



# Population growth and taxes: the effect of regional differences in the Spanish inheritance tax

Rafael González-Val<sup>1,2</sup> · Miriam Marcén<sup>1</sup>

Received: 27 December 2022 / Accepted: 1 December 2023  
© The Author(s) 2024

## Abstract

This paper assesses the impact of inheritance tax on population growth exploiting the quasi-random differences in the inheritance tax across different Spanish regions over the last 20 years. Using a dynamic difference-in-differences approach to municipality population data, we found a robust-positive short-term effect (1–4 years) on the population growth for small inheritances. The impact is sizable and represents roughly 6% of the standard deviation, but this dissipates after 7 years. The heterogeneity analysis by age group reveals a clear positive and lasting response to the inheritance tax benefits for those aged 50–69 years. This is especially seen in municipalities close to the border pointing to migration costs as a key factor in changes of residence in response to the inheritance tax law differences.

**JEL Classification** H3 · J6 · K34 · R23

## 1 Introduction

Despite the significant differences in inheritance tax (IT henceforth) among countries/regions, few studies have examined individuals' responses to this tax. Since the 1970s, at least 10 of the OECD countries have repealed inheritance taxes, although 24 of the 37 OECD countries still differentially tax end-of-life bequests (flat rate variation: 4% (Italy)–40% (the UK and the USA) or progressive rate variation: 1% (Chile)–80% (Belgium)) (OECD 2021). Prior works have mainly focused on individual decisions related to wealth accumulation and testament planning (Glogowsky

---

✉ Miriam Marcén  
mmarcen@unizar.es

Rafael González-Val  
rafaelg@unizar.es

<sup>1</sup> Departamento de Análisis Económico, Facultad de Economía y Empresa, Universidad de Zaragoza, Gran Vía 2, 50005 Zaragoza, Spain

<sup>2</sup> Facultat d'Economia i Empresa, Institut d'Economia de Barcelona (IEB), John Maynard Keynes, 1-11, 08034 Barcelona, Spain

2021; Goupille-Lebret & Infante 2018) but overlooked the potential impact on aggregate population growth, which is the topic of this paper. The understanding of how IT affects population growth is of interest because IT has become an important player in the new international tax system scenario and one of the most unpopular taxes in many countries (Gross et al. 2017; OECD 2021). Additionally, changes in population growth may have important implications for inter-regional wage differences, housing costs, or fiscal revenues (Kline & Moretti 2014).

Theoretically, the expected impact of IT on population growth can be explained by the “voting with the feet” concept from classical economic theory (Tiebout 1956). This approach solves the classic problem of how consumers reveal their preferences regarding the level of provision of public goods. When a person (or a group of individuals) cannot individually influence the decisions made in their place of residence (related to public goods/services or taxes), they may decide to move (“vote with their feet”). Thus, IT may significantly affect population growth because fiscal differences may induce individuals to change their residence to enjoy tax benefits. There is no existing within-country evidence on the magnitude of this phenomenon on population growth and its consequences for IT. We, at least in part, fill this gap here.

Our empirical strategy addresses the aforementioned challenge by exploiting the quasi-random historical differences in IT across regions in Spain. We use the geographical and temporal variation in IT across Spanish regions to identify the effect of IT differences on population growth. To that end, we construct a comprehensive high-frequency data set of IT reforms at the regional level. This information is merged with local- or municipal-level data on population growth from the municipal register for 20 years (1998–2017). The Spanish case is interesting for various reasons. In Spain, there are considerable variations in the IT law across regions (IT regulation is decentralized) and over time (IT law reforms usually occur after a change in the regional government), with differences persisting until today. In regions such as País Vasco or Madrid (among others), heirs with a close family affiliation (son/daughter) to a deceased person are almost exempt from inheritance taxation, but in other regions, such as Asturias, individuals with the same kinship may be taxed with a maximum rate of 36%. The Spanish framework also lessens endogeneity concerns. This is based on the 5 years of residence requirement of the Spanish legislation to obtain residence status and thus to take advantage of the tax benefits in each region.

We estimate a dynamic model to gauge transitory/permanent shocks. To capture the IT impact better, we distinguish two tax base scenarios: (1) small inheritance (< 150,000 euros) and (2) large inheritance ( $\geq$  600,000 euros). Our estimation strategy also takes into account local-level observable and unobservable characteristics, which can vary among regions and over time. Within the small inheritance scenario, we find an economically significant and positive short-term effect of IT on the population growth rate of a municipality when there is a more beneficial IT regulation in that place than in the neighbouring regions. After the seventh year, the observed impact is negative, which may point to a non-permanent settlement of the population as a consequence of the variations in IT. In contrast, within the large inheritance scenario, we observe a positive but marginally significant coefficient for the importance of IT to population growth. Our results are robust to the use of different subsamples.

We uncover heterogeneous responses to IT by age based on sensitivity to IT, with older individuals surely being more concerned about death. This analysis also allows us to mitigate possible concerns about the changes in the fertility rates, which may cause the population growth to vary but are unlikely to be a consequence of IT differences. Inheritance taxes appear to have had a positive impact on the population growth rate at the municipal level of those individuals aged 50 to 59, regardless of the inheritance scenario. In contrast, there are no differential effects for those aged 30 to 49 in the same period of time, although, since the fifth year, the detected impact is negative regardless of the inheritance scenario, meaning that the population growth rate of those aged 30 to 49 has decreased. Overall, the findings hint at the different and important role of IT in the evolution of population growth by age group.

The last part of the paper provides suggestive evidence of the role of IT in population growth depending on the migration costs. Since all inter-municipality moves involve paying the “new” life costs (which may include finding a new job, a house, shops, and health facilities, among others), we focus our attention on the psychological costs (a reduction in contact with friends/family/traditions), which are more likely to vary with individuals’ place of birth and distance. We first explore whether those originating from other regions are those migrating to the municipalities in regions with more favourable IT. This is based on the idea that those individuals are more affected by the psychological costs of migration than those who were born in the same region (Marcén and Morales 2022). Then, we study the response of the individuals to the IT differences when the physical distance is small. The migration costs almost disappear among close municipalities (Jofre-Monseny 2014; McKinnish 2007). This happens in bordering municipalities among regions, where we can analyse the role of the IT differences in areas with quite low migration costs.

Our work contributes to two strands of the literature: (1) the empirical research on the “voting with the feet” theory and (2) the literature on the role of fiscal incentives in demographics. Although it is obvious that the “voting with the feet” theory is not new in economic theory, there are few empirical works on this issue related to fiscal competition between regions or countries. Some authors have investigated whether social benefits can make some places attractive to the population. There is evidence for several welfare benefits programs using data from the US (the Aid to Families with Children (ADFC) program), Australia (welfare policies), and Spain (the System of Protection for Temporary Agricultural Workers) (Fiva 2009; Gelbach 2004; Jofre-Monseny 2014; McKinnish 2005, 2007). Considering mobility responses to taxes, research has shown that billionaires and athletes are more likely to reside in countries where taxes are lower (Kleven et al. 2019; Moretti and Wilson 2023; Sanandaji 2014). Exploring the possible impact on population growth of the inter-state migration’s response to the fiscal competition, we find a work using Australian data and considering the case of IT (Grossman 1990). Analyzing the in- and out-migration, this author quantified an increase in 0.20 per cent in the population growth during the first three years after the elimination of IT as a consequence of inter-state migration. In Spain, there is evidence of income tax’s impact on location choices using administrative data (Agrawal and Foremny 2019). Along the same line, a recent paper tries to

examine the impact of regional tax competition on the changes of residence of Spanish individuals without using specific data on mobility (López-Laborda and Rodrigo 2022), but the results are limited because of data limitations. The authors use Spanish data on the personal income tax declarations in two moments of time (2006 and 2012) to define the possible change of residence of Spanish individuals. However, this analysis excludes many individuals who are potentially more likely to move (elderly people) in response to regional IT differences but who are not liable to pay the personal income tax. Therefore, their analysis cannot derive a clear causal impact of the differences in IT on individuals' movements. The wide window of time considered also limits the analysis, and the authors cannot clearly separate the individual contribution of the regional taxes because the time period includes more than one change in the regional taxes. We add to this literature using an extensive annual dataset covering all populations that allows us to run a more accurate causal analysis of the impact of IT on population growth. We also contribute to this line of research by examining the tax effect using a dynamic approach (permanent/transitory shocks).

In the same strand of the literature and also related to our work are those studies examining the migration of specific population groups in response to the taxes. There are some works pointing to the mobility of elderly population as a potential explanation for their findings on tax returns but without any specific empirical analysis of migrations or population change. Using US federal estate tax return data, it is found that the tax differences of inheritance, estate, and sales taxes between US states had a negative impact on the number of federal estate tax returns filed in a state for those having high state taxes (Bakija and Slemrod 2004). Those authors associate that result with the mobility of elderly people, but their analysis relies only on descriptive evidence. The existing empirical evidence on this issue is mixed without providing clear results on that explanation. Older adults appear to be more likely to migrate to US states that exempt food from sales taxes and spend less on welfare, but the effect of personal income and inheritance taxes is not clear and depends on how those taxes are measured (Conway and Houtenville 2001; Önder and Schlunk 2015). The effects of cuts in IT are also associated with a change in the composition of the retiree population in Switzerland in favour of high-income retirees, but without a significant impact on tax revenues (Brüllhart and Parchet 2014). We extend this literature by showing that the change in IT can differentially impact population growth by age group and over time. It is not only those early in the life cycle who respond to fiscal incentives by changing their place of residence, and not all groups of the population respond in the same way at the same moment in time.

Regarding the second line of research, what the literature has suggested is that the mere existence of agglomeration externalities does not indicate which places should have fiscal benefits (Glaeser et al. 2008). Without a better understanding of the impact of taxes on population growth, any governmental spatial tax policy could have positive or negative effects. Following this line of research, our work is closely related to that studying the impact of income subsidies on population growth in rural Australia (Kettlewell and Yerokhin 2019). Although that is quite a recent paper, its dataset was concentrated in the mid-twentieth century, and it found only a temporary effect on population growth in the targeted areas. We use a more

recent dataset, and our estimated positive impact is also transitory, as in the Australian case.

The rest of the research work is organized as follows. Section 2 describes the data used. The methodology is described in Sect. 3, and the results are presented in Sect. 4. Section 5 concludes.

## 2 Data

### 2.1 The Spanish inheritance tax

The inheritance tax is regulated by Law 29/1987 and Royal Decree 1929/1991, which enacts the State Inheritance Tax Regulation.<sup>1</sup> This tax is under Spanish regions' control (NUTS 2 regions, the so-called *Comunidades Autónomas*), including the tax revenues and regulation. It was transferred by Law 8/1980 in 1980, but it was not until the early 2000s that the Spanish regions (with the exception of Navarra and País Vasco, territories with a special status granted by the Spanish Constitution) could make decisions about IT under Laws 14/1996 and 21/2001. These laws granted greater power to the regions regarding this tax, including regulatory matters. Spanish regions can change tax rates, increase tax benefits and allowances, as well as establish their own reductions for the transmissions (Martínez 2010; Sablina 2010).<sup>2</sup>

Beneficiaries of *mortis causa* acquisitions are considered taxpayers (natural persons), and the tax return is due six months after the date of death (although an extension can be obtained in some cases).<sup>3</sup> It is a progressive tax that becomes payable upon receipt of an inheritance—whether this is property, money, or an asset of any kind. The tax base is the net value of each heir's inheritance. This is considered to be the actual market value of the assets and rights, less any deductible expenses.<sup>4</sup> Failure to pay the tax results in a surcharge and interest, which increases exponentially. The tax applies to everyone, Spanish residents and non-residents, if the asset is located in the country (such as real estate). A crucial point of the inheritance tax is that the residence of the deceased determines the region in which the individual will be taxed, and these regions have certain legislative powers.<sup>5</sup> That is, where and how much the heir pays depends ultimately on the residency status of the deceased.

<sup>1</sup> The law also rules the gift tax, but in this paper, we focus exclusively on the inheritance tax.

<sup>2</sup> The local authorities have no legislative power in respect of this tax, which means that all the municipalities within the same region share the same IT law.

<sup>3</sup> Beneficiaries of life insurance policies are also taxpayers.

<sup>4</sup> For the case of properties, there was a “*real or actual value*” of the property for tax purposes, which is the minimum fiscal value during the period under consideration in our work. This “*real value*” was a sort of minimum acceptable value established by the administration, calculated using the cadastral value (a public registry) and coefficients determined by the public administration.

<sup>5</sup> There was just one Spanish region (Comunitat Valenciana) that also required that heirs reside in the same region as the decedent. This law reform only affects a few years in our sample, and results do not change after running the analysis excluding that region.

As López-Laborda and Rodrigo (2022), point out, this motivates that the rules in the IT are more elaborate, precisely, to hinder changes of residence for tax reasons.<sup>6</sup> The residence requirement is stricter than in other taxes. It is requested that the decedent has stayed the greatest number of days in the last five years (a 5-year residency requirement) before death.

Differences over space and across regions in IT provide exogenous variation that is the core of our empirical strategy. We use information on historical differences in IT across regions in Spain for the period 1998–2017. All IT regulations for the period under consideration at the national and regional levels have been compiled by double-checking this information from the reports provided by the Spanish Treasury (*Ministerio de Hacienda*) on its website from 2002 and the reports prepared by the General Council of Economists from 2006.<sup>7</sup>

As López-Laborda and Rodrigo (2022) highlight, it is not easy to find a synthetic indicator of the differences in IT across regions because this tax depends on factors such as the composition of the estate, the number of heirs and their relationship to the heirs' own wealth. Here, we consider the IT reforms affecting individuals who are more likely to receive an inheritance (close relatives: sons/daughters and spouses).<sup>8</sup> We focus on those groups because we are exploring significant changes in population growth. Minor differences in the IT, or ones that may affect a group of individuals who are less likely to receive an inheritance, are also less likely to have a significant impact on population growth. These close-relative-related IT differences represented the most important changes in that tax during the period under consideration across regions (see the reports of the Spanish *Ministerio de Hacienda*), with spatial variation in IT across regions but also over time.<sup>9</sup>

We establish two classifications based on two inheritance scenarios: (1) small inheritance (<150,000 euros) and (2) large inheritance ( $\geq 600,000$  euros). This approach is based on the idea that the smaller the inheritance, the more people can

<sup>6</sup> Changes in residency are managed by the local authorities (i.e., the municipality's town hall). Individuals who move need to register in the administrative public registry called "*padrón municipal*," indicating the new address in the municipality.

<sup>7</sup> Note that although our sample period starts in 1998, these reports cover all the regulations during that period of time. See *Panorama de la Fiscalidad Autónoma y Foral*, edited by the Spanish General Council of Economists (*Consejo General de Economistas*), *REAF-REGAF asesores Fiscales*, and the electronic reports on *Tributación Autónoma* edited by the *Ministerio de Hacienda* on the following website (accessed on January 26, 2022).

<http://www.hacienda.gob.es/es-ES/Areas%20Tematicas/Financiacion%20Autonomica/Paginas/libro%20electronico%20tributacion.aspx>.

Also, note that the national legislation did not change during the period under consideration.

<sup>8</sup> These correspond to the family groups I and II in the Spanish IT regulation. Group I is composed of children (natural and adopted) under 21 years, and group II includes children (natural and adopted) over the age of 21, grandchildren, spouses, parents/grandparents (including adoptive), and in some regions, unmarried partners. There are two additional groups (III and IV) defined for those distantly related and unrelated. Usually, tax benefits are exclusively applicable to individuals in groups I and II.

<sup>9</sup> There are other regional taxes. However, the greatest regional differences in taxation are observed in the Inheritance Tax according to the Spanish General Council of Economists (February 27, 2017), see *Panorama de la Fiscalidad Autónoma y Foral*. It is also detailed in that document that in other taxes of regional regulatory competence, there have not been as many regulatory differences.

be affected by the IT reforms concerning that level of inheritance. The large inheritance scenario follows the classification made by the Spanish *Ministerio de Hacienda*, but it is unlikely to affect many individuals since the number of individuals receiving large inheritances is probably small given that, according to the data from that public institution, the average inheritance is usually around 150,000 euros or below.<sup>10</sup>

Considering the previous inheritance scenarios and the different IT regulations across regions, we establish two classifications of the Spanish municipalities for all years from 1998 to 2017, distinguishing between regions with few or no tax benefits and regions with many tax benefits and allowances.<sup>11</sup> Regions within each class change over time as they modify the regional inheritance tax law. Figure 1 displays the temporal evolution of IT laws across regions in Spain in both scenarios, revealing that many regions tended to introduce tax benefits and allowances, especially in the small inheritance case. This leads to a second crucial point in our analysis: tax competition among regions. When we examine IT laws from a spatial perspective focusing on municipalities, our spatial unit of analysis, in the small inheritance scenario, we observe almost 80% of the Spanish municipalities with more IT benefits (exemptions, tax credits, and deductions) than those municipalities located in their neighbouring regions for at least 1 year, with 46% entering this category by the year 2007. In the case of the large inheritance scenario, around 64% of the Spanish municipalities have more IT benefits than those municipalities located in their neighbouring regions for at least 1 year.

## 2.2 Population growth

Our geographical unit is the municipality.<sup>12</sup> Municipalities are the smallest spatial units (local governments); they are the administratively defined “legal” cities. They are also the lowest spatial subdivision in Spain, the LAU 2/NUTS 5 regions, comprising the country’s total land area and therefore the entire population. The sample includes a yearly average of 7913 municipalities (98% of the total municipalities excluding the islands).<sup>13</sup>

We use annual population data spanning the period 1998 to 2017 from the Spanish Statistical Office (*Instituto Nacional de Estadística*, INE). There are two data sources: The population censuses provide population figures for 2001 and 2011 (every 10 years). For the inter-census years, we obtained population data at the city level from the annual revision of the municipal register (*Padrón continuo*). The

<sup>10</sup> Unfortunately, individual data on the amount of the inheritances are not available.

<sup>11</sup> Other authors have provided similar information for some years (López-Laborda and Rodrigo 2022; Ribes Ribes 2010).

<sup>12</sup> As mentioned above, IT laws vary across regions but municipalities have no legislative power to rule on the tax. However, if we perform the analysis considering regional data instead of municipality data, then the small sample size (15 regions) and the large size of units (millions of inhabitants) makes it difficult to obtain any significant effect. Additionally, the use of municipality data allows us to run the cross-border analysis presented below.

<sup>13</sup> The Balearic and Canary islands are excluded for not having border regions.

municipal register includes those individuals who reside regularly in each municipality; it is updated with births and deaths. Registration is compulsory. The municipal register contains official and comprehensive yearly data on the population living in each municipality by January 1. These data refer to the same period for which the IT regulations were collected.<sup>14</sup> The extended municipality sample allows us to conduct dynamic analysis with sufficient observations.<sup>15</sup> The sample ends in 2017 to avoid possible endogeneity concerns (possible changes in residence that pre-dated the IT reforms) generated by the regional competition on IT announcements that have occurred in Spain since that year.<sup>16</sup>

We focus our attention on the standardized logarithmic population growth rate at the municipality level. Hence, the mean is zero and the standard deviation is equal to one in all years. In the main analysis, the population growth includes the entire population (individuals of all ages). In the heterogeneity analysis, the population growth is calculated by age groups. Nevertheless, our results are robust to the use of a non-standardized logarithmic population growth rate. Annual logarithmic population growth averaged  $-0.004$  over the entire period considered varying from  $-1.73$  (Portbou, Catalonia) to  $2.43$  (Llaurí, Comunitat Valenciana).

### 3 Empirical strategy

To understand the extent to which the IT law reforms affected population growth, we exploit the temporal and geographic variation in the IT differences as follows:

$$\begin{aligned} \text{PGR}_{it} = & \sum \beta_k \text{IT}_{itk} + \delta_i + \sum \text{RegionFE} + \sum \text{YearFE}_i \\ & + \sum \text{RegionFE} \times \text{Time}_t + \sum \text{RegionFE} \times \text{Time}_t^2 + u_{it} \end{aligned} \quad (1)$$

where  $\text{PGR}_{it}$  is defined as the standardized population growth of municipality  $i$  in year  $t$ .<sup>17</sup> The variable  $\text{IT}_{itk}$  is an indicator that takes the value 1 if municipality  $i$  in year  $t$  is located in a region with more IT benefits than those municipalities in any of the neighbouring regions during  $k$  periods ( $k=1-2$  years,  $3-4$  years,  $5-6$  years,  $7-8$  years,  $9-10$  years, and  $+11$  years) and 0 otherwise.<sup>18</sup> That is, these time dummies measure not only the differences in the IT benefits (exemptions, tax credits,

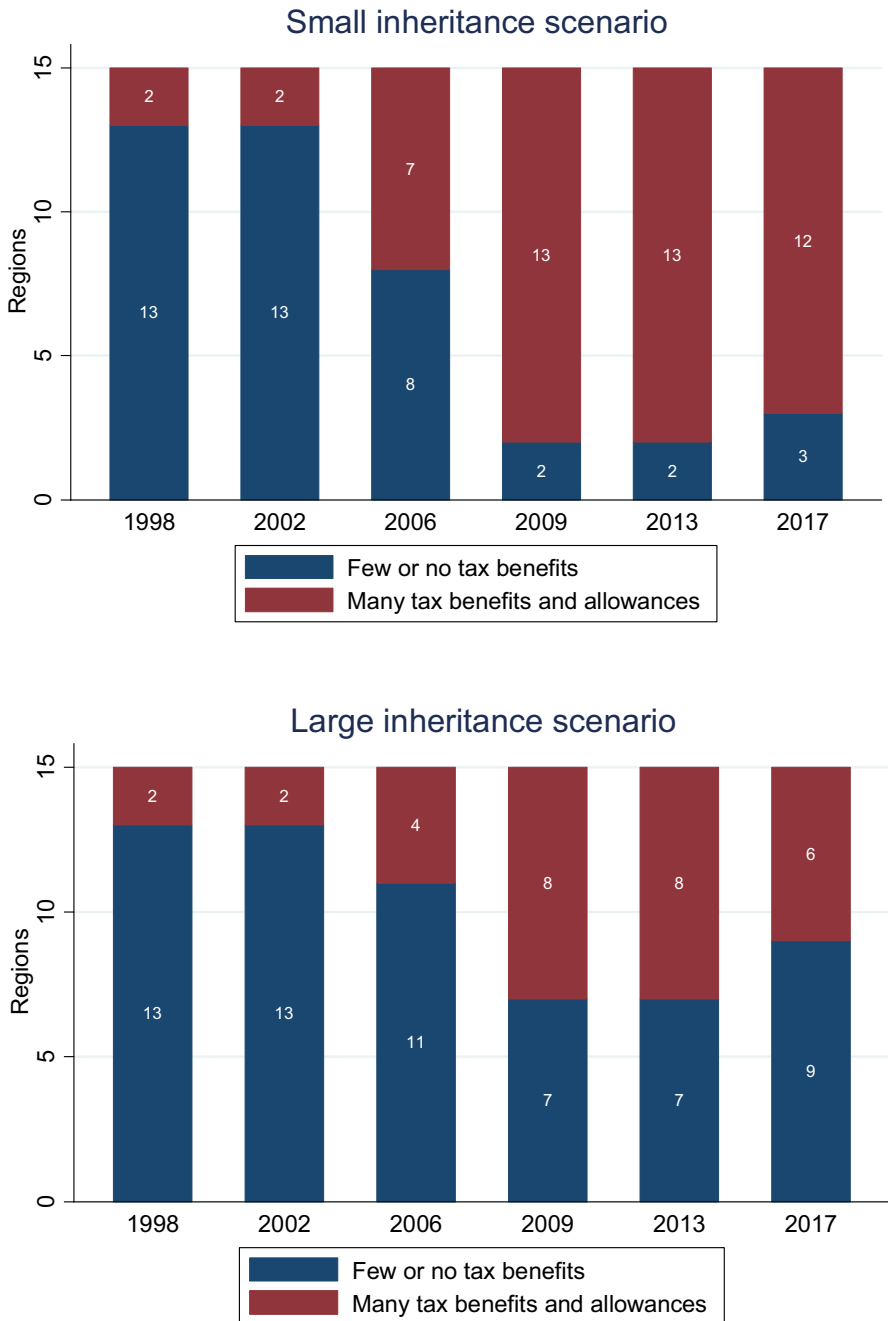
<sup>14</sup> Many of the IT law reforms were included in the annual General Regional Budgets, which usually come into force on January 1.

<sup>15</sup> The data limitations do not allow us to study this issue at the micro-level because this information is unavailable.

<sup>16</sup> In the 2017 meeting of the Spanish Regional Presidents, two Spanish regions accused others of promoting relocations of firms and people because of the tax benefits, including the case of IT, although there was no empirical evidence confirming this claim. Since then, several regional governments and political parties have made announcements of significant IT reforms because of the increasing sensitivity to this issue. These changes could affect the migration decisions of people in Spain.

<sup>17</sup> As mentioned above, the normalization or standardization of that growth rate generates a variable whose mean is zero, and the standard deviation is equal to one for all years.

<sup>18</sup> Since the response to changes in IT may not be instantaneous, the use of 2-year periods is considered appropriate in this literature (Brühlhart and Parchet 2014).



**Fig. 1** Temporal variation of the regional inheritance tax laws, Notes: The graphs show the classification of the 15 Spanish regions from 1998 to 2017 in terms of the regional inheritance tax law. The Balearic and Canary Islands are excluded

and deductions) between neighbouring regions but also the time elapsed under these different tax schemes, regardless of the cause of the difference in the regional tax regimes, that can be an IT law reform in the region considered or a law modification approved by any of the neighbouring regions.

For instance, the region of Madrid modified its IT law in the year 2006, introducing more tax benefits in the small inheritance scenario, but their municipalities have more IT benefits than those in the neighbouring regions only for two years because the neighbouring regions also approved similar IT law reforms in the following years. This means that for Madrid's municipalities, the  $IT_{itk}$  dummy takes the value 1 only for years  $t-2$  after the law reform in 2006 (although the IT benefits were in force all years after 2006).

The regions of Navarra and País Vasco provide an alternative example. These territories have a special status granted by the Spanish Constitution, which means that they had more IT benefits than any other region in the country many years before the start of our sample period in 1998.<sup>19</sup> Thus, for the municipalities within these two regions, the  $IT_{itk}$  dummy for  $t+11$  years takes the value 1 since 1998 until all the neighbouring regions approved similar IT benefits; this happened in the middle 2000s for both regions.

Therefore, the treatment group includes municipalities in regions with more tax benefits than those municipalities in any of the neighbouring regions, while the control group is composed of the municipalities in regions with *fewer* or *the same* IT benefits as those municipalities in the neighbouring regions. Note that the treatment depends not only on the IT law by region but also on the neighbours' laws. What matters is not only the regional IT law, but whether the region has more, less, or the same IT benefits as its neighbours. Often, municipalities will enter the treatment group when the region they belong to approves an IT law reform introducing more tax benefits than in any neighbouring region, which means that the IT law reform date will coincide with the start of the treatment, but in some cases, even if a region introduces IT benefits it can continue in the control group if all its neighbours already had the same level of IT benefits, because there would be no incentive for individuals to move. The latter is the case of the municipalities within Catalonia, Galicia, and Extremadura. Although those regions approved IT benefits, they did not have more IT benefits than any neighbouring region any year. Furthermore, it can also happen that municipalities within a region move from the treatment to the control group if their region reduces or eliminates tax benefits, or even if their region does not modify its IT law, as long as the neighbouring region that had fewer IT benefits introduces a similar level of tax benefits.

We focus on IT differences among neighbouring regions since the literature has shown that migrations due to fiscal and welfare reasons tend to occur between very close areas, where a greater number of people can migrate at lower migration costs (Jofre-Monseny 2014; McKinnish 2005, 2007). If only the movements of those with great fortunes, who can migrate to more remote areas, were considered, it would

<sup>19</sup> Navarra and País Vasco are the only two regions with many IT benefits and allowances from 1998 to 2002 in both inheritance scenarios reported in Fig. 1.

be impossible to detect statistically significant changes in the aggregate population growth rate because the richest people represent a small percentage of the total population.

The  $\beta_k$  coefficients capture the dynamic response of population growth to the IT reforms. This dynamic difference-in-differences analysis has been used in the literature to study the impact of legislative changes, such as unilateral divorce, child custody and child support, and mortgage law reforms, on demographic variables (Bellido and Marcén, 2014; González-Val 2021; González-Val and Marcén 2012; Halla 2013; Wolfers 2006) and allows us to observe the response over time of the population growth at the municipality level to the IT differences across regions. Positive  $\beta_k$  coefficients indicate an increase in population growth as a consequence of the IT differences, while negative estimated points mean the opposite. We would expect individuals to change their place of residence when the migration costs are lower than the expected tax benefits of their heirs (positive  $\beta_k$  coefficients).<sup>20</sup> However, a decrease in IT revenues could negatively affect public services (such as the health system or education), so we could also expect the opposite, that is, a reduction in population growth (negative  $\beta_k$  coefficients). Observable characteristics at the local level (municipal mean age and political party in the regional government) that can affect the outcome of interest are controlled in  $\delta_i$ .<sup>21</sup> Regional and temporal (annual) fixed effects are added jointly with the regional-specific time trends (linear and quadratic) to control for unobservable characteristics that may vary among regions and/or over time.<sup>22</sup>

Our empirical strategy is based on the plausible exogeneity of the IT law reforms. While no policy is ever adopted arbitrarily, our concern here is whether the changes in the place of residence pre-dated the IT reforms. Spain presents a particular case for a study that reduces this concern because the Spanish legislation establishes that, to gain access to the IT benefits of a particular region, individuals are required to have a 5-year residence period prior to the surely unpredictable date of death.<sup>23</sup> This

<sup>20</sup> Note that out-migration could also be reduced if the place of residence is more attractive for individuals.

<sup>21</sup> For the importance of the age structure of the municipalities in population growth, we control for the mean age in the municipalities. The literature highlights the significant decrease in Spain's total fertility rate in the last decades and the rise in the mean age at first childbirth, which hinders fertility recovery (Delgado et al. 2008). This provides more support for this control variable because municipalities with younger individuals are surely more likely to have more babies. In that setting, population growth would be driven by fertility decisions that are unlikely to be related to IT reforms. The political party in the regional government is also a necessary control since it could be argued that what we are capturing with the IT law reforms are differences in ideologies across political parties (with the right-wing parties being more willing to include more tax benefits in the reforms) and not only differences in the IT regulations.

<sup>22</sup> Our regional fixed effects and the regional-specific time trends (linear and quadratic) should control, for example, the regional differences in fertility. In the Spanish context of low fertility rates, there are important differences between regions. Burillo et al. (2020) study spatial-temporal changes in local fertility in Spanish municipalities over a 16-year period (2002–2017) that almost coincides with our sample period, finding that the highest fertility is mainly observed in Southern Spain and along the Mediterranean coast.

<sup>23</sup> The exceptions are the regions of Navarra and País Vasco, with a special rule that only requires a 1-year period of residence.

should mitigate our aforementioned concerns, given that regional governments can normally change every 4 years or more frequently.<sup>24</sup> This reduces the possibility of predicting the possible future tax policies in each region. Furthermore, the 5-year residence period also avoids the moving decision to be influenced by simultaneous changes in other taxes that can change year-by-year and only require a 1-year residence, such as the autonomic personal income tax or the wealth tax.

There are some potential issues with the dynamic diff-in-diff model in Eq. (1). These are, basically, the possible existence of pre-trends (the parallel trends assumption) and issues related to the variation in treatment timing, particularly with respect to time since treatment (Callaway and Sant’Anna 2021; de Chaisemartin and D’Haultfoeuille 2020; de Chaisemartin and D’Haultfoeuille 2020). To check both potential issues, we estimate an event study using the diff-in-diff estimator for multiple time periods proposed by Callaway and Sant’Anna (2021) and Sant’Anna and Zhao (2020). Figure 3 in the Appendix displays the results for both the small and large inheritance scenarios, showing no evidence of significant pre-trends in our data, supporting that diff-in-diff assumptions hold. This provides additional evidence on the validity of the specification presented here.<sup>25</sup>

## 4 Results

### 4.1 Main results, heterogeneity analysis, and robustness checks

Table 1 provides an assessment of IT’s impact on the population growth rate at the local level after estimating Eq. (1). As mentioned above, two scenarios are considered to compare the IT differences across regions: small inheritance (column 1) and large inheritance (column 2). Having more IT benefits primarily affected the population growth in the small inheritance scenario. We find an economically significant and positive short-term effect (1–4 years) of IT on the average standardized logarithmic population growth rate of a municipality (column 1) after the introduction of more IT benefits in the region of that municipality than in those located in the neighbouring regions. The impact is sizable—representing roughly 6% of the population growth rate’s standard deviation.<sup>26</sup> However, after the seventh year, the impact turns negative, which suggests a decrease in the population growth as a consequence

<sup>24</sup> We have to clarify here that in several regions, there was not any change in the regional government during the period under consideration. Additionally, a change in the regional government does not imply an automatic change in the legislation, as the legislative data reveal. In any case, we have introduced controls for the political party in each regional government as well as other geographical and time-fixed effects to reduce the possible concerns in this issue.

<sup>25</sup> Our conservative interpretation of the event study results exclusively focus on identification. The reason is that the different generic approaches for estimating treatment effect parameters using difference-in-differences with multiple time periods are equivalent from the identification perspective, but this is not the case from the estimation/inference perspective, which requires a correct model specification because misspecification can lead to biased estimates (Callaway and Sant’Anna 2021).

<sup>26</sup> Note that results can be downwards biased due to possible frictions caused by adjustment costs, for example.

of the IT benefits. The long-run negative effects represent around 5.5% of the standard deviation. There is a positive, albeit non-significant, impact 3–4 years after the reforms in the large inheritance scenario (column 2). These reforms primarily affect the few individuals with many more assets. However, the population growth rate again decreases from the fifth year onwards as a consequence of having more IT benefits. The empirical evidence presented here only indicates a short-run possible positive effect on the population growth rate. This is consistent with studies finding a temporary positive effect of fiscal policies (Grossman 1990; Kettlewell and Yerokhin 2019).<sup>27</sup>

We next asked who is responding to the regional IT differences. It can be surmised that older people are more concerned about death and hence the IT that their heirs will have to pay. We propose a heterogeneity analysis by age to assess this issue. Table 2 presents the results for three age subgroups (30–49, 50–69, and 70–84). This time, population growth only measures the growth in each age group. As before, a positive effect on the standardized logarithmic population growth rate is detected 1–6 years after the introduction of IT reforms but only for individuals aged 50 to 69 years (columns 3 and 4). This is true regardless of the scenario proposed (small or large inheritance), but the impact is long lasting in this case.

We do not see any positive and significant coefficients in the short-run among young people (columns 1 and 2, aged between 30 and 49 years). There is a long-term negative impact of the IT.<sup>28</sup> Of note, for those aged 70–84 years, which should be the most concerned about death, we do not observe any statistically significant effect (columns 5 and 6). These estimates are, at least in part, consistent with studies finding a positive impact on the migration of older individuals as a consequence of the reduction in the IT (Brühlhart and Parchet 2014; Önder and Schlunk 2015). However, we only find this for part of the elder individuals, those aged 50–69. This could be because older people are less likely to move due to dependency and health issues. Additionally, the legal residence requirement of at least 5 years that is established in the IT legislation can play a role in their non-response to the IT reforms. Those aged 70–84 years old could consider themselves close to death and decide not to migrate because they would be unable to survive the legal residence period. The estimates by age-group may also indicate that the short-run positive effect observed in Table 1 might be driven by the dominated effect of the IT on people aged 50–69. However, the negative effect in the long term detected in Table 1 could be explained by the response of people aged 30–49 (see Table 2). Our findings suggest that the increase in older people caused by the IT differences may increase outflows of young people some years later. Overall, the findings hint at the different and important role of the regional IT differences in the evolution of the population growth by age group.

<sup>27</sup> The specifications include all the controls for observable and unobservable characteristics described previously. As a robustness check, we also estimated using the non-standardized logarithmic population growth rate as the dependent variable, and the results hold.

<sup>28</sup> The negative effect on the population growth of those aged 30–49 can impact total population growth through a double channel: the direct decrease in that group of population and the indirect effect on population growth through fertility. This is seen because this group includes women of reproductive age.

**Table 1** Dynamic analysis of the impact of IT on the population growth rate

Dep. variable	Small inheritance	Large inheritance
	(1)	(2)
	Standardized logarithmic population growth rate	Standardized logarithmic population growth rate
1–2 years	0.028** (0.013)	– 0.013 (0.014)
3–4 years	0.060** (0.014)	0.014 (0.016)
5–6 years	– 0.038 (0.023)	– 0.104*** (0.016)
7–8 years	– 0.173*** (0.023)	– 0.283*** (0.025)
9–10 years	– 0.065** (0.032)	– 0.307*** (0.031)
+ 11 years	– 0.055*** (0.013)	– 0.034* (0.023)
Year Fixed Effects	Yes	Yes
Region Fixed Effects	Yes	Yes
Region-specific linear time trends	Yes	Yes
Region-specific quadratic time trends	Yes	Yes
Other controls: mean age and political party	Yes	Yes
Observations	150,345	150,345
$R^2$	0.082	0.084

Robust standard errors are clustered at the regional level and reported in parentheses

\*\*\*Significant at the 1% level, \*\*significant at the 5% level, and \*significant at the 10% level

The results satisfy the robustness checks using different subsamples. We repeated the analysis excluding all the municipalities in the capital region of Madrid. In that region, there was a considerable reduction in the taxation of wealth and income in the period under consideration, which may generate doubts regarding whether IT differences or changes in any other tax may be driving our results. The estimated coefficients for the population growth of the entire population and by age group are presented in Appendix (Table 6). The results do not change substantially. Thus, the presence of the municipalities of Madrid is not driving our findings.

Similarly, we checked the robustness of our results when splitting the sample. We separated the large municipalities ( $\geq 10,000$  inhabitants) from the small ones ( $< 10,000$  inhabitants). We performed this robustness check because the distribution of the municipalities by size in Spain is quite heterogeneous: Small municipalities are mainly in the north and the inland center of the country, while large municipalities are more concentrated in the south and along all the eastern and southern coastlines. Therefore, moving distances and migration costs are different across regions.

**Table 2** Heterogeneity analysis by age group: dynamic analysis of the impact of IT on the population growth rate

Dep. variable: standardized logarithmic population growth rate	Small inheritance	Large inheritance	Small inheritance	Large inheritance	Small inheritance	Large inheritance	Small inheritance	Large inheritance
Age group	30–49	30–49	50–69	50–69	70–84	70–84	70–84	70–84
	(1)	(2)	(3)	(4)	(5)	(6)	(5)	(6)
1–2 years	-0.000 (0.013)	-0.029* (0.015)	0.038*** (0.013)	0.046*** (0.015)	-0.001 (0.015)	-0.001 (0.013)	-0.001 (0.015)	-0.001 (0.013)
3–4 years	0.016 (0.014)	-0.004 (0.016)	0.085*** (0.014)	0.071*** (0.016)	-0.001 (0.012)	0.000 (0.013)	-0.001 (0.012)	0.000 (0.013)
5–6 years	-0.092*** (0.023)	-0.123*** (0.017)	-0.011 (0.021)	0.038** (0.016)	0.001 (0.017)	-0.000 (0.012)	0.001 (0.017)	-0.000 (0.012)
7–8 years	-0.094*** (0.022)	-0.175*** (0.024)	-0.080*** (0.022)	-0.090*** (0.023)	-0.001 (0.012)	0.000 (0.034)	-0.001 (0.012)	0.000 (0.034)
9–10 years	-0.026 (0.022)	-0.237*** (0.035)	-0.038 (0.028)	-0.039 (0.032)	0.008 (0.029)	0.006 (0.065)	0.008 (0.029)	0.006 (0.065)
+ 11 years	-0.053*** (0.012)	-0.057*** (0.021)	0.046** (0.012)	0.041* (0.022)	0.006 (0.010)	0.007 (0.031)	0.006 (0.010)	0.007 (0.031)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region-specific linear time trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region-specific quadratic time trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other controls: mean age and political party	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	150,256	150,256	150,317	150,317	150,317	150,317	150,317	150,317
R <sup>2</sup>	0.030	0.031	0.056	0.056	0.013	0.013	0.013	0.013

Robust standard errors are clustered at the regional level and reported in parentheses

\*\*\*Significant at the 1% level, \*\*Significant at the 5% level, and \*Significant at the 10% level

The estimates are presented in Tables 7 and 8 in the Appendix. The conclusions obtained from the analysis using the small municipalities are, again, similar to the main results. Some small differences are seen in the larger municipalities, but the qualitative findings are maintained.

## 4.2 Mechanisms at play: born in a different region and border municipalities

This subsection provides empirical evidence on some of the mechanisms at play in the response of the population growth to the regional IT differences. If the IT differences considered here really matter in this setting, then we should observe dissimilar responses depending on the migration costs. Individuals move when the expected tax benefits for their heirs are higher than their own migration costs. However, not all changes of residence imply the same costs. Although all inter-municipality changes of residence involve paying the “new” life costs (which may include finding a new job, a house, shops, health facilities, etc.), the psychological costs (including a reduction in the contact with friends/family/traditions) are more likely to vary with the distance between the place of birth and the possible new host municipality. We thus concentrate our attention on those psychological costs that can vary with the distance and perform two separate analyses: (1) the response of those born in a different region and (2) the behaviour of people living in border municipalities between regions.<sup>29</sup>

We first explore whether those originating from other regions are those migrating to the municipalities with more favourable IT regulations.<sup>30</sup> This is based on the idea that individuals who live in a different region from where they were born are more sensitive to the psychological costs than those who return to their home region (Marcén and Morales 2022). This time, population growth only measures the change in the population living in a region while born in another region. These people moved to the region from another area in the past; unfortunately, data on the move date are not available. Nevertheless, the exclusion of people who have never moved should make our estimates of the effects more precise because the target population in these is people whom we know to have moved from other regions.

Table 3 reports estimates for both the small and the large inheritance scenario. For the population growth rate of those born in a different region, we observe a positive and significant effect only after 3–4 years. The estimated coefficients subsequently turn negative or non-significant. Thus, it seems that migration costs in the

<sup>29</sup> In Spain, there is an official data set of administrative changes of residence called “Estadísticas de Variaciones Residenciales” elaborated by the INE. However, that information at the municipality level is restricted to municipalities having more than 10,000 inhabitants, which dramatically reduces our sample size to less than 800 units (around 90% of the Spanish municipalities have less than 10,000 inhabitants). The sample size is smaller for border municipalities with 146 municipalities within 15 km from the regional border, and 211 municipalities when the distance is 25 km from the border. Nevertheless, we repeated the analysis using this data set, and results were similar to those reported in Table 3 and 4. These results are available from the authors upon request.

<sup>30</sup> The residence requirement of five years may decrease mobility, and therefore, our results should be considered as a lower bound.

form of psychological costs matter for the magnitude of the effect of regional IT differences on population growth.

Second, we checked the response of the population growth in the municipalities located close to the border between regions. Figure 2 shows the spatial distribution of these municipalities. Following the literature (Jofre-Monseny 2014), we do not limit ourselves to those municipalities on the border but also consider those close to the border—up to a distance of 25 km. We have already explained the importance that the literature on migration has given to the distance between places as a fundamental factor when making decisions to change residence. The empirical literature has shown that most people do not move far from their place of birth. For instance, (Rauch 2014) used 2000 US census data and found that the large majority of people in the US moved a distance between 0 and 100 km from their place of birth. In European countries, internal mobility has traditionally been low. Prior work (Cheshire and Magrini 2006) estimated that the population mobility in the US is 15 times higher than that in Europe, and migration movement in Spain is even lower (Bentolila 1997).

With a focus on the low migration costs among the border municipalities, some authors have studied individuals' response to public policies (Jofre-Monseny 2014; McKinnish 2007). We explore the extent to which regional IT differences play a role in the population growth of those areas with quite low migration costs, at least in terms of psychological costs. Therefore, these regions are where more people can migrate at a low cost. The results are presented in Table 4 and 5. Table 4 considers two distance thresholds for the total population growth. Table 5 focuses our attention on the already-detected age group that is more sensitive to the changes in IT (people aged 50–69). Estimates with total population (Table 4) maintain some possible positive and significant effects 3–4 years after the IT reforms—especially in the small inheritance scenario (but only at the 10% level). The statistical significance is lost as we move away from the regional borders less than 25 km (columns 3–4). For the age group from 50 to 69 years (Table 5), a positive and significant effect is observed again in the short term—especially in the small inheritance scenario. It is noteworthy that, in the long term (more than 9 years after the introduction of the IT reforms), we observe a positive and significant effect (column 1). This result might suggest that the introduction of more tax benefits has settled the population, although this is limited to the scenario with the small inheritance. In this case, regional IT differences could have a permanent and positive effect on the rate of population growth.

**Table 3** Mechanism #1: born in a different region: dynamic analysis of the impact of IT on the population growth rate

Dep. variable: standardized logarithmic population growth rate for those born in a different region	Small inheritance (1)	Large inheritance (2)
1–2 years	0.010 (0.013)	–0.005 (0.015)
3–4 years	0.059*** (0.014)	0.040** (0.016)
5–6 years	–0.032 (0.021)	–0.045*** (0.016)
7–8 years	–0.052*** (0.018)	–0.063*** (0.019)
9–10 years	–0.024 (0.026)	–0.076*** (0.026)
+ 11 years	–0.035*** (0.012)	–0.002 (0.022)
Year fixed effects	Yes	Yes
Region fixed effects	Yes	Yes
Region-specific linear time trends	Yes	Yes
Region-specific quadratic time trends	Yes	Yes
Other controls: mean age and political party	Yes	Yes
Observations	147,453	147,453
$R^2$	0.002	0.002

The number of observations changes because of the data availability. Robust standard errors are clustered at the regional level and reported in parentheses

\*\*\*Significant at the 1% level, \*\*significant at the 5% level, and \*significant at the 10% level

## 5 Conclusions

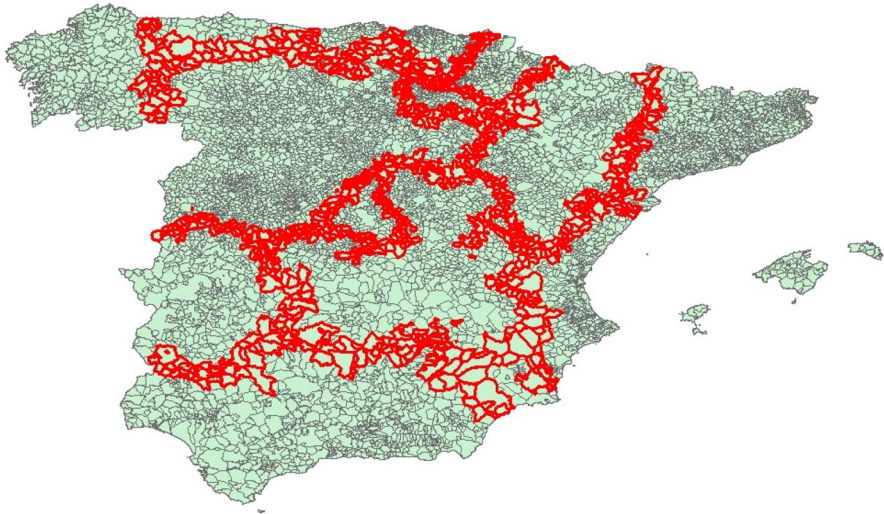
In an international context in which tax competition between countries/regions will surely change after the historical agreement among the G7 nations in 2021,<sup>31</sup> policymakers should not forget the role that taxes can play in population growth. Here, we asked if the inheritance tax could be a factor encouraging population growth. A priori, the answer is not easy because changes of residence are expensive and not all people can afford to move for economic reasons as well as due to social, work, and family issues. If only the richest people (the largest potential payers of this tax) moved to obtain better IT benefits, then we would not observe statistically significant variations in the total population growth rates because the richest people represent a small percentage of the population. Despite the existing challenges, we present rigorous empirical evidence that allows us to answer that question affirmatively

<sup>31</sup> That agreement modifies the international tax system to support a global minimum corporate tax rate (15 per cent) that companies have to pay regardless of where they are located. <https://www.g7uk.org/g7-finance-ministers-agree-historic-global-tax-agreement/>.

**Table 4** Mechanism #2: Close to border municipalities: Dynamic analysis of the impact of IT on the population growth rate

Dep. variable: standardized logarithmic population growth rate	Small inheritance <15 km (1)	Large inheritance <15 km (2)	Small inheritance <25 km (3)	Large inheritance <25 km (4)
Distance				
1–2 years	0.018 (0.023)	-0.007 (0.024)	0.009 (0.019)	-0.022 (0.021)
3–4 years	0.046* (0.027)	0.011 (0.027)	0.043* (0.022)	-0.026 (0.023)
5–6 years	-0.112** (0.048)	-0.154*** (0.028)	-0.086* (0.048)	-0.152*** (0.024)
7–8 years	-0.161*** (0.038)	-0.267*** (0.033)	-0.176*** (0.034)	-0.278*** (0.029)
9–10 years	0.152 (0.097)	-0.281*** (0.039)	0.133* (0.070)	-0.261*** (0.034)
+ 11 years	-0.082*** (0.020)	-0.070** (0.029)	-0.079*** (0.016)	-0.073*** (0.025)
Year fixed effects	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes
Region-specific linear time trends	Yes	Yes	Yes	Yes
Region-specific quadratic time trends	Yes	Yes	Yes	Yes
Other controls: mean age and political party	Yes	Yes	Yes	Yes
Observations	42,735	42,735	59,211	59,211
R <sup>2</sup>	0.081	0.084	0.076	0.078

Robust standard errors are clustered at the regional level and reported in parentheses.  
 \*\*\*Significant at the 1% level, \*\*Significant at the 5% level, and \*Significant at the 10% level



**Fig. 2** Spatial distribution of the Spanish border municipalities between regions

but not for all people and not permanently. Middle-aged people (50–69 years old) are more positively affected by the regional IT differences.

What we observe is that IT differences increase overall population in the short-run but decrease the total population in the long-run. However, estimates by age-groups revealed that the positive effect is driven by people aged 50–69, while the negative effect is driven by people aged 30–49. Moreover, the later decrease in young population exceeds the initial increase in older people because the effect on total population in the long-run is negative. These results suggest that the increase in elder people caused by the IT differences may increase outflows of young people some years later. For any reason, the increase in the older population makes the municipality/region less appealing and young people move out. Is that possible? A review of the literature points to two possible explanations for that kind of behaviour. Firstly, there is a behavioural explanation: Some authors find that large proportions of citizens consider the rising number of older persons to be a worrisome evolution (Schoenmaeckers et al. 2008). Second, several studies find a negative link between population ageing and economic growth (Bloom et al. 2011; Hu et al. 2021; Maestas et al. 2016). Furthermore, an increase in the older population shifts the labour force to health and care activities, which often show constant or even decreasing returns to scale. Young adults are usually more willing to move (Skjerpén and Tønnessen 2021), especially to urban areas and places with greater shares of young people because they are usually more interesting from a young person's perspective (da Silva et al. 2021). Thus, the increase in older people attracted by IT benefits could be creating incentives to move out some years later for young people searching for job opportunities.

**Table 5** Mechanism #2: Close to border municipalities: Dynamic analysis of the impact of IT on the population growth rate for those aged 50–69

Dep. variable: standardized logarithmic population growth rate for those aged 50–69	Small inheritance <15 km (1)	Large inheritance <15 km (2)	Small inheritance <25 km (3)	Large inheritance <25 km (4)
Distance				
1–2 years	-0.030 (0.022)	-0.031 (0.024)	-0.013 (0.019)	-0.013 (0.021)
3–4 years	0.079*** (0.028)	0.056** (0.026)	0.069*** (0.023)	0.032 (0.023)
5–6 years	-0.019 (0.046)	-0.035 (0.029)	-0.047 (0.039)	-0.037 (0.024)
7–8 years	-0.065* (0.037)	-0.090*** (0.030)	-0.102*** (0.032)	-0.120*** (0.027)
9–10 years	0.193*** (0.058)	-0.059 (0.038)	0.105** (0.050)	-0.067** (0.033)
+ 11 years	0.050** (0.020)	-0.002 (0.028)	0.055*** (0.016)	0.016 (0.024)
Year fixed effects	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes
Region-specific linear time trends	Yes	Yes	Yes	Yes
Region-specific quadratic time trends	Yes	Yes	Yes	Yes
Other controls: mean age and political party	Yes	Yes	Yes	Yes
Observations	42,727	42,727	59,190	59,190
R <sup>2</sup>	0.054	0.054	0.050	0.050

Robust standard errors are clustered at the regional level and reported in parentheses  
 \*\*\*Significant at the 1% level, \*\*Significant at the 5% level, and \*Significant at the 10% level

Our analysis has focused on the differences in the IT between neighbouring regions using municipality population data. As the literature suggests, it is easier to find a significant effect among neighbouring regions because of the lower migration costs (Jofre-Monseny 2014; McKinnish 2007). Accordingly, we merge a regional classification of IT benefits with annual population data for the period 1998 to 2017 at the municipality level. Data at the regional level are scarce and therefore more problematic for finding significant effects. Our dynamic analysis shows a possible positive effect of the regional IT differences in the short term and in the small inheritance scenario. This suggests that the tax system can be a factor influencing people's residence choice. Of course, other variables related to the labor market, the provision of private and public services (health and education), cultural aspects, human capital, and social capital, among others, may also be relevant when choosing where to live. Our model accounts for the possible differences between regions by introducing several observable controls (the mean age of the population by municipality and political party in government) but also region and year fixed effects, along with linear and quadratic specific time trends. Our findings are robust after considering several subsamples.

We cannot directly explore the mechanisms through which IT affects decision making regarding the place of residence due to the lack of individual data. However, we present evidence regarding possible changes in the population growth rate of those born in a different region and in the case of municipalities close to the border between regions. People aged 50 to 69, who are surely more sensitive to death and to the IT that their heirs will have to pay, appear to increase in those municipalities close to border areas with more tax benefits than their neighbouring regions. Thus, migration costs appear to matter because we easily observe a significant impact of tax benefits on population growth when they are low.

## Appendix

See Tables 6, 7, 8 and Fig. 3

**Table 6** Robustness check #1: dynamic analysis of the impact of IT on the population growth rate, excluding Madrid

Variable dependiente: Tasa de crecimiento normalizada de la población	Small inheritance	Large inheritance	Small inheritance	Large inheritance	Small inheritance	Large inheritance
Age group	All	All	30–49	30–49	50–69	50–69
	(1)	(2)	(3)	(4)	(5)	(6)
1–2 years	0.026** (0.013)	-0.016 (0.015)	-0.003 (0.013)	-0.030** (0.015)	0.040*** (0.013)	0.046*** (0.015)
3–4 years	0.051*** (0.014)	0.005 (0.016)	0.012 (0.014)	-0.009 (0.016)	0.077*** (0.014)	0.065*** (0.016)
5–6 years	-0.048** (0.023)	-0.114*** (0.016)	-0.098*** (0.023)	-0.127*** (0.017)	-0.017 (0.021)	0.037** (0.016)
7–8 years	-0.187*** (0.023)	-0.234*** (0.027)	-0.103*** (0.022)	-0.140*** (0.026)	-0.086*** (0.022)	-0.067*** (0.026)
9–10 years	-0.087*** (0.032)	-0.297*** (0.038)	-0.041* (0.022)	-0.208*** (0.043)	-0.047* (0.026)	-0.013 (0.039)
+ 11 years	-0.052*** (0.013)	-0.031 (0.023)	-0.051*** (0.012)	-0.055*** (0.021)	0.049*** (0.012)	0.045*** (0.022)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region-specific linear time trends	Yes	Yes	Yes	Yes	Yes	Yes
Region-specific quadratic time trends	Yes	Yes	Yes	Yes	Yes	Yes
Other controls: mean age and political party	Yes	Yes	Yes	Yes	Yes	Yes
Observations	146,976	146,976	146,887	146,887	146,948	146,948
R <sup>2</sup>	0.073	0.073	0.027	0.027	0.049	0.049

Robust standard errors are clustered at the regional level and reported in parentheses

\*\*\*Significant at the 1% level, \*\*Significant at the 5% level, and \*Significant at the 10% level

**Table 7** Robustness check #2: Dynamic analysis of the impact of IT on the population growth rate considering municipalities  $\geq 10,000$  inhabitants

Dep. variable: standardized logarithmic population growth rate	Small inheritance		Large inheritance		Small inheritance		Large inheritance	
Age group	All	(1)	All	(2)	50–69	(3)	50–69	(4)
1–2 years	0.074	(0.046)	-0.080	(0.058)	0.041	(0.040)	-0.054	(0.050)
3–4 years	-0.067	(0.048)	-0.326***	(0.059)	0.041	(0.042)	-0.217***	(0.053)
5–6 years	0.180***	(0.069)	-0.264***	(0.064)	0.152**	(0.061)	-0.127***	(0.048)
7–8 years	-0.203**	(0.087)	-0.643***	(0.092)	0.071	(0.074)	-0.369***	(0.081)
9–10 years	0.045	(0.096)	-0.362***	(0.090)	0.177*	(0.091)	-0.291***	(0.091)
+ 11 years	-0.197***	(0.052)	0.145***	(0.052)	0.208***	(0.042)	0.159***	(0.053)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region-specific linear time trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region-specific quadratic time trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other controls: mean age and political party	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,601	10,601	10,601	10,601	10,601	10,601	10,601	10,601
$R^2$	0.185	0.192	0.192	0.192	0.310	0.310	0.311	0.311

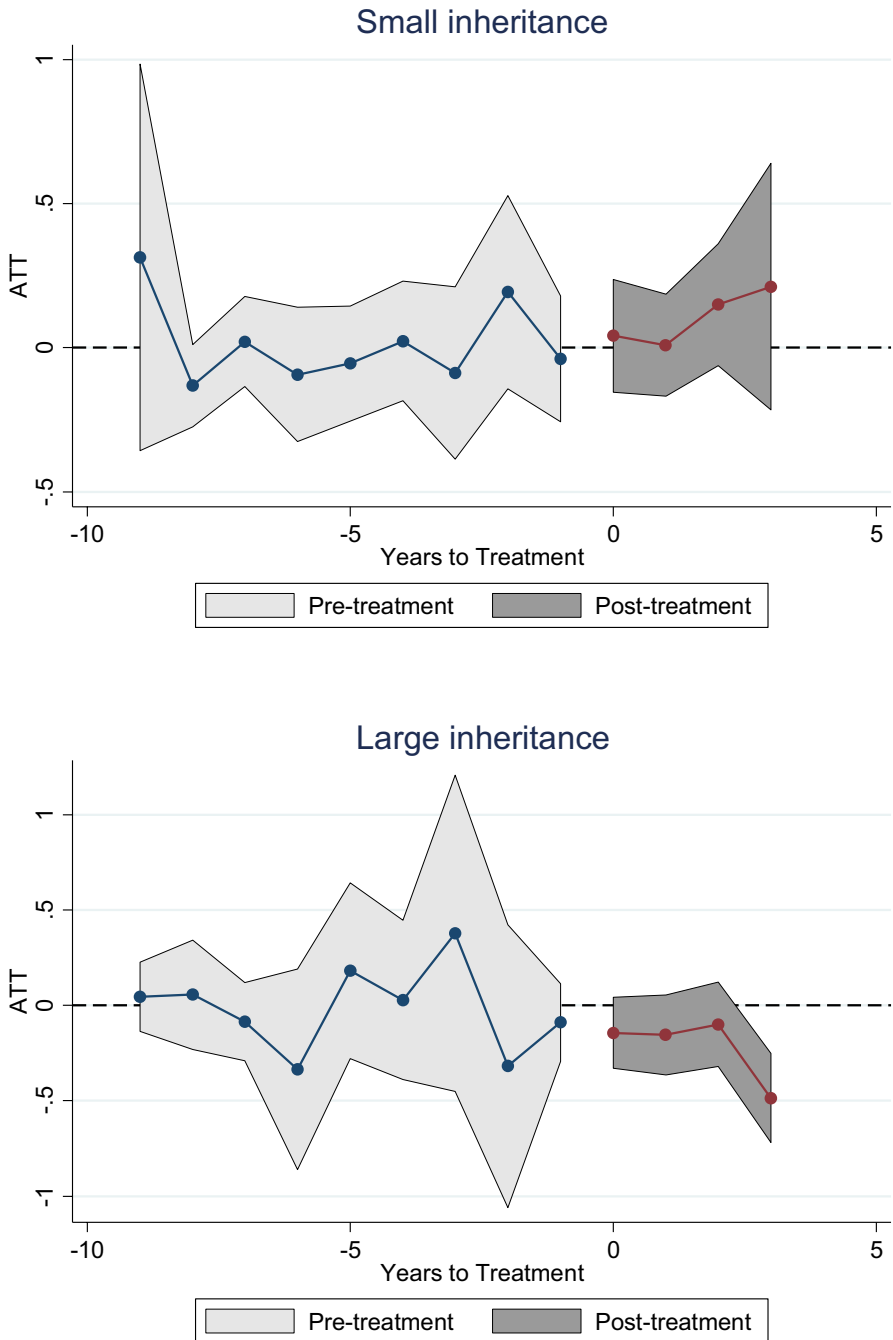
Robust standard errors are clustered at the regional level and reported in parentheses

\*\*\*Significant at the 1% level, \*\*Significant at the 5% level, and \*Significant at the 10% level

**Table 8** Robustness check #3: dynamic analysis of the impact of IT on the population growth rate considering municipalities < 10,000 inhabitants

Dep. variable: standardized logarithmic population growth rate	Small inheritance		Large inheritance		Small inheritance		Large inheritance	
Age group	All	(1)	All	(2)	50–69	(3)	50–69	(4)
1–2 years	0.024*	(0.013)	-0.010	(0.015)	0.034***	(0.013)	0.045***	(0.015)
3–4 years	0.056***	(0.014)	0.012	(0.016)	0.076***	(0.014)	0.065***	(0.016)
5–6 years	-0.053**	(0.025)	-0.098***	(0.016)	-0.014	(0.022)	0.037**	(0.016)
7–8 years	-0.167***	(0.024)	-0.275***	(0.025)	-0.077***	(0.023)	-0.087***	(0.024)
9–10 years	-0.068*	(0.036)	-0.305***	(0.032)	-0.040	(0.029)	-0.036	(0.033)
+ 11 years	-0.045***	(0.014)	-0.035	(0.024)	0.051***	(0.012)	0.042*	(0.022)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region-specific linear time trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region-specific quadratic time trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other controls: mean age and political party	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	139,744	139,744	139,744	139,744	139,716	139,716	139,716	139,716
R <sup>2</sup>	0.077	0.078	0.078	0.078	0.051	0.051	0.051	0.051

Robust standard errors are clustered at the regional level and reported in parentheses  
 \*\*\*Significant at the 1% level, \*\*Significant at the 5% level, and \*Significant at the 10% level



**Fig. 3** Event study. Event study estimated using the doubly robust DiD estimator based on stabilized inverse probability weighting and ordinary least squares by Sant'Anna and Zhao (2020). Control group: Not yet treated observations. Estimations include municipal and year fixed-effects, and two control variables: municipal mean age and political party in the regional government. Regional-specific time trends (linear and quadratic) are not allowed

**Acknowledgements** This paper received the Alexandre Pedrós award to the best paper presented by a young scholar at the Meeting on Public Economics in 2020. Earlier versions of this paper were presented at the 86th International Atlantic Economic Conference (New York, 2018), at the XLIV Reunión de Estudios Regionales (Valencia, 2018), at the 58th Annual Meeting of the Southern Regional Science Association (Washington DC, 2019), at the 27th Meeting on Public Economics (Barcelona, 2020), at the 39th Annual Conference of the European Association of Law and Economics (Lisbon, 2022) and at the 13th Annual Conference of the Spanish Association of Law and Economics (Madrid, 2023), and all the comments made by participants are much appreciated. The authors benefited from the helpful comments and suggestions from Fernando Gómez Pomar, Blanka Imre, Ana-María Ríos, Carsten Ochsén and Nataliya Savchuk. All remaining errors are ours.

**Funding** Open Access funding provided thanks to the CRUE-CSIC agreement with Springer Nature. Funding was provided by Instituto de Estudios Fiscales (Ministerio de Hacienda y Función Pública), Ministerio de Ciencia e Innovación and Agencia Estatal de Investigación, MCIN/AEI/10.13039/501100011033 (project PID2020-114354RA-I00), Gobierno de Aragón (project S39\_20R, ADETRE research group) and ERDF.

**Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

## References

- Agrawal DR, Foremny D (2019) Relocation of the rich: migration in response to top tax rate changes from Spanish reforms. *Rev Econ Stat* 101(2):214–232. [https://doi.org/10.1162/REST\\_A\\_00764](https://doi.org/10.1162/REST_A_00764)
- Bakija J, Slemrod J (2004) Do the rich flee from high state taxes? Evidence from federal estate tax returns. *Source Natl Tax J*. <https://doi.org/10.3386/w10645>
- Bellido H, Marcén M (2014) Divorce laws and fertility. *Labour Econ* 27:56–70. <https://doi.org/10.1016/j.labeco.2014.01.005>
- Bentolila S (1997) Sticky labor in Spanish regions. *Eur Econ Rev* 41(3–5):591–598. [https://doi.org/10.1016/S0014-2921\(97\)00002-0](https://doi.org/10.1016/S0014-2921(97)00002-0)
- Bloom DE, Canning D, Fink G (2011) Implications of population aging for economic growth population aging and economic growth (16705). <http://www.nber.org/papers/w16705>
- Brühlhart M, Parchet R (2014) Alleged tax competition: the mysterious death of bequest taxes in Switzerland. *J Public Econ* 111:63–78. <https://doi.org/10.1016/j.jpube.2013.12.009>
- Burillo P, Salvati L, Matthews SA, Benassi F (2020) Local-scale fertility variations in a low-fertility country: evidence from Spain (2002–2017). *Can Stud Popul* 47(4):279–295. <https://doi.org/10.1007/s42650-020-00036-6>
- Callaway B, Sant'Anna PHC (2021) Difference-in-Differences with multiple time periods. *J Econom* 225(2):200–230. <https://doi.org/10.1016/J.JECONOM.2020.12.001>
- Cheshire PC, Magrini S (2006) Population growth in European cities: weather matters—but only nationally. *Reg Stud* 40(1):23–37. <https://doi.org/10.1080/00343400500449259>
- Conway KS, Houtenville AJ (2001) Elderly migration and state fiscal policy: evidence from the 1990 census migration flows. *Natl Tax J* 54(1):103–123. <https://doi.org/10.17310/ntj.2001.1.05>
- da Silva SM, Silva AM, Cortés-González P, Braziené R (2021) Learning to leave and to return: mobility, place, and sense of belonging amongst young people growing up in border and rural regions of mainland Portugal. *Sustainability (switzerland)* 13(16):1. <https://doi.org/10.3390/su13169432>
- de Chaisemartin C, D'Haultfœuille X (2020) Two-way fixed effects estimators with heterogeneous treatment effects. *Am Econ Rev* 110(9):2964–2996. <https://doi.org/10.1257/AER.20181169>

- Delgado M, Meil G, Zamora López F (2008) Spain: short on children and short on family policies. *Demogr Res* 19:1059–1104. <https://doi.org/10.4054/DemRes.2008.19.27>
- Fiva JH (2009) Does welfare policy affect residential choices? An empirical investigation accounting for policy endogeneity. *J Public Econ* 93(3–4):529–540. <https://doi.org/10.1016/J.JPUBECO.2008.11.001>
- Gelbach JB (2004) Migration, the life cycle, and state benefits: how low is the bottom? *J Polit Econ* 112(5):1091–1130. <https://doi.org/10.1086/422560>
- Glaeser EL, Gottlieb J, Glaeser EL, Gottlieb J (2008) The economics of place-making policies. *Brook Pap Econ Act* 39(1):155–253
- Glogowsky U (2021) Behavioral responses to inheritance and gift taxation: evidence from Germany. *J Public Econ* 193:104309. <https://doi.org/10.1016/j.jpubeco.2020.104309>
- González-Val R (2021) The effects of the 2012 spanish law reform to protect mortgage debtors. *Hous Policy Debate* 31(2):239–253. <https://doi.org/10.1080/10511482.2020.1805488>
- González-Val R, Marcén M (2012) Unilateral divorce versus child custody and child support in the US. *J Econ Behav Organ* 81(2):613–643. <https://doi.org/10.1016/j.jebo.2011.08.008>
- Goupille-Lebret J, Infante J (2018) Behavioral responses to inheritance tax: evidence from notches in France. *J Public Econ* 168:21–34. <https://doi.org/10.1016/j.jpubeco.2018.09.016>
- Gross C, Lorek K, Richter F (2017) Attitudes towards inheritance taxation—results from a survey experiment. *J Econ Inequal* 15(1):93–112. <https://doi.org/10.1007/s10888-016-9344-4>
- Grossman PJ (1990) Fiscal competition among states in Australia: the demise of death duties. In: *Autumn* (vol 20, issue 4). <https://www.jstor.org/stable/3330297>
- Halla M (2013) The effect of joint custody on family outcomes. *J Eur Econ Assoc* 11(2):278–315. <https://doi.org/10.1111/jeea.12003>
- Hu Q, Lei X, Zhao B (2021) Demographic changes and economic growth: impact and mechanisms. *China Econ J* 14(3):223–242. <https://doi.org/10.1080/17538963.2020.1865647>
- Jofre-Monseny J (2014) The effects of unemployment protection on migration in lagging regions. *J Urban Econ* 83:73–86. <https://doi.org/10.1016/J.JUE.2014.08.001>
- Kettlewell N, Yerokhin O (2019) Area-specific subsidies and population dynamics: Evidence from the Australian zone tax offset. *Pap Reg Sci* 98(1):451–476. <https://doi.org/10.1111/PIRS.12333>
- Kleven H, Landais C, Søgaard JE (2019) Children and gender inequality: Evidence from Denmark. *Am Econ J: Appl Econ*. <https://doi.org/10.1257/app.20180010>
- Kline P, Moretti E (2014) People, places, and public policy: some simple welfare economics of local economic development programs. *Ann Rev Econ* 6(1):629–662. <https://doi.org/10.1146/annurev-economics-080213-041024>
- López-Laborda J, Rodrigo F (2022) Mobility of top income taxpayers in response to regional differences in personal taxes: evidence from Spain. *Economics* 16(1):152–169. <https://doi.org/10.1515/econ-2022-0016>
- Maestas N, Mullen KJ, Powell D (2016) The effect of population aging on economic growth, the labor force and productivity. *Am Econ J Macroeconom* 15:306–332
- Marcén M, Morales M (2022) The effect of same-sex marriage legalization on interstate migration in the USA. *J Popul Econ* 35(2):441–469. <https://doi.org/10.1007/s00148-021-00842-5>
- Martínez FA (2010) The inheritance Tax in Spain from the perspective of free movement of capital and right of establishment. *Intertex* 38(67):359–370. <https://doi.org/10.54648/TAXI2010039>
- McKinnish T (2005) Importing the poor: welfare magnetism and cross-border welfare migration. *J Hum Resour* 15(1):57. <https://doi.org/10.3368/JHR.XL.1.57>
- McKinnish T (2007) Welfare-induced migration at state borders: new evidence from micro-data. *J Public Econ* 91(3–4):437–450
- Moretti E, Wilson DJ (2023) Taxing billionaires: estate taxes and the geographical location of the ultra-wealthy. *Am Econ J Econ Pol* 15(2):424–466. <https://doi.org/10.1257/pol.20200685>
- OECD (2021) Inheritance taxation in OECD countries. OECD. <https://doi.org/10.1787/e2879a7d-en>
- Önder AS, Schlunk H (2015) State taxes, tax exemptions, and elderly migration. *J Region Anal Policy* 45(1):47–67. <https://doi.org/10.22004/ag.econ.243979>
- Rauch F (2014) Cities as spatial clusters. *J Econ Geogr* 14(4):759–773. <https://doi.org/10.1093/jeg/lbt034>
- RibesRibes A (2010) Discriminatory inheritance taxation of non-residents in Spain: possible solutions. *Eur Tax* 50(12):550–557
- Sablina M (2010) Is the Spanish inheritance and gift tax incompatible with the free movement of workers and capital?: the reasoned opinion of the EU Commission IP/10/513. <https://recercat.cat/handle/2072/67828>

- Sanandaji T (2014) The international mobility of billionaires. *Small Bus Econ* 42(2):329–338. <https://doi.org/10.1007/S11187-013-9481-0>
- Sant' Anna PHC, Zhao J (2020) Doubly robust difference-in-differences estimators. *J Econom* 219(1):101–122. <https://doi.org/10.1016/j.jeconom.2020.06.003>
- Schoenmaeckers RC, Callens M, Vanderleyden L, Vidovičová L (2008) Attitudes towards population ageing and older people. Springer, Dordrecht, pp 195–220. [https://doi.org/10.1007/978-1-4020-6611-5\\_10](https://doi.org/10.1007/978-1-4020-6611-5_10)
- Skjerperen T, Tønnessen M (2021) Using future age profiles to improve immigration projections. *Popul Stud* 75(2):255–267. <https://doi.org/10.1080/00324728.2020.1794019>
- Tiebout CM (1956) A pure theory of local expenditures. *J Polit Econ* 64(5):416–424
- Wolfers J (2006) Did unilateral divorce laws raise divorce rates? A reconciliation and new results. *Am Econ Rev* 96(5):1802–1820. <https://doi.org/10.1257/aer.96.5.1802>

**Publisher's Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.