Agglomeration of knowledge intensive activities as driver of high skilled inter-regional migration: a gravity model with Spanish labour mobility data

Jose Blanco-Álvarez[*1]
Manuel González-López[2]

[1]Economic and Statistics Department, University of Leon
corresponding author: jblaa@unileon.es
[2]Applied Economics Department, University of Santiago de Compostela

March 5, 2025

Extended Abstract

Currently, the idea that human capital is a key element for economic growth and development is fully widespread and accepted. This importance is even greater for developed countries such as those in the EU that are immersed in a transition towards post-industrial societies. Technological advances together with relative deregulation and commitment to free trade since the 80s have allowed the division of productive tasks within value chains, which have become global processes. Those simpler productive activities that depend on low-skilled labour have been located in less developed countries characterised by lower labour costs, while developed countries have maintained control over those tasks with greater technological content within the chain, such as research and development, design or marketing. In order to retain these more complex tasks and compete satisfactorily in an international environment, it is necessary the availability of a high skilled workforce.

Likewise, one of the ways for less advanced countries to upgrade positions within global value chains and increase the proportion of added value captured and so their development possibilities, consists of improving the educational level of their workforce. This increase in human capital requires long-term policies and important investments. When considering the international context, the emigration of these high skilled individuals can constitute a problem to the extent that it reduces the average human capital that remains in the country, in a process commonly refereed as a "brain drain". Currently there are several theories that defend the existence of potential compensatory mechanisms that partially or totally offset the potential losses of human capital caused by this emigration, thus turning this brain drain into a brain gain.

The regional case starts from a much greater freedom of movement for labour factor that allows the magnitude of migration to be higher than its international counterpart. In a simple theoretical framework, these migratory movements sustained over time would cause a redistribution of population and economic activity between regions, but in the long term they would equalise marginal productivity and factor costs, eliminating incentives for subsequent migratory flows. In practice, we know that convergence between regions has not occurred or has not reached sufficiently fast rates, which we can observe with the persistence of important territorial disparities in the case of EU regions.

---

[*]A previous version was submitted and accepted to ERSA 63rd but authors were unable to attend and present it

One of the possible explanations is that high skilled individuals have a greater propensity to emigrate and are attracted to these economic centres where there are knowledge-intensive activities that demand this type of workers. Assuming the existence of external economies of agglomeration that lead these workers to be more productive when crowding together, then it might develop a theoretical model where initial differences ignite self-sustained migration flows from Periphery to core regions (Malul, 2015; Miyagiwa, 1991). This dynamic will deplete human capital stocks of less developed regions whereas increasing the stock of core regions, thus acting as a divergence force.

The agglomeration on some core EU regions than received the name of "global cities" and the corresponding loss of population in small to medium cities within peripheral regions has been observed in several countries, such as France, United Kingdom or Spain, with agglomerations in Paris, London and Madrid respectively (González-Leonardo et al., 2021; Swinney & Williams, 2016).

Therefore the contribution of our paper consists in studying the effect of agglomeration of knowledge intensive activities as a driver of high skilled inter-regional migration. To do so, we rely on a gravity model extensively used in the last decades to study international migration (Beine et al., 2016; Czaika & Parsons, 2017; Grogger & Hanson, 2011; Mayda, 2010; Ortega & Peri, 2013).

Our empirical specification thus is comprised by two different equations studying the pure scale of high skilled migration (1) and the skill composition of mobility flows (2):

$$
\begin{aligned}
\ln n_{ijt}^h = \\
\beta_1(\ln W_{jt}^h) + \beta_2(\ln A_{jt}) + \beta_3(\ln E_{jt}) + \beta_4(X_{ij}) + \\
+ \beta_5(\ln M_{ijt}) + \beta_6(K_{jt}) + \delta_{it} + \varepsilon_{ijt}
\end{aligned}
\tag{1}
$$

$$
\begin{aligned}
\ln\left(\frac{n_{ijt}^h}{\sum_s n_{ijt}^s}\right) = \\
\beta_1(\ln W_{jt}^h - \ln W_{jt}^l) + \beta_2(\ln A_{jt}) + \beta_3(\ln E_{jt}) + \\
+ \beta_4(X_{ij}) + \beta_5(\ln M_{ijt}) + \beta_6(K_{jt}) + \delta_{it} + \varepsilon_{ijt}
\end{aligned}
\tag{2}
$$

Where n_{ijt}^h is the migration of individuals with skill level h from region i to region j in year t. We build our model with annual flow data on labour mobility between the 17 Spanish Autonomous Communities (equivalent to NUTS2 level) for years 2002 to 2021. This information comes from a special petition to Spanish Public Employment Service (*Servicio Público de Empleo Estatal*, SEPE) which provide us with a dataset containing information on mobility based on contract data. Under Spanish law all signed labour contracts are required to contain standardised information on a myriad of topics included the location of workplace, education attainment of the worker or they place of current residence. Therefore we define labour migration as the flow derived from all cases where the Autonomous Community of the worker differ from Autonomous Community of the workplace.

W_{jt}^h accounts for the wage in the destination region in the same year. The term A_{jt} includes amenities acting as pull factors for migrants such as education and public-health provision. E_{jt} includes migration costs acting as destination, fundamentally the unemployment rate that we understand as a proxy for the easiness of finding a job and the proportion of temporary contracts over total workforce. X_{ij} includes invariant factors acting by pair origin-destination: the distance between regions, dummy variable for common border and dummy for common language. M_{ijt} specifically controls for already established migration networks, proxied by the stock of migrants originally from region i already living in region j at time t.

K_{jt} is our main interest variable: a measure of the agglomeration of knowledge-intensive activities. Follow our hypothesis, we expect a significant and positive coefficient explaining the relevance of this variable to attract high skilled migrants. More specifically, we employ business structure data coming from the Spanish Na-

tional Institute of Statistics to calculate a relative regional specialization index in some sectors identified as *Knowledge-Intensive Business Services* or KIBS (Zieba, 2021). The agglomeration of these activities in EU regions has been documented in the past (Rodríguez-Pose & Crescenzi, 2008; Vence-Deza & González-López, 2014).

Finally, δ_{it} accounts for fixed effects included to capture the possible omitted variables acting in the region of origin. In this case, we interact this origin region fixed effects with the fixed effects by year, therefore making it time-variant.

As usual, ε_{ijt} is our estimation error.

Equation 2 includes the same variables but regress the proportion of high skilled individuals within the migration flow. Only change is in the first term, expressing now the high skilled premium in the wages on destination region.

With these specifications, there are potential threads that might undermine our results, such as the endogeneity of our variable of interest, which is likely to be affected by a circular causation relation with our dependent variable. To address this difficulty we implement a set of robustness tests: 1) a full set of fixed effects including by region of origin, destination, year and the interactions between origin and year and pair origin-destination; 2) a specifications regressing the lag of our variables; 3) a dynamic model included the lagged migration flows as explanatory; 4) a pseudo-poison maximum likelihood estimation (Santos Silva & Tenreyro, 2006); 5) alternative measures of agglomeration of knowledge-intensive activities.

Our preliminary results suggest that this agglomeration of knowledge intensive economic activities is indeed a key driver of high skilled migration. Therefore, there are important implications for EU policymakers in charge of cohesion policies and for national and regional authorities concerned about a balanced territorial development. The economic convergence of less developed regions might be undermined by prevailing differences on economic structure and by the dynamism of core regions that are draining a significant amount of human capital from them.

Keywords: Migration - KIBS - Agglomeration - Regional development - Gravity model

JEL codes: J24 - J61 - O15 - R23

References

Beine, M., Bertoli, S., & Fernández-Huertas Moraga, J. (2016). A practitioners' guide to gravity models of international migration. *The World Economy*, *39*(4), 496–512. https://doi.org/10.1111/twec.12265

Czaika, M., & Parsons, C. R. (2017). The gravity of high-skilled migration policies. *Demography*, *54*(2), 603–630. https://doi.org/10.1007/s13524-017-0559-1

González-Leonardo, M., López-Gay, A., & Demogràfics, C. (2021). From rural exodus to interurban brain drain: The second wave of depopulation. *Ager*, *2021*(31), 7–42. https://doi.org/10.4422/ager.2021.01

Grogger, J., & Hanson, G. H. (2011). Income maximization and the selection and sorting of international migrants [tex.ids= grogger2011jodea]. *Journal of Development Economics*, *95*(1), 42–57. https://doi.org/10.1016/j.jdeveco.2010.06.003

Malul, M. (2015). The process of brain drain in peripheral regions [tex.ids= malul2015ael publisher: Routledge]. *Applied Economics Letters*, *22*(17), 1419–1423. https://doi.org/10.1080/13504851.2015.1037429

Mayda, A. M. (2010). International migration: A panel data analysis of the determinants of bilateral flows. *Journal of Population Economics*, *23*(4), 1249–1274. https://doi.org/10.1007/s00148-009-0251-x

Miyagiwa, K. (1991). Scale economies in education and the brain drain problem [tex.ids= miyagiwa1991iera publisher: [Economics Department of the University of Pennsylvania, Wiley, Institute of Social and Economic Research, Osaka University]]. *International Economic Review*, *32*(3), 743–759. https://doi.org/10.2307/2527117

Ortega, F., & Peri, G. (2013). The effect of income and immigration policies on international migration. *Migration Studies*, *1*(1), 47–74. https://doi.org/10.1093/migration/mns004

Rodríguez-Pose, A., & Crescenzi, R. (2008). Mountains in a flat world: Why proximity still matters for the location of economic activity. *Cambridge Journal of Regions, Economy and Society*, *1*(3), 371–388. https://doi.org/10.1093/cjres/rsn011

Santos Silva, J., & Tenreyro, S. (2006). The log of gravity. *Review of Economics and Statistics*, *88*(4), 641–658. https://doi.org/10.1162/rest.88.4.641

Swinney, P., & Williams, M. (2016). *The great british brain drain. where graduates move and why*. Centre for Cities. London. https://www.centreforcities.org/publication/great-british-brain-drain-where-graduates-move-and-why/

Vence-Deza, X., & González-López, M. (2014). Regional concentration of knowledge-intensive business services in europe. *Environment and Planning C: Government and Policy*, *32*(6), 1036–1058. https://doi.org/10.1068/c11171r

Zieba, M. (2021). Knowledge-intensive business services. In M. Zieba (Ed.), *Understanding knowledge-intensive business services: Identification, systematization, and characterization of knowledge flows* (pp. 49–90). Springer International Publishing. https://doi.org/10.1007/978-3-030-75618-5_3