.0482	0.272
Sufficient equipment	.397	.0438	0.000
Infrastructure	.713	.0386	0.000
Constant	–.001	.0408	0.990
Log likelihood	–2413.1387	Prob > chi2	0.0000
Number of obs.	9342	Pseudo R2	0.2547
LR $chi^2(14)$	1649.10		

* Estimated with each level of the wage attribute as dummies.

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