

Kirk Bansak: Improving refugee integration through data-driven algorithmic assignment

In this article the author proposes an algorithm to support the assignment of refugees within a country in order to maximize the chance of the refugees to find employment. Hereby, the motivation is presented in a comprehensible way arguing that refugees, after experiencing war, violence, sometimes a dangerous voyage and long times in refugee camps, have very few resources and are not used to local factors as language and culture and therefore, have usually difficulties integrating in the job market. These factors can, among others, help to explain the employment gap between refugees and other immigrants. To give the problem statement further importance, it is also mentioned and underpinned with citations, that self-sufficiency is regarded to be a very important step to further integration into society.

To investigate the problem statement, the author mentions three categories of factors that influence the success of a refugee finding employment: Location based factors, refugee specific factors (e.g. education level, language skills) and the synergies between a place and a refugee's specific factor. I think the article does a very good job in visualizing the three different factor categories.

The algorithm is then built up in the three stages modeling, mapping, and matching. For the modelling stage supervised learning algorithms were trained to predict the chance of employment for every refugee in every location. This was done using a combination of two models. One only takes the refugees intrinsic factors into account, while the other model analyzed subgroups of refugees in a certain location to account for potential refugee/location synergies. Unfortunately, neither the used supervised learning models, nor how they are combined is specified in the article. This makes a critique of these technical aspects and reproducing the findings impossible. It would also have been nice to read some information about the data preparation and/or normalization, which was not mentioned at all. Also, the distribution of the subgroup, assigned by a human to a certain location, could, if not evenly distributed, greatly influence the predictions of the refugee/location synergies. I feel this is likely the case, especially for the locations with fewer refugees (some only have in the range of 200). For example, the NGO distributing the refugees, could assign a certain education level or nationality over proportionally to a certain location, resulting in easier networking with compatriots and better employment chances or worse employment chances due to an oversupply respectively. It is hard to estimate how large these effects can be, since the article is not elaborating on the distribution of the subgroups. The article does, however, briefly mention that it is important that the assignment process is not determined by unobserved refugee characteristics to get robust predictions. On the other hand, the whole evaluation of the dataset of the USA is based on human assignment, which likely includes biases not represented in the refugee characteristics of the dataset, such as for example a picture of the refugees.

Since the refugees are usually assigned to a family and not an individual base, their individual predictions are transformed to case base prediction for the whole family or case grouping. Several mapping functions were briefly mentioned with the preferred being the predicted probability that at least one refugee in the case would find employment at the location in question. In the last step each case is assigned to a specific location under the maximization of a benefit function. Here many different costs and constraints can be defined according to the need of the institution or country using the algorithm. The metric used for the evaluation of the performance of the algorithm was chosen to be the average of the probability that at least one refugee per family gains employment. In general, I

find the chosen approaches and structure of the algorithm for the modelling, mapping and match making comprehensible and meaningful.

The given algorithm is then trained on both a dataset from the USA and Switzerland, each containing data from several past years. Then the expected rate of employment was predicted using the most recent part of the two datasets, which were not included in the training set. This approach is senseable and represents a close to real application scenario. The report claims that the algorithm improves the prospects of refugees finding employment by ~40% in the USA ~75% in Switzerland. This is, in my opinion, a bit of a bold claim, since these numbers are purely predictive. It is unfortunately not possible to compare the calculated optimal assignment of refugees with any measured data, since the algorithm likely assigns most individuals to a different location than where they were actually assigned. Considering the fact that it is highly unlikely for the chosen model to track the real world context in an exact manner, I would expect the actual percentage increases to be a bit lower. This potential is nonetheless very impressive and the article mentions the need for a randomized control trial for a real validation.

I have the impression that the model might be improved by choosing more recent data for the training dataset for both cases, provided that there is enough data left for a good prediction. This suggestion comes from the fact that the refugee distribution can change quite quickly over time [1], as for example with the refugee crisis in 2016. Since it is anyways suggested (and shown in citation 19) that early employment is often highly predictive of long-term employment it would be possible to shorten both prediction and measurement horizon to react more quickly to changing dynamics in the refugee number or distribution. Further improvements might be possible by including industry specific work experience of the refugees into the prediction model. This way for example refugees with a background in mining or farming could be assigned to respective locations.

On the other hand, applying this algorithm could have negative social consequences, which are not addressed within the article. As already mentioned the algorithm could end up assigning people of the same origin to the same location. While it is easy to imagine, how this can be beneficial for employment, this can also lead to segregation of the refugee population from other refugees or the nationals of a certain country, which is counterproductive to integration. Such a segregation and its negative effects can for example be seen in the agglomeration of Paris [2]. The procedure could also be discriminative against women, by matching the location of the family to maximize the expected employment chance for the most employable person. For families from more patriarchal cultures this might more often be the man than the women. This could make finding a job and integrating even harder than random assignment for women, even if they would be willing to work. Also I am a bit concerned about the fairness on an individual basis of the algorithm. Even though the article claims that the algorithm increases employment chances for everyone I would persist on a detailed analysis of this as a policy evaluator. I think it is easily imaginable that there might be some cases, where optimizing for a more employable person instead of a person that has worse overall chances for employment might yield a better mean employment probability.

[1] Asylstatistik Staatssekretariat für Migration Switzerland
<https://www.sem.admin.ch/sem/de/home/publiservice/statistik/asylstatistik/archiv.html>

[2]Matthieu Delage et Serge Weber, L'espace résidentiel des étrangers dans la métropole parisienne
<https://journals.openedition.org/hommesmigrations/2985>