Meeting Qualification Mismatch with Vocational Training

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While in an ideal world the qualification preferences of job seekers and employers would coincide, in reality this is often not the case. Besides informational asymmetries (job seekers not knowing which qualifications are demanded by employers) the reason is that employers may be in need of qualifications that are not considered attractive by the job seekers. In the country of Georgia, we want to address this problem through a "recommendation system" which will suggest vocational training to job seekers. There are two main problems to be tackled in this project: (1) How can we decide what would be the most useful qualification for a given job seeker, and (2) how can we incentivize the job seekers to follow our recommendations? This policy brief discusses our approach to this problem.

Introduction

Qualification mismatches are common in many labor markets around the world (see for example, Ghignoni and Verashchagina (2014) for Europe, McGuinness and Sloane (2011) for the UK, and Béduwé and Giret (2011) for France). It is well known that qualification mismatch is a relevant problem also in the country of Georgia, as was shown in various studies (see ISET (2012) and The World Bank (2013)).

The ISET Policy Institute (ISET-PI) was commissioned by the World Bank to assist the Social Service Agency (SSA) of Georgia, an agency of the Ministry of Labor, Health, and Social Affairs, in developing a system which will recommend vocational training to job seekers with the aim to reduce the qualification mismatch in Georgia.

Job Seekers' Preferences Matter

Vocational training addresses the needs of two different groups. It is demanded by job seekers, who want to improve their human capital in a way that matches their preferences and, in the optimal case, maximizes their chances to get back into employment. At the same time, vocational training also addresses the needs of employers, whose businesses may face shortages in qualified personnel.

It is not enough to only include employers in the analysis if one wants to effectively fight the qualification mismatch. If one does not consider job seeker's preferences, it may happen that people prefer to not participate in the vocational training system at all. Even if one can effectively incentivize job seekers to attend training programs, as is the case in Germany for example, where the refusal to participate in training is sanctioned by a reduction of unemployment benefits (cf.

Neubäumer (2012)), it is likely that involuntary training will be less effective. Therefore, it is problematic that most studies which analyze the demand for qualifications in the job market, for example for the European Union (Lettmayr and Nehls (2012)), New Zealand (Earle (2008)), and Australia (Shah (2010)), exclusively focus on employers and neglect the preferences of the people who are to be trained. In Georgia, we will do it differently.

Why Would Job Seekers Follow Our Recommendations?

The objective of the recommendation system we develop is to maximize the impact the training has on the employment chances of the job seeker. Arguably, this is also the primary goal for most job seekers, as they often state that they want to receive training in an "employable" profession. Therefore, if the purpose of the recommendation system is communicated properly, and if it is transparent and trustworthy, the job seekers may want to voluntarily follow its advice.

Recommendation System vs. Matching Algorithm

One can think of two different ways of advising job seekers in their training choices: recommendation systems and matching algorithms.

Recommendation systems make suggestions to job seekers separately. These kinds of systems are ubiquitous on the Internet. For example, Amazon.com proposes books to its customers based on their purchasing history. In a similar way, a recommendation system for vocational training would suggest vocational training programs to job seekers based on relevant data about their characteristics and the job market situation. Yet its major shortcoming is that a

recommendation system will not take into account what other job seekers do and what recommendations were given to them.

For that reason, in a recommendation system, it can happen that the number of people recommended to choose a certain program is larger than that program's capacity (because the advice comes as a ranking, this does not cause the system to be useless, as the job seeker may then choose the program which is highest in the ranking and which has free places).

Likewise, if many job seekers follow the advice of the recommendation system, oversupply and undersupply of certain qualifications in the job market is not ruled out. This is again due to the fact that recommendations are made separately. If there is a huge demand for, say, plumbers, and many people receive the advice to receive training in plumbing, this may subsequently cause an oversupply of plumbers.

In contrast, a matching algorithm aims at an overall optimum for the whole group of job seekers. Genuine matching algorithms do not make separate recommendations, but propose a globally optimal assignment. In Western countries they are used, for example, to match interns to hospitals, students to universities, and kidneys to dialysis patients. Matching theory is one of the most successfully applied subfields of game theory, acknowledged through the award of the Economics Nobel Prize of 2012 to matching theorist Alvin E. Roth. The standard survey of matching theory is Roth and Sotomayor (1990).

In a matching algorithm, the abovementioned problems of a recommendation system would not occur (up to statistical uncertainty), because the matching algorithm would take into account how the suggestions made by the system affect the demand for a program. It would aim to keep the number of people, likely to choose a program, to remain below its capacity.

While a matching algorithm is more ambitious, it also has disadvantages compared to a simple recommendation system. First of all, the data requirements are higher, as the capacities of programs have to be taken into account. More importantly, in a matching algorithm the recommendations will be generated in a way that is not transparent to the job seeker (though it is possible to give some general explanations). This may reduce acceptance and willingness to participate. The recommendation system, on the other hand, can work in a relatively transparent way. Finally, a recommendation system can be adjusted and changed on an ongoing basis by Social Service Agency personnel without the help of external experts. Given its complexity, this is hardly possible with a matching algorithm.

Therefore, it was decided that the simpler option of a recommendation system is to be pursued. Later, the system may be upgraded to a full-blown matching algorithm.

The Technical Aspects of How Recommendations are made

Consider the situation of a job seeker looking for vocational training. Through the envisioned system, they will receive a recommendation of which qualification to pick in the vocational training system of the SSA.

The pieces of information used for making this recommendation are personal characteristics of the job seeker (like age, gender, preferences, skills, and other information obtained through the website worknet.ge which is operated by the SSA) and the current and future economic situation in different sectors. To this end, we will use value added tax data that can be decomposed into 45 sectors and updated on a monthly basis. For forecasts, we will draw on the Business Confidence Index of ISET, which allows decomposition into 5 sectors.

Given the information about the job seeker and the economic environment in different sectors, we will answer the question: "How many months do we expect the job seeker to be unemployed in the year after the training if the training was in qualification X?" Here, X can be whatever is offered in the vocational training system at the location of the job seeker, for example welder, mechanic, accountant, or IT expert. Alternatively, we could answer the question: "What is the salary we expect the job seeker to have in the year after the training if the training was in qualification X?"

The recommendation made to the job seeker will be: "Choose the training in field X if somebody with your personal characteristics, given the economic situation and outlook, has the lowest expected number of unemployed months (or the highest salary) in X in the year after training in X was received." This recommendation is likely to be accepted by the job seeker if also the job seeker wants to maximize their employment chances (or maximize salary).

The forecast can be made using econometric regression analysis. Let i be a job seeker and x_i be the number of months unemployed in the year after training was received. Then we have for each qualification one estimation equation

$$x_i = \alpha_i + \beta_1 y_{i1} + \beta_2 y_{i2} + \beta_3 y_{i3}...$$

where alpha is the intercept and the betas are the coefficients for different personal and economic characteristics. When the alpha and beta coefficients are known, then one can enter the specific data for a job seeker and forecast how long it would take him to find a job if training would be received in a particular field.

For estimating the coefficients, no recommendations will be made for some time (like 3 months) after the system is launched and only information will be collected. The SSA or a specialized survey agency will call the job seekers every month after they

received training and ask whether they found employment. Job seekers who received training through the SSA will be obliged to answer this question truthfully. Information about the characteristics of the job seeker is known through their participation in the worknet.ge system, which is a requirement for anybody who wants to receive vocational training through the SSA.

When the recommendation phase starts, further data will be collected. Errors in the estimation of the coefficients will be corrected "automatically" through the feedback (in terms of job market performance of the trainees) that the system gets on an ongoing basis. To increase this effect, the database used for the estimation of the coefficients will be "rolling", i.e. people who recently received training will be added while those who received training a longer time ago (e.g. one year or more) will be removed from the database.

Conclusion

In Georgia, ISET will design and implement a recommendation system for vocational training, addressing the qualification mismatch in the labor market. As in many other areas, Georgia is willing to go for innovative policy solutions making use of advanced economic methods, very much in line with the country's reputation as one of the top reformers in the world.

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