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Technological Entrepreneurship and Rural Development: A Binomial to Combat Depopulation in Spain

Abstract

Objective: This study aims to characterise the phenomenon of depopulation in the rural environment from the point of view of the opportunities offered by technology-based rural entrepreneurship as a lever that promotes population fixation and the economic dynamisation of the most depressed territories subject to the economic and social imbalances generated by depopulation.

Research Design & Methods: The research approach is based on the application of case studies as an empirical research technique. In particular, the strategy for the promotion of rural start-ups in CyL – the largest European region and one of the Spanish regions most affected by the negative consequences of depopulation – is analysed.

Findings: Empirical evidence has shown that economic conditions have impacted the extent and duration of migration flows from rural areas to a more industrialised urban environment. Thus, in recent decades, the spatial distribution of the population has taken shape characterised by strong concentrations in large cities as opposed to the dispersion and low density of the population in large areas of the territory.

Implications / Recommendations: The promotion of rural entrepreneurship through the development of specific actions to encourage the creation of start-up companies could be a solution to the demographic challenge.

Contribution / Value Added: The creation of a regional entrepreneurial ecosystem has been possible owing to the financing, growth, scaling, and business internationalisation programmes promoted by the regional government.

Keywords: technological entrepreneurship; rural development; depopulation; startups

Article classification: research article

JEL classification: M13, P25, R58, O38, J11

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Introduction

Concern about the negative economic and social consequences associated with the strong demographic imbalances existing in a large part of Europe is currently a common concern in most European countries. The intense migratory flows from rural to urban areas over the last century have led to the emergence of strong imbalances that have, in turn, resulted in the concentration of the population in large cities, while rural areas are suffering a progressive process of depopulation and ageing. These migratory processes have become an important source of inter-territorial inequality. The adverse effects of such processes are nowadays at the centre of political, social, and academic debate. The fixation of the population in the most deprived areas is nowadays one of the common elements that can be observed in the political agendas of most European governments. At the same time, the phenomenon of depopulation is a multifaceted reality that has been the subject of a particular interest to the scientific community. Beyond the economic implications, many studies have investigated the consequences of depopulation in fields as diverse as, among others, the environment (Falcucci et al., 2007; Martínez-Abraín et al., 2020) sociology (Paniagua, 2011), or cultural heritage conservation (Gómez-Limón et al., 2007; Salas, 2019).

On the other hand, the available evidence has clearly determined that economic factors strongly condition the phenomenon of depopulation (Dax & Fischer, 2018; Li et al., 2019). The most economically-depressed areas suffer more intensely from the migratory flows of their population towards more prosperous territories in search of new opportunities (Pinilla & Sáez, 2017). In this context, the development of new economic activities, local entrepreneurship, and innovation are all essential conditions for boosting rural development and contributing to population retention.

In recent years, a trend aiming to boost rural entrepreneurship (Müller & Korsgaard, 2018) and counteract the dynamics of depopulation and economic sluggishness in rural areas has visibly emerged. The promotion of initiatives and programmes that encourage the creation of rural start-ups is a good example. The rural environment offers ample potential for the development of innovative ideas in sectors as diverse as agriculture and agribusiness, agricultural biotechnology, and tourism. The socio-demographic characteristics of rural areas also open up opportunities for the development of start-ups offering, *inter alia*, telemedicine services, dependency care, and collective transport solutions. These initiatives can be boosted by programmes for the promotion of rural entrepreneurship launched by different local and regional administrations.

Within the European Union (EU), Spain is one of the countries most affected by the economic imbalances posed by the demographic challenge. Aware of the magnitude of the challenge, national, regional, and local authorities have in recent years deployed a wide range of policies and action programmes aimed at promoting rural development through the promotion of entrepreneurship as a driving force for economic activity in these territories. Within these strategies, the promotion of the creation of rural start-ups within the Rural Development Programmes of the Structural Funds stands out.

One of the Spanish regions that suffer the most from the consequences of ageing and depopulation is the Region of Castilla y León (CyL). This study aims to characterise the phenomenon of depopulation in the rural environment from the point of view of the opportunities offered by technology-based rural entrepreneurship as a lever that promotes population fixation and the economic dynamisation of the most depressed territories subject to the economic and social imbalances generated by depopulation. To achieve this objective, the research approach is based on the application of case studies as an empirical research technique. In particular, the strategy

for the promotion of rural start-ups in CyL, the largest European region and, as mentioned before, one of the Spanish regions which have been the most affected by the negative consequences of depopulation, is analysed as a good practice.

The demographic challenge in rural areas – depopulation and ageing

The phenomenon of depopulation in the European rural environment has its origin in the demographic movements occurring on a large scale within the framework of the urbanisation processes initiated in the mid-20th century in Western Europe (Pereira & Navarro, 2015; Baudin & Stelter, 2019). In Spain, these migratory flows from rural areas to more developed urban centres, subject to strong industrialisation processes and the development of the service sector, began in the 1960s and 1970s. This trend was soon interrupted by the counter-urbanisation processes that emerged at the end of the 1980s and continued until the 1990s (Camarero, 1993). These phenomena led to the decongestion of large urban centres in favour of nearby population centres. Despite this, the problem of depopulation of rural areas in Spain continues to be more pressing than ever, even more so if one considers that nearly 80% of the population is concentrated in only 9% of municipalities with a population of more than 10,000 inhabitants (INE, 2020).

The region of CyL is one of the European regions most affected by the phenomenon of depopulation due to the existence of specific socio-economic characteristics that make it particularly vulnerable to the adverse effects of population loss. Thus, the existence of a greater agricultural tradition in the region is coupled with the smaller initial size of its population centres (García, 2000), characterised by a strong population dispersion and low demographic density, with the smallest municipalities being precisely those which have suffered most severely from the problem of depopulation. Municipalities in the region with a population of fewer than 2,000 inhabitants lost, on average, more than 58% of their population in the last five decades (Gómez-Limón et al., 2007).

On the other hand, the demographic change experienced by the region is pressured by the concurrence of several determining factors such as the ageing of the population, the fall in fertility rates, and the aforementioned migratory flows from rural areas to large urban centres.

The available empirical evidence shows that the evolution of the population in CyL has regressive features. It would suffice to analyse the vegetative growth of the population over the last two decades to confirm this (see Table 1).

Thus, while from 1998 to 2018 the Spanish population grew by 17.2%, Castile and León lost 3% of its inhabitants, a percentage that practically doubles when considering the period of 2008–2018. This circumstance is aggravated in the north-western provinces of the region, with population losses of over 8% between 1998 and 2018. Particularly noteworthy is the case of the Province of Zamora, where the population contracted by nearly 15% during this period.

Another factor conditioning depopulation is the degree of rurality of the territory. As can be seen in Table 2, the percentage of the rural population (residing in municipalities with a population of fewer than 2,000 inhabitants) amounts to 25.2% in Castile and León. This figure almost doubles when considering the Province of Zamora. It also shows that more than 90% of the region's municipalities are rural, reflecting the fact that the municipalities that are not considered rural are limited to the provincial capitals and large county seats.

The economic and social imbalances generated by the phenomenon of depopulation and, in particular, the adverse consequences produced by demographic tensions in rural areas, are one of the main concerns in Europe. The Treaty on the Functioning of the EU, known as the Treaty

Table 1. Population evolution of CyL and Spain

Territory	1998	2008	2018	% variation 1998–2008	% variation 2008–2018	% variation 1998–2018
Ávila	167,132	171,815	158,498	2.8	-7.8	-5.3
Bugros	346,355	373,672	357,070	7.9	-4.4	3.1
León	506,365	500,200	463,746	-1.2	-7.3	-8.4
Palencia	179,623	173,454	162,035	-3.4	-6.6	-9.8
Salamanca	349,550	353,404	331,473	1.1	-6.2	-5.2
Segovia	146,755	163,899	153,342	11.7	-6.4	4.5
Soria	91,593	94,646	88,600	3.3	-6.4	-3.3
Valladolid	492,029	529,019	519,851	7.5	-1.7	5.7
Zamora	205,201	197,221	174,549	-3.9	-11.5	-14.9
Castilla y León	2,848,603	2,557,330	2,409,164	2.9	-5.8	-3.0
Spain	39,852,651	46,157,822	46,722,980	15.8	1.2	17.2

Source: the authors’ own elaboration based on INE data (various years).

Table 2. Degree of rurality in CyL and Spain

	Total population	% rural population	Total manipulation	% rural manipulation	Total population density	Rural population density
Ávila	158,498	34.9	248	95.2	19.7	8.1
Bugros	357,070	24.1	371	97.3	25.5	6.8
León	463,746	23.1	211	85.3	29.8	8.3
Palencia	162,035	26.7	191	94.2	20.1	6.3
Salamanca	331,473	28.7	362	95.9	26.8	8.1
Segovia	153,342	35.7	209	94.7	22.4	9.7
Soria	88,600	28.0	183	95.6	8.6	2.9
Valladolid	519,851	11.2	225	88.9	64.1	9.0
Zamora	174,549	47.5	248	98.4	16.5	8.3
Castilla y León	2,409,164	25.2	2,248	94.4	25.7	7.4
Spain	46,722,980	5.8	8,124	72.3	92.6	9.8

Source: the authors’ own elaboration based on INE data.

of Lisbon, takes up this concern and expresses it in Articles 174 and 175 by stating that it is essential to “promote the harmonious development of the Union as a whole”, with particular attention to rural areas and regions with severe demographic handicaps or low population density. In this context, the work of European institutions to address the demographic challenge and territorial imbalances has been unceasing, albeit with partly questionable results. This is the case for the 1995 Report from the Commission to the Council and the European Parliament on the demographic situation in the EU, through the European Commission’s Green Paper on

Confronting demographic change: A new solidarity between the generations (published in 2005), to the Resolution adopted by the European Parliament in 2017, titled *The deployment of cohesion policy instruments by regions to address demographic change* (European Commission, 1995).

In Spain, concern about the negative consequences associated with the depopulation of the territory has been on the agenda of the main public institutions for several years. In this respect, various actions have been carried out to tackle the demographic challenge. These include the creation of the Commissioner for the Demographic Challenge in 2017 and the development of the National Strategy for the Demographic Challenge, approved in 2019, which aims to provide answers to three demographic issues, namely depopulation, ageing, and the effects of the floating population. To this end, three priority lines of action are established: a) to guarantee the functionality of territories affected by depopulation and low density; b) to improve competitiveness and facilitate the development of new economic activities as well as the promotion of entrepreneurship; and c) to favour the settlement and fixation of the population in rural areas.

The region of CyL has also developed over the last few years a wide-ranging programme of actions in order to respond to the challenge posed by the demographic change. These include the 2016 creation of the Demographic Policy Council of the Junta de CyL (JCyL), as well as the Working Group on depopulation and ageing, in which CyL participates together with other European regions. Also relevant is the approval of the Agenda for the Population of CyL 2010–2020, which was revised in 2017.

Research methodology

The primary research approach adopted here is based on applying case studies as an empirical research technique. In particular, a research strategy to understand the dynamics present in unique contexts is used to collect qualitative and quantitative evidence to describe, verify, or generate theory (Eisenhardt, 1989). In addition, a literature and documentary review of the state of the art was carried out.

In the present study, following the principle of relevance and appropriateness to the formulated research objective, a non-probabilistic and non-random sampling by convenience was adopted to select the territorial unit of analysis. In particular, the geographical area under study is the Spanish region of Castilla y León, which comprises nine provinces (Ávila, Burgos, Palencia, León, Salamanca, Segovia, Soria, Valladolid, and Zamora) and is home to around 2.4 million inhabitants. The criteria applied for the selection of the territorial unit of the study were the following: a) the negative population growth trend; b) a high degree of rurality; c) the ageing demographic structure; d) low population density; and e) a strong dispersion of the population in small, sparsely-populated municipalities. Out of all the analysed Spanish regions, Castilla y León was the territory that best met all these criteria and was, therefore, selected as a representative case study to identify public strategies to promote technological entrepreneurship in rural areas subject to solid demographic tensions in Spain.

Once we had determined the territorial unit of study, the following steps were carried out:

1. Defining the mechanisms for obtaining and accessing organisations and key informants. In particular, persons responsible for industry and employment in the Autonomous Community of Castilla y León were identified, and unstructured personal interviews were used as the main channel for accessing relevant information and documentary review.
2. Transcribing the data through the transcription of the interviews.

3. Analysing the results: the information obtained in the interviews was coded, processed, analysed, and contrasted with the evidence obtained from official statistical sources.
4. Drawing general conclusions.

In the collection of information related to the constructs, multiple sources of were also used, the description of which appears in Table 3.

Table 3. Selection of variables and primary sources of information and data collection instruments

Dimension	The analysed variables	Sources of information
Socio-demographic characterisation of the region	<ul style="list-style-type: none"> – total population – the percent of the rural population – the number of municipalities – population density – the ageing index 	National Statistics Institute (INE, various years)
Strategies to promote entrepreneurship and innovation	<ul style="list-style-type: none"> – the number of platforms for launching innovative ideas – the number of business accelerators – the number of financial platforms – applications for start-up funding – the cumulative volume of funding – the volume of induced investment – the number of jobs created – the percentage of start-up projects by the productive sector 	Startup Reception Plan (JCyL, various years) Strategy for Entrepreneurship, Innovation and the Self-Employed in CyL 2016–2020
Tax incentives to support the creation of startups	<ul style="list-style-type: none"> – tax exemptions for investment in the development of start-ups – land price subsidies in industrial estates or technology parks – subsidised renting of workspaces and incubators for entrepreneurship – tax deductions on the acquisition of shares in start-ups in income tax – the reduction of the corporate tax rate – a reduction in the corporate tax base 	The Law to Support Entrepreneurs (Law 14/2013, of September 27, 2013) introduced in the Personal Income Tax Law (Law 35/2006, of November 28, 2006 Law 27/2014, of November 27, On Corporate Income Tax, 2014 Legislative Decree 1/2013, of September 12, 2013, by which the Consolidated Text of the Legal Provisions of the Community of CyL in Matters of Own and Assigned Taxes is approved, 2013

Source: the authors' own elaboration.

Technological entrepreneurship in rural areas – a lever for transformation

As stated in the 2019 National Strategy for the Demographic Challenge, “the fixation of the population in the territory requires turning it into a space of opportunities, which takes advantage of local resources through the generation of economic activity, the promotion of entrepreneurship and the use of the talent associated with the environment” (Nández, 2020a).

In this context, technological entrepreneurship is postulated as a transforming and dynamising lever for the rural environment, and as an engine for economic growth, generation of quality employment, and population fixation. The available evidence shows that ‘technological companies’ are characterised by achieving the greatest productivity gains in the shortest time. Despite this, the technological entrepreneurial initiatives that can be developed in rural areas are strongly conditioned by the existence of insufficient infrastructures and connection networks. The existence of a digital divide in rural areas (Jorge-Vázquez, 2021, 2022), associated with a lower degree

of technological training and adoption by the population, can also be an obstacle to the development of entrepreneurial initiatives in the technology sector. To overcome these difficulties, it must be the priority to guarantee full territorial connectivity by the commitments set out in the European Digital Agenda 2020.

The role of start-ups in promoting rural entrepreneurship. Case study: CyL (Spain)

CyL is an example of a European region that in recent years has been able to adopt specific innovative actions aimed at favouring and strengthening the regional entrepreneurial ecosystem. These measures have focused on improving business competitiveness based on four main lines of action: financing, growth, scaling, and internationalisation. The promotion of start-ups has also been facilitated by the creation of a regional network of accelerators and incubators, together with the implementation of specific programmes aiming to boost local entrepreneurship in rural areas.

Strategy for the promotion of emerging entrepreneurship and innovation in CyL

Strategies aimed at encouraging entrepreneurial activity and the proliferation of start-ups by public administrations are present in all processes and policies for territorial development and the productive fabric of any public administration. More specifically, in the case of CyL, within the *Plan de acogida a startup*, five types of initiatives can be distinguished in the process of creating or developing start-ups with the purpose of turning them into competitive companies:

- launching pad for innovative ideas – this section would be aimed at entrepreneurial ideas in the early stages;
- business accelerator measures – aimed at transforming a high-potential project into a business opportunity within the shortest possible time;
- financial platform – financial measures aimed at the start-up and development of innovative entrepreneurial projects through various instruments such as grants, microcredits, subsidies, etc.;
- land – this section includes all the subsidies for entrepreneurs who set up in the Technology Parks located in CyL;
- tax incentives – this last aid package would be aimed at encouraging contributions from investors interested in supporting the development of start-ups.

All these measures aimed at Startups are included in the Strategy for Entrepreneurship, Innovation, and the Self-Employed of CyL 2016–2020 (JCyL, 2021).

Since the creation of this financial platform in 2016, and according to the latest data published in the first quarter of 2021, 19,376 applications have been submitted and more than 88% have been financed with an amount of more than 2,585 million EUR and an induced investment of more than 4,577 million EUR. In cumulative terms, the number of applications increased by 1850% in the period of 2016–2021. In terms of employment, this translates into the maintenance or creation of 192,485 jobs. By productive sectors, the services sector accounts for 23.2% of the submitted projects; it is followed in order of importance by the commerce sector (21.7%), the agri-food sector (15.5%), and the tourism sector (11.4%).

Within this programme, a series of grants or subsidies can also be found to promote investment activities, R&D&I and the internationalisation of companies. There is also the possibility of financing with venture capital, with a minority and temporary participation in the share capital of the companies. One of the advantages of this resource is that it does not require guarantees, as

banks do not participate in it. The ICE has shares in Sodical (*Sociedad de Capital Riesgo de CyL*), which invests in companies for an amount ranging from 20,000 EUR to 2,000,000 EUR and for periods of between four and seven years. This company also manages seed capital projects. In this case, the amount ranges from 20,000 EUR to 90,000 EUR, and the term is between three and five years. JCyL has also a series of capitalisation programmes, including the following: mining land, innovative growth plan, entrepreneurship with an innovative component, and the consolidation of innovative companies.

JCyL also participates in projects of the European Commission and the EIB group. One of these is the SME initiative, which aims to provide financing to small and medium-sized enterprises in several European countries. The ICE has signed agreements with different agents that support entrepreneurship, and it has an entrepreneur's office that offers various services. JCyL supports the internationalisation process of companies with advice on trade promotion and other issues.

In fact, the ICE has offices in different countries around the world to support companies at the point of destination. In the field of innovation, training and capacity-building activities for company employees and managers stand out, as human capital is one of the essential factors for promoting R&D&I. Among the training programmes, the *Gestidi Executive* programme stands out, which seeks to update the knowledge of technicians and managers in this field. The main training areas include digitalisation, product, or process innovations and 4.0 technologies. The public sector can also promote innovation through the Public Procurement of Innovation (PPI), which is an instrument that consists in purchasing business solutions based on innovation.

Fiscal policy to support rural entrepreneurship

Supporting start-ups in their initial stages is fundamental and to this end, it is important to have the support of the public sector. This support is implemented through public policies. Within these policies, JCyL stands out in two areas:

1) Allowances for entrepreneurs setting up in the Technology Parks of CyL:

This is a series of public incentives implemented by the 'no income' side, by which JCyL selects an industrial land in different industrial parks or centres where start-ups can start their activity with a bonus on the price of the land. There is also an offer of spaces for rent in the region by the Junta, which offers discounts to entrepreneurs. In some cases, these are buildings for common uses, while others involve co-working spaces (see Figure 1).

As can be seen, the territorial distribution of the industrial estates where JCyL introduces a bonus for the establishment of startups is well-distributed. Only the province of Soria in the border area with Aragón, the eastern part of the region (Zamora-Salamanca), and the north of Palencia show gaps in terms of industrial estates with a bonus from the region of JCyL. In addition to this subsidy, there is also an example of good practice in the subsidised rental of co-working areas for entrepreneurs and common use, as shown in Figure 2.

In this case, there is not such a wide territorial distribution of these places where start-ups, instead of buying, can rent space. Most of them are concentrated in the capital of the region (Valladolid) and its surroundings.

2) Tax incentives to encourage contributions from investors interested in supporting the development of start-ups:

Undoubtedly, the entrepreneurial ecosystem is booming, so investing in start-ups can become a powerful engine to stimulate the local economy. Precisely with the aim of stimulating investors

to allocate part of their assets to start-up business projects, the State has provided a series of tax benefits (Náñez, 2020b).

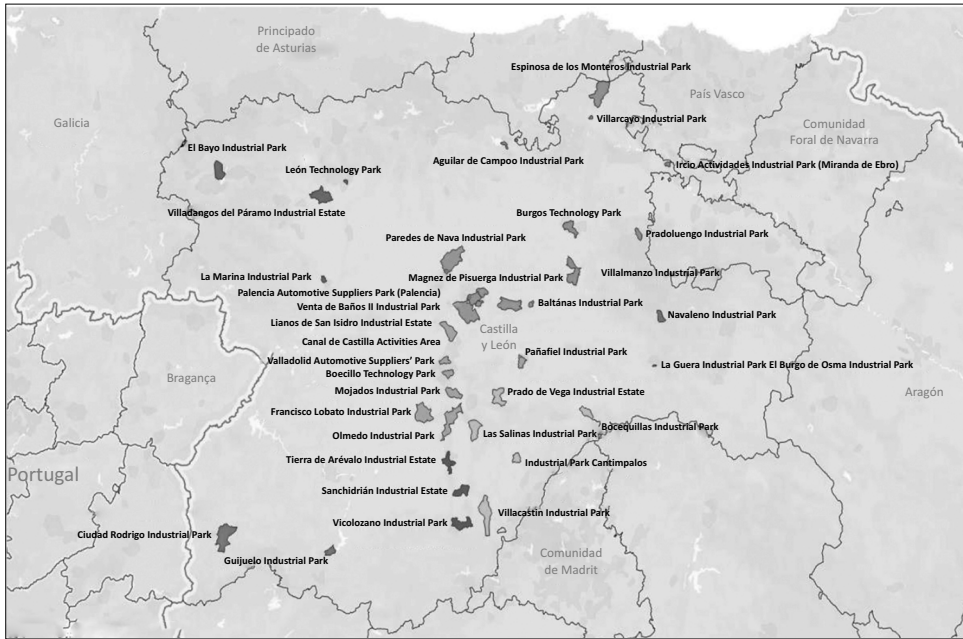


Figure 1. Industrial Park with Start-up establishment bonus by province

Source: the authors' own elaboration using the Tableau Desktop Edition and data extracted from JCyL.

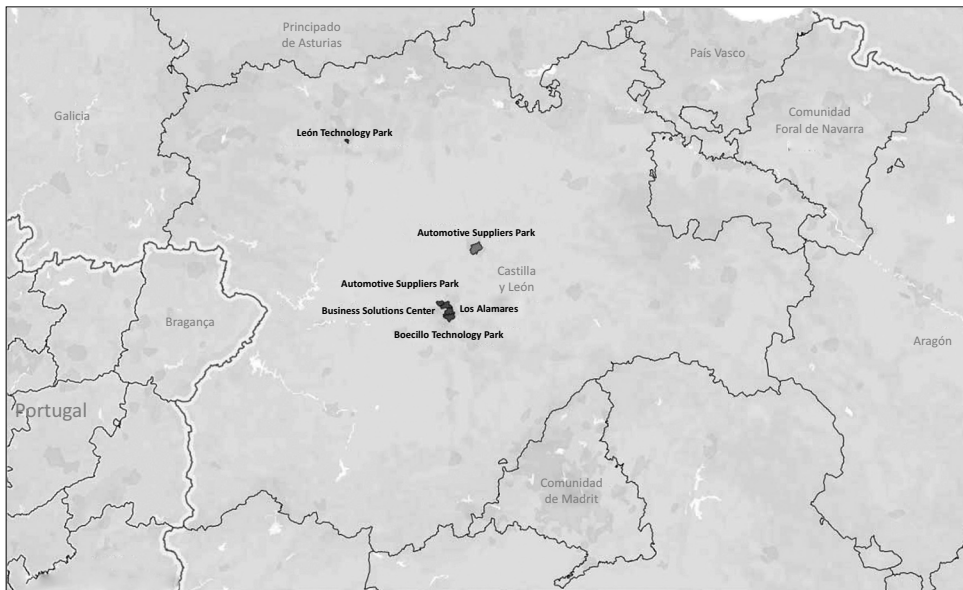


Figure 2. Spaces for rent (common use and co-working building)

Source: the authors' own elaboration using the Tableau Desktop Edition and data extracted from JCyL

The Law to Support Entrepreneurs (Law 14/2013, of September 27, 2013) introduced in the Personal Income Tax Law (Law 35/2006, of November 28, 2006) allows for a deduction of 20% of the amounts destined to the acquisition of shares in startups. However, the applicable deduction was limited to 50,000 EUR per year (i.e., up to the maximum deduction limit of 10,000 EUR). In addition, at the state level, start-ups can apply a reduced corporate income tax rate of 15% in the first year in which their taxable income is positive, as well as in the following year. Additionally, those start-ups that receive their income from the exploitation of certain intangible assets may take advantage of a reduction in the corporate income tax base of up to 60% (effective tax rate of 10%) by applying the tax regime known as the “patent box” (Law 27/2014, of November 27, On Corporate Income Tax, 2014). All these measures aimed at supporting Startups are included in the Strategy for Entrepreneurship, Innovation, and Self-Employment of CyL (2016–2020), and the tax incentive in favour of entrepreneurs is included in the 8th article (Legislative Decree 1/2013, of September 12, 2013, by which the Consolidated Text of the Legal Provisions of the Community of CyL in Matters of Own and Assigned Taxes is approved, 2013).

Specifically, the incentive is included in the Personal Income Tax and affects those who invest in a start-up located in CyL. Taxpayers will be able to deduct 20% of the amounts invested during the year in the acquisition of shares or participations as a consequence of agreements for the incorporation of companies or capital increase in public limited companies, limited liability companies, or labour companies when the company allocates the financing received to investment projects carried out in the territory of CyL. Acquisitions of shares or participations for a minimum amount of 0.5% and a maximum of 45% of the capital of the company, which are maintained in the assets of the acquirer for at least three years, will give the right to apply this deduction. The maximum amount of the deduction will be 10,000 EUR. However, it is necessary to comply with additional requirements related to the maintenance of the workforce.

As can be seen, despite maintaining a deduction percentage similar to that of the other Spanish regions under scrutiny, CyL has a higher deduction limit, which is beneficial.

To promote the development of viable business projects in CyL, the regional government has designed a financial platform for public-private collaboration whose main objective is to finance the business competitiveness strategy and, in particular, to promote innovation and inclusive, rural, technology-based, social entrepreneurship. This instrument, managed by the ICE, aims to boost the economy of the most disadvantaged rural areas of the region, which are subject to strong demographic pressures such as depopulation and ageing. The business projects eligible for this programme can be new or can be the result of an expansion or modernisation, as long as they meet three requirements: a) the project must be developed in CyL; b) it must be technically-, economically-, and financially-viable; and c) it must be intended to finance investments or working capital.

Conclusion

The strong economic and social imbalances linked to depopulation are nowadays a common factor of concern in a large part of Europe. The need to repopulate the most depressed areas and provide them with new opportunities and instruments to boost their economic activity is unquestionable. Spain has been one of the countries that have suffered most severely from the consequences of the great rural exodus that took place in the middle of the 20th century and, in particular, in the Spanish region of CyL due to its socio-economic characteristics.

Empirical evidence has shown that economic conditions have impacted the extent and duration of migration flows from rural areas to a more industrialised urban environment. Thus, in recent decades, a spatial distribution of the population has taken shape, characterised by strong concentrations in large cities as opposed to the dispersion and low density of the population in large areas of the territory.

Finally, the promotion of rural entrepreneurship through the development of specific actions to encourage the creation of start-up companies could be a solution to the demographic challenge. The region of CyL is a good example of a territory that has been affected by the adverse effects of depopulation but, in recent years, has been able to lead a strategy of business revitalisation in its rural environment. The creation of a regional entrepreneurial ecosystem has been possible owing to the financing, growth, scaling, and business internationalisation programmes promoted by the regional government. The creation of a network of incubators has also boosted the creation of rural start-ups that are helping to generate employment and fix the population in a very accelerated manner.

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Conflicts of Interest

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Data Availability Statement

All data will be available and shared upon request.