EXTENDED ABSTRACT

Title: Migration flows within Spain after the covid-19 pandemic: the role of digitalization

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Abstract:

A trend reversal in migration flows was brought on by COVID-19 in 2020. Because of the attraction that the concentration of better and higher-paying jobs and cultural and social amenities exerted on people, especially the youngest and most qualified ones, the main urban centres recorded positive net migrant flows prior to the pandemic (Glaeser and Mare, 2001; De la Roca, 2017; Ahlin et al. 2018). However, the pandemic breakout prompted authorities in many nations to order a population lockdown. Additionally, it was mandated that enterprises that engaged in non-essential activity temporarily close. Restrictions were later added to the "new normal" in order to prevent population massive infection, particularly in the hospitality and tourism industries.

In this situation, the world's major cities had net population outflows, which led a brand-new phenomenon known as the "Covid exodus" by authors (Florida et al., 2021)

Cities out-migration were reported for Manhattan and San Francisco (Ramani and Bloom, 2021); Oslo (Tønnessen, 2021); and Stockholm (Vogiazides and Kawalerowicz, 2022). But also, big cities in Japan (Fielding and Ishikawa, 2021); India (Mohanan, 2020); Britain (Rowe et al, 2021); Germany (Stawarz, et al. 2022); US (Haslag and Weagley, 2022) and Spain (Gonzalez-Leonardo et al., 2022) lost population in 2020.

The inability to enjoy the cultural and social amenities that larger cities typically offer, stricter lockdown measures, and fear of contagion as a result of the higher difficulty to maintain social distance in big cities and the effective higher incidence of the COVID-19 illness are likely some of the non-economic factors that pushed people out of urban areas. Economic factors like job loss and increased housing expenses in cities may also contribute to explain why people wanted to move elsewhere.

In this context, teleworking, a common phenomenon that denotes carrying out a productive activity remotely, rose to prominence. Companies were compelled to use it throughout the lockdown, and after it ended, many of them continued to use it wholly or in part. The rapid advancement of information and communication technology (ICT) in recent years has made it possible for some workers to work remotely and has accelerated digitalization in the workplace during the Covid pandemic. Working remotely provides individuals with the option of where to live, regardless the location of their work centres. This lessens the significance of the distance between the workers' homes and places of employment (Glaeser, 2022). Additionally, this may contribute to blur what we know as integrated labour markets, which take commuting criteria into account for their definition. Additionally, the commutes of working individuals may be significantly impacted by teleworking.

A perfect framework for studying the factors of the destination municipalities drawing population flows is provided by the net outflow of people from big cities and the widespread adoption of remote work, with a focus on the role that high-speed internet access (or digitalization in general) has played on migration decisions. To the best of our knowledge, this has not been previously explored in Spain and the scenario

after COVID-19 pandemic and the availability of information of high-speed internet access at municipal level makes the study possible and relevant.

In order to perform this analysis, we resort to the information of Residential Variation Statistics micro dataset, which compiles information on every individual move that imply a municipality change. EVR provides information on the date of the residential variation and the municipalities of departure and arrival. EVR exploits information such as the date of the residential variation and the municipalities of departure and arrival. It also considers personal characteristics of the migrant such as nationality, birthplace (either municipality or country of origin), birth date and gender, which makes possible to determine the migration motivations for specific groups that may present heterogeneous behaviour. EVR provides high-quality information because of the application of advanced control and data-collection procedures, but also because of the implementation of Spain's Continuous Register, which updates residential variation information immediately. The potential criticism of the use of these data is that it represents only registered moves.

With regards to dependent variables, we consider the information on high-speed internet access at municipal level provided by the Spanish Ministry of Economic Affairs and Digital Transformation. With respect to the control variables, we resort to information at municipal level of population, distance, housing costs, income and employment. The information of labour market factors is important to be considered for local labour market areas (LLMAs), which are territories that show a strong socio-economic cohesion since they represent the areas where people live and work. These areas are defined for the Spanish case by Boix and Galletto (2006) and Boix, et al. (2015), which take into account the Italian National Institue of Statitics (Istituto Nazionale di Statistica ,ISTAT) procedure to define "Los Sistemi Locali del Lavoro" Municipal information on population is obtained from the Spanish Continuous Register, the distance between origin and destination municipalities is calculated taking into consideration the municipalities centroids and considering the Euclidean distance between them. Housing costs at municipal level are extracted by using big data techniques from Fotocasa, a Spanish real estate company that provides a web-based service. With respect to labour market factors, information on income is obtained from Household Income Distribution Atlas of the Spanish Institute of Statistics (Instituto Nacional de Estadística, INE), whereas the information of registered employment is extracted from the Spanish Social Security database. Finally, the

information on average weather and precipitation is obtained from the Spanish Meteoroly Agency (Agencia Estatal de Meteorología, AEMET).

Following the individual maximization principle, individuals decide to migrate whether the expected utility of destination is higher than the expected utility reported by the origin area minus the cost of moving. The expected utility is given by specific attributes of these areas and the individual idiosyncratic preferences.

$$E(U^k_j) - c(D_{ij}) > E(U^k_i)$$

If we aggregate all these individual decisions, we can define y_{ij}, which captures the number of flows registered between every pair of spatial units *i* and *j*, and a gravity specification can be written as follows:

$$y_{ij} = e^{\beta_0}(D_{ij})^{\beta_k} \prod_{l=1}^{L} F_{il}^{\lambda_{il}} \prod_{l=1}^{L} F_{jl}^{\lambda_{jl}} \varepsilon_{ij}$$

where y_{ij} depends multiplicatively on *L* push ($F_i^{\lambda_{il}}$) and pull ($F_j^{\lambda_{jl}}$) factors and ε_{ij} is the idiosyncratic error.

From the methodological perspective, Poisson Pseudo Maximum Likelihood (PPML) technique, proposed by Santos Silva and Tenreyro (2006), stands as the workhorse in gravity models due to it deals in a natural way with an excess of zero flows. Therefore, we use this methodology and express the conditional expectation of the endogenous variable given by the set of regressors $x_{ij} = (1, D_{ij}, F_{jt-1l}, d_i,)$ as in the exponential function that follows:

$$E(y_{ij}|x_{ij}) = exp[\beta_0 + \beta_k \, ln(D_{ij}) + \sum_{k=1}^{K} \lambda_{jl} \, lnF_{jt-1l} + + \sum_{i=1}^{I} \theta_j d_i] \quad (4)$$

Preliminary results show a significant and positive effect of high-speed internet access in destinations as an attractor of population flows. The effect observed of of high-speed internet access is even higher for nationals, non-returned migrants and the young cohorts of age.

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