SECTOR-LEVEL ECONOMIC EFFECTS OF REGULATORY COMPLEXITY: EVIDENCE FROM SPAIN

2023

BANCO DE ESPAÑA
Eurosistema

Documentos de Trabajo
N.º 2312

Juan S. Mora-Sanguinetti, Javier Quintana,
Isabel Soler and Rok Spruk

SECTOR-LEVEL ECONOMIC EFFECTS OF REGULATORY COMPLEXITY: EVIDENCE FROM SPAIN

SECTOR-LEVEL ECONOMIC EFFECTS OF REGULATORY COMPLEXITY: EVIDENCE FROM SPAIN (*)

Juan S. Mora-Sanguinetti

BANCO DE ESPAÑA

Javier Quintana

BANCO DE ESPAÑA

Isabel Soler

EUROPEAN UNIVERSITY INSTITUTE (EUI)

Rok Spruk

UNIVERSITY OF LJUBLJANA

(*) The views expressed are those of the authors and should not be attributed to the Banco de España or the Eurosystem. We are grateful to the comments of an anonymous referee who has reviewed the working paper version of this article, as well as to the suggestions of the participants at the research seminar of the Banco de España – Eurosystem and the 2022 Conference of the French Association of Law & Economics (AFED) (Montpellier).

Contact: Juan S. Mora-Sanguinetti. Banco de España – Eurosystem (Spain), Alcalá, 48 - 28014 Madrid. E-mail: juans.mora@bde.es. Tel.: (0034) 91 338 5197. Rok Spruk. University of Ljubljana (Slovenia), School of Economics and Business, Kardeljeva ploscad 17, SI-1000 Ljubljana. E-mail: rok.spruk@ef.uni-lj.si. Tel: +386(0)1 589 25 43. Isabel Soler is in the European University Institute (EUI) (Italy). Javier Quintana is in the Banco de España – Eurosystem (Spain).

https://doi.org/10.53479/29854

Documentos de Trabajo. N.º 2312

April 2023

The Working Paper Series seeks to disseminate original research in economics and finance. All papers have been anonymously refereed. By publishing these papers, the Banco de España aims to contribute to economic analysis and, in particular, to knowledge of the Spanish economy and its international environment.

The opinions and analyses in the Working Paper Series are the responsibility of the authors and, therefore, do not necessarily coincide with those of the Banco de España or the Eurosystem.

The Banco de España disseminates its main reports and most of its publications via the Internet at the following website: http://www.bde.es.

ISSN: 1579-8666 (on line)

Abstract

This paper studies for the first time the impact on various measures of economic efficiency of regulatory complexity by sector in Spain. We base our analysis on an innovative database that classifies 206,777 regulations by economic sector and region, which highlights the growing volume of regulation, as well as its diversity by sector, region and business cycle stage.

This analysis first looks at the aggregate impacts of sectoral regulatory complexity on the employment-to-population ratio, total working hours, sectoral GDP shares, labour intensity and capital intensity. Secondly it delves into the heterogeneous impacts observed across firms of different sizes and ages, drawing on the MCVL (Continuous Work History Sample), a rich database at the enterprise level.

On the first front, we estimate a set of multiple fixed-effects model specifications across 13 economic sectors, 23 regulatory sectors and 17 Spanish regions over the period 1995-2020. Our results suggest that greater regulatory complexity has a negative impact on the employment rate and on value added. The effect on employment is consistent with previous findings for the United States. In particular, ceteris paribus, each additional increase in the regulatory complexity index is associated with a 0.7 percent drop in the sector-level employment share. Furthermore, our findings suggest that several distortionary sector-level effects of increasing regulatory complexity are taking place. For instance, markedly lower labour intensity and decreased sector-level investment rates, which confirm that greater regulatory complexity entails non-trivial sector-level costs. Distortionary effects of regulatory complexity materialise through compositional differences, mainly in the form of reduced wages and a lower investment rate.

On the second front, using data on employment by firms' characteristics, we show that the negative impact of regulatory complexity is concentrated on smaller and younger firms. This finding supports the hypothesis that greater regulatory complexity imposes a burden that small and less experienced firms are less able to handle. At the sector level, the manufacturing sectors are the most negatively affected. This may be related to the higher investment required by these sectors.

Keywords: sectoral regulation, regulatory complexity, economic sectors, structural policies, employment.

JEL classification: K2, R11, J00, E02.

Resumen

En este documento se estudia por primera vez el impacto de la complejidad regulatoria a escala sectorial en España en diversas medidas de eficiencia económica. El análisis se fundamenta en una innovadora base de datos que ha clasificado 206.777 normas españolas, tanto por sector de actividad como por comunidades autónomas, y que pone de manifiesto el creciente volumen de regulación, así como su diversidad por sector, a escala geográfica y por etapa del ciclo económico.

Estudiamos en primer lugar los impactos económicos de la complejidad de la regulación sectorial de forma agregada en la relación empleo-población, las horas de trabajo totales, las participaciones sectoriales en el PIB, la intensidad de trabajo o la intensidad de capital. En segundo lugar, ahondamos en los impactos heterogéneos observados sobre las empresas con diferentes tamaños y edades, haciendo uso de una rica base de datos a escala empresarial: la Muestra Continua de Vidas Laborales.

En el primer caso, estimamos un conjunto de especificaciones con efectos fijos múltiples a través de 13 sectores económicos, 23 clasificaciones legales por sector y las 17 comunidades autónomas durante el período 1995-2020. La evidencia sugiere que una mayor complejidad regulatoria tiene un efecto negativo sobre la tasa de empleo y un impacto negativo sobre el valor añadido. El efecto sobre el empleo es coherente con los hallazgos previos para Estados Unidos. En concreto, cada aumento del índice de la complejidad de regulación adicional se asocia con una caída del 0,7% en la cuota de empleo a escala sectorial, *ceteris paribus*. Además, nuestros resultados sugieren que se están produciendo varios efectos distorsionadores a escala sectorial: la intensidad de la mano de obra es notablemente menor y las tasas de inversión disminuyen como respuesta al aumento de regulación. Estos efectos distorsionadores se materializan a través de las diferencias de composición, principalmente mediante la reducción de los salarios y de la tasa de inversión.

En el segundo caso, utilizando datos desagregados de empleo según las características de las empresas, mostramos que el impacto negativo de la complejidad de la regulación se concentra en las empresas más pequeñas y jóvenes. Así pues, este hallazgo apoya la hipótesis de que una normativa más compleja impone una carga que las empresas pequeñas y con menos experiencia están menos capacitadas para manejar. A escala sectorial, el grupo de sectores más afectado es el manufacturero. Esto puede estar relacionado con la mayor inversión requerida en esos sectores.

Palabras clave: regulación sectorial, complejidad de la regulación, sectores de actividad, políticas estructurales, empleo.

Códigos JEL: K2, R11, J00, E02.

1. Introduction

1.1. Regulation and economic performance

It is now a well-established fact that the institutional framework affects long-term economic development (see, among others, Hall and Jones 1999, Henisz 2000, Rodrik 2000, Acemoglu et. al. 2005 or Fatás and Mihov 2013). In particular, regulation is one of the fundamental pillars of that institutional framework in a mature economy.[2] Regulation indeed may be viewed as the vehicle through which structural policies are formulated and expressed (Jalilian et al. 2007, Mora-Sanguinetti and Soler, 2022). Therefore, it should perhaps come as no surprise to find general results such as Djankov et al. (2006), suggesting that improving regulatory performance from the worst quintile to the best quintile may increase the growth rate up to 2 percentage points.

Despite its importance, however, empirical studies on the design and complexity of regulation and its economic impacts, working with norms in a disaggregated way, collecting disaggregated information on their form characteristics or sectors affected, have so far been scarce. This is due in part to the difficulty of accessing and processing this information in order to construct useful and easily trackable quantitative indicators for statistical analysis with variation over time, sector and space. The body of regulation in a developed country can, in fact, have a very considerable volume. In the case of Spain, for example, the entire body of law is made up of hundreds of thousands of norms. Only in 2021, the Spanish administrations as a whole adopted 12,704 norms (Mora-Sanguinetti and Soler, 2022). In addition to the measurement problem, and related to it, it should also be noted that unfortunately there has been a lack of contact and interdisciplinary work in recent decades between economists and jurists, which has hindered the progress of both disciplines. Regulatory analysis seems, in fact, a particularly fertile field for interdisciplinary work (Doménech Pascual, 2014).

The first empirical analyses with these disaggregated characteristics are thus recent and can be found for the U.S. (Dawson and Seater, 2013; McLaughlin et al., 2019) apart from earlier suggestions made by Friedman (2004). In the case of Spain, the construction of quantitative indicators of regulation has also been more recent (Marcos et al., 2010; Econlaw Strategic Consulting, 2009; Mora-Sanguinetti, 2019).

Without the loss of generality, it is perhaps worth asking whether regulation generates positive or negative impacts on economic activity (Mora-Sanguinetti and Pérez-Valls, 2021). This is a question that lies at the forefront of the discussion on the optimal design of regulatory institutions and policies (Ogus, 2004). On the one hand, market regulation can be positive to the extent that it mitigates market failures, such as imperfect information. From the point of view of microeconomic theory, violating the First Welfare Theorem as a result of market failures would be a reason to resort to regulation. Alongside this, according to the Second Welfare Theorem, redistributive regulation could achieve an efficient allocation (Peltzman et al. 1989)

On the other hand, from a negative point of view, Laffont and Tirole (1993) point out that market failures are a necessary but not sufficient condition for regulation to exist, since

[2] We can certainly cite the more "classic" works in this regard such as North (1981, 1990a, 1999) but also more recent examples such as Afonso (2022)

regulation could have a restricted effect for informational, transactional or administrative-political reasons. At one extreme, poorly designed regulation could lead to an increase in transaction costs rather than to their reduction (Helpman 2008)

In summary, regulation would therefore be an instrument for either reducing (Wallis and North 1986, Yang and Borland 1991, Bischoff and Bohnet 2000, Kovac and Spruk 2016) or increasing transaction costs (North 1990b, Gratton et. al. 2021)[3]. However, beyond the overall and aggregated impacts of regulation on economic activity mentioned at the beginning, it should be noted that, so far, except for the case of the USA, analysis of the economic impacts of regulation, with disaggregated databases that can provide details of the sectoral distribution of regulation, to the best of our knowledge, has not yet been addressed.

1.2. Objectives, structure of our paper and summary of the results

This paper aims to assess, in empirical terms, whether sectoral regulation and its complexity generate positive or negative impacts on economic activity. This analysis is carried out for the first time for the case of Spain. To perform the analysis, we rely on a novel database, the first for Spain and the second at the international level[4] (to the best of our knowledge), that classifies 206,777 regulations by sector of activity and by Spanish region over the period 1995-2020 (Mora-Sanguinetti and Soler, 2022). The type of indicators constructed quantify the complexity of regulation as explained in section 2. A descriptive analysis of the database shows that regulation and its complexity has been increasing in recent decades but that it is diverse at the sector level, by region and appears to be sensitive to the economic cycle. The interest in the relationship between regulation and the economic cycle has also been analyzed for the case of Italy (Di Vita and Ferrante, 2021).[5]

Specifically, in economic terms, our analysis first looks at the aggregate impacts on the employment-to-population ratio, total working hours, sectoral GDP shares, labor intensity or capital intensity, but it also delves, in the second place, into the heterogeneous impacts observed over firms with different sizes and ages, making use of a rich database at the enterprise level, the MCVL - Continuous Work History Sample.

The preliminary evidence suggests that greater regulatory complexity has a negative effect on employment rate and has a negative impact on value added. In particular, we show that each additional regulatory case is associated with 0.7 percent drop in the sector-level employment share, *ceteris paribus*. The effect on employment is consistent with the finding of Bailey and Thomas (2017) for the US, which showed that US industries that are more intensely regulated experienced lower employment growth.

[3] These two references refer to political economy problems. North (1990b) shows that, under flexible budget constraints, politicians may have incentives to increase transaction costs through the overproduction of rules and laws. Gratton et al. (2021) discuss the relationship between the rise of regulation in Italy and the period of political instability in the 1990s.
[4] See the references for the analysis of the US case mentioned throughout this article.
[5] The authors consider both regulations (and Constitutional Court decisions) affecting Italy as a whole and regional regulations. According to these authors, regulation in Italy would have asymmetric effects on the growth rate of per capita income, in relation to the different phases of the business cycle.

Furthermore, our sector-level results uncover a series of distortionary sector-level effects of increasing regulatory complexity that are taking place. These include markedly lower labor intensity and decreased sector-level investment rates, which confirm that expansive regulatory complexity entails non-trivial sector-level costs. Distortionary effects of regulatory complexity materialize through compositional differences mainly through reduced wages and investment rate.

Secondly, when we make use of disaggregated data (MCVL), exploiting information on employment by firms' characteristics, we show that the negative impact of the complexity of regulation concentrates on smaller and younger firms. A 10% of new regulations is related to a 0.5% relative fall in the number of workers employed by firms with less than 10 employees. Thus, this finding supports the hypothesis that a more complex regulation imposes a burden than small and less experienced firms are less capable to handle. At the sector level, the group of sectors most affected is manufacturing. The magnitude of the effect is 50% greater than in the case of the services sector.

The rest of the article is structured as follows: section 2 presents more details on the regulatory database and defines the concept of "regulatory complexity" departing from Mora-Sanguinetti and Soler (2022). Section 3 describes our economic variables based on data provided by the Spanish National Statistics Institute – INE – and the MCVL. Section 3 describes our identification strategy and econometric results for the case of aggregated models. Section 4 describes our identification strategy and econometric results for the case of disaggregated models. Section 5 provides some general conclusions and further discussion of the results from our research.

2. Measuring regulation

2.1. The concept and measurement of regulatory "complexity"

As mentioned, this article makes use of a new set of regulatory indicators for each sector of activity and for each autonomous community of Spain. The aim of the regulatory indicators is to provide an approximation to the "complexity" of the regulatory framework. To clarify, "complexity" is a formal concept that may be measured in different ways: first, as the volume of regulation or, secondly, through its linguistic and relational dimensions.[6]

The regulatory indicators studied in this article operationalize the first perspective -measuring the volume of regulation-, which is currently the most developed in the literature (with examples for the United States, Australia or Spain) and is easily quantifiable (Kirchner 2012, Dawson and Seater 2013, Mora-Sanguinetti and Soler 2022)[7]. For the Spanish case specifically, see also the articles by Econlaw Strategic Consulting (2009), Marcos et al. (2010) and Mora-Sanguinetti (2019), who worked on the analysis of regional regulation.

Our regulatory indicators approximate the "volume" by computing the number of new norms adopted each year by each autonomous community and for each sector. If administrations adopt more new

[6] This particular approach is the one developed in De Lucio and Mora-Sanguinetti (2022).

[7] On a practical level, one can approximate the "volume" from different perspectives which includes, but is at the same time not limited to, counting the number of norms, the number of regulatory paragraphs or sentences [Waltl and Matthes (2014)], a ratio of the number of norms and pages [Kirchner (2012)] or even the number of words in different sets of regulations [Mora-Sanguinetti and Spruk (2018)]. For a review of different methodologies, an additional discussion is provided in Mora-Sanguinetti (2019).

regulations each year in a given sector, this will result in a higher indicator. An explicit advantage of such approach is that the overall trend of regulatory complexity is easily captured whilst the volume of regulation can be compared across space and time in a relatively straightforward manner.

As a result, we are able to exploit a rich and novel dataset with time series of the complexity of regulation that economic sectors face across different subnational units in Spain. Thus, even if we exploit changes in the volume of regulations, we can rely on the fact that the general legal framework is common across regions. Therefore, our setting provides a unique advantage with respect to cross-national analyses in terms of the comparability between different observations.

The measurement of the volume of regulation in Spain is consistent with respect to other possible measures of "complexity" (readability and number of links) as both this research and the results of De Lucio and Mora-Sanguinetti (2022) show their consistency in Spain. Over time, all measures of complexity have increased hand in hand: the volume of regulation has increased, while its readability has decreased and the number of links has increased.

2.2. The economic relevance of regulatory "complexity"

Measuring complexity is useful from an economic analysis point of view, because it is an approximation of the cost of accessing or understanding the regulatory framework. This cost is higher as the volume and diversity of regulatory administrations increases. More recently, economic theory suggests that firms are more likely to violate regulations that they are unaware of or about which they have doubts as to whether or not they are in force (Bardhan 2002, Di Vita 2018). Not to mention that an institutional framework in which different administrations publishing norms coexist may lead to some costs of coordination and understanding of which norm to apply (Ellingsen 1998, Di Vita 2018).

In practical terms, it is conceivable that complexity translates into the need to contract legal assistance to analyze which regulations are applicable to a given transaction and a greater likelihood of having to pay penalties to administrations for non-compliance, which tends to increase transaction costs. In addition, a complex regulatory framework, for the above reasons, can generate litigiousness and increase congestion of judicial bodies, which implies numerous economic inefficiencies (Palumbo et al., 2013). Consistently, there is evidence specifically for Italy that would link increased regulatory complexity with excessive length of civil court proceedings (Di Vita, 2010). An excessive volume of regulation invokes potential penalties, contracting of legal aid and judicial expedience which can promulgate legal uncertainty. As will be discussed later, the costs of regulation may be proportionally more or less important or burdensome depending on the size of the firms. For example, it is conceivable that a small company may not have its own legal department to advise it, whereas a large company, whether it has in-house legal services or resources to pay for external legal services, may be more certain to face any change in the regulatory environment.

The findings emanating from the existing literature, particularly for the U.S, highlight negative effects of overly complex regulation that translates into both "direct" and "indirect" costs for economic agents. The "direct" costs refer to undesired changes in the behavior of economic agents and the costs incurred in complying with the regulation, such as contacts with the administration or the completion of documentation. The latter have been referred to in some literature as "administrative burdens" or red tape (Kox 2005, López et al. 2008).

The "indirect" ones have to do with inefficiencies, which may be generated by the actions (or by undesired changes in the functioning) of the public institutions themselves when they operate in contexts of greater regulatory complexity: there could be changes in the size of the public sector and the judicial system could see its congestion increase.

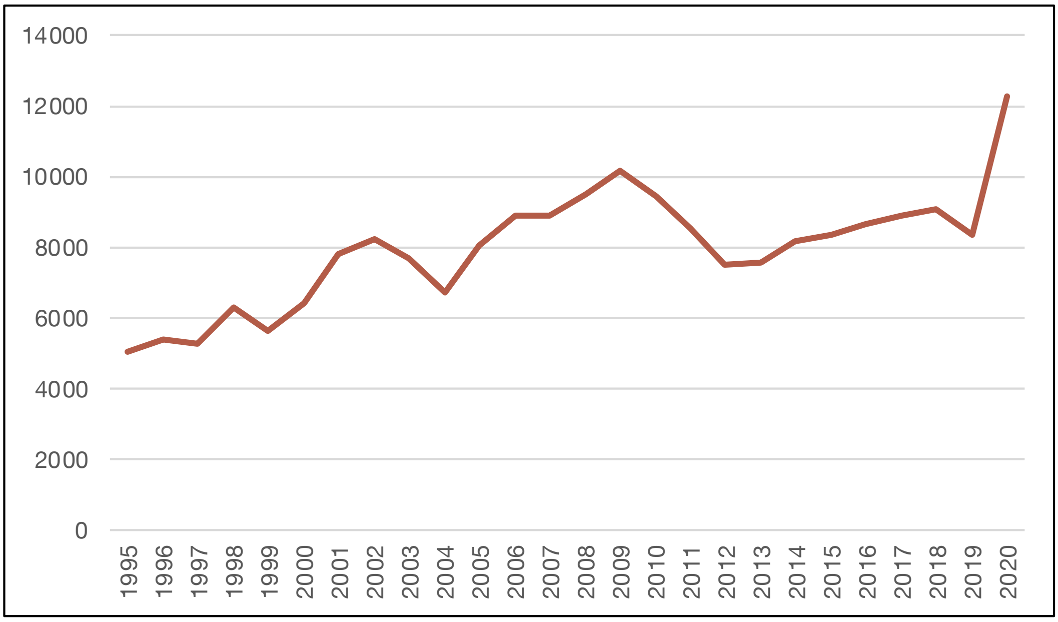
As for specific studies, Dawson and Seater (2013) found, for the case of the United States, that federal regulations added in the last 50 years would have reduced real GDP growth by about 2 percentage points on average in the period 1949-2005. In terms of further example, a study by Di Vita (2017) finds that regulatory complexity has a negative impact on GDP and regional GDP per capita in the case of Italy. More recently, Chambers et al. (2019) concluded that, in the case of the United States, a 10% increase in the effective federal regulatory burden increases the poverty rate by 2.5%.

From a sectoral point of view, which is the focus of this paper, it is worth noting that Bailey and Thomas (2017) showed that U.S. industries that are more intensely regulated experienced a lower rate of firm creation and lower employment growth. Also for the United States, Coffey et al. (2020) identified the sectors affected by regulations and concluded that economic growth in the United States has been held back by federal regulations by 0.8 % per year.

2.3. The intensity of regulatory complexity in Spain in focus

Our database contains 206,777 new norms enacted over the period 1995-2020.[8] Our set of regulatory indicators comes from Mora-Sanguinetti and Soler (2022). The quantity of new norms increased over time (see Figure 1), this is also the case by sectors and by regions. The regulation variable had a countercyclical behavior, this can be appreciated in the crisis period of 2008-2010 when more laws than usual were enacted, and especially in the period of the COVID crises, the year 2020.[9]

Figure 1: Evolution of the volume of total sector regulation (all Autonomous Communities)



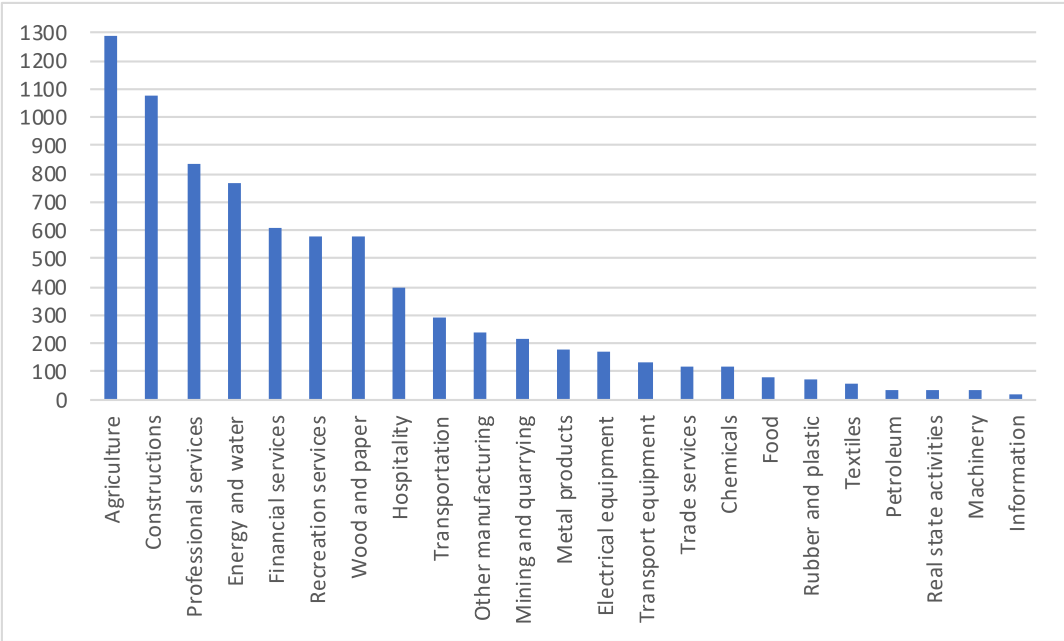
Source: Mora-Sanguinetti and Soler (2022)

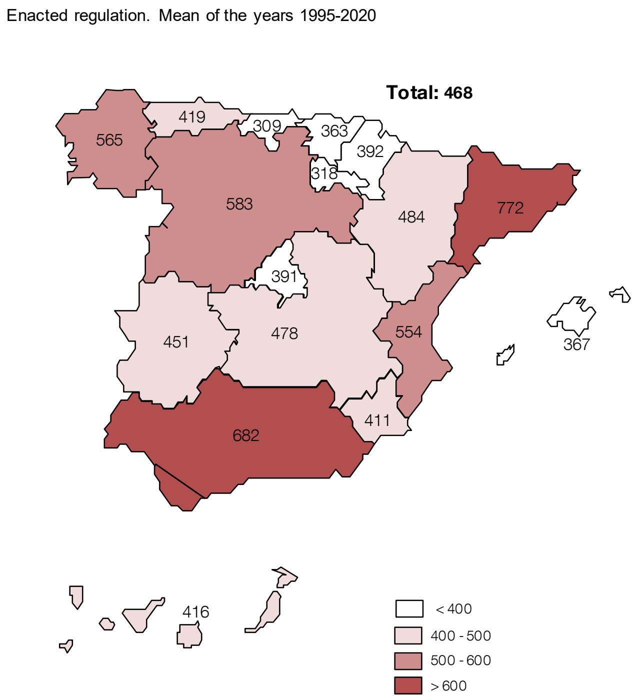
The regulation across different sectors is heterogeneous (see Figure 2). In general, service sectors and agriculture are more regulated than industrial sectors. Also, heterogeneity can be found across different regions, however it might be partially dampened since there is a minimal set of laws in each regions by the construction of the legal system (see in articles 148 and 150 of the Spanish Constitution).

[8] By way of reference, during this period, the Autonomous Communities adopted 219,903 norms (and all the administrations as a whole adopted 300,769). For the sake of completeness, it should be noted that the Autonomous Communities, in the entire democratic period (1979-2022) adopted 286,459 norms and the whole of all the administrations 414,272. See also Mora-Sanguinetti (2022).

[9] Precisely, the most affected sectors by the COVID, like hospitality, recreational services or textiles, were the ones with the biggest increase in the volume of new laws.

Figure 2: Average of total sectoral regulation per year. Graphic representation (map) of the period 1995-2020.





Source: own calculations.

Both the countercyclical behavior and the higher regulation of the service sectors and agriculture (in contrast with the industrial sectors) are consistent with the results from the OCDE Civil Justice Project (Palumbo et al. 2013).

3. Economic data and variables analysed

3.1. Aggregate economic data

As indicated above, this paper first analyses the impact of regulation on aggregate economic variables. Our set of dependent variables consists of five distinctive measures of sectoral composition: (i) employment-to-population ratio, (ii) total working hours, (iii) sectoral GDP share, (iv) labor intensity and (v) capital intensity. Raw economic data is obtained from the public data provided by the Spanish National Statistics Institute – INE. More specifically, the measure of employment-population ratio is constructed as a simple fraction of salaried employees per sector relative to the total population size of the autonomous community. Total working hours are counted at the level of the sector and include the hours of salaried employees whilst sectoral GDP share is computed as the ratio of sector-level value added relative to the total value added of the autonomous community. To capture labor intensity, we leverage labor-based compensation against sector-level value added. The resulting variable has the ability to capture sector-level reliance on labor inputs in the production of final output and may be easily comparable across space and time. In a similar vein, we compute capital intensity variable by leveraging sector-level gross-fixed capital investment against the value added of the respective sector. Without the loss of generality, capital intensity variable reflects the sector-level differences in the reliance on tangible assets in the production of final output and can be compared across autonomous communities, sectors as well as over time. The data on 13 different economic sectors[10] is considered using INE's classification scheme for 17 autonomous communities[11] for the period 2000-2020. Table 2 reports baseline descriptive statistics for our sample.

Table 2: Descriptive statistics on key measures

	Employment-to-population ratio	Total working hours	Sectoral GDP share	Labor intensity	Capital intensity
Mean	0.11	213,379	0.106	0.12	0.09
Standard deviation	0.09	307,575	0.072	0.09	0.07
Min	0.009	1040	0.001	0.0001	-0.001
Max	0.417	1,969,595	0.381	0.386	0.500

Source: Own elaboration based on INE data (2022).

The key variable of interest in our model is the intensity of regulatory complexity. We capture the level of complexity through the volume of new regulation observed across 23 different

[10] Agriculture, commerce, construction, energy and water, financial activities, light manufacturing, tourism and hospitality, extractive industries, information and telecommunications, professional activities, real estate, transport, recreation and leisure

[11] Andalusia, Aragon, Asturias, Balearic Islands, Canary Islands, Cantabria, Castilla La Mancha, Castilla y Leon, Catalonia, Extremadura, Galicia, La Rioja, Madrid, Murcia, Navarra, Basque Country, Valencian Community.

regulatory sectors[12] and full sample of considered autonomous communities. The data on the volume of new regulation is from Mora-Sanguinetti and Soler (2022).

It is worth noting that the INE-based data just varies over 13 sectors of activity instead of the 23 sectors of the regulation database. However, we can match these sectors and work with all of them at the same time. We thus construct a strongly balanced panel of 7,760 observations across merged sectors and autonomous communities for the period for the period 2000-2020.

3.2. Disaggregated economic data – DIRCE and MCVL

To analyse the impact of regulatory complexity according to the size and age characteristics of the companies, we use the merged Integrated Central Balance Sheet Data Office and the DIRCE databases [as it is used in González et al., (2022)] to obtain firm-level data: number of active firms as well as entry and exit rates. This data represents a quasi-universe of the Spanish economy, as it is documented in Albrizio et al. (2021). We also use data from the Continuous Work History Sample - *Muestra Continua de Vidas Laborales* (MCVL) which allows us to obtain information on the level of employment of different establishments according to the region in which their employees work. Table 3 summarizes the percentages that each category accounts for over the total number of companies and total employment. It can be seen that the number of small and medium-sized firms (less than 250 employees) accounted for almost all of the firms in the sample. However, once we look at the number of employees in each category the distribution is much more evenly distributed. Similarly, the number of firms started less than five years ago are the largest group, but have on average a smaller number of employees, which evens out the distribution of the number of jobs among different ones.

Table 3. Descriptive statistics on business demographics

Firm Size	Less than 10	10 to 49	50 to 250	More than 250
Share of firms	60.1%	30.1%	8.0%	1.2%
Share of employment	31.1%	27.3%	18.4%	23.4%
Firm Age	Less than 5	5 to 10	10 to 20	More than 20
Share of firms	45.0%	19.7%	21.8%	13.5%
Share of employment	21.7%	19.4%	29.7%	29.1%

Note: Average share of firms and employment in each category of firms between 2004 and 2018.
Sources: Integrated Central Balance Sheet Data Office (DIRCE) and Continuous Work History Sample (MCVL)

4. Aggregate economic effects of regulatory complexity

4.1. Identification strategy

The goal of our identification strategy is to estimate the contribution of regulatory complexity to sector-level economic outcomes consistently. Therefore, our aim is to estimate the set of specifications that

[12] Agriculture, mining and quarrying; food products, beverages and tobacco; textiles and wearing apparel; wood and paper products; coke and refined petroleum products; chemicals; rubber and plastics products; basic metals and fabricated metals; computer, electronic and optical products; machinery and equipment; transport equipment; other manufacturing, electricity, gas and water supply; construction; wholesale and retail services; transportation and storage services; accommodation and food services; information and communication services; financial and insurance services; real estate activities; professional, scientific and technical services; arts, entertainment and recreation services.

plausibly capture the effect of regulation on the variety of outcomes at the sectoral level. To this end, we estimate the set of multiple fixed-effects model specifications of the following form:

$$y_{i,j,t} = \hat{\pi}_0 + \hat{\lambda}_1 \cdot Q_{i,j,t} + \mathbf{X}'_{i,j,t}\hat{\beta} + \mu_{i\epsilon N} + \eta_{j\epsilon J} + \psi_{t\epsilon T} + \varepsilon_{i,j,t} \quad (1)$$

where y denotes the economic outcome in sector $i = 1,2, \dots N$ in the autonomous community $j = 1,2, \dots J$ over time $t = 1,2, \dots T$ where T represents the number of years in the sample. Our key treatment variable is Q which represents our measure of regulatory complexity, and $\hat{\lambda}_1$ is the corresponding key parameter of interest, and denotes the sector-level response to the change in regulatory complexity between time $t-1$ and t. Our model specification comprises three different layers of unobserved effects, which pose three distinctive sources of heterogeneity bias that is per se unobserved to the econometrician. In particular, μ denotes the full set of sector-fixed effects, η represents the full vector of autonomous community-fixed effects and ψ captures the full set of time-varying technology shocks common to all sectors. The stochastic disturbances are denoted by ε and capture the idiosyncratic transitory sector-level impulses.

As it was explained, our full panel comprises observations of sectoral economic outcomes both across autonomous communities and over time, which invokes a higher dimensionality of the panel, compared to standard two-way fixed-effects setup. To capture the multi-way dimensionality of our panel, we estimate structural equation (1) by implementing Guimarães and Portugal (2010) and Correia (2016) partitioning algorithm which provides us the exact least-squares solution to estimate the full set of structural coefficients. In doing so, we estimate the full vector of coefficients from exact least-square solutions by relying on Gauss-Seidel-Liebmann method (Seidel, 1874). The method is known for its ability to use successive displacement approach to solve a system of linear equations through an iterative procedure. The method can be applied to any policy matrix with non-zero elements on the diagonal. More specifically, the matrix of non-zero values is decomposed into two components: (i) lower triangular component and (ii) strictly upper triangular component through a simple iterative decomposition. Compared to the standard Jabobi matrix, a single storage vector is required which implies that many elements can be iteratively overwritten. This is particularly advantageous for systems involving complex and large policy matrices. Convergence of the method is guaranteed by the shape of matrix which can be either strictly positive-definite or irreducibly diagonally dominant. We rely on this approach for two major reasons. First, the successive displacement of the parameters from the observed matrix ensures a steady, fast and efficient computation of the parameters which favorably reduces the biases typically encountered in least-square solutions. And second, by iteratively learning the value of the successive policy parameter, the noise is partially teased out from the signal of the underlying parameter on the regulatory impact which, in turn, tends to reduce measurement error and renders the parameter more reliable, further mitigating the extent of omitted variable bias. Suppose that $\widehat{\lambda_1}$ is given as a closed-form solution:

$$\hat{\lambda}_1 = \frac{\sum_{i=1}^{n}(Q_i - \bar{Q})(y_i - \bar{y})}{\sum_{i=1}^{n}(Q_i - \bar{Q})^2} \quad (2)$$

Where $\bar{y}$ denotes the mean value of the outcome of interest. By simultaneously controlling for the heterogeneity bias induced by autonomous community-level unobserved effects and time-fixed effects, we solve for $\hat{\lambda}_1$ using the partitioning algorithm in four distinctive steps:

Step #1: Initialize $\lambda_1^{(0)}, \lambda_2^{(0)}, \dots, \lambda_k^{(0)}$

Step #2: Partially differentiate $\frac{\partial \sum_{i=1}^{n}(y_i - \bar{y})}{\partial \lambda_1} = \sum_{i=1}^{n} Q_{1i}(y_i - \mathbf{X}'\hat{\beta}) = 0$ to solve for $\lambda_1^{(1)}$

Step #3: Partially differentiate $\frac{\partial \sum_{i=1}^{n}(y_i - \bar{y})}{\partial \lambda_2} = \sum_{i=1}^{n} Q_{2i}(y_i - \mathbf{X}'\hat{\beta}) = 0$ to solve for $\lambda_2^{(1)}$

Step #4: Repeat until the full convergence is achieved.

Where Gauss-Seidel algorithm provides stable and slow iteration of the likelihood function depending on the strength of correlation between parameter estimators, and does not require a full-fledged calculation of the inverse of coefficient matrices. It can be easily extended to maximum likelihood or other forms of non-linear estimation (Smyth, 1996).

One major caveat behind multi-way fixed effects estimation of (1) invokes the static effect of regulatory complexity on sectoral economic outcomes. Since sequential exogeneity assumption behind Q is easily violated, we compute the dynamic effect of regulatory complexity by estimating the series of dynamic panel-level specifications of the following form (see equation 3):

$$y_{i,j,t} = \sum_{t=1}^{k} y_{i,j,t-k}\delta_k + \hat{\lambda}_1 \cdot Q_{i,j,t} + \mathbf{X}'_{i,j,t}\hat{\beta} + \mu_{i\epsilon N} + \eta_{j\epsilon J} + \psi_{t\epsilon T} + \varepsilon_{i,j,t} \quad (3)$$

where δ_k denotes the set of coefficients on k-th lag of the sector-level economic outcome. The key advantage of the dynamic specification is that $\hat{\lambda}_1$ is estimated in the presence of the non-zero covariance between the full set of unobserved effects and finite lag of the dependent variable. We estimate an extensive battery of specifications by making use of the Arellano and Bond (1991) dynamic panel-level estimator. The second advantage is that short-term and long-term effect of regulatory complexity can be empirically disentangled. Whilst $\hat{\lambda}$ captures short-term effect of the regulatory complexity, the long-term effect is computed as follows:

$$\lambda_1^{Long-Run} = \frac{\hat{\lambda}_1}{1-\sum_{t=1}^{k} \delta_k} \quad (4)$$

where $\lambda_1^{Long-Run}$ denotes the long-run effect of regulatory complexity conditional on the past outcome dynamics captured by $\sum_{t=1}^{k} \delta_k$. It should be noted that the comparison between $\lambda_1^{Long-Run}$ and $\hat{\lambda}_1$ may reveal the influence of economic cycle on the overall effect. For instance, if $\lambda_1^{Long-Run} > \hat{\lambda}_1$, short-run cyclical component appears to be somewhat less important in the overall effect than long-run deterministic components of the regulatory complexity. By contrast, if $\lambda_1^{\widehat{Long-Run}} < \lambda_1$, the short-run effect of regulatory complexity exceeds its long-run counterpart, and thus indicatively suggests that a more complex regulatory framework may have pronounced short-run effect whilst dissipating beyond the short-run horizon.

4.2. Results

Table 4 provides a summary of the results. Column (1) shows the estimated effect of regulatory complexity on employment-to-population rate. The evidence suggests that greater regulatory complexity has a dampening effect on employment rate. In particular, each additional regulatory case is associated with 0.7 percent drop in the sector-level employment share, ceteris paribus. Estimates in column (2) suggest no effect of regulatory complexity on total working hours. By contrast, the evidence from column (3) indicate a marked increase in sectoral-level GDP share in response to an augmented regulatory complexity. The estimated structural coefficient is both large and statistically significant. A reduction in employment rate amid an expansion of GDP participation may invariably suggest that expansive regulation may facilitate a classical labor-augmenting technological change where expensive inputs such as labor are replaced by feasible substitutes. Columns (4) and (5) indicate important compositional differences in sectoral structure in response to increasing regulatory complexity. Point estimate in column (4) suggests that each additional regulatory case decreases labor intensity (i.e. proxied by the output share of wages) considerably. The estimated magnitude indicates 0.1 percent drop in sector-level labor intensity in response to augmented regulatory complexity. In a similar vein, the estimated coefficient in column (5) indicates a small but pervasive reduction in sector-level capital intensity in response to increasing regulatory backlog. In particular, each additional regulatory case is associated with around 0.08 percent drop in the sector-level capital intensity (i.e. proxied by sector-level investment rate). The estimated coefficient is statistically significant at 1%, respectively. Without the loss of generality, the estimate in column (5) implies that additional regulation tends to distort investment rates. Although the estimated effect is not large, it appears to be statistically significant at conventional level. Hence, our preliminary results indicate several distortionary sector-level effects of increasing regulatory complexity highlighted by reduced employment rates, markedly lower labor intensity and decreased sector-level investment rates, which confirm that expansive regulatory complexity entails non-trivial sector-level costs. Whilst the effect on the overall productivity is not negative, distortionary effects of regulatory complexity materialize through compositional differences mainly through reduced wages and sector-level investment rate.

Table 4: Fixed-effects estimated relationship between regulatory complexity and sectoral productivity and composition

	Employment-to-population ratio	Total working hours	Sectoral GDP share	Labor intensity	Capital intensity
	(1)	(2)	(3)	(4)	(5)
$\hat{\lambda}_1$	-.007***	.002	.003**	-.001***	-.0008***
	(.001)	(.002)	(.001)	(.0001)	(.0001)
# observations	7,312	7,758	7,312	7,760	7,388
Adj. R^2	0.07	0.01	0.05	0.12	0.13
Dyadic cluster	INE-CNAE	INE-CNAE	INE-CNAE	INE-CNAE	INE-CNAE
# dyadic clusters	221	221	221	221	221

Notes: the table presents the effect of regulatory complexity on sector-level economic outcomes across 13 economic sectors and 23 regulatory sectors and 17 autonomous communities in Spain in the period 1995-2020. Standard errors are adjusted for serially correlated stochastic disturbances and heteroskedastic distribution of random error variance using finite-sample adjustment of the empirical distribution function through the multi-way error component model across 221 dyadic clusters that correspond to sector-autonomous community-year paired observation. Standard errors are denoted in the parentheses. Asterisks denote statistically significant coefficients at 10% (*), 5% (**) and 1% (***), respectively.

Source: Self elaboration.

By way of example, our estimates convey important insights into the sector-level magnitudes of changes in the underlying outcomes in response to a more complex regulation. Evaluating our point estimates at the mean values highlights reasonably large negative impacts of more expansive regulation on sector-level outcomes. For instance, expanding the index of regulatory complexity by the average rate of growth in the region with lowest expansion up to the present day (i.e. Madrid) implies that employment-to-population ratio would drop by 0.07 percent (=-0.007×0.109). In the regions with the highest average growth rate of regulatory complexity (i.e. Castilla La Mancha), the employment-to-population ratio would decrease by 0.2 percentage points (=0.007×2.87), respectively. Similar and pervasive deterioration of sector-level outcomes is perceptible elsewhere. For instance, labor intensity drops by 0.1 percent (=-0.01×0.109) in Madrid opposed to 0.2 percent in Castilla La Mancha, if the regulatory volume continually increases at the average rate. Somewhat similar but smaller decrease are evident with respect to capital intensity.

5. Disaggregated economic effects of regulatory complexity

5.1. Employment and business demographics

As emphasized above, another relevant dimension of the relationship between the complexity of regulation and economic performance as its heterogeneous impact across different types / classifications of firms. In this section we analyse the correlation between the measure of regulatory complexity and the economic performance of different economic sectors in Spanish autonomous communities. We investigate whether when a sector located in an autonomous community faces an increase in regulatory complexity employment or business demographics are affected in the following periods. Our units of analysis are the 23 different sectors located in each of the 17 regions of Spain. For each of the observations we compute annual changes in the level of employment, as well as changes in the number of active firms and the ratio of firm entry and exit. We regress each of the different economic performance variables on the (log) number of new regulations introduced over the previous year affecting a sector in a particular region.

In our specification we also include a larger set of fixed effects. The first of these fixed effects are sector-region fixed effects (γ_{sr}), such that we control for all unobservable characteristics of a sector in a region that might be related to an endogenous change in the regulation they face. In addition, we include sector-year (γ_{rt}) and region-year fixed effects (γ_{rt}), so that we can control for potential changes in regulation due to changes in the economic situation of a sector or region (see equation 5). In this way, any threat to the exogeneity of the effect of regulatory complexity should have a variation at the sector, region and year level, simultaneously affecting economic performance and the number of new rules affecting the sector and region in the year. Thus, we estimate a compact fixed-effects specification as follows:

$$\Delta y_{srt} = \gamma \cdot \Delta RegCompl_{srt-1} + \gamma_{sr} + \gamma_{st} + \gamma_{rt} + \varepsilon_{srt} \quad (5)$$

where our key variable of interest is $\Delta RegCompl$ which denotes the first-differenced regulatory complexity variable and the key parameter of interest is γ which captures the contribution of regulatory complexity to sector-level economic performance. The variable ε_{srt} denotes stochastic disturbances, capturing transitory shocks to the sector-level performance trajectories. Standard errors are adjusted for serially correlated stochastic disturbances using finite-sample adjustment of the empirical distribution function through the multi-way error component model at the sector- and year-level applying Cameron et. al. (2011) multi-way clustering scheme. Table 5 shows the regression results for the change in employment, the number of firms and the change in the rate of firm entry and exit. The evidence clearly shows that there is a negative relationship between the level of regulatory complexity and economic performance. Column (1) shows that a sector located in a region facing 10% more new regulations reduces employment in the following year by 0.28% with respect to the same sector located in the rest of the regions. For analysing the firms' extensive margin, we also look at the number of firms, the entry rate and the exit rate for each sector-region-year group. The evidence uncovers a significant relationship between a higher complexity of regulation and a lower number of firms in the economy. This aggregate result is consistent with the finding in Mora-Sanguinetti and Pérez-Valls (2021). It seems that most of this effect is caused by a lower entry rate of firms, and not through a higher exit rate. This means that a higher complexity in the regulation prevents firms to enter to the market and, as a result, there are less firms in the market. In particular, an additional 10% of new regulations lowers the entry rate of a sector-region by around 1.7 percentage points. For example, if Andalusia and Catalonia (the two autonomous communities with the highest regulatory complexity) had the same number of additional regulations as Madrid or the Basque Country (the two autonomous communities with the lowest regulatory complexity), the former would have a 1.41% higher level of employment and a 0.25% higher number of firms.

Table 5: Effects of regulation on sector-region performance

VARIABLES	Employment (log changes)	Firm density (log changes)	Entry rate (difference)	Exit rate (difference)
	(1)	(2)	(3)	(4)
Regulation (t-1)	-0.0281***	-0.00507**	-0.167***	-0.0495
	(0.00887)	(0.00234)	(0.0356)	(0.0447)
# observations	3,687	4,187	4,187	4,187
R^2	0.286	0.845	0.278	0.440

Notes: the table presents the effect of regulatory complexity on sector-region-year-level firms' dynamics across 23 regulatory sectors and 17 autonomous communities in Spain in the period 2004-2018. The dependent variables are the log change of employment between *t* and *t-1*, log change of number of firms between t and t-1, and the difference in the rate of entry and exit of firms between t and t-1. The independent variable is the log of the number of new regulations introduced at t-1. The specification includes sector-region, sector-year and region-year fixed effects. Standard errors are two-way clustered by sector and region and denoted in the parentheses. Asterisks denote statistically significant coefficients at 10% (*), 5% (**) and 1% (***), respectively.

5.2. *Heterogeneity analysis: firm size and firm age*

Another relevant dimension of the relationship between the complexity of regulation and economic performance is its heterogeneous impact across different types of firms. Even if this heterogeneity might arise along many firm characteristics, two one of the most prominent are firm size and firm age. As it was discussed in Section 2.2. the burden of dealing with additional regulations might be relatively heavier for smaller firms that for larger-size firms that may have advantages in terms of scale or corporate legal infrastructure. Following the spirit in the previous section, we compare the evolution of employment of different economic sectors across different regions and its reaction to changes in the level of regulation that each particular sector-region faces. However, this section takes differentiated regressions for the labor employed by firms of different sizes. We use a time panel (Continuous Work History Sample - *Muestra Continua de Vidas Laborales* -MCVL- from the INE) with worker-level information on employment, industry, location, and employer characteristics to compute the number of workers employed by less than 10, between 10 and 50, between 50 and 250, and more than 250-employee firms. Table 6 shows the elasticity between the number of new regulations affecting a sector in a particular region and the change in employment in the following year by firms in each of the size brackets.

Table 6: Effects of regulation on sector-region performance

	(1)	(2)	(3)	(4)
Panel A: Effect heterogeneity by firm size				
Firm Size	Less than 10 employees	10 to 49 employees	50 to 250 employees	More than 250 employees
Regulation (t-1)	-0.0494**	-0.0481**	-0.0124	0.00755
	(0.0195)	(0.0210)	(0.0182)	(0.0147)
# observations	3,663	3,686	3,954	2,762
R^2	0.205	0.274	0.226	0.328
Panel B: Effect heterogeneity by firm age				
Firm Age	Less than 5 years	5 to 10 years	10 to 20 years	More than 20 years
Regulation (t-1)	-0.0912**	-0.0452**	-0.0162	-0.00790
	(0.0411)	(0.0207)	(0.0161)	(0.0111)
# observations	3,298	3,348	3,483	3,537
R^2	0.316	0.242	0.271	0.278

Notes: the table presents the effect of regulatory complexity on sector-level economic outcomes by firm-size across 23 regulatory sectors and 17 autonomous communities in Spain in the period 2004-2018. The dependent variable is the log change in employment in the corresponding sector, region and firm-size or firm-age group in year t. The independent variable is the log of new regulation observations for each sector and region in year t-1. The specification includes sector-region, sector-year and region-year fixed effects. Standard errors are two-way clustered sector and region. Standard errors are denoted in the parentheses. Asterisks denote statistically significant coefficients at 10% (*), 5% (**) and 1% (***), respectively.

The negative effects of rising complexity of regulation concentrate in smaller and younger firms. If a particular sector-region pair faces an additional 10% of new regulations, there is a 0.5% relative fall in the number of workers employed by firms with less than 10 employees. The hit is also significant among the employment by firms with less than 50 employees. On the other hand, when larger firms face a higher volume of regulation, their employment levels are not affected. A similar relationship arises with respect to firms age. Table 6 shows that the negative impact of rising complexity of regulation impacts mainly younger firms, while the employment in firms with longer tenure does not react to additional regulations.

5.3. *Heterogeneity analysis: economic impacts by sector of activity*

Another potentially relevant dimension of heterogeneity is the different branches of activity of the economy. Until now, our analysis has worked with the assumption of a homogeneous effect on the different sectors. Table 7 deals with this aspect by running the regressions of changes in employment on changes in regulatory complexity, grouping the 23 economic sectors into three large groups: agriculture and extractive sectors, manufacturing and services. The results in Table 7 show that the increase in regulatory complexity has negative effects on employment in the different economic sectors. Importantly, while there are differences among the estimates for the three major groups, they remain within the same order of magnitude. This fact underscores the importance of regulatory complexity on the economy, given that its effects occur on every part of the economy. Among the three groups, the one on which the effect of regulatory complexity is most pronounced is the manufacturing sector. The magnitude of the effect is 50% greater than in the case of the service sectors. For agriculture the estimator is similar, although the estimate is subject to a larger estimation error. The fact that manufacturing sectors are more affected by regulatory complexity may be related to the higher investment required by these sectors. This result is consistent with other papers that point out that deficiencies in the design (or functioning) of an economy's institutional framework have particularly negative impacts on investment in assets. Specifically, it is worth mentioning this discussion in the case of weak enforcement mechanisms (Dejuán and Mora-Sanguinetti, 2021). It is known that sectors of activity differ relevantly in their dependence on knowledge or intangible assets (OECD 2017, Corrado et al. 2009).

Table 7: Effects of regulation on sector-region performance

Economic sectors	Agriculture	Manufacturing	Services
	(1)	(2)	(3)
Regulation (t-1)	-0.0202	-0.0291**	-0.0187***
	(0.0134)	(0.0138)	(0.00714)
# observations	372	1,872	1,620
R^2	0.588	0.355	0.172

Notes: the table presents the effect of regulatory complexity on sector-level economic outcomes by firm-size across 23 regulatory sectors and 17 autonomous communities in Spain in the period 2004-2018. The dependent variable is the log change in employment in the corresponding sector, region and macro sector group in year t. The independent variable is the log of new regulation observations for each sector and region in year t-1. The specification includes sector-region, sector-year and region-year fixed effects. Standard errors are two-way clustered sector and region. Standard errors are denoted in the parentheses. Asterisks denote statistically significant coefficients at 10% (*), 5% (**) and 1% (***), respectively.

6. Conclusion

This paper analyzed, in empirical terms, whether sectoral regulation and its complexity generate positive or negative impacts on economic activity. To the best of our knowledge, with the exception for the case of the U.S., analysis of the economic impacts of regulation, with disaggregated databases at the sector level, has not yet been addressed. Our analysis focuses on the case of Spain, relying on a novel database that classified 206,777 regulations by sector of activity and by Spanish region over the period 1995-2020. A descriptive analysis of the database shows that regulation and its complexity has been increasing in recent decades but that it is diverse at the sector level, by region and appears to be sensitive to the economic cycle.

The preliminary evidence suggests that greater regulatory complexity has a dampening effect on employment rate and has a negative impact on value added. In particular, each additional increase in regulatory complexity index is associated with 0.7 percent drop in the sector-level employment share, *ceteris paribus*. The effect on employment is consistent with the finding of Bailey and Thomas (2017) for the US, which showed that US industries that are more intensely regulated experienced lower employment growth.

Secondly, when we make use of disaggregated data (MCVL), exploiting information on employment by firms' characteristics, we show that the negative impact of the complexity of regulation concentrates on smaller and younger firms. A 10% of new regulations is related to a 0.5% relative fall in the number of workers employed by firms with less than 10 employees. At the sector level, the group of sectors most affected is manufacturing. The magnitude of the effect is 50% greater than in the case of the services sector.

The analysis of the channels through which these effects are observed is part of the future research agenda, but it is worth mentioning that the costs of regulation may be proportionally more or less important or burdensome depending on the size of the firms. For example, it is conceivable that a small company may not have its own legal department to advise it, whereas a large company, whether it has in-house legal services or resources to pay for external legal services, may be more certain to face any change in the regulatory environment. On the other hand, the higher sensitivity to regulatory uncertainty that seems to be observed in manufacturing sectors may depend on their greater dependence on capitalization investment, especially intangible investment. This is more difficult to regulate and protect (in terms of enforcement) in a manner consistent with previous results in the literature.

From a public administration and public management point of view, this research project provides useful information for the debate on the importance (and consequences) of "Better regulation" (see, among others, Betancor, 2009 or European Commission, 2015) and sets out a strategy for analysing the *ex post* consequences of regulation (Doménech Pascual, 2005).

References

Acemoglu, Daron, Simon Johnson and James A. Robinson. (2005). “Institutions as a fundamental cause of long-run growth”. In P. Aghion and S. N. Durlauf (eds.), *Handbook of Economic Growth*. Elsevier, Vol. 1, pp. 385-472.

Afonso, Oscar. (2022). “The impact of institutions on economic growth in OECD countries”. *Applied Economics Letters,* 29(1), pp. 63-67.

Albrizio, Silvia, Beatriz González and Dmitry Khametshin. (2021). “A Tale of Two Margins: Monetary Policy and Capital Misallocation in Spain”. Working Paper.

Arellano, Manuel, and Stephen Bond. (1991). “Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations”. *The Review of Economic Studies,* 58(2), pp. 277-297.

Bailey, James B., and Diana W. Thomas. (2017). “Regulating away competition: The effect of regulation on entrepreneurship and employment”. *Journal of Regulatory Economics,* 52(3), pp. 237-254.

Bardhan, Pranab. (2002). “Decentralization of governance and development”. *Journal of Economic Perspectives,* 16(4), pp. 185-205.

Betancor, Andrés. (2009). *Mejorar la regulación. Una guía de razones y de medios.* Colección Fundación Rafael del Pino - Marcial Pons.

Bischoff, Ivo, and Armin Bohnet. (2000). “Gesamtwirtschaftliche Transaktionskosten und wirtschaftliches Wachstum”. *Jahrbücher für Nationalökonomie und Statistik,* 220(4), pp. 419-437.

Cameron, A. Colin, Jonah B. Gelbach and Douglas L. Miller. (2011). “Robust inference with multiway clustering”. *Journal of Business & Economic Statistics,* 29(2), pp. 238-249.

Chambers, Dustin, Patrick A. McLaughlin and Laura Stanley. (2019). “Regulation and poverty: an empirical examination of the relationship between the incidence of federal regulation and the occurrence of poverty across the US states”. *Public Choice,* 180(1-2), pp. 131-144.

Coffey, Bentley, Patrick A. McLaughlin and Pietro Peretto. (2020). “The cumulative cost of regulations”. *Review of Economic Dynamics,* 38, pp. 1-21.

Corrado, Carol, Charles Hulten and Daniel Sichel. (2009). “Intangible capital and US economic growth”. *Review of Income and Wealth,* 55(3), pp. 661-685.

Correia, Sergio. (2016). *A feasible estimator for linear models with multi-way fixed effects.* Pre-print. http://scorreia.com/research/hdfe.pdf

Dawson, John W., and John J. Seater. (2013). “Federal regulation and aggregate economic growth”. *Journal of Economic Growth,* 18, pp. 137-177.

Dejuan-Bitria, Daniel, and Juan S. Mora-Sanguinetti. (2021). “Which legal procedure affects business investment most, and which companies are most sensitive? Evidence from microdata”. *Economic Modelling,* 94, pp. 201-220.

Di Vita, Giuseppe. (2010). “Production of Laws and Delay in Court Decisions”. *International Review of Law and Economics,* 30(3), pp. 276-281.

Di Vita, Giuseppe. (2018). “Institutional quality and the growth rates of the Italian regions: The costs of regulatory complexity”. *Papers in Regional Science,* 97(4), pp. 1057-1081.

Di Vita, Giuseppe, and Livio Ferrante. (2021). “Is the Legislative Complexity a Constraint to the Convergence of the per Capita GDP across Italian Regions? An Econometric Analysis”. *European Journal of Law and Economics,* 51, pp. 541-561.

Djankov, Simeon, Caralee McLiesh and Rita Maria Ramalho. (2006). “Regulation and growth”. *Economics Letters,* 92(3), pp. 395-401.

Doménech Pascual, Gabriel. (2005). “El seguimiento de normas y actos jurídicos”. *Revista de Administración Pública,* 167, mayo-agosto.

Doménech Pascual, Gabriel. (2014). “Por qué y cómo hacer análisis económico del Derecho”. *Revista de Administración Pública,* 195, septiembre-diciembre.

Econlaw Strategic Consulting. (2009). *Evolución de la actividad regulatoria en España 1978-2008: Descentralización y comunidades autónomas.* Econlaw.

Ellingsen, Tore. (1998). “Externalities vs. internalities: A model of political integration”. *Journal of Public Economics,* 68(2), pp. 251-268.

European Commission (2015). *Communication from the commission to the European parliament, the council, the European economic and social committee and the committee of the regions. Better regulation for better results - An EU agenda.* Strasbourg, 19.5.2015. COM(2015) 215 final.

Fatás, Antonio, and Ilian Mihov. (2013). “Policy volatility, institutions, and economic growth”. *Review of Economics and Statistics,* 95(2), pp. 362-376.

Friedman, Milton. (2004). “Freedom’s Friend”. *Wall Street Journal*. June 11.

González, Beatriz, Enrique Moral-Benito and Isabel Soler. (2022). “Schumpeter Meets Goldilocks: the Scarring Effects of Firm Destruction”. Documentos Ocasionales - Banco de España, 2216. https://www.bde.es/f/webbde/SES/Secciones/Publicaciones/PublicacionesSeriadas/DocumentosOcasionales/22/Files/do2216e/do2216e.pdf.

Gratton, Gabriele, Luigi Guiso, Claudio Michelacci and Massimo Morelli. (2021). “From Weber to Kafka: Political instability and the overproduction of laws”. *American Economic Review,* 111(9), pp. 2964-3003.

Guimaraes, Paulo, and Pedro Portugal. (2010). “A simple feasible procedure to fit models with high-dimensional fixed effects”. *The Stata Journal,* 10(4), pp. 628-649.

Hall, Robert E., and Charles I. Jones. (1999). “Why do some countries produce so much more output per worker than others?”. *The Quarterly Journal of Economics,* 114(1), pp. 83-116.

Helpman, Elhanan (ed.). (2008). *Institutions and economic performance.* Harvard University Press.

Henisz, Witold J. (2000). “The institutional environment for economic growth”. *Economics & Politics,* 12(1), pp. 1-31.

Jalilian, Hossein, Colin Kirkpatrick and David Parker. (2007). “The impact of regulation on economic growth in developing countries: A cross-country analysis”. *World Development,* 35(1), pp. 87-103.

Kirchner, Stephen. (2012). "Federal legislative activism in Australia: A new approach to testing Wagner's law". *Public Choice,* 153(3-4), pp. 375-392.

Kovač, Mitja, and Rok Spruk. (2016). "Institutional development, transaction costs and economic growth: evidence from a cross-country investigation". *Journal of Institutional Economics,* 12(1), pp. 129-159.

Kox, Henk L. M. (2005). "Intra-EU Differences in Regulation-caused Administrative Burden for Companies". *CPB Netherlands Bureau for Economic Policy Analysis Memorandum,* 136, Rev. 1.

López, Paloma, Ángel Estrada and Carlos Thomas. (2008). "Una primera estimación del impacto económico de una reducción de las cargas administrativas en España". *Boletín Económico - Banco de España,* julio-agosto. https://repositorio.bde.es/bitstream/123456789/1291/1/art1.pdf

Lucio, Juan de, and Juan S. Mora-Sanguinetti. (2022). "Drafting 'better regulation': the economic cost of regulatory complexity". *Journal of Policy Modeling*. https://doi.org/10.1016/j.jpolmod.2021.10.003

Marcos, Francisco, Juan Santaló and Albert Sánchez-Graells. (2010). "Measuring regulatory intensity by the Spanish regions (1978-2009)". IE Business School Working Paper DE8132I.

McLaughlin, P. A., O. Sherouse, D. Francis, J. Nelson, T. Powers, W. Stover and J. Broughel. (2019). *StateReg Data, QuantGov.* Mercatus Center, George Mason University.

Montalvo Jääskeläinen, Federico de. (2016). "Potestad legislativa y evaluación *ex post* de las normas: hacia un mejor Parlamento a través de la regulación inteligente". *Revista de las Cortes Generales,* 97-99, pp. 79-184.

Mora-Sanguinetti, Juan S. (2019). "La 'complejidad' de la regulación española. ¿Cómo medirla? ¿Qué impacto económico tiene?". *Revista ICE, 907* (marzo-abril), pp. 147-162 [Sección Tribuna de Economía].

Mora-Sanguinetti, Juan S. (2022). "Las cuatrocientas mil normas de la democracia española. Cuantificación e impacto de la complejidad normativa de España". *Revista de las Cortes Generales,* 114, pp. 231-253. https://doi.org/10.33426/rcg/2022/114/1722

Mora-Sanguinetti, Juan S., and Ricardo Pérez-Valls. (2021). "How does regulatory complexity affect business demography? Evidence from Spain". *European Journal of Law & Economics,* 51, pp. 203-242.

Mora-Sanguinetti, Juan S., and Isabel Soler. (2022). "La regulación sectorial en España. Resultados cuantitativos". Documentos de Trabajo - Banco de España, 2202. https://www.bde.es/f/webbde/SES/Secciones/Publicaciones/PublicacionesSeriadas/DocumentosTrabajo/22/Fich/dt2202.pdf

Mora-Sanguinetti, Juan S., and Rok Spruk. (2018). "Industry vs services: do enforcement institutions matter for specialization patterns? Disaggregated evidence from Spain". Documentos de Trabajo - Banco de España, 1812. https://repositorio.bde.es/bitstream/123456789/7312/1/dt1812e.pdf

North, Douglass C. (1981). *Structure and Change in Economic History*. Norton.

North, Douglass C. (1990a). *Institutions, institutional change and economic performance.* Cambridge University Press.

North, Douglass C. (1990b). "A transaction cost theory of politics". *Journal of Theoretical Politics,* 2(4), pp. 355-367.

North, Douglass C. (1999). "Understanding the process of economic change". Occasional Paper - IEA (Institute of Economic Affairs), 106.

OECD. (2017). *OECD Science, Technology and Industry Scoreboard 2017: the Digital Transformation.* OECD Publishing.

Ogus, Anthony I. (2004). *Regulation: Legal Form and Economic Theory.* Bloomsbury Publishing.

Palumbo, Giuliana, Giulia Giupponi, Luca Nunziata and Juan S. Mora-Sanguinetti. (2013). "The Economics of Civil Justice: New Cross-Country Data and Empirics". OECD Economics Department Working Papers, 1060.

Peltzman, Sam, Michael E. Levine and Roger G. Noll. (1989). "The economic theory of regulation after a decade of deregulation". *Brookings Papers on Economic Activity, Microeconomics.* Brookings Institution, pp. 1-59.

Rodrik, Dani. (2000). "Institutions for high-quality growth: what they are and how to acquire them". *Studies in Comparative International Development*, 35(3), pp. 3-31.

Seidel, Philipp Ludwig. (1873). "Über ein Verfahren, die Gleichungen, auf welche die Methode der kleinsten Quadrate führt, sowie lineäre Gleichungen überhaupt, durch successive Annäherung aufzulösen", Vol. 11. *Abhandlungen der Mathematisch-Physikalischen Classe der Königlich Bayerischen Akademie der Wissenschaften.* Verlag der Akademie.

Smyth, Gordon K. (1996). "Partitioned algorithms for maximum likelihood and other non-linear estimation". *Statistics and Computing,* 6(3), pp. 201-216.

Wallis, John J., and Douglass North. (1986). "Measuring the transaction sector in the American economy, 1870-1970". In S. Engerman and R. E. Galman (eds.), *Long-Term Factors in American Economic Growth.* University of Chicago Press, pp. 95-162.

Waltl, Bernhard, and Florian Matthes. (2014). "Towards Measures of Complexity: Applying Structural and Linguistic Metrics to German Laws". *Jurix, International Conference on Legal Knowledge and Information Systems.*

Yang, Xiaokai, and Jeff Borland. (1991). A microeconomic mechanism for economic growth. *Journal of Political Economy,* 99(3), pp. 460-482.