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A Gravity Model Approach**

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Migration and Online Job Search: a Gravity Model Approach

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Abstract

Most studies of migration focus on realized migration. Data on realized migration take substantial time to collect and are available to researchers and policymakers only at a significant delay. In this study we consider a new potential data source in the form of tracking the patterns of online job seekers actively searching for a job in a country other than their current home. The advance of internet job search allows job seekers to explore international employment options before making a decision to move. We characterize job seeker interest across national borders by looking at user behavior on a major job search website. We investigate the determinants of cross-border job search using a standard gravity model and find that both the determinants and the relative importance of the determinants for job search are strikingly similar to those for past realized migration. This suggests both that job seekers are likely to act on their international job search and that these data may be useful for predicting future migration patterns. We use our results to explore the labor market mobility implications of a country, such as the UK, leaving the EU and find that leaving the EU may have international

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immigration impacts similar to increasing the distance between the leaver and the other EU countries by over one third.

Introduction

It is difficult to study mobility and migration due to a general lack of timely and detailed data. Even where we have data collected from country surveys, these only capture individuals before or after migration, limiting our ability to track international migration. No transnational surveys are regularly conducted with representation and questions which are sufficiently appropriate for producing even annual measures of labor migration. The OECD, the World Bank, and the International Migration Institute at the University of Oxford have jointly collected a Database on Immigrants in OECD Countries (DIOC) and have extended it as well to non-OECD destination countries (DIOC-E or DIOC extended).² The latest update to this dataset was released in 2014 and covers migration in 2010/2011 (Arslan et al., 2014).

In order to overcome some of the data challenges for measuring international migration, a number of studies have looked at potential migration using surveys of migration intentions (Fassmann and Hintermann 1997; Wallace, 1998; Krieger 2003; Fassmann and Münz, 2002; see also Fouarge and Ester, 2007). Surveys such as the Eurobarometer Labour Mobility Survey have been repeatedly used in this literature, but they also come with a number of caveats. For example, Boeri et al. (2002) acknowledges that little is known about whether somebody who indicates a general propensity to migrate in an opinion poll has serious intentions to move.

Rather than exploring realized migration, in this paper we focus on revealed interest in work-related migration based on job searches on a major job search website.³ The benefits of this data source include its timeliness, the comprehensiveness of its coverage, and collecting information based on observing behavior rather than on survey questions about intentions. We focus on a sample of 48 countries where job seekers in our sample could use the same medium to search at home or abroad. Some of these job seekers may be currently living abroad and are looking to return home. Many are likely responding to information they have about economic conditions both at home and abroad. We investigate the determinants of cross-border job search using a standard gravity model and find that both the determinants and the relative importance of the determinants for job search are strikingly similar to those for past realized migration as reported in Beine et al (2011).

Migration preferences based on job search have the advantage of being more timely and of being based on revealed preferences rather than self-reported ones. Measuring migration intentions through revealed job search preferences may be a valuable step ahead, although these measures may overestimate the scale of mobility and focus primarily on the labor supply

² Dataset and documentation is available on the OECD website: <http://www.oecd.org/els/mig/dioc.htm>.

³ Horton et al. (2017) estimate a gravity model for a much narrower definition of “digital labor markets,” focusing on individual projects performed by contractors on a digital labor platform. This is significantly different than job search sites such as Indeed where a worker would in general physically move to the new employer.

side. Obviously, labor migration intentions are not equivalent to realizations. These differences may be larger the larger the barriers are to enter the host countries, although job seekers likely take into consideration the legal and economic possibility of moving when conducting their job search. To some extent, these indicators suffer from some of the same caveats that affect surveys of migration intentions, especially when it comes to the interaction between revealed preferences and actual moves. In addition, job search is only one facet of considering an international move, although an international survey described in Mamertino (2017b) reported that a key reason people move internationally is work.

Our data come from the job search site Indeed, which has separate websites for more than 60 countries around the world. Online job search provides us with much larger samples than we can get from traditional surveys: for our time sample Indeed reported over 200 million unique visitors per month globally based on Google Analytics reports on their site traffic. By limiting our study only to countries which have an Indeed site we ensure that people can either search for jobs at home or abroad to limit potential bias.

Throughout the study our unit of analysis will be the single 'job search' which involves an active search on one of the Indeed websites from a distinct mobile/desktop device or user account⁴. To avoid systematic double-counting and bias coming from heterogeneity in search intensity (e.g., average searches per user) across countries, users performing more than one search from the same device or user account will be counted only once.

This study also aims to contribute to the growing literature on online labor markets and job search (see the seminal contribution from Stevenson, 2008), and their relevance as a source of real-time data to study the labor market. According to Kurekova et al (2015), this is a particular area of increasing interest and one that has a strong potential to widen our knowledge about various socio-economic issues. Many aspects of job search have been transformed due to the availability of online tools for job search, candidate search and job matching (European Commission and ECORYS 2012). A Harris Poll commissioned by the Indeed Hiring Lab in 2015 revealed that labor markets in advanced countries are increasingly moving online. Worldwide 78% of workers who were hired in the year prior to the survey took place and took some action to find a job in the six months before used online resources in their job search (Indeed Hiring Lab, 2015). In a recent report Boston Consulting Group and Recruit Works Institute (Kazumasa and Okubo, 2015) conducted a survey of 13.000 individuals across 13 countries and found that, globally, internet job sites were the most frequently used channel by job seekers as 55% of all respondents stated that they had used such sites during their most recent job search.

Therefore it should not come as a surprise that innovative data sources and analytical methods based on online sources have been used for the study of the labor market (among the most recent contributions: Amuri and Marcucci 2010; Fabo and Tijdens, 2014; Askitas and Zimmermann, 2015; Helleseter et al., 2015; Hershbein and Kahn, 2016; Gee, 2015; Marinescu

⁴ Job searches associated with one or more keywords and a location, only a keyword(s) or a location, or blank are part of our sample.

and Rathelot, 2015; Villena and Banfi, 2015). However, this literature has not examined migration to date.

Previous literature on geographic mobility show that people move to places with better economic conditions (Greenwood et al., 1986; Bound and Holzer, 2000; Wozniak, 2010; Adserà and Pytliková, 2012). At the same time however, research on the response of migrants to economic crisis has found that “crisis- related increases in the outflows of nationals have been rather small” (OECD, 2012a, p. 44) and that the direct effects of economic turmoil on bilateral migration flows appear to be limited (Elsner and Zimmermann, 2013). Following Burda (1995) it could be argued that economic uncertainty may increase the option value of waiting for potential migrants, but the asymmetric impact of the global financial crisis may have changed the distribution of migration flows across countries. Elsner and Zimmermann (2013) found relevant migration-diversion effects as a result of the changing economic landscape in Europe in the aftermath of the global financial crisis. They argue that while destination countries -- such as Germany -- received larger migration inflows after the crisis, thanks to increased relative attractiveness vis-à-vis other potential destinations, countries like Spain experienced bigger outflows and a deterioration in their relative attractiveness. They also estimate that diversion effect accounted for 78 percent of the observed increase in flows from the EEA origin countries to Germany between 2007 and 2012 (Elsner and Zimmermann, 2013). While our findings do not necessarily go against Burda’s “option value of waiting” argument, they would seem to support the argument that cross-border job search behaviors do respond to shocks and changed economic conditions, and can be seen as a signal of job seekers’ evaluation of labor market health.

When it comes to cross-border flows, does job search behave similarly to actual moves? Intuitively, as long as searching for a job in a different country is one of the many steps a prospective economic migrant might take when considering a move, we would expect job search across countries to show patterns similar to those of work-related migration. Job seekers, as potential migrants, should respond to migration’s direct and indirect costs in the same way migrants do.

A counter-argument to this is that job search may actually be more responsive to possible push and pull factors as long as it does not expose the potential migrant to any actual cost, but only to hypothetical ones that are conditional on the move taking place at some point in time.

While to some this question might seem like something akin to an intellectual exercise more than anything else, it has relevant real-world implications. As a matter of fact, understanding whether cross-border job search responds in a consistent way to measure the triggers of cross-border labor flows can start to tell us how good job search patterns may be in gauging the potential evolution of flows of people across countries. This is particularly relevant if we consider the relative lack of timely and up-to-date information on global migration patterns.

After exploring the traditional determinants of migration and showing that we find similar determinants and relative magnitudes for online job search flows, we focus on the role of EU

membership and specifically investigate the potential impact of a country leaving the open labor market of the EU. We find that our model predict the impact of this would be substantial, with something like a “hard Brexit” having a similar impact on labor market flows between the leaver and the rest of the EU as increasing the distance between them by over one third.

In the next sections we describe our data, the gravity model and our main results. We then discuss our findings of the role of the EU membership dummy specifically in light of Brexit and then conclude.

Data

Data on Indeed job searches come from a dataset of aggregated and anonymous search data from Indeed sites in 48 markets⁵. We define cross-border searchers as the job seekers who based on their IP address location are currently located in one country but search for work on an Indeed site in another country. If the same searcher looks in more than one country, they are counted once for each country in which they search, but only one search per locality per IP address in a month is counted. We conducted our main analysis on the average monthly count of searchers for each country pair over the period of June 2016 through May 2017 measured as a share of traffic from the origin country.⁶

Data on distance, language, culture, colonial linkages and religion were taken from the gravity dataset from Head et al (2010).⁷ Data on migration flows refer to 2010 and were taken from the database on Immigrants in OECD countries (DIOC).⁸

Model

Following Beine et al. (2009), we fit a gravity model with our cross-sectional sample of job search and migration flows, the average monthly count of searchers for each country pair for 48 countries as a share of the origin country traffic. The model is estimated with ordinary least squares (OLS) and includes country-specific effects for both sending and destination countries. We report standard errors adjusted for heteroscedasticity through the Huber-White procedure.

⁵ There are Indeed sites in over 60 markets but we focused on the 48 sites with sufficient maturity and traffic to capture international job search. The list of the 48 sites is included in the appendix. We were only provided total cell counts, not individual characteristics or identifiable private information.

⁶ We performed a number of robustness checks on our sample including testing the sensitivity of the analysis to outliers where we used both the mean and the median values and found negligible differences between the two. We also considered different time samples (in particular before Brexit) and found little difference in the aggregate results and thus are here reporting the most recent one year of data. We also measured our flows as the share of destination traffic with little qualitative or quantitative change in the results. There are similar results over a shorter time sample in the blog post by Mamertino (2017a).

⁷The Head et al (2010) data is available here: <http://econ.sciences-po.fr/thierry-mayer/data>

⁸OECD migration data is available here:

<http://www.oecd.org/els/mig/databaseonimmigrantsinoecdcountriesdioc.htm>

According to the prevalent economic theory on the subject, as discussed in Beine et al. (2011), the structure and the size of migration flows arise from a complex mix of self-selection factors (differences in wages or probability to find a job across countries, welfare programs and amenities, migration costs, etc.) and out-selection factors (immigration policies at destination, mobility agreements, etc.). Models of migration predict that differences in GDP per capita, labor market prospects and a range of other elements that influence the relative attractiveness of a location along with geographical proximity, cultural ties and language affinity should all be important determinants in the decision to move abroad for work-related reasons. A gravity model with country-specific effects allows us to test if job search is related to similar factors. Thus we estimate a model similar to the one used by Beine et al. (2011) for migration. One key feature to note is that the latest available realized migration data is from 2010, but our data is from June 2016 through May 2017. One additional regressor we include is to capture if both members of the country pair are EU members. We discuss the motivation for including this term in the results section below, but it is important to note that our data is skewed towards EU countries with 15% of our sample being EU pairs.⁹

The main gravity model specification is:

$$\ln(flow_{ij}) = \alpha_0 + \alpha_1 EU_{ij} + \alpha_2 language_{ij} + \alpha_3 colony_{ij} + \alpha_4 religion_{ij} + \alpha_5 \ln(distance_{ij}) + \gamma_j + \gamma_i + \varepsilon_{ij},$$

where i is the IP address (sending) country and j is the job search site (receiving) country. We then considered two additional models: one including OECD migration flows and the other including the diaspora measure of Beine et al. (2011).

The battery of robustness checks we ran included restricting the sample to an increasingly smaller group of countries based on where the website Indeed is more widely used and established, but results did not change in any significant way even in the most conservative scenario. We also considered different time samples and also found little variation in the results.

Results

Our results for the main specification, Model 1, as well as the two alternative models are presented in Table 1. There are two key features to note of the results for Model 1. First, the typical gravity variables are all statistically significant in our job search flows regressions. Second the magnitudes, particularly the relative magnitudes of the coefficients on the regressors, are remarkably similar to those in the migration regressions reported in Beine et al. (2011). These findings suggest that online job search behavior is related to similar factors as realized migration (and that determinants are stable over time since the realized data are from 2010 and our search data sample is from 2016-2017). Thus we may be able to use this novel

⁹ If we included all 189 World Bank member countries, the 19 EU countries with an Indeed website would make up 1% of the pairs (or 2% if all 28 EU member states were included).

data source as a proxy for migration data since it is available sooner (and at higher frequency) than migration data.

Our model controls for the impact of the characteristics of the sending and receiving countries (e.g. whether the country is particularly attractive or unattractive for job seekers), as well as for the impact of how close or distant they might be in terms of both geography and language/culture. All these factors taken together are expected to determine the likelihood of a job seeker to search for a job in a different country based on where he or she is currently located. We can think of EU membership as another factor contributing to the reduction of the legal and bureaucratic costs of moving for potential migrants and which affects their considerations regarding whether to take up a job in another EU country or not. Using a dataset of cross-border job search flows on Indeed across 48 countries (that includes both EU and non-EU countries) in an average month in 2016, we estimated the amount of additional job search that takes place within the EU¹⁰, where free movement of labour is a reality.

¹⁰ Our model is not immune to the classic “chicken or the egg problem”—that is whether the higher flows of workers and job seekers across EU countries is a consequence of the EU membership or if these flows have always been higher among countries that today belong to the EU. This is consistent with other gravity models of migration.

Table 1: Results for Gravity Model of Job Search (dependent variable is $\ln(\text{flow of job search})$)¹¹

Variable	Model 1 Estimated Coefficient (Robust Standard Error)	Model 2 Estimated Coefficient (Robust Standard Error)	Model 3 Estimated Coefficient (Robust Standard Error)
Intercept	1.96*** (0.37)	-4.53*** (0.44)	-3.38*** (0.53)
Common language	1.17*** (0.10)	0.97*** (0.12)	1.04*** (0.09)
Colony dummy	0.68*** (0.15)	0.37** (0.16)	---
Common religion dummy	0.76*** (0.08)	0.37*** (0.09)	0.28*** (0.08)
$\ln(\text{distance})$	-0.92*** (0.04)	-0.58*** (0.05)	-0.53*** (0.04)
$\ln(\text{DIOC MigrationFlows})$	---	0.36*** (0.02)	---
$\ln(\text{Diaspora})$	---	---	0.35*** (0.02)
EU member dummy	0.40*** (0.08)	0.25** (0.09)	0.44*** (0.08)
Adjusted R²	0.87	0.92	0.90

, * = significance at the 5% and 1% level respectively. Note that origin and destination country fixed effects are included in all regressions.

As Table 1 makes clear, all of the standard determinants of migration are statistically significant in our model of online job search. Common language is a particularly important driver of international job search, with a common language approximately doubling the job search flows going between the countries, controlling for the other determinants. The effect of having cultural ties and similarities in the legal or bureaucratic system (which our model measures as the presence of historical colonial links and a common religion) is somewhat smaller, but still very relevant. Formerly being part of the same colonial empire and sharing a common religion range in effect from approximately a 37% increase to a 76% increase in bilateral job search flows depending on the other variables included in the model. Greater distance between the sending

¹¹Standard OLS coefficients are reported here. The asymmetric effects of dummy variables on the log transformed dependent variable are reported in the section B of the Appendix following Kennedy (1981).

and receiving country decreases the job search flows. A one percent increase in distance is associated with a 0.5% to an almost 1% increase in job search flows depending on the other controls.

Model 2 includes a control for past realized migration flows. There is a significant positive relationship confirming that the future job search is related to past realized migration flows, but the other determinants remain significant with similar relative importance patterns as in model 1. Model 3 adds in the diaspora measure used in Beine et al (2011) and continues to show similar patterns as in Models 1 and 2 and is consistent with the broad findings of Beine et al for realized migration data.

Finally, in all three models we include a dummy variable to capture if both countries are members of the EU. We find that membership of the EU delivers an additional 25-44% increase in the relative amount of job search exchanged between two member countries in an average month. But while this may be on the lower end of the estimated effects across our different independent variables, it does not mean that belonging to the EU is an unimportant factor when it comes to cross-border job search, and not just because this number is equivalent to tens of thousand of unique searches each month. Even once we factor out all the possible factors that influence the likelihood of a job seeker to search for work in a specific foreign country (including EU ones), EU job seekers are still significantly more likely to search within the EU borders. We discuss the implications of these findings further in the section below.

Discussion of the Role EU Membership

One of the key regressors included in our model is the EU member dummy. The European Union (EU) has been an experiment in international cooperation in many dimensions, but one of the key benefits has been the removal of labor market restrictions as part of the Schengen Agreement (OECD, 2012) and its expansion to new countries with the successive EU enlargements (among others, Constant and Zimmermann, 2013). While movement of temporary “guest workers” across the borders of the European Economic Community (EEC) was common in the years of booming economic growth between 1958 and 1972, the oil crisis that started in 1973 threatened the open-doors policy regarding migrant workers, who were welcomed when the economy needed them but were expected to leave when times were hard. A period of restricted migration within the EEC member states -- which was constantly challenged throughout the 1970s and 1980s -- came to an end with the expansion of the Schengen agreements and the establishment of the freedom of movement principle for all nationals of Member States. This was finalized with the signing of the Maastricht Treaty in 1992, which created the European Union and introduced the concept of a common European citizenship.

At this point in history, mobility across European countries was already on the rise. Recchi (2009) points to a constant expansion of the cross-state mobile population within the EU in the two decades preceding the 2004 enlargement. According to more recent data from Eurostat,

about 46% of total immigration to the EU member states in 2013 was made of EU citizens from another EU country, with significant variation across countries. In the same year, 40% of all intra-EU permanent migration (and 48 for people aged 15-64) was made of individuals coming from another EU15 country (different than the reporting country)¹². Some of this movement would likely have occurred without the free flows of labor, but this expansion is puzzling in the light of the economic growth and the decline of income differentials in the EU15 over the same period. According to Recchi (2009), pro-mobility policies and the rise of non-labor migration have countered the diminishing appeal of intra-EU mobility that might be expected on the basis of purely economic conditions -- income convergence above all.

Since the UK voted to leave the European Union (EU) in June of 2016, the media spotlight has focused on the EU's principle of freedom of movement and what it means for the countries that do or do not participate in it. In our analysis we quantify the contribution brought by EU membership in terms of additional flows of actual and potential migrants, while controlling for the effect of other relevant characteristics.¹³ This will help us to answer the following questions: how relevant is the EU¹⁴ when it comes to the "virtual movement" of people across countries as captured by cross-border job search flows? And how relevant is it in comparison to other factors such as geography, language, culture and the overall attractiveness of a country? And what does this tell us about the likely fallout of a "hard Brexit" where the UK might no longer participate in the open EU labor market?

While we know that cross-border job search flows do not always translate into migration flows, our analysis above suggests that they are influenced by a range of factors similar to those that trigger or hinder migration. While factors such as geography, language, culture and overall attractiveness of a country are all relevant in explaining cross-border job search, we were interested in going beyond them in order to measure the *additional* role played by a free-movement of labor zone like the European Union. This is particularly interesting today now that one member state is faced with a very real prospect of exiting the open labor market of the European Union. Quantifying the contribution brought by the EU membership in terms of additional flows of potential migrants also offers an opportunity to gauge the likely fallout in the event of a fully-fledged Brexit, for example, as well as get a better understanding of the effect that similar custom unions might have in other regions.¹⁵

Given the semilogarithmic functional form of the model specification, there is an asymmetry between the impact of joining versus leaving the EU, as well as for all the other dummy variables (Kennedy, 1981).¹⁶

¹²Eurostat database. "Migration and migrant population statistics." Last modified May 2015.

http://ec.europa.eu/eurostat/statistics-explained/index.php/Migration_and_migrant_population_statistics

¹³ Other research focused on the role of open borders in the EU includes Mamertino and Sinclair (2016) and Kennan (2017).

¹⁴ Our sample only includes 19 EU countries with an Indeed website.

¹⁵ A similar analysis for a shorter time sample was reported in Mamertino (2017c).

¹⁶ Following Kennedy (1981), consider the following model: $\ln(Y) = a + bX + cD + \varepsilon$. If D switches from 0 to 1, the percent impact of D on Y is: $100[\exp(c^* - \frac{1}{2}v^*(c^*)) - 1]$, where c^* is the estimated coefficient and

For the dummy variables of Model 1, our results following Kennedy (1981) are:

	OLS coefficient	Kennedy (1981)	
		0 to 1	1 to 0
EU membership	0.40	0.49	-0.33
Common language	1.17	2.19	-0.69
Belongs to former colonial empire	0.68	0.94	-0.49
Shared religion	0.76	1.14	-0.53

Our calculation for the impact of removing a country (e.g. the UK) from EU membership is comparing the coefficient on $\ln(\text{distance})$, which remains -0.92, to the EU membership dummy for the UK going from 1 to 0, which is -0.33. Thus our results suggest that leaving the EU could reduce bilateral job search flows to/from a leaver, e.g. the UK, by 33 percent, controlling for common language, religion, former colonial empire, and distance. To put this size into context, this is similar to increasing the distance between the leaver and the other EU countries by over one third.

Conclusion

In this study we show that cross-border job search on a major job search website is predicted by similar determinants as realized international migration. This means that job search patterns may be useful real-time indicators of mobility since there is a lag in mobility data.

Our results suggest that international job search is affected by the same factors that affect migration. Thus tracking where people search for jobs can give us a unique glimpse into potential migration patterns—something that is even more relevant if we consider how hard it is to come by up-to-date information on migration flows. This is especially valuable as even the most comprehensive data on global migration, such as those collected by the OECD, date back to 2010. Search data provide an alternative, real time source of data on migration intentions.

We can use these more timely data for analysis of major changes in global labor markets such as the possibility that the UK will leave the open labor market of the EU as part of Brexit. We find that this form of hard Brexit would predict a substantial decrease in job search flows between the UK and the EU similar to the impact of increasing the distance between the UK and the EU by over one third.

Further research could use other characteristics from job search behavior to characterise and predict global talent flows using methods similar to Kerr et al. (2016).

$v^*(c^*)$ is the estimated variance of c^* . If D switches from 1 to 0, the percent impact of D on Y is instead: $100\{\exp[-(c^*-1/2v^*(c^*))] - 1\}$.

References

Adserà, Alícia, and Mariola Pytliková. "The Role of Language in Shaping International Migration." *The Economic Journal* 125, no. 586 (August 1, 2015): F49–81. doi:10.1111/eoj.12231.

Arslan, C. Jean-Christophe Dumont, Zovanga Kone, Yasser Moullan, Caglar Ozden, Christopher Parsons, and Theodora Xenogiani (2014), "A New Profile of Migrants in the Aftermath of the Recent Economic Crisis", OECD Social, Employment and Migration Working Papers, No. 160, OECD Publishing. <http://dx.doi.org/10.1787/5jxt2t3nnjr5-en>

Beine, Michel, Frédéric Docquier, and Çağlar Özden. "Diasporas." *Journal of Development Economics* 95.1 (2011): 30-41.

Boeri, T., Bertola, G., Brucker, H., Coricelli, F., Dolado, J., FitzGerald, J., de la Fuente, A., Garibaldi, P., Hanson, G., Jimeno, J., Portes, R., Saint-Paul, G., and Spilimbergo, A. (2002), *Who's Afraid of the Big Enlargement?* Centre for Economic Policy Research, London.

Bound, John, and Harry J. Holzer. "Demand Shifts, Population Adjustments, and Labor Market Outcomes during the 1980s." *Journal of Labor Economics* 18, no. 1 (2000): 20–54.

Burda, Michael C. "Migration and the Option Value of Waiting." *Economic & Social Review*, 1995. <http://www.tara.tcd.ie/handle/2262/64775>.

Constant, Amelie F., and Klaus F. Zimmermann. *International Handbook on the Economics of Migration*. Edward Elgar Publishing, 2013.

Elsner, Benjamin, and Klaus F. Zimmermann. "10 Years After: EU Enlargement, Closed Borders, and Migration to Germany." IZA Discussion Paper. Institute for the Study of Labor (IZA), 2013. <https://ideas.repec.org/p/iza/izadps/dp7130.html>.

Fabo, Brian, and Kea Tijdens. "Using Web Data to Measure the Demand for Skills." Discussion Paper. Central European Labour Studies Institute (CELSI), 2014. <https://ideas.repec.org/p/cel/dpaper/21.html>.

Fassmann, R., and Hintermann, C. (1997), "Migrationspotential Ostmitteleuropa. Struktur und Motivation potentieller Migranten aus Polen, der Slowakei, Tschechien und Ungarn", ISR-Scientific Report 15, Innsbruck.

Fassmann, R., and Münz, R. (2002), EU-Enlargement and the future of East-West migration, in: IOM (ed.), *New challenges for migration policy in Central and Eastern Europe*, Geneva, IOM.

Fouarge, D., and Ester, P. (2007), *Mapping migration intentions in Europe: Perceived costs and benefits*, Institute for Labour Studies, Tilburg University.

Gee, Laura K. "The More You Know: Information Effects in Job Application Rates by Gender in a Large Field Experiment." SSRN Scholarly Paper. Rochester, NY: Social Science Research Network, June 1, 2015. <http://papers.ssrn.com/abstract=2612979>.

Greenwood, M. J., G. L. Hunt, and J. M. McDowell. "Migration and Employment Change: Empirical Evidence on the Spatial and Temporal Dimensions of the Linkage." *Journal of Regional Science* 26, no. 2 (May 1986): 223–34.

Head, Keith, Thierry Mayer, and John Ries. "The erosion of colonial trade linkages after independence." *Journal of International Economics* 81.1 (2010): 1-14.

Hershbein, Brad; Kahn, Lisa B.; "Is Technological Change Exacerbated in Recessions? Evidence from Vacancy Postings" (2016)

Horton, John, William R. Kerr, and Christopher Stanton. "Digital Labor Markets and Global Talent Flows." *High-Skilled Migration to the United States and its Economic Consequences*. University of Chicago Press, 2017.

Indeed Hiring Lab. "The Science of Talent Attraction". October 2015 <http://blog.indeed.com/2015/10/22/science-behind-job-search/>

Kazumasa, Sakurai and Okubo, Yukio. 2015. "Job Seeker Trends 2015: Channels, Search Time, and Income Change." BCG Perspectives. <https://www.bcgperspectives.com/content/articles/human-resources-media-entertainment-job-seeker-trends-2015/>.

Kennan, John. *Open Borders in the European Union and Beyond: Migration Flows and Labor Market Implications*. No. w23048. National Bureau of Economic Research, 2017.

Kennedy, P. E. (1981). Estimation with correctly interpreted dummy variables in semilogarithmic equations. *American Economic Review*, 71, 801.

Kerr, Sari Pekkala, William Kerr, Çağlar Özden, and Christopher Parsons. "Global talent flows." *The Journal of Economic Perspectives* 30, no. 4 (2016): 83-106.

Krieger, T. (2003), Migration trends in an enlarged EU, European Foundation for the Improvement of Working and Living Conditions, Dublin.

Kureková, Lucia, Miroslav Beblavý, and Anna Elisabeth Thum. "Using Online Vacancies and Web Surveys to Analyse the Labour Market: A Methodological Inquiry." *IZA Journal of Labor Economics* 4, no. 1 (2015): 1–20.

Mamertino, Mariano. "International Job Search Now – A Look At the Economic Factors Behind Global Job Search" Indeed Hiring Lab Blog Post (2017a) Available at: <http://www.hiringlab.org/2017/02/07/international-job-mobility-report/>

Mamertino, Mariano. "To Move or Not to Move? The Psychology Behind Global Job Search" Indeed Hiring Lab Blog Post (2017b) Available at: <http://www.hiringlab.org/2017/03/01/psychology-behind-global-job-search/>

Mamertino, Mariano. "The Impact of a "Hard Brexit" on EU Labour Mobility: Indeed Hiring Lab Blog Post (2017c) Available at: <http://www.hiringlab.org/2016/12/15/mpact-of-a-hard-brexite-on-eu-labour-mobility/>

Mamertino, Mariano, and Tara M. Sinclair. "Online Job Search and Migration Intentions Across EU Member States." Institute for International Economic Policy Working Paper No. 2016-05 (2016).

Marinescu, Ioana Elena, and Ronald P. Wolthoff. "Opening the Black Box of the Matching Function: The Power of Words." SSRN Scholarly Paper. Rochester, NY: Social Science Research Network, June 1, 2015. <http://papers.ssrn.com/abstract=2612323>.

OECD. *Free Movement of Workers and Labour Market Adjustment*. Paris: Organisation for Economic Co-operation and Development, 2012. <http://www.oecd-ilibrary.org/content/book/9789264177185-en>.

OECD. *International Migration Outlook 2012*. Paris: Organisation for Economic Co-operation and Development, 2012. http://www.oecd-ilibrary.org/content/book/migr_outlook-2012-en.

Recchi, Ettore. "Cross-State Mobility in the Eu." *European Societies* 10, no. 2 (May 1, 2008): 197–224. doi:10.1080/14616690701835287.

Stevenson, Betsey. "The Internet and Job Search." Working Paper. National Bureau of Economic Research, March 2008. <http://www.nber.org/papers/w13886>.

Villena, Benjamin; Banfi, Stefano; " Do High-Wage Jobs Attract More Applicants? Directed Search Evidence from the Online Labor Market"

Wallace, C. (1998), "Migration Potential in Central and Eastern Europe", IOM Cooperation Centre for Europe and Central Asia, Geneva.

Wozniak, Abigail. "Are College Graduates More Responsive to Distant Labor Market Opportunities?" *Journal of Human Resources* 45, no. 4 (2010): 944–70.

Appendix

A. Countries included in our sample:

Argentina	Denmark	Japan	Philippines	Spain
Australia	Finland	Kuwait	Poland	Sweden
Austria	France	Luxembourg	Portugal	Switzerland
Bahrain	Germany	Malaysia	Qatar	Taiwan
Belgium	Great Britain	Mexico	Romania	Turkey
Brazil	Greece	Netherlands	Russian Federation	United Arab Emirates
Canada	Hong Kong	New Zealand	Saudi Arabia	United States
Chile	Hungary	Norway	Singapore	Venezuela
Colombia	Ireland	Oman	South Africa	
Czech Republic	Italy	Peru	South Korea	