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A practitioners' guide to gravity models of international migration*

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In international macroeconomics, bilateral data refers to data capturing flows of economic activity between a specific origin and a specific destination. Origin and destination refer to a given geographical area, such as a city, a region, a country or even a set of countries, which share some common features. The scope of economic activities involving bilateral flows is quite large. It concerns, for instance, international trade, international migration, foreign direct investments, and portfolio investments, just to name the most prominent examples. This paper deals with the use of bilateral data in the context of international migration. The academic literature has recently made extensive use of this type of data to identify the potential determinants of the magnitude and the composition of the international flows of economic migrants between countries. To that aim, the literature has mainly relied on a very popular tool, the gravity model.

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Bilateral data on migration are a blessing

Compared to data that are specific only to one destination or to one origin country, the use of bilateral data yields a set of obvious advantages for the analysis of international migration, and it allows capturing specific phenomena of interest. In other words, the use of bilateral data is a blessing. Using bilateral data allows for analysis of the impact of factors that are pair specific in nature. Examples of this include the analysis of migrants' networks in shaping future migration flows. The analysis of the influence of bilateral migration policies, such as the impact of visa restrictions, the effect of bilateral agreements, or even the influence of multilateral treaties such as the Schengen agreement, is only possible if bilateral measures of flows and policies are available. Furthermore, the combination of information at the origin level, at the destination level, and over time yields econometric models with many dimensions. These dimensions, in turn, permit the use of econometric panel data approaches with a large set of so-called fixed effects, which capture the role of specific factors that are either difficult to measure or even impossible to quantify in a satisfying way (such as cultural proximity between countries). As a consequence, when treated in an appropriate way, the use of bilateral data yields econometric models that are less subject to modelling errors.

Bilateral data on migration are a curse

While the access to bilateral data is a blessing in many respects, it is nevertheless also a curse. Indeed, the analysis of bilateral data requires appropriate statistical tools such as the gravity model that make the best use of the information embedded in the dyadic dimension. The breaking down of the migration process into various destinations of emigration calls for a sound theoretical treatment of the individual choices of the prospective migrants in terms of optimal destination. In that respect the dominant theoretical approach has been the Random Utility Maximization (RUM) approach, which has been developed over the last few decades by a number of scholars. In a nutshell, the RUM model assumes that agents maximize their utility, which varies across a large set of domestic and foreign destinations. In the canonical RUM model, location-specific utility contains both a deterministic and a stochastic component. The deterministic component, which describes the attractiveness of each location for potential migrants, is modeled as a function of income variables, amenities, and the specific migration costs. The stochastic components are individual-specific, and the modeling approach assumes convenient statistical properties such as the type of stochastic distribution and a constant substitution rate between alternative destinations. The key implication of our paper is that the econometric treatment must be based on the relationships as implied by the theory, and must account for any deviation between the underlying hypotheses of the theory and what the data do and do not capture. Our practitioners' guide lists the main dangers faced by an econometric approach using the dyadic data for international migration, in the same spirit as what has recently been done for trade by Head and Mayer (2014).

The dangers of falling with gravity

The main issues and dangers with the use of a gravity model are the following. First, gravity equations used without reference to the theory face the danger of not using the appropriate form of the key variables, such as the bilateral migration rate. In general, our paper argues that a micro-based econometric model should be favored instead of a so called "a-theoretical" specification. Another danger is that the inclusion of the deterministic components might be insufficient to make the stochastic component

consistent with the underlying assumptions of the theory. Fortunately, econometric solutions to this issue exist, but imply that researchers invest beyond the simple econometric methods that have been mainly used so far. One obviously desirable development of the literature is to include approaches that account in a satisfying way for the issues of multilateral resistance of migration (Bertoli and Fernández-Huertas Moraga, 2013). Finally, there are specific econometric issues such as the large presence of zeroes in the bilateral migration flows. This calls for the use of specific estimation methods such as the Pseudo Poisson Maximum Likelihood approach.

What gravity models have produced so far

While many challenges are still ahead of us, the existing literature has not been inactive in terms of pinning down the determinants of migration flows. The empirical analyses can be classified into three major areas depending on the dimension of the factors that capture the limelight in the analysis. A first strand looks at the factors that are specific to the origin countries, a second one focuses on the destination-specific determinants, and thirdly a large body of the literature looks at the role of factors that are specific to each migration corridor.

Origins matter – One of the most important factors is the income at origin. Income at origin has an ambiguous role on the magnitude of migration. On the one hand, an increase in income at origin reduces the wage differential with all foreign destinations, so lowering the magnitude of emigration. On the other hand, in poor origin countries, low income is often associated with liquidity constraints that prevent many candidates moving out of the country. In many countries, these liquidity constraints are strengthened by important credit constraints affecting the prospective migrants. In this context, an improvement in the economic conditions at origin might therefore lead to a surge in the emigration rate. Another factor that has received little attention in the academic literature is the unemployment rate. While some papers have allocated some analysis to the specific role of unemployment at origin, refinements constitute a desirable avenue of research. One of the interesting directions would be to look at the specific effect(s) of unemployment benefits in the origin country.

Other factors at origin are potentially important. One kind of determinant includes the so-called environmental and climatic shocks that affect origin countries, especially developing ones. A growing literature has been devoted to their global role, highlighting some existing indirect effects (e.g. through wages), rather than direct ones. In particular, adverse climatic shocks and natural disasters tend to lead to more emigration, mainly through a deterioration of the labor market conditions in the origin countries, rather than through a more direct reaction of the affected people. Other potential determinants that have so far received little attention include the institutional factors or the demographic structure of the origin countries.

Destinations matter – Variations of income and unemployment at destination also play a very important role in the explanation of migration flows. With respect to income, wage differential can be regarded as one of the most robust determinants found in the literature. This does not mean however that all studies find the same magnitude of the effect. There are several reasons for this. A first main reason is related to the empirical measurement of wage differentials. In order to have a large geographical coverage researchers have often to rely on GDP per head as a proxy of wages. This overlooks the possible discrepancy between the two measures, and the variation in wages within a given country. A second main reason for the variation in the findings relates to the specific form of the econometric model used. The literature assumes that what matters is either the relative difference in wages, or in contrast the absolute difference.

Expectations of income and unemployment are crucial to explain the flows of international migrants. In the presence of risk aversion, prospective migrants need to form expectations about the future state of the economy, at home and abroad. A few recent papers such as Bertoli et al. (2013) and Beine et al. (2013) have empirically looked at this aspect, connecting expectations with business cycles and aggregate fluctuations. These papers support a role for adverse economic shocks, such as the financial crisis, in explaining the magnitude and the direction of the international flows of workers between countries.

Migration corridors definitely matter – The empirical literature is more silent on the role of general immigration policies as determinants of international migration. The reason for that is the scarcity of empirical measures of restrictiveness that are policy based. Efforts are clearly needed to create indicators of stringency on international mobility of people that are comparable across countries and over time. In contrast, the recent literature has integrated new indicators of bilateral immigration policies, i.e. policies that are specific to a migration corridor. Two main indicators have been used recently. One is the existence of bilateral visa requirements (or waivers). The second one concerns multilateral agreements between a subset of countries, such as the Schengen agreement between some European countries. The recent literature has supported the significant impact of these policies. From that perspective, general integration processes such as trade agreements between countries, or monetary unification in a given area, have also been found to spur international mobility.

At the bilateral level, other factors have also been found to be important to explain international migration. One of the main factors is definitely the size of the migrants' network at destination. Diasporas tend to reduce migration costs for prospective migrants, especially the unskilled ones. The literature based on gravity models has confirmed that these diasporas have a significant role at the macro-economic level (see, for instance, Beine et al., 2011). Networks also substitute nowadays for factors that were at work in previous decades such as colonial links between countries. Nevertheless other dyadic factors are still important, as demonstrated by numerous empirical studies. Linguistic proximity stands high on this list. Even in a globalized world with English as the lingua franca, people tend to head to countries that share their mother language, or countries that belong to the same linguistic family. Cultural proximity is also at work in this context, although cross-country measures are less straightforward in this case.

References

- **Beine, M., Bourgeon P., Bricongne J.-C.** (2013). Aggregate Fluctuations and International Migration. *CESifo Working Paper* No. 4379, Munich.
- **Beine, M., Docquier F.** and **Özden Ç.** (2011). Diasporas. *Journal of Development Economics* 95(1), 30-41.
- **Bertoli, S., Fernández-Huertas Moraga J.** (2013). Multilateral Resistance to Migration. *Journal of Development Economics* 102, 79-100.
- **Bertoli, S., Brücker H., Fernández-Huertas Moraga J.** (2013). The European Crisis and Migration to Germany: Expectations and the Diversion of Migration Flows. *Working Paper* No. 2013/21, CERDI, University of Auvergne.
- **Head, K., Mayer T.** (2014). Gravity Equations: Workhorse, Toolkit, and Cookbook. Chapter to appear in *Handbook of International Economics*, Vol. 4, eds. Gopinath, Helpman, and Rogoff, Elsevier.

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