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Does decentralization of governance promote urban diversity? Evidence from Spain

Jorge Díaz-Lanchas[a] and Peter Mulder[b]

ABSTRACT
The worldwide trend to decentralize the responsibilities and budgets of governments impacts regional economies in various ways. We use the example of Spain to test empirically whether the decentralization of governance is an important determinant of the sectoral composition of cities in an urban system. Our regression results, exploiting unique firm-level and time-varying transport-cost data, support the hypothesis that governance decentralization and the establishment of regional government headquarters in specific cities have been conducive to a more diverse urban economic structure and a more even city-size distribution in the Spanish urban system during a period of continuous reductions in transport costs.

KEYWORDS
decentralization; urban diversity; specialization; generalized transport costs; Spain

JEL C35, R12, R58
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INTRODUCTION

We analyse the role of government decentralization on cities' diversification and specialization patterns. Government decentralization – that is, a 'deconcentration' of institutional capacities from a central to a more local level – has been at the forefront of institutional and policy transformations all around the world over the last decades (Bardhan, 2002). The regional and urban studies literature on decentralization has focused predominantly on the impact of fiscal and political decentralization on public-service delivery, public expenditure, economic growth, poverty reduction, income inequality and regional disparities (Aray, 2019; Carniti et al., 2019; González-Alegre, 2010; Kyriacou et al., 2017; Rodríguez-Pose & Ezcurra, 2010, 2011). Remarkably, this body of literature has not paid much attention to the potential impact of decentralization on the economic structure of cities.

At the same time, there is no shortage of theories to explain urban diversity and specialization in a system of cities. Most of these are quantitative models in the spirit of the seminal works of Christaller (1933/66), Muth (1969), Henderson (1974) and Fujita et al. (1999). The different theoretical approaches that have emerged in the regional and urban studies literature attribute growth and transformation patterns across cities to changes in trading costs and interactions with other cities, technological change, product life-cycles and learning processes – starting from different assumptions about (the micro-foundations of) agglomeration and dispersion forces (Duranton & Puga, 2014). Surprisingly, this body of literature has also not paid much attention to decentralization as a potential source of the economic structure of cities.

In this article we link the predominantly theoretical literature on diversification in a system of cities with the predominantly empirical literature on increasing governance decentralization. Our main hypothesis is that in an era of falling transport costs, fiscal and political decentralization helps smaller cities in an urban system to expand and diversify their economic structure, offsetting potential negative effects of the economic integration on the size and growth of small and medium cities. An important economic rationale for decentralization is that it makes governments more responsive and efficient in the provision of public goods and services, thanks to their supposed information advantages and flexibility in adapting

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to citizens' diverse preferences (Breton, 1996; Martinez-Vázquez & McNab, 2003; Oates, 1972; Tiebout, 1956).

However, the decentralization of governance also impacts regional economies and local firm dynamics in more than the provision of public goods and services. 'There is indeed plenty of anecdotal evidence that different policies implemented by governments at local and regional levels are influencing local and regional performance' (Ezcurra & Rodríguez-Pose, 2013, p. 398). Hence, decentralization of governance potentially impacts diversification and specialization patterns in a system of cities.

One can think of several mechanisms for how governance decentralization impacts local industrial structures. First, subnational governments with enough fiscal and political authority attract qualified people, thus contributing to agglomeration economies in cities that host regional government seats (Bardhan, 2002). Second, since fiscal decentralization often involves fiscal competition, subnational governments have incentives to foster local business development in order to increase their tax base, which materializes in, for example, tax privileges, more flexible labour markets or other forms of assistance (Martinez-Vázquez & McNab, 2003). This could help less-developed regions compete with richer ones (Qian & Weingast, 1997), while a more optimal vertical allocation of competences for policies in a federally organized system of jurisdictions (Breton, 1996; Oates, 1999) may also increase the efficiency of the urban system (Henderson & Abdel-Rahman, 1991). Third, decentralization gives subnational governments the opportunity to actively pursue economic development policies which fit the strengths and weaknesses of their regions better than do central government policies (Lessmann, 2012). This idea relates to the laboratory role played by fiscal federalism. The perspective of laboratory federalism suggests that multilevel systems of jurisdictions can be seen as innovation systems in which public policies are the object of a continuous process of innovation and imitation, driven by decentralized experimentation and competition (Kerber & Eckardt, 2007). This not only involves learning about superior policies of others but also develops a high capability of innovativeness and adaptability with regard to policies and institutions (Kerber, 2005). These laboratory practices of policy innovation may enable productive behaviour through the devolution of knowledge to rights to act (Garzarelli, 2006). It is quite conceivable that such processes of policy innovation impact local industrial structures, for example, through corporate law reforms or by improving a local governments' ability/skill at exploiting the benefits of decreasing transport costs. In this paper we build upon this literature and argue that in a context of more economic integration, government decentralization plays a role in diversifying cities.

We test empirically whether the decentralization of governance is a potentially important determinant of the sectoral composition of cities in an urban system. We do so by using the example of Spain. Spain is a particularly interesting country to analyse in this context for several reasons. First, following a peaceful transition to democracy (1975–79), Spain became one of the most decentralized countries in the world in just over three decades, departing from a highly centralized institutional framework during its era of dictatorship (İrepoğlu Carreras, 2016; Lago-Peñas et al., 2017; Solé-Ollé, 2010).[1] Second, during the same period, Spain underwent deep and far-reaching social, urban and economic transformations under the influence of market reforms, European economic integration and falling transport costs (cf. Moreno, 2002). Indeed, infrastructure growth development between 1980 and 2007 has been especially spectacular (Zofío et al., 2014). Third, as we show, during the period 1995–2007 it was more the rule than the exception that cities fundamentally changed their economic structure; hence, the Spanish urban landscape changed substantially, with an increasing number of cities diversifying their production structure.

We develop a bivariate probit regression framework to assess the probability that cities develop a certain typology over time. In our analysis, we consider the possibility that cities, in addition to the polar cases of complete diversity and specialization, also may combine both typologies through co-agglomeration economies (cf. Ellison et al., 2010; Ellison & Glaeser, 1997; Helsley & Strange, 2014) or feature none of them. We exploit unique firm-level and time-varying transport-cost data for the period 1980–2007 to control for various key mechanisms and assumptions in the theoretical literature on city formation, including the role of a city's market potential, city size, transport costs, labour-force skill composition, product standardization and historical patterns of specialization. To measure decentralization, we use the regional authority index developed by Hooghe et al. (2016), allowing us to quantify the degree of government autonomy over time at a subnational level.

The remainder of the paper is structured as follows. In the next section we provide theoretical foundations for our hypothesis as to how governance decentralization may impact on the industrial structure of cities. In the data section we describe our databases and the calculation of key variables and present a descriptive analysis of (changes in) the urban system of Spain. In the econometric section we develop our bivariate probit econometric approach and present our main regression results. The last section concludes.

THEORETICAL BACKGROUND

Traditionally, theoretical models in the spirit of Henderson (1974) generally imply that efficiency in the size and number of specialized versus diverse cities can be achieved if some mechanisms enabling the creation and development of new cities are present (e.g., Abdel-Rahman, 1990, 1996; Henderson & Becker, 2000). The two usual mechanisms put forward in this literature are (1) autonomous local governments and (2) a market with land developers. For example, a theoretical model developed by Anas and Xiong (2005) analyses the internal urban structure of cities and questions of the efficiency of an urban system as in the Henderson (1974) tradition, but assumes that inter-city trade is costly. Starting from one diversified city that manufactures a product with a variety of services as inputs, they show that a specialized city will self-organize if land developers do not act just in time to set up diversified cities. In this setting, low inter-city trading costs will increase the size of the specialized city.

In contrast, Tabuchi and Thisse (2011) developed a new economic geography model of central places to show that increasing economic integration under the influence of falling trade costs favours the emergence of large and diversified cities, which can then coexist with small and specialized cities. Their model analyses the size and location of cities (the urban aspect) as well as the spatial distribution of each industry across cities (the industrial aspect) and is part of the relatively new tradition of quantitative economic geography models that can accommodate many asymmetric locations in an urban system that may differ by geography, productivity or amenities, and that are systematically linked through distance-dependent trade, commuting and migration flows (Redding & Rossi-Hansberg, 2017).

In the case of Spain, falling trade costs and increasing economic integration since the 1980s went together with the development of a more even city-size distribution and the emergence of a range of relatively small diversified cities, as will be shown in the next section (see also González-Val et al., 2014, 2015). This seems to oppose the argument of Tabuchi and Thisse (2011) that weak spatial frictions tend to concentrate economic activity in space and suggests instead that some mechanism, such as autonomous local governments or a market with land developers, determines the size and number of specialized versus diverse cities in urban system as it does in the Anas and Xiong (2005) model. However, Anas and Xiong themselves already observe that in an era of falling inter-city transport and communication costs, the idea that land developers will set up cities at efficient times may be largely anachronistic.

As noted in the previous section, we contend that in a context of falling transport costs, fiscal and political decentralization may have allowed cities in urban system to diversify their economic structure by virtue of hosting regional government headquarters. We argue that is the case of Spain. The creation of 17 autonomous local governments, rather than the actions of developers, may well have been the mechanism that established 'new' diversified cities through lumpy adjustments at the optimal time, confirming the theoretical predictions of Henderson and Becker (2000).

According to a different strand of the literature, factors such as urban infrastructure, institutional capacity and industrial composition may be more conducive to (urban) economic growth than city size and agglomeration economies (Burger & Meijers, 2016; Camagni et al., 2015; Frick & Rodríguez-Pose, 2018; Meijers et al., 2016). The arguments therein, amongst others, observe that in Europe second-tier cities often outperform first-tier cities in economic growth rates; this leads to a reappraisal of connectivity in urban networks as a potential substitute for agglomeration benefits. In our paper, we therefore hypothesize that it may be the fragmentation of central authority and the introduction of more intergovernmental competition that generate urban growth, and thereby cause second-tier cities to often outperform first-tier cities in economic growth rates while diversifying their economic structure.

DATA AND DESCRIPTIVE ANALYSIS

Data

Urban areas

We consider 69 functional urban areas as defined by the Organisation for Economic Co-operation and Development (OECD) (Brezzi et al., 2012, pp. 19–58). Together, these areas comprise, on average for the period 1995–2007, 46% of Spain's total population and 93% of its urban population. Data on urban-area population are obtained from the Spanish Statistical Institute (INE) census.

Diversification and specialization

We define the diversity and specialization of cities in terms of relative employment shares, following Duranton and Puga (2000). To measure the degree of specialization in city i at time t, we use the relative specialization index (RZI_{it}), defined as:

$$RZI_{it} = \max_{it}\left(\frac{s_{ikt}}{s_{kt}}\right) \quad (1)$$

where s_{ikt} is the share of employment x of sector k in city i in time t: $s_{ikt} = \left(x^k_{it}/\sum_k x_{it}\right)$; and s_{kt} is the share of each sector k at the national level: $s_{kt} = \left(x^k_t/\sum_k x_t\right)$. Accordingly, the degree of diversification of city i at time t is measured by using the relative diversification index (RDI_{it}), defined as:

$$RDI_{it} = \frac{1}{\sum_k |s_{ikt} - s_{kt}|} \quad (2)$$

As RZI_{it} and RDI_{it} are continuous variables, we follow Duranton and Puga (2001) and consider the median per year for each index to categorize cities by their specialization and diversity patterns, respectively. As a result, we create two discrete variables, S_{it} (specialization) and D_{it} (diversification), where S_{it} takes the value 1 for a city i with RZI values above the median in year t, and 0 otherwise; similarly, D_{it} defines diverse cities on the basis of RDI values above the median in year t. As noted, in our analyses we account for the fact that cities, apart from being specialized and diversified, can also be 'co-agglomerated' and 'non-typified'. A city is defined as co-agglomerated when both its RZI and RDI values are above their corresponding medians. Finally, a city is defined as non-specified if both RZI and RDI values are below their corresponding medians. Hence, our empirical strategy exploits the combination of the two discrete variables S_{it} and D_{it} to obtain four typologies of cities: diversified

(0,1), specialized (1,0), co-agglomerated (1,1) and non-typified (0,0).

To calculate S_{it} and D_{it}, we rely on the so-called Sistema de Análisis de Balances Ibéricos (SABI) database, a unique firm-level database for services and manufacturing sectors at the municipality level (NUTS-5). The data set is produced by Bureau van Dijk based on information registered in the Spanish Registry of Commerce (*Registro Mercantil*). SABI identifies the municipality in which each firm is located, the sector in which it operates and its number of workers. For our period of analysis (1995–2007) it includes economic and financial information for about 1.3 million firms. We use the Statistical Classification of Economic Activities in the European Community (NACE) classification to aggregate employment information for up to 38 different sectors, including agriculture, manufacturing, banking, services and public-sector activities.[2] This allows us to compute accordingly the RZI and RDI indicators for each of the 69 urban areas over a period of 13 years, obtaining a complete panel database of 897 observations.

Decentralization

The decentralization of governance in Spain encompasses fiscal, political and administrative decentralization. These refer, respectively, to the ability of subnational governments to raise revenues, obtain decision-making authority, and deliver public goods and services. The territorial administrative decentralization in Spain entails 17 autonomous communities (regional governments) and includes the establishment of a set of new regional capital cities, which host regional government headquarters that developed a complete list of competencies in regional and urban policies related to economic regulations, managerial tasks and fiscal issues, allowing these cities to attract firms and workers to meet the new requirements and necessities of the regional governments.

We use two variables to measure decentralization in our regression analysis. First, we include a dummy (Reg_Gov_i) to qualify cities as regional capitals, defined as cities that host institutional and regional government headquarters and which were politically set once the regional governments were created in their recognition by the Spanish Constitution (1978). In our sample this applies to 15 of our 69 urban areas.[3] Second, we use the frequently used regional authority index (RAI) developed by Hooghe et al. (2016). This cross-country composite index captures the degree of regional government authority over the period 1950–2010 for subnational governments with a population over 150,000 inhabitants. The RAI is an increasing index in which the value 0 indicates no regional authority among the following dimensions: institutional depth, policy scope, fiscal autonomy, borrowing autonomy, representation, law-making, executive control, fiscal control, borrowing control and constitutional reform. We use the RAI data at the NUTS-3 (provinces, *p*) level for Spain between 1995 and 2007, plus the year 1980, ranging from 1 to 25.5, and impute the same index value to all the cities in each province, assuming a similar regional decentralization across all cities of that province.[4]

Accessibility

The relative accessibility of urban areas plays a key role in determining the specialization patterns of an urban system. In our analysis we operationalize this with the relative market potential (RMP) of each urban area. We define the RMP for city i as:

$$RMP_{it} = \underbrace{\frac{Urban\ Population_{it}}{GTC_{iit}}}_{Internal\ RMP} + \underbrace{\sum_{j\neq 1}^{N} \frac{Urban\ Population_{jt}}{GTC_{ijt}}}_{External\ RMP} \quad (3)$$

where the urban population is defined as before; and GTC is the generalized transport costs measure created by Zofío et al. (2014) for Spain. Construction of the GTC made use of a digitalized road map and geographical information system (GIS) software (Arc/GIS) to calculate the least-cost itinerary between an origin i and a destination j. The GTC differentiates the economic costs related to both distance (€/km) and time (€/h), and accounts for their time-varying components (fuel prices, tolls, gross salaries, etc.). Zofío et al. (2014) combine all these economic components of the GTC into an annual time-varying bilateral GTC that distinguishes intra-city transport costs (GTC_{iit}) from inter-city transport costs (GTC_{ijt}). The digitalized road networks used for the GTCs are available every five years from 1980 to 2005, plus 2007. Given the annual availability of data in the SABI database for the period 1995–2007, we use the road networks from 1995 onwards and linearly interpolate for the remaining years.

Equation (3) also implies that our measure of RMP identifies each urban area's degree of both internal and external accessibility. The internal RMP accounts for a city *i*'s home-market effect, while the external RMP accounts for its accessibility to other cities. Using annual data for population size and GTC, we calculate annual time-varying indices for both internal and external RMP. This allows us to accurately decompose the change in a city's total RMP into changing within-city population or transport costs dynamics (internal RMP) and changes of the city's relative position within the system of cities (external RMP) – which we think is the most appropriate way to capture urban dynamics in a system of cities (e.g., Anas & Xiong, 2005; Tabuchi & Thisse, 2011).

Agglomeration economies

In our analysis we control for different dimensions of agglomeration economies, including education level, sectoral composition and the degree of product standardization. Education level – measured as the share of highly educated people in city i – is included to show that larger cities tend to attract more highly skilled workers (Glaeser et al., 2014), but also to account for possible key specialization drivers in diversified and co-agglomeration economies (Ellison et al., 2010). Data on education levels are obtained from the INE Census.

We measure for each city i its sector composition as the ratio of manufacturing workers to service workers ($Ratio\_MS_{it}$). Finally, we control for the fact that diversified and specialized cities also differ in their degree of product standardization. Duranton and Puga (2001) argue that firms move to specialized cities once their internal economies of scale afford them the efficiency gains to produce standard products. Clark and Stanley (1999) propose a measure of standardization based on plant-level scale economies and minimum efficient scales (MES). Accordingly, there exists a positive correlation between the MES and product standardization: that is, standardized products are the result of plant-scale economies whose costs decline as plant size increases. We take this industry-level definition (Cilasun & Günalp, 2012; Clark & Stanley, 1999) and apply it at the city level. We define MES (product standardization) as the average sales per firm (p) corresponding to the first P largest firms out of the total number of firms F located in city i such that they account for at least 50% of the city's total sales:

$$MES_{it} = \frac{\sum_{p=1}^{P} sales\_per\_firm_i^p}{P_i} \left| \left(\frac{\sum_{p=1}^{P} sales\_per\_firm_i^p}{\sum_{f=1}^{F} sales\_per\_firm_i^f} \right) \right. \geq 50\% \quad (4)$$

The data on sales and sectoral employment needed for $Ratio\_MS_{it}$ and MES_{it} originate from the SABI database.

Descriptive analysis

The urban system in Spain has changed considerably over the past decades. Data from the World Bank, the Spanish Census and SABI show that the urban dynamics encompass at least three dimensions. First, recent urban population growth in Spain has been relatively high. From 1995 to 2007, annual urban growth rates converged to around 1% in the United States and the European Union (EU), whereas in Spain the rate increased from < 0.5% per year in 1995 to > 2% per year after 2002. Second, Spain's accelerating urbanization went together with a trend towards a more even city-size distribution between 1980 and 2007,[5] implying a relatively strong growth of medium-sized cities during this period. Third, during the period 1995–2007, it was more the rule than the exception that Spanish cities fundamentally changed their economic structure, with an increasing number of them diversifying their production structure.

Table 1 summarizes these dynamics by presenting a transition matrix for our typology of cities. The main diagonal indicates that purely diversified cities are the most prominent and stable. This stability motivates us to control our econometric analysis for levels of specialization and diversification in 1995 to avoid the problem of omitted variable bias in the results. Second, and more importantly, Table 1 shows that only 28 of the 69 cities considered (i.e., 40%) maintain their original typology over time. More specifically, cities that were non-typified and specialized in 1995 tended to diversify their economic structure by becoming either diverse cities or co-agglomeration economies by 2007. Finally, co-agglomerated cities maintained their situation or lost their specialization in favour of diversified cities.

Figure 1 shows the urban diversity dynamics across space by presenting maps of the urban system. The left side shows that in 1995 diversified cities were either province capitals (Sevilla, Albacete, Alicante and Badajoz) or the richest cities in Spain (Madrid, Barcelona, Bizkaia and Valencia). Specialized cities were mainly located in the north-west and close to cities with a certain diversity. Co-agglomerated cities were either located farther from the centre (Lugo, Pontevedra and Ciudad Real) or consisted of very small cities surrounding larger diverse cities (Toledo and Guadalajara), whereas non-typified cities formed a dispersed pattern, often being located near diversified cities. The latter may be indicative of Alonso's concept of 'borrowed size' (Meijers et al., 2016) in which small and medium-sized cities, facilitated by connectivity in urban network, may internalize the agglomeration

Table 1. Transition matrix for each type of city, 1995–2007.

	City (2007)				
City (1995)	**Non-typified**	**Specialized**	**Diversified**	**Co-agglomerated**	**Total**
# Non-typified	1	1	8	3	13
Share (%)	7.69	7.69	61.54	23.08	18.84
# Specialized	3	1	9	9	22
Share (%)	13.64	4.55	40.91	40.91	31.84
# Diversified	0	0	21	1	22
Share (%)	0.00	0.00	95.45	4.55	31.84
# Co-agglomerated	2	0	5	5	12
Share (%)	16.67	0.00	41.67	41.67	17.39
# Total	6	2	43	18	69
Share (%)	8.70	2.90	62.32	26.09	100

Note: The type of city in 1995 and 2007 is defined using the 1995 threshold to define a city's typology.
Source: Authors' own elaboration from the Sistema de Análisis de Balances Ibéricos (SABI) database.

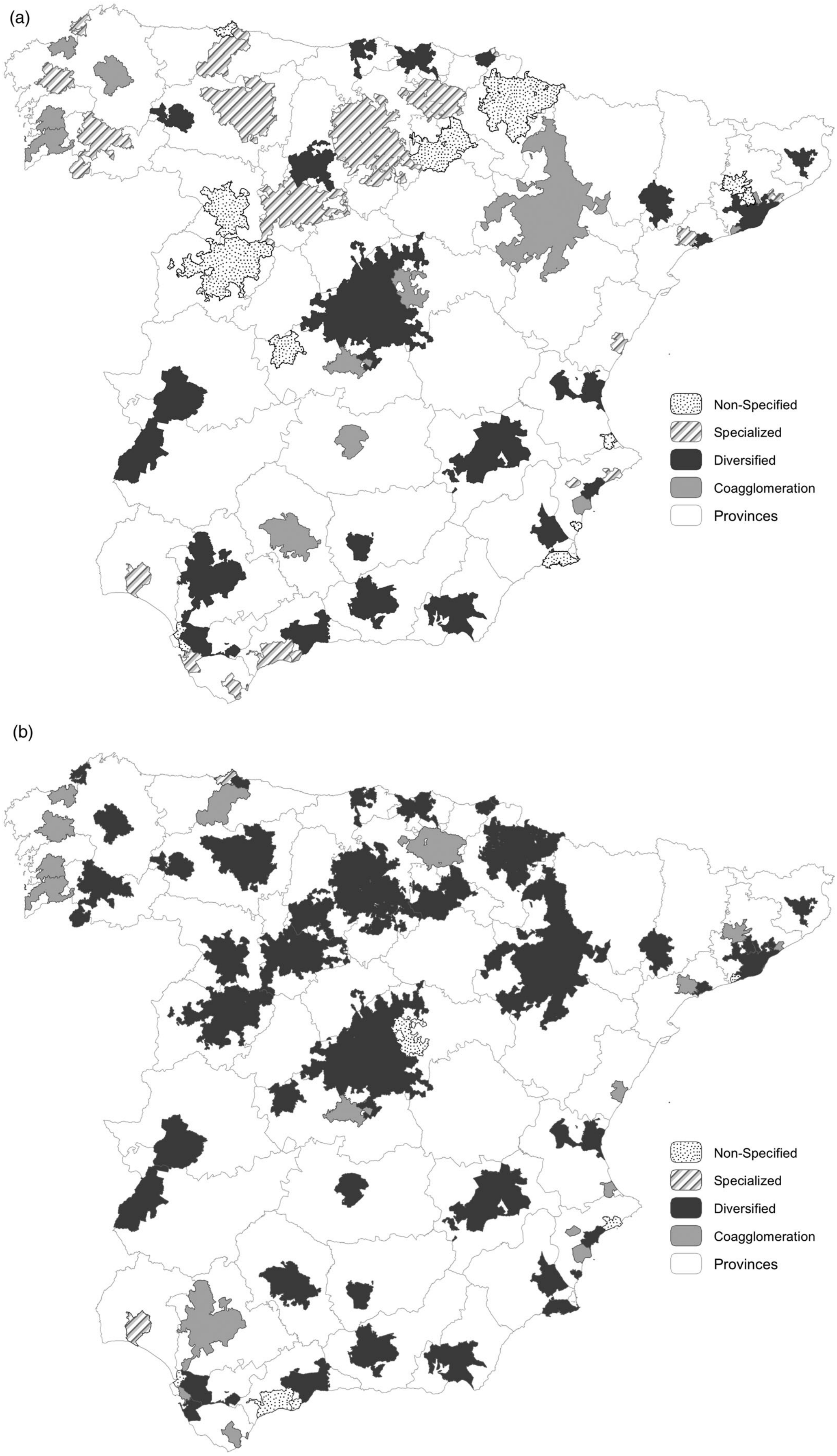

Figure 1. Four type of cities in Spain, (a) 1995 and (b) 2007.
Note: The type of city in 1995 and 2007 is defined using the cities' 1995 definition.
Source: Authors' own elaboration from the Sistema de Análisis de Balances Ibéricos (SABI) database.

economies of nearby larger cities while avoiding their agglomeration costs. The right side of Figure 1 shows that in 2007 many cities had diversified their economic structure. Cities in the north-west now became either diversified (Valladolid, Salamanca and León) or co-agglomerated cities (Oviedo, La Coruña, Pontevedra and Álava). At the same time, several large diverse cities (Seville) transformed into co-agglomerated ones. In contrast, various smaller cities near the biggest cities became either purely specialized (Guadalajara) or diversified (Pamplona, Cádiz and Manresa).

We conclude this section with a set of facts and growth dynamics. Table 2 distinguishes the four types of cities plus those with the presence or absence of regional government headquarters.[6] It shows that, on average for 1995–2007, non-typified cities are mainly small and medium-sized cities in terms of population and they show a preponderance of relatively small firms. Specialized cities face the highest transport costs (low accessibility) and have the smallest populations and shares of highly educated people. In contrast, diversified cities are the most populated, host the largest share of highly educated people and have the lowest transport costs (high accessibility). Co-agglomerated cities, for their part, tend to be medium-sized and big cities with a large share of highly educated people and relatively high transport costs. For the internal RMP, diversified cities and co-agglomeration economies have the largest internal market, whereas non-typified cities present the smallest one. The opposite holds for external RMP.

The RAI values are identical for specialized and diversified cities; these two opposing city types are thus randomly distributed over regions with different degrees of political decentralization. The ratio of manufacturing to service workers is higher in specialized and non-typified cities and lowest in diverse ones. Product standardization is higher in cities with some sort of specialized structure (specialized and co-agglomerated cities) or even in non-typified cities. Cities with regional government headquarters are relatively large and diversified, featuring a high internal and low external market potential, a relatively high share of educated people and, interestingly, also a relatively high ratio of manufacturing to service workers and high product standardization. Last, RAI values are identical for cities with and without regional government headquarters. Evidently, regional capitals can be found in regions with different degrees of political decentralization; this confirms that our two measures of decentralization do not coincide, but also that we can isolate the impact of the capital city on cities' diversification in comparison with all the cities in the same province and with the same level of decentralization.

The summary of growth dynamics in Table 3 shows that diversification increased most in co-agglomerated cities, followed by diversified cities. Specialization increased most in specialized cities and declined in non-typified cities. Population growth (affecting the RMP indicators) has been highest in non-typified cities for the period 1980–2007, followed by co-agglomerated and diversified cities in the period 1995–2007. Transport costs declined for all type of cities, but declined the most for diversified cities up to 1995 and for specialized cities after 1995. Cities with regional government headquarters featured relatively high population growth, leading to an increase in internal market potential. Their increase in diversification was remarkably lower than that of cities without regional government headquarters. By contrast, their decline in specialization and transport costs was not significantly different.

ECONOMETRIC ANALYSIS

Econometric specification

Our econometric approach relies on estimating the probability of a city i to become either specialized (S_i) or diversified (D_i). We do so by combining two independent probit models for city i, where 1 (specialization) and 2 (diversification) identify each equation (t subscripts have been removed):

$$S_{i1}^* = X_{i1}\beta_1 + \varepsilon_{i1}, \quad S_{i1} = 1 \text{ if } S_{i1}^* > 0, 0 \text{ otherwise} \tag{5a}$$

$$D_{i2}^* = X_{i2}\beta_2 + \varepsilon_{i2}, \quad D_{i2} = 1 \text{ if } D_{i2}^* > 0, 0 \text{ otherwise} \tag{5b}$$

where:

$$\begin{pmatrix} \varepsilon_{i1} \\ \varepsilon_{i2} \end{pmatrix} \Bigg| X_1, X_2 \Bigg) \sim N\left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & \rho \\ \rho & 1 \end{pmatrix}\right]$$

where S_{i1}^* and D_{i2}^* indicate each type of city. The key point in this setting is ρ, the *tetrachoric correlation* between ε_{i1} and ε_{i2}. If $\rho = 0$, both expressions (5a) and (5b) are independent and we could estimate the probability for a city to be diversified or specialized by means of two independent probit models. In contrast, if $\rho \neq 0$, and ε_{i1} and ε_{i2} are correlated, we must estimate expressions (5a) and (5b) simultaneously as a bivariate probit model (Greene, 2012). In a more general setting, the log-likelihood function takes the form:

$$\log L = \sum_{i=1}^{2} \log\Phi_2 \begin{bmatrix} (2S_{i1} - 1) \\ (2D_{i2} - 1) \\ (2S_{i1} - 1)(2D_{i2} - 1)\rho \end{bmatrix} = \sum_{i=1}^{2} \log\Phi_2[q_{i1}\beta_1 X_{i1}, q_{i2}\beta_2 X_{i2}, q_{i1}q_{i2}\rho] \tag{6}$$

where $\log L$ refers to the log-likelihood function, $q_{i1} = (2S_{i1} - 1) = -1$ if $S_{i1}^* = 0$ and $q_{i1} = 1$ if $S_{i1}^* = 1$; and $q_{i2} = (2D_{i2} - 1) = -1$ if $D_{i2}^* = 0$ and $q_{i2} = 1$ if $D_{i2}^* = 1$. Now let $\omega_{i1} = \rho_{i1} X_{i1}\beta_1$ and $\omega_{i2} = \rho_{i2} X_{i2}\beta_2$. Thus, the probabilities entering equation (6) are:

$$\text{Prob}(S_{i1}^* = S_{i1}, D_{i2}^* = D_{i2} | X_1, X_2) = \Phi_2(\omega_{i1}, \omega_{i2}, q_{i1}q_{i2}\rho) \tag{7}$$

The probabilities change as long as $\rho \neq 0$. To the extent that expressions (5a) and (5b) are dependent,

Table 2. Descriptive statistics, averages for 1995–2007.

Type of city	Statistics	RDI	RZI	Population (thousands)	Average GTC (€)	Internal RMP (logs)	External RMP (logs)	RAI	High education (% population)	Ratio M/S	MES (logs)
Non-typified	Mean	1.65	9.48	144.14	661.16	7.48	11.00	22.97	8.41	0.60	14.93
	Median	1.63	5.60	115.01	626.88	7.51	11.01	23.5	8.05	0.47	14.78
	SD	0.35	14.19	75.45	156.46	0.56	0.18	0.91	3.39	0.43	0.61
Specialized	Mean	1.66	21.38	181.26	739.75	7.76	10.88	22.27	8.22	0.53	14.83
	Median	1.61	9.78	168.22	774.98	7.78	10.88	22.5	8.06	0.42	14.77
	SD	0.36	31.52	91.39	162.48	0.71	0.24	1.80	2.95	0.44	0.49
Diversified	Mean	2.33	3.76	774.69	645.6	8.43	10.89	22.27	10.02	0.29	14.88
	Median	2.18	3.25	255.46	638.89	8.17	10.88	22.5	9.63	0.27	14.77
	SD	0.72	2.22	1285.34	146.43	1.21	0.19	1.80	2.66	0.13	0.49
Co-agglomerated	Mean	1.94	17.83	245.622	681.72	7.98	10.97	22.80	9.60	0.45	14.93
	Median	1.89	7.65	177.95	673.80	7.81	10.98	22.5	9.26	0.41	14.81
	SD	0.44	25.06	191.75	218.65	0.86	0.34	0.72	3.04	0.24	0.52
Regional capitals	Mean	2.39	8.23	1009.06	612.04	8.71	10.88	22.56	11.19	0.53	15.20
	Median	2.27	4.64	311.00	586.00	8.39	10.89	22.5	10.80	0.43	15.17
	SD	0.78	9.73	1486.77	161.04	1.21	0.25	1.72	2.81	0.33	0.49
No regional capitals	Mean	1.79	14.20	198.452	705.05	7.75	10.93	22.48	8.48	0.43	14.79
	Median	1.72	5.59	150.163	728.93	7.63	10.95	22.5	8.29	0.32	14.69
	SD	0.45	25.11	163.829	169.53	0.77	0.24	1.50	2.87	0.36	0.49
Total	Mean	1.92	12.90	374.67	684.83	7.96	10.92	22.5	9.07	0.45	14.88
	Median	1.89	5.38	176.84	670.32	7.78	10.94	22.5	8.83	0.35	14.78
	SD	0.59	22.80	782.00	172.16	0.97	0.24	1.55	3.07	0.35	0.52

Source: Authors' own elaboration from the Sistema de Análisis de Balances Ibéricos (SABI), GTC and Urban Areas databases.

Table 3. Population, GTC and RAI patterns by type of city: growth rates for the periods 1980–95 and 1995–2007.

Type of city	RZI 1995–2007	RDI 1995–2007	Population 1980–95	Population 1995–2007	GTC 1980–95	GTC 1995–2007	RAI 1980–95	RAI 1995–2007
Non-typified	−34.4%	−3.3%	27.3%	34.6%	−12.2%	−7.4%	32.0%	8.5%
Specialized	76.6%	−20.9%	4.8%	3.7%	−13.5%	−10.2%	24.3%	8.3%
Diversified	−55.4%	25.1%	9.0%	13.7%	−14.1%	−8.4%	26.5%	8.3%
Co-agglomerated	20.6%	29.4%	9.9%	15.4%	−12.4%	−9.8%	20.6%	8.9%
Regional capitals	−30.2%	20.7%	12.0%	16.3%	−13.6%	−8.9%	30.9%	8.0%
No regional capitals	−29.0%	28.8%	6.5%	13.2%	−13.1%	−8.2%	24.3%	8.5%

Note: Growth rates are calculated using the 2007 threshold to define a city's typology.
Source: Authors' own elaboration.

equation (7) estimates the joint probabilities for a city to diversify and specialize both at the same time. These joint probabilities exactly correspond to the four city typologies we distinguish in the data section as follows: diversified: P(0,1), specialized: P(1,0), co-agglomerated: P(1,1) and non-typified: P(0,0).

To estimate these probabilities, we take logarithms in (5a) and (5b) and include time-fixed effects (γ_t)[7] to obtain the following probit expressions (now with t subscripts):

$$S^*_{i1t} = \alpha_1 + \ln X_{i1t}\beta_1 + \gamma_{1t} + \varepsilon_{i1t} \qquad (8a)$$

$$D^*_{i2t} = \alpha_2 + \ln X_{i2t}\beta_2 + \gamma_{2t} + \varepsilon_{i2t} \qquad (8b)$$

Vectors X_{i1} and X_{i2} are two vectors of regressors that include the range of variables presented in the data section such as:

$$X_{i1t} = (\ln RMP\_Internal_{it},\ \ln RMP\_External_{it},\ RegGov_{it},\ \ln RAI^P_{it},\ \ln Sh\_HighEduc_{it}, \ln \text{Ratio\_MS}_{it},\ \ln MES_{it},\ \ln \text{RZI}_{1995}) \qquad (9a)$$

$$X_{i2t} = (\ln RMP\_Internal_{it}, \ln RMP\_External_{it}, Reg\_Gov_{it}, \ln RAI^P_{it},\ \ln Sh\_HighEduc_{it}, \ln \text{Ratio\_MS}_{it}, \ln MES_{it},\ \ln \text{RDI}_{1995}) \qquad (9b)$$

where P is the NUTS-3 (province) where city i is located. We hypothesize that our governance-decentralization variables (Reg_Gov_i and RAI^P_{it}) positively impact the probability that cities diversify and negatively impact the probability that cities specialize. Falling inter-city trading cost and relatively low levels of external RMP may advance the emergence of either diversified cities (cf. Tabuchi & Thisse, 2011) or specialized cities, as high transport costs cause economic activity – and thus population – to concentrate (inefficiently) in diversified cities (cf. Anas & Xiong, 2005). We expect higher levels of internal RMP – that is, relatively large cities that have good internal accessibility – to favour diversification. The remaining covariates control for agglomeration economies. We argue that the greater the share of highly educated people, the higher the probability that a city diversifies (Glaeser et al., 2014; Viladecans-Marsal, 2004). By contrast, we assume that the ratio of manufacturing to service workers and product standardization increases the probability that a city is specialized (Duranton & Puga, 2000; Henderson, 1974).

RESULTS

This section summarizes the main regression results. Table 4 shows the estimated coefficients for the two probit models in (8a) and (8b). The left and right sides indicate, respectively, the probability that a city is specialized or diversified. Models (1) and (3) include the decentralization variables, *Reg_Gov* and RAI; models (2) and (4) interact the *Reg_Gov* with the RMP and RAI variables to assess and isolate the impact of a city being a regional capital on its market power and degree of decentralization, respectively. All regression models yield ρ values that are statistically significant, implying that the two probit models are indeed interdependent and should be jointly estimated in a bivariate regression framework. The negatives values for ρ indicate a negative correlation between both types of probabilities pointing out that diversification and specialization in cities can operate in opposite directions. In addition, the regression results for all models show that, as expected, the probability that cities are specialized increases as the share of highly educated people decreases, the ratio of manufacturing to service workers increases and the degree of product standardization increases. The opposite is true for the probability that cities are diversified. Furthermore, our results highlight that the probability that cities are specialized (diversified) is influenced by previous (1995) levels of specialization (diversification). As for the role of decentralization, we find that both a city's being a regional government capital (*Reg_Gov*) and a city's degree of decentralization (RAI) positively (negatively) affect the probability that it will diversify (specialize). Also, in models (2) and (4) we find no statistically significant effect for the interaction term between the regional government capital dummy and the degree of decentralization (RAI); this is reassuring, as it confirms that a city's status as regional government capital does not relate to its region's degree of decentralization (cf. Table 2).

Furthermore, the regression results show that the coefficients for the internal RMP – the home-market effect – are negative (positive) for the probability that cities

Table 4. Probit estimations: baseline models, 1995–2007.

	$Pr(S_i = 1 \mid X)$		$Pr(D_i = 1 \mid X)$	
	(1)	**(2)**	**(3)**	**(4)**
$\ln(MP\_Internal_{it})$	−0.088	0.145*	0.207**	0.124
	(0.059)	(0.080)	(0.082)	(0.088)
$\ln(MP\_External_{it})$	−0.628***	−0.786***	−0.710***	−0.597**
	(0.215)	(0.250)	(0.223)	(0.236)
Reg_Gov_{it}	−0.055	–	0.352**	–
	(0.135)		(0.137)	
$\ln(RAI^{P}_{it})$	−3.351***	−2.618***	1.778***	1.263*
	(0.719)	(0.781)	(0.623)	(0.702)
Reg_Gov_{it}*$\ln(MP\_int_{it})$	–	−0.741***	–	0.392*
		(0.177)		(0.204)
Reg_Gov_{it}*$\ln(MP\_ext_{it})$	–	0.616**	–	−0.566**
		(0.304)		(0.28)
Reg_Gov_{it}*$\ln(RAI^{P}_{it})$	–	−0.207	–	1.067
		(1.055)		(1.038)
$\ln(sh\_HighEduc_{it})$	−1.410***	−1.627***	1.991***	2.031***
	(0.227)	(0.248)	(0.242)	(0.245)
$\ln(ratio\_MS_{it})$	0.354***	0.365***	−0.070	−0.064
	(0.073)	(0.074)	(0.065)	(0.064)
$\ln(MES_{it})$	0.312**	0.305**	−0.609***	−0.611***
	(0.125)	(0.127)	(0.128)	(0.128)
$\ln(RZI1995_{i})$	0.902***	0.819***	–	–
	(0.099)	(0.099)		
$\ln(RDI1995_{i})$	–	–	1.375***	1.337***
			(0.227)	(0.227)
ρ	−0.357\ast \ast \ast	−0.334***	−0.357***	−0.334***
	(0.068)	(0.069)	(0.068)	(0.069)
N	897	897	897	897
Year FE	Yes	Yes	Yes	Yes
Spatial FE	No	No	No	No

Note: Robust standard errors. Standard errors are shown in parentheses. Significance level: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. i refers to city i; P refers to province. Columns (1) and (2) indicate the probability of specialization, whereas columns (3) and (4) do the same for the probability of diversification.

become specialized (diversified), whereas the coefficients for external RMP – the inter-city accessibility effect – are negative and statistically significant in all four models. However, when we interact the RMP variables we find that a city being a regional government capital qualifies the effect of the RMPs. Moreover, the coefficient of the interaction term between the regional capital dummy and internal RMP is statistically significant and negative (positive) for cities that are specialized (diversified). The opposite holds for the coefficient of the interaction term between the regional government capital dummy and external RMP. Together, these results imply that a higher internal (external) RMP unconditionally increases (decreases) the probability that a city is diversified (specialized), but also if a city is a regional capital, its higher internal RMP decreases the probability that the city becomes specialized. That is, a city's being a regional capital strongly counters the negative impact of a high external RMP on the probability of its specialization.

Table 5 presents for each type of city the implied joint marginal effects from the bivariate estimation. The average marginal effects have the same interpretation as in an independent probit model, but taking into account the joint determination of our two endogenous variables (S^{*}_{i1} and D^{*}_{i2}). The results on the left are based on models (1) and (3) from Table 4, while those on the right are based on models (2) and (4). The results clearly reinforce our finding that a regional government capital or a city located in a relatively decentralized region has an increased (decreased) probability of diversifying (specializing). They also give further support on the interaction between decentralization and the RMPs. A city being a regional government capital increases the positive effect of a high (low) internal RMP – the home-market effect – on the probability of diversification (specialization). Only for a regional capital does a high (low) external RMP – the inter-city accessibility effect – increase (decrease) the probability of specialization (diversification).

Table 5. Average marginal effects: baseline models, 1995–2007.

	Baseline model 1				Baseline model 2			
	Non-typified ***P*(0,0)**	**Specialized** ***P*(1,0)**	**Diversified** ***P*(0,1)**	**Co-agglomerated** ***P*(1,1)**	**Non-typified** ***P*(0,0)**	**Specialized** ***P*(1,0)**	**Diversified** ***P*(0,1)**	**Co-agglomerated** ***P*(1,1)**
$\ln(MP\_Internal_{it})$	−0.021	−0.061***	0.056***	0.026	−0.052**	0.002	−0.006	0.055**
	(0.018)	(0.022)	(0.021)	(0.019)	(0.021)	(0.026)	(0.026)	(0.022)
$\ln(MP\_External_{it})$	0.255***	0.028	−0.005	−0.278***	0.266***	−0.028	0.047	−0.285***
	(0.056)	(0.068)	(0.065)	(0.060)	(0.064)	(0.073)	(0.073)	(0.067)
Reg_Gov_{it}	−0.054**	−0.085**	0.076*	0.063*	–	–	–	–
	(0.027)	(0.042)	(0.045)	(0.035)				
$\ln(RAI^{P}_{it})$	0.324**	−1.033***	1.009***	−0.299*	0.264	−0.767***	0.780***	−0.276
	(0.153)	(0.223)	(0.216)	(0.161)	(0.176)	(0.235)	(0.237)	(0.187)
$Reg\_Gov*\ln(MP\_int_{it})$	–	–	–	–	0.068	−0.224***	0.228***	−0.071
					(0.051)	(0.055)	(0.059)	(0.051)
$Reg\_Gov*\ln(MP\_ext_{it})$	–	–	–	–	−0.011	0.236***	−0.235**	0.009
					(0.071)	(0.091)	(0.092)	(0.076)
$Reg\_Gov*\ln(RAI^{P}_{it})$	–	–	–	–	−0.164	−0.261	0.247	0.179
					(0.238)	(0.338)	(0.335)	(0.256)
$\ln(sh\_HighEduc_{it})$	−0.095	−0.699***	0.656***	0.138**	−0.075	−0.735***	0.723***	0.087
	(0.062)	(0.075)	(0.069)	(0.065)	(0.066)	(0.077)	(0.076)	(0.069)
$\ln(ratio\_MS_{it})$	−0.056***	0.084***	−0.085***	0.057***	−0.058***	0.084***	−0.087***	0.062***
	(0.018)	(0.021)	(0.020)	(0.019)	(0.018)	(0.020)	(0.021)	(0.020)
$\ln(MES_{it})$	0.053*	0.190***	−0.177***	−0.066**	0.058*	0.186***	−0.180***	−0.064*
	(0.030)	(0.041)	(0.039)	(0.032)	(0.031)	(0.041)	(0.040)	(0.033)
$\ln(RZI1995_{i})$	−0.176***	0.176***	−0.182***	0.182***	−0.158***	0.158***	−0.168***	0.168***
	(0.020)	(0.020)	(0.022)	(0.022)	(0.020)	(0.020)	(0.022)	(0.022)
$\ln(RDI1995_{i})$	−0.256***	−0.292***	0.256***	0.292***	−0.256***	−0.277***	0.256***	0.277***
	(0.043)	(0.051)	(0.043)	(0.051)	(0.044)	(0.051)	(0.044)	(0.051)
N	897	897	897	897	897	897	897	897
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Spatial FE	No	No	No	No	No	No	No	No

Note: Robust standard errors. Standard errors are shown in parentheses. Significance level: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. *i* refers to city *i*; *P* refers to province.

The various marginal effects for non-typified and co-agglomerated cities lead to a mixed result between these two opposite types of cities. A city's probability of becoming a non-typified city (i.e., of developing no clear typology) decreases if it is a regional government capital, but increases if it is located in a relatively decentralized region. The opposite holds for a city's probability of becoming co-agglomerated. Finally, the marginal effects for the different agglomeration economy variables as well as the former levels of diversification and specialization have the expected (significant) effects, thus confirming the previous findings.

ROBUSTNESS CHECKS

The results may suffer from endogeneity between our key variables (RMPs and RAI) on cities' diversification. We follow different strategies to deal with this potential problem. First, Table 6 takes lagged data on our RMP and RAI variables from 1980. The digitalized road network and the GTCs are available for 1980, therefore we can calculate the corresponding RMP indicators for this year. The same applies to the RAI which is provided for Spanish provinces in 1980. The use of lagged variables in 1980 as instrumental variables makes sense in the case of the Spanish decentralization process. As explained by Cámara Villar (2018), after the recognition of the so-called 'Autonomous State' (*Estado de las Autonomías*) in the Spanish Constitution in 1978, there was a transition period between 1979 and 1983 in which regions declared their autonomous features and the basic financing and transfer laws from the central government to subnational entities were set. As a result, the decentralization properly started around 1983. Given that our controls are built before the end of this transition period, we can properly address the subsequent endogeneity problems.

Table 6. Probit estimations: baseline models with variables from 1980.

	$Pr(S_i = 1 \mid X)$		$Pr(D_i = 1 \mid X)$	
	(1)	(2)	(3)	(4)
$\ln(MP\_Internal80_i)$	−0.017	0.203***	0.010	−0.075
	(0.053)	(0.071)	(0.064)	(0.070)
$\ln(MP\_External80_i)$	−0.323*	−0.457**	−0.573***	−0.492***
	(0.183)	(0.211)	(0.190)	(0.191)
Reg_Gov_{it}	−0.214	–	0.593***	–
	(0.140)		(0.136)	
$\ln(RAI80_i^P)$	0.002	0.863	1.247***	0.619
	(0.485)	(0.555)	(0.451)	(0.498)
$Reg\_Gov_{it}*\ln(MP\_int80_i)$	–	−0.917***	–	0.475**
		(0.213)		(0.193)
$Reg\_Gov_{it}*\ln(MP\_ext80_i)$	–	0.677***	–	−0.713***
		(0.194)		(0.253)
$Reg\_Gov_{it}*\ln(RAI80_i^P)$	–	−0.478	–	2.206*
		(0.994)		(1.319)
$\ln(sh\_HighEduc_{it})$	−1.278***	−1.597***	1.937***	2.065***
	(0.221)	(0.250)	(0.238)	(0.246)
$\ln(ratio\_MS_{it})$	0.370***	0.316***	−0.114	−0.058
	(0.074)	(0.076)	(0.070)	(0.069)
$\ln(MES_{it})$	0.397***	0.426***	−0.544***	−0.520***
	(0.130)	(0.135)	(0.123)	(0.123)
$\ln(RZI1995_i)$	0.876***	0.760***	–	–
	(0.099)	(0.095)		
$\ln(RDI1995_i)$	–	–	1.476***	1.434***
			(0.221)	(0.225)
ρ	−0.351\ast \ast \ast	−0.314***	−0.351***	−0.314***
	(0.067)	(0.069)	(0.067)	(0.069)
N	897	897	897	897
Year FE	Yes	Yes	Yes	Yes
Spatial FE	No	No	No	No

Note: Robust standard errors. Standard errors are shown in parentheses. Significance level: $***p < 0.01$, $**p < 0.05$, $*p < 0.1$. i refers to city i; P refers to province; 80 indicates variables in 1980. Columns (1) and (2) indicate the probability for a city to become specialized, whereas columns (3) and (4) do the same for the probability of diversification.

Table 7. Average marginal effects: baseline models with variables from 1980.

	Baseline model 1				Baseline model 2			
	Non-typified $P(0,0)$	**Specialized $P(1,0)$**	**Diversified $P(0,1)$**	**Co-agglomerated $P(1,1)$**	**Non-typified $P(0,0)$**	**Specialized $P(1,0)$**	**Diversified $P(0,1)$**	**Co-agglomerated $P(1,1)$**
ln($MP\_Internal80_i$)	0.001	−0.005	0.005	−0.001	−0.024	0.054***	−0.057***	0.027
	(0.015)	(0.018)	(0.017)	(0.016)	(0.018)	(0.021)	(0.021)	(0.019)
ln($MP\_External80_i$)	0.171***	0.057	−0.042	−0.186***	0.183***	0.014	−0.000	−0.196***
	(0.050)	(0.055)	(0.053)	(0.054)	(0.054)	(0.057)	(0.060)	(0.058)
Reg_Gov_{it}	−0.071***	−0.159***	0.157***	0.074**	–	–	–	–
	(0.027)	(0.039)	(0.048)	(0.036)				
ln($RAI80_i^P$)	−0.234*	−0.264*	0.233*	0.264**	−0.285**	0.038	−0.059	0.306**
	(0.123)	(0.143)	(0.132)	(0.131)	(0.143)	(0.148)	(0.151)	(0.156)
Reg_Gov_{it}*ln(MP_int80_i)	–	–	–	–	0.084	−0.273***	0.282***	−0.093
					(0.056)	(0.056)	(0.062)	(0.058)
Reg_Gov_{it}*ln(MP_ext80_i)	–	–	–	–	0.008	0.276***	−0.278***	−0.006
					(0.056)	(0.069)	(0.071)	(0.058)
Reg_Gov_{it}*ln($RAI80_i^P$)	–	–	–	–	−0.335	−0.544	0.526	0.354
					(0.285)	(0.367)	(0.361)	(0.298)
ln($sh\_HighEduc_{it}$)	−0.110*	−0.662***	0.619***	0.154**	−0.094	−0.730***	0.731***	0.093
	(0.062)	(0.072)	(0.066)	(0.065)	(0.068)	(0.076)	(0.075)	(0.070)
ln($ratio\_MS_{it}$)	−0.052***	0.097***	−0.095***	0.050**	−0.049**	0.072***	−0.077***	0.053***
	(0.019)	(0.022)	(0.021)	(0.020)	(0.019)	(0.021)	(0.021)	(0.021)
ln(MES_{it})	0.024	0.193***	−0.181***	−0.036	0.019	0.188***	−0.189***	−0.018
	(0.031)	(0.041)	(0.038)	(0.033)	(0.032)	(0.040)	(0.040)	(0.034)
ln($RZI1995_i$)	−0.173***	0.173***	−0.176***	0.176***	−0.145***	0.145***	−0.158***	0.158***
	(0.020)	(0.020)	(0.021)	(0.021)	(0.019)	(0.019)	(0.021)	(0.021)
ln($RDI1995_i$)	−0.276***	−0.313***	0.276***	0.313***	−0.277***	−0.294***	0.277***	0.294***
	(0.042)	(0.050)	(0.042)	(0.050)	(0.044)	(0.050)	(0.044)	(0.050)
N	897	897	897	897	897	897	897	897
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Spatial FE	No	No	No	No	No	No	No	No

Note: Robust standard errors. Standard errors are shown in parentheses. Significance level: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. i refers to city i; P refers to province; 80 indicates variables in 1980.

The results in Table 6 are similar to those presented in Table 4, and even reinforce them once we control for RMP and RAI variables in 1980. These results also justify the use of bivariate estimations whose marginal effects are shown in Table 7. It shows that most of our results are robust to this control for potential endogeneity problems, except for the marginal effects of an independent internal RMP on the left panel that becomes statistically insignificant. On the other hand, the marginal effects of the interaction term between the lagged internal RMP and the regional capital dummy remain statistically significant and are stronger than before. The latter also holds for the complementary interaction with the lagged external RMP. Also, note that in Table 7 the marginal effects for the impact of the degree of decentralization (RAI80) are weaker than they would be for current values (Table 5). This is evident, as decentralization in Spain started between 1979 and 1983 and the degree of decentralization increased (substantially) over time.

Our second strategy takes three-year lags in all explanatory variables and assesses their impact on the dependent (contemporaneous) variables. The results are shown in Table 8 (probit estimations) and Table 9 (marginal effects). As seen, these results resemble those in Tables 4 and 5 for both sign and statistical significance levels, except for the *Reg_Gov* variable which loses statistical significance for diversified cities on the right side of Table 9, although the sign remains the same.

Finally, we perform a series of analyses that aims to (1) include spatial fixed effects; (2) substitute the RMP variables by their population and GTC components; (3) consider alternative categorization of cities; (4) attend to different measures of decentralization; and (5) controls by regional institutional quality. Because of space limitations, the results of all these robustness checks are presented and explained in detail in Appendices A and B in the supplemental data online. Taken together, these additional results by and large support the main

Table 8. Probit estimations: baseline models (with a three-year lag), 1995–2007.

	$\Pr(S_i = 1 \mid X)$		$\Pr(D_i = 1 \mid X)$	
	(1)	(2)	(3)	(4)
$\ln(MP\_Internal_{it-3})$	−0.051	0.248**	0.268**	0.132
	(0.069)	(0.098)	(0.105)	(0.113)
$\ln(MP\_External_{it-3})$	−0.864***	−1.081***	−0.752***	−0.644**
	(0.249)	(0.293)	(0.256)	(0.269)
Reg_Gov_{it-3}	0.023 (0.154)	–	0.293*	–
			(0.161)	
$\ln(RAI^P_{it-3})$	−3.224***	−2.341***	2.156***	1.535*
	(0.832)	(0.896)	(0.747)	(0.803)
$Reg\_Gov_{it-3}*\ln(MP\_int_{it-3})$	–	−0.848***	–	0.695***
		(0.19)		(0.23)
$Reg\_Gov_{it-3}*\ln(MP\_ext_{it-3})$	–	0.708**	–	−0.768**
		(0.346)		(0.339)
$Reg\_Gov_{it-3}*\ln(RAI^P_{it-3})$	–	−0.234	–	0.978
		(1.194)		(1.168)
$\ln(sh\_HighEduc_{it-3})$	−1.634***	−1.925***	2.539***	2.647***
	(0.254)	(0.281)	(0.275)	(0.276)
$\ln(ratio\_MS_{it-3})$	0.397***	0.429***	−0.050	−0.038
	(0.078)	(0.081)	(0.072)	(0.070)
$\ln(MES_{it-3})$	0.117	0.088	−0.673***	−0.695***
	(0.123)	(0.127)	(0.149)	(0.148)
$\ln(RZI1995_i)$	0.817***	0.720***	–	–
	(0.097)	(0.095)		
$\ln(RDI1995_i)$	–	–	0.859***	0.817***
			(0.257)	(0.261)
ρ	−0.399\ast \ast \ast	−0.364***	−0.399***	−0.364***
	(0.079)	(0.081)	(0.079)	(0.081)
N	690	690	690	690
Year FE	Yes	Yes	Yes	Yes
Spatial FE	No	No	No	No

Note: Robust standard errors. Standard errors are shown in parentheses. Significance level: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. *i* refers to city *i*; *P* refers to province. Columns (1) and (2) indicate the probability of specialization, whereas columns (3) and (4) do the same for the probability of diversification.

Table 9. Average marginal effects: baseline models (with a three-year lag), 1995–2007.

	Baseline model 1				Baseline model 2			
	Non-typified ***P*(0,0)**	**Specialized** ***P*(1,0)**	**Diversified** ***P*(0,1)**	**Co-agglomerated** ***P*(1,1)**	**Non-typified** ***P*(0,0)**	**Specialized** ***P*(1,0)**	**Diversified** ***P*(0,1)**	**Co-agglomerated** ***P*(1,1)**
$\ln(MP\_Internal_{it-3})$	−0.040*	−0.066**	0.061**	0.046**	−0.073***	0.021	−0.026	0.078***
	(0.021)	(0.029)	(0.027)	(0.023)	(0.026)	(0.033)	(0.033)	(0.027)
$\ln(MP\_External_{it-3})$	0.315***	−0.015	0.029	−0.329***	0.332***	−0.075	0.099	−0.356***
	(0.065)	(0.081)	(0.076)	(0.067)	(0.074)	(0.086)	(0.087)	(0.077)
Reg_Gov_{it-3}	−0.058*	−0.059	0.048	0.068*	–	–	–	–
	(0.031)	(0.052)	(0.052)	(0.039)				
$\ln(RAI^{P}_{it-3})$	0.238	−1.098***	1.045***	−0.185	0.156	−0.768***	0.777***	−0.165
	(0.176)	(0.268)	(0.257)	(0.179)	(0.197)	(0.271)	(0.275)	(0.211)
$Reg\_Gov_{it-3}*\ln(MP\_int_{it-3})$	–	–	–	–	0.030	−0.307***	0.308***	−0.031
					(0.057)	(0.060)	(0.065)	(0.058)
$Reg\_Gov_{it-3}*\ln(MP\_ext_{it-3})$	–	–	–	–	0.011	0.295***	−0.293***	−0.013
					(0.082)	(0.107)	(0.109)	(0.087)
$Reg\_Gov_{it-3}*\ln(RAI^{P}_{it-3})$	–	–	–	–	−0.143	−0.247	0.236	0.154
					(0.261)	(0.386)	(0.385)	(0.281)
$\ln(sh\_HighEduc_{it-3})$	−0.153**	−0.860***	0.802***	0.210***	−0.138*	−0.918***	0.905***	0.150**
	(0.071)	(0.087)	(0.081)	(0.070)	(0.075)	(0.089)	(0.088)	(0.076)
$\ln(ratio\_MS_{it-3})$	−0.070***	0.090***	−0.088***	0.068***	−0.075***	0.090***	−0.096***	0.081***
	(0.019)	(0.024)	(0.022)	(0.020)	(0.020)	(0.023)	(0.023)	(0.022)
$\ln(MES_{it-3})$	0.104***	0.165***	−0.150***	−0.118***	0.117***	0.160***	−0.152***	−0.125***
	(0.032)	(0.046)	(0.043)	(0.034)	(0.033)	(0.044)	(0.044)	(0.036)
$\ln(RZI1995_i)$	−0.164***	0.164***	−0.162***	0.162***	−0.139***	0.139***	−0.148***	0.148***
	(0.020)	(0.020)	(0.021)	(0.021)	(0.019)	(0.019)	(0.022)	(0.022)
$\ln(RDI1995_i)$	−0.162***	−0.180***	0.162***	0.180***	−0.157***	−0.169***	0.157***	0.169***
	(0.048)	(0.056)	(0.048)	(0.056)	(0.050)	(0.056)	(0.050)	(0.056)
N	690	690	690	690	690	690	690	690
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Spatial FE	No	No	No	No	No	No	No	No

Note: Robust standard errors. Standard errors are shown in parentheses. Significance level: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. *i* refers to city *i*; *P* refers to province.

conclusions presented above, and thus also provide evidence for the robustness of our baseline models and control variables to potential endogeneity problems.

CONCLUSIONS

Around 1980, Spain undertook one of the most intense worldwide decentralization processes, which was concurrently followed by a rapid decline in transport costs, relatively high rates of urban growth and an equalization of city-size distribution. In this paper we have shown that, in the period 1995–2007, many cities shifted their economic structure towards a more diversified industrial composition. In a context of a deep economic integration process, as characterized, inter alia, by a drastic fall in transport cost, we find that more, and not less, diversified and co-agglomerated cities appeared. Based on the results of a bivariate probit regression framework that exploits unique firm-level and time-varying transport-cost data, we argue that in an era of falling transport costs, fiscal and political decentralization helps smaller cities in an urban system to expand and diversify their economic structure, offsetting potential negative effects of the economic integration on size and growth of small and medium cities.

As such, this paper links the predominantly theoretical literature on diversification in a system of cities with the empirical literature on increasing governance decentralization. More, specifically, we interpret the decentralization process as a political version of the lumpy adjustment process by developers that help cities – in this case regional government capitals – to diversify in the theoretical urban systems models of Henderson and Becker (2000) and Anas and Xiong (2005). In particular, the transfer of political power from a central administration to regions and localities established a set of new regional capitals that developed a complete list of competencies in regional and urban policies. Our findings fall in line with most of the existing literature on growth and transformation patterns across cities (e.g., Abdel-Rahman & Fujita, 1993; Anas & Xiong, 2005; Duranton & Puga, 2000, 2001; Ellison et al., 2010; Helsley & Strange, 2014; Henderson, 1974), but more interestingly, lend support to the idea that decentralization may help explain why second-tier cities often outperform first-tier cities (Camagni et al., 2015; Frick & Rodríguez-Pose, 2018; Meijers et al., 2016). Although our study focuses on the peculiarities of the Spanish decentralization case, it also sheds a light on ongoing regional dynamics (Iammarino et al., 2019) by which the deepening of economic integration processes goes together with widening regional gaps.

A critical issue to be addressed by future research in this area evidently is the unravelling of the mechanisms behind the observed relationship between decentralization and diversification. For example, it may well be that increasing diversification in the context of increasing decentralization could be conditional on the quality of local institutions and on the local governments' ability/skill in exploiting the benefits of decreasing transport costs. Also, there might be a threshold below which the positive effects of decentralization on urban diversification could not work if weak local institutions are present. Appendices A and B in the supplemental data online provide some preliminary evidence that supports these hypotheses, but certainly a more in-depth analysis of the evolution of local institutional quality under the influence of decentralization processes is warranted. Our results suggest at the very least that the regional and urban studies literature about the impact of fiscal and political decentralization on economic growth, income inequality and regional disparities may benefit from a greater emphasis on decentralization's role in shaping specialization patterns in an urban system.

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DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

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NOTES

1. Carrion-i-Silvestre et al. (2008) show that, in 1980, 89.5% of public expenditures were concentrated in the central government, whereas local government accounted for the remaining 10.5%, and no funds were attached to regional governments. By 2001, the share of expenditures in the central government was reduced to 60.5%, but the fiscal capacity of subnational levels increased to 26.4% for regions and 13.1% for local governments. Indeed, Lago-Peñas et al. (2017) argue that Spain's fiscal decentralization proceeded even further between 2001 and 2009 as a result of tax-sharing mechanisms introduced in 2001.

2. See Tables B2–B4 in Appendix B in the supplemental data online for details.
3. This definition was set as part of the decentralization. Most of these cities are officially recognized as regional capital cities. Exceptions include Vitoria and Valladolid, which are considered 'institutional cities'.
4. The RAI includes time-variant identical scores for all Spanish (NUTS-3) provinces, except those located in regions with more autonomy: the Basque Country, Galicia, Navarra and Catalonia.
5. To measure the city-size distribution, we calculated for Spain the Gini population index and Zipf's coefficient. The Gini population index decreased from 0.644 in 1980 to 0.590 in 2007. Zipf's coefficient was obtained as a β-coefficient from ordinary least squares (OLS) regressions of the (log)rank of the city on its (log)population: $lnRank_{it} = \alpha_i + \beta_i lnPop_{it} + \varepsilon_{it}$, where t = 1980, 1995 and 2007. Zipf's coefficient increased from 0.901 in 1980 to 1.030 in 2007.
6. Average GTC is calculated as the average transport costs of a city to all other cities such as $\overline{GTC}_{it} = \left(\sum_{i=1}^{j} GTC_{ijt}/N\right)$.
7. The RAI is collinear with the spatial effects (μ_i), so in the baseline specifications we consider only time-fixed effects. Appendices A and B in the supplemental data online present robustness checks, including regression with spatial effects, but without the RAI.

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