

COVID 19



Nuevas dinámicas del mercado laboral tras el confinamiento en Andalucía: el empleo del futuro post-Covid 19 y respuesta a nuevos confinamientos

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Analysis of firm survival during the first year of COVID-19 in Spain

Javier García Clemente & Jesús Rodríguez

Abstract

We analyze the aggregated survival rates of more than a million employer units followed quarterly from April 1st, 2020 to April 1st, 2021, using new data from the experimental statistics of Demographic Situation of Companies (CODEM), by the Spanish National Statistics Institute (INE). This approach makes use of fractional regression methods to explain the survival rate by the region, sector, size of the company and whether or not a Short Time Work Compensation Scheme (named ERTE in Spain) had been adopted. Our main results show that the survival rate were significantly higher in those companies where an ERTE was adopted. Nevertheless, this effect was not homogeneous, particularly benefiting the most vulnerable firms. These firms were, as expected, the smallest (from 1 to 5 employees) and the ones which operate in some service sectors related to leisure, education, tourism and hospitality. Additionally, some unobserved heterogeneity among regions have been considered too, suggesting Balearic and Andalusian firms to be the most likely to close.

JEL classification: E65, L20, L50, D20, H32.

Keywords: Company survival, Covid19, ERTE, STWS, business closings.

Resumen

En este trabajo analizamos las tasas de supervivencia agregadas de más de un millón de unidades empleadoras, seguidas trimestralmente desde abril de 2020 hasta abril de 2021, con datos de la nueva estadística sobre Situación Demográfica de Empresas (CODEM), del Instituto Nacional de Estadística (INE). Para ello, utilizamos métodos de regresión fraccional con el objetivo de explicar la tasa de supervivencia empresarial por regiones, sectores, tamaño de empresa y si estas se acogieron a un Expediente de Regulación Temporal de Empleo (ERTE). Los principales resultados muestran que la tasa de supervivencia fue significativamente mayor en aquellas empresas que adoptaron el ERTE. Sin embargo, dicho efecto parece no ser homogéneo, beneficiando especialmente a las empresas más vulnerables. Por su parte, observamos que estas empresas más vulnerables fueron las más pequeñas (de 1 a 5 empleados), y aquellas que operaban en servicios relacionados con el ocio, la educación, el turismo y la hostelería. Por último, la heterogeneidad a nivel regional sugiere una menor tasa de supervivencia empresarial en determinadas Comunidades Autónomas, destacando Baleares y Andalucía.

Key findings

- Education, leisure-related services and micro-enterprises experienced the least survival rates during the pandemic.
- On the other hand, industries, health care services and larger businesses were the most resilient profiles.
- Firms whose employees were sent to ERTE schemes are significantly associated with higher survival rates, controlling by their main characteristics.
- However, this ERTE positive effect seems to be greater for the weakest firms and smaller for the resilient, working as a sort of convergence effect.
- The regional unobserved heterogeneity point at Northern Spain located firms as the most surviving ones, in contrast to Balearic and Andalusian companies, the least surviving.

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1. Introduction

The survival of the companies is one of the multiple socioeconomic dimensions which have been negatively shocked by the pandemic. From the economic perspective, this is one of the most important issues which governments have dealt with, since the generalized lock-down has led to the sudden closing of many firms. Nonetheless, despite being generalized throughout the whole economy, the impact of this shock may not have been equal for all companies. In this regard, the economic sector or the company size may have been crucial when talking about the survival of the companies throughout the pandemic.

In addition, with the aim to relieve the negative impact of the lock-down in the labor market, some kind of Job Retention Schemes were massively used in most countries during the early stages of the sanitary crisis, as reported in OECD (2020) and Müller and Schulten (2020). Focusing on Spain, this policy (known as ERTE) consists in a temporary suspension of the labor relationship between the employer and the employee, or alternatively, a reduction of working hours justified by a major cause. During this period, the employee is getting a social security allowance while the employer only has to assume a social contribution, which is a minor part of the employee's wage. As a result, it works as a transitory mechanism of flexibility to adjust the labor market, whose cost is essentially assumed by the public administration. This policy main purpose is to maintain the employees position despite not being working, avoiding a sharp boost of unemployment during the shock. However, since the firms are not assuming the adjustment costs (labor or redundancy costs), this policy may avoid business closings and help them overcome transitory shocks.

Despite existing before the pandemic, the Spanish ERTEs were only widely used then, covering around 3 million of workers (more than 20% of the affiliated workers) in the second quarter of 2020. The following quarters it covered around 5% of the affiliated workers, which is still a significantly higher proportion than it was during the previous recession. (Izquierdo Peinado et al., 2021)

Moreover, since the Spanish government first approved these Covid-19 related ERTEs in March, 2020, their expiration date has been postponed several times, remaining in the current legislation. Therefore, some evaluation of the impact of this policy in all dimensions is urgently needed. This time, we have focused our question on whether or not it might have braked the business exit, and if so, in what extent.

Related literature. At the beginning of the pandemic, Bartik et al. (2020) conducted a survey to quantify the early impact of the Covid-19 outbreak on US small businesses, finding mass layoffs and closures as a result. Similarly, Fairlie (2021) observed an unprecedented drop in active business owners in the early 2020 using US Current Population Survey data. However, these effects seem to be heterogeneous: According to Crane et al. (2020), the US business exit during the early outbreak was elevated for certain sectors, but lower than usual for other industries. Bloom et al. (2021), despite reporting overall negative impacts of Covid-19 on US firms sales, observed that it depends significantly on the firm size, the percent of the online revenue and the business owner's

demographics. Additionally, using small business data from Oakland, Bartlett and Morse (2020) found noticeable differences in the firm survival capability during the pandemic, especially by its size. These differences, also affected the effectiveness of business assistance programs, as the US Payroll Protection Program (PPP). So far, the main contribution to the topic using Spanish data come from Fernández Cerezo et al. (2021). They use business data from a Bank of Spain own survey to measure variations in company sales and employment, finding great heterogeneity mainly among sectors and firm sizes.

By contrast, most of the Short Time Work Scheme (STWS) literature use pre-Covid data and do not focus its attention on the implications for firms, but for employees and its capability to retain them. A seminal example come from Hijzen and Venn (2011), who designed a natural experiment for 19 OECD countries in order to estimate the causal effects of STWS on preserving jobs in the Great Recession, finding overall but not widespread positive effects. Afterwards, in Hijzen and Martin (2013) they remarked the crucial role of good timing in the application of these public policies.

More recently, Cahuc (2019) explored the pros and cons of STWS, highlighting them as a worthy instrument to temporarily adjust the labor market during recessions, but also alerts about the risk of turning to inefficiency sources. However, the most recent and remarkable contribution can be found in Cahuc et al. (2021). Using French data they measured the heterogeneous effects of STWS on firms considering the Great Recession period. Their results pointed out the effectiveness of STWS for firms hit by strong negative revenue shocks. On the contrary, for firms facing a limited decrease in revenues this policy only would have been a sort of "windfall effect", in authors' words.

Our main contribution to the COVID-19 impact on firms literature comes from the use of this new Spanish Demographic Situation of Companies database to measure the heterogeneity in the survival rate of companies during the pandemic. On the other hand, we also contribute to Short Time Work Schemes literature by finding an association of the Spanish ERTE policy with firm survival rates.

The next pages are organized as follows: In section 2 we introduce the database and methods; section 3 contains a descriptive analysis followed by the main results of the regressions performed; and finally, the conclusions and a discussion about the results, contributions and limitations is summarized in section 4.

2. Data and Methodology

2.1. Data

In order to analyze the survival of the companies during the first year of the Covid-19 pandemic in Spain we retrieved data from the experimental statistics of Demographic Situation of Companies (CODEM), by the Spanish National

Statistics Institute (INE).¹ These data gather aggregated information about the number of surviving companies and its rate regarding a initial cohort of 1,102,738 employer units followed from April 1st, 2020 to April 1st, 2021, in a quarterly frequency.

The first dataset (henceforth referred as Sector dataset) contain aggregated data for 4 quarters, 17 regions (Spanish Autonomous Communities), 81 sectors of the National Classification of Economic Activities (CNAE) which were aggregated into 16 sectors for interpretative purposes and 2 ERTE situations (yes or no). Considering 12 missing values it comes to 2,164 observations altogether.

Then, we were forced to drop the sectorial dimension to include a categorical number of employees, as a proxy of the company size, for the second dataset (henceforth referred as Size dataset), leading to 680 observations with no missing values.

Understanding the nature of the datasets containing variables, any observation represents the rate of companies which did not close over the initial cohort, observed in a given period, region, ERTE situation and either sector or size (depending on the dataset).

2.2. Methodology

Following by a first descriptive observation of the data which suggested differences in the survival rate by sector, size, region and ERTE situation, some fractional logit regressions with robust default standard errors were carried out in STATA 16² to estimate the relationship of every of these characteristics with the survival rate. The choice of this technique is justified by the fractional nature of the outcome variable, survival rate. As it takes continuous values within the close interval $[0, 1]$, the effect of any particular covariate cannot be constant troughout the range of the vector x and the predicted values from an OLS regression can never be guaranteed to lie in the unit interval.

This fractional regression method proposed by Papke and Wooldridge (1996) simply solves these issues using a quasi-likelihood estimator and a logistic distribution for the conditional mean of the dependent variable. Therefore, the log-likelihood function for these fractional models is of the form of equation 1.

$$\ln L = \sum_{j=1}^N y_j \ln \left\{ G(x'_j \beta) \right\} + (1 - y_j) \ln \left\{ 1 - G(x'_j \beta) \right\} \quad (1)$$

where $\ln L$ is maximized, N denotes the sample size, y_j is the dependent variable (for us, the survival rate), $G(\cdot)$ represents a logistic functional form (thus $\exp(x'_j \beta) / \{1 + \exp(x'_j \beta)\}$) and x_j are the covariates for individual observation j . Finally, the β denotes the parameters to be optimized by numerical algorithms.

¹https://ine.es/experimental/codem/experimental_codem.htm (last consult July 5th, 2020).

²Using fracreg logit command. Visit **Stata Manual** for further details.

As mentioned, the conditional mean for the survival rate will follow the logistic distribution given by equation 2.

$$E(y_j|x_j) = \exp(x_j'\beta) / \{1 + \exp(x_j'\beta)\} \quad (2)$$

2.2.1. 1st regression: sector data

The set of covariates included in the first regression of the company survival rate were all dummy variables by sector, regions, quarters and ERTE. These covariates may allow us to catch the heterogeneity in the company survival rate among sectors, regions, time and finally the ERTE estimated effect via the computed marginal effects of each covariate. Note that since all the covariates are factor levels, the marginal effects will represent discrete changes from the base level. In this specification, the omitted categories were hospitality and tourism sector, trend dummy=1, Andalusia and no ERTE.

2.2.2. 2nd regression: size data

Likewise, the second regression was based on the same structure as the previous one, but replacing the sector dummies by the size dummies. Then, the marginal effects may differ from the first regression and the size effects on survival rate will be quantified too. For this regression, the omitted categories were 1-5 employees size, trend dummy=1, Andalusia and no ERTE.

3. Results

3.1. Descriptive statistics

We are considering the survival rate as the dependent variable. For both datasets its values are bounded between 0 and 1 but its frequency distribution is skewed to the upper values. (see Figure 1) It is explained because at the initial period (t=0), all observations begin with survival rate = 1 (all companies alive), then it starts decreasing gradually (when some companies close) for the subsequent periods (t=1,2,3,4). Table 1 displays the main descriptive stats of the survival rate for both datasets, considering all observations except for the initial period (t=0), which would not provide any useful information. There, we observe survival rate means above 90% in both cases and median values even greater.

Table 1: Survival rate (S) descriptive stats.

	mean	sd	min	max	p25	p50	p75	N
S, sector data	0.9275	0.0650	0.6058	1	0.8980	0.9429	0.9758	2164
S, size data	0.9666	0.0428	0.7376	1	0.9571	0.9821	0.9947	680

Data source: CODEM.

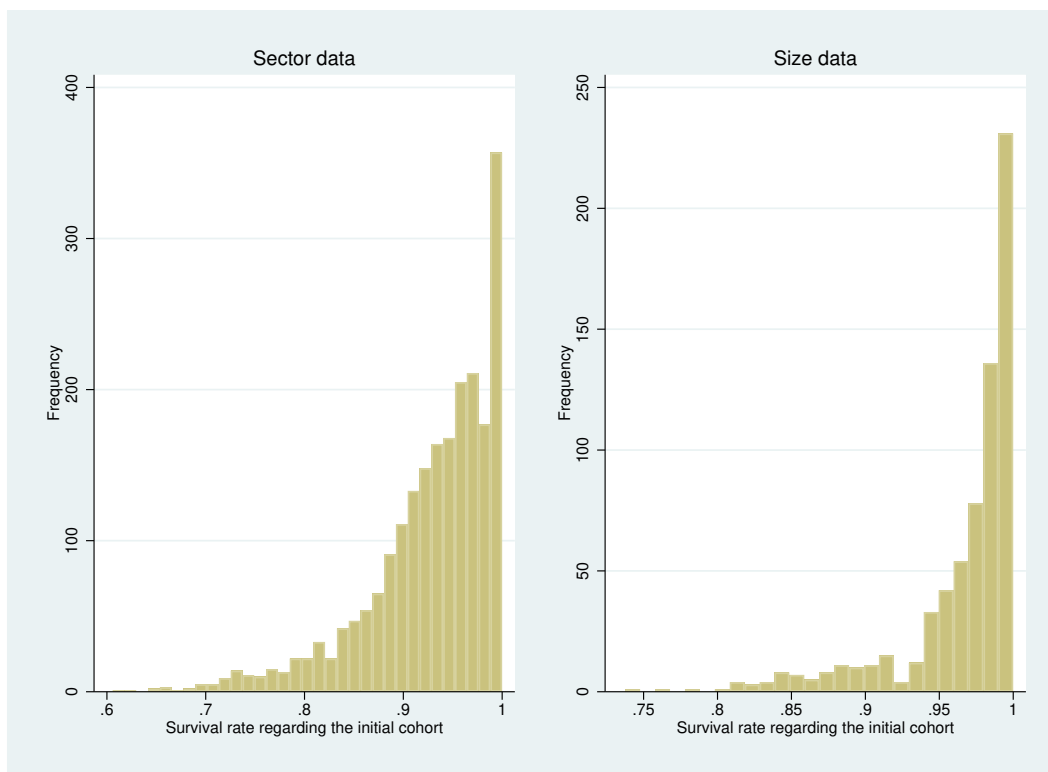


Figure 1: Survival rate distribution. Data source: CODEM.

In order to identify the potential relationship between the survival rate and the sector, size, region and ERTE situation, we analyzed the distribution of the survival rate by these attributes. To sum up these results, some box-plots will be displayed in the following pages.

Figure 2, which shows the survival rate regarding the ERTE situation, reveal higher survival rates for firms in ERTE. Using the sector dataset, the survival rate mean is 90.21% for non-ERTE companies and 95.33% for ERTE's ones. Nevertheless, this difference seems to be lower in the size dataset (96.21% survival mean for non-ERTE companies and 97.11% for ERTE's).

Moreover, in figure 3 some regional heterogeneity can be observed in both datasets. The survival rate mean fluctuate around 2 percentage points above and below regarding the region. On the other hand, according to figure 4, the survival rate of the cohort seems to fall proportionally every quarter.

Additionally, figures 5 and 6 reveal interesting patterns for the survival rate. Particularly, in figure 5, the existing heterogeneity among sectors is clear, remarking education (82.33% survival rate mean), hospitality/tourism (89.96%) and arts/entertainment (88.37%) as the most vulnerable sectors, as oppose to extractive (95.91%) and supply industries (96.46%), which were the most resilient.

Lastly, the survival rate seems to be directly related with the company size, increasing the survival as the company is larger. (see Figure 6). In firms with less than 5 employees the survival mean was only 90.58%, while firms with 6-9 employees increased this mean up to 96.68%, and larger firms up to 98 or 99%.

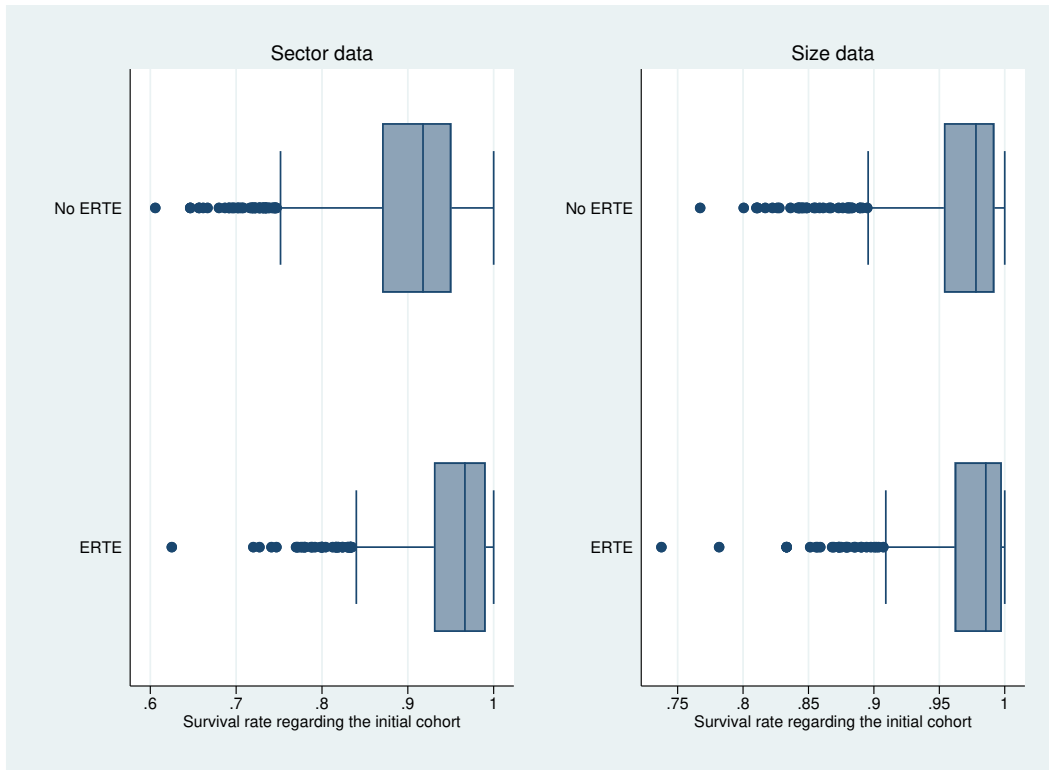


Figure 2: Survival rate by Short Time Work Scheme (ERTE).
Data source: CODEM.



Figure 3: Survival rate by region. Data source: CODEM.

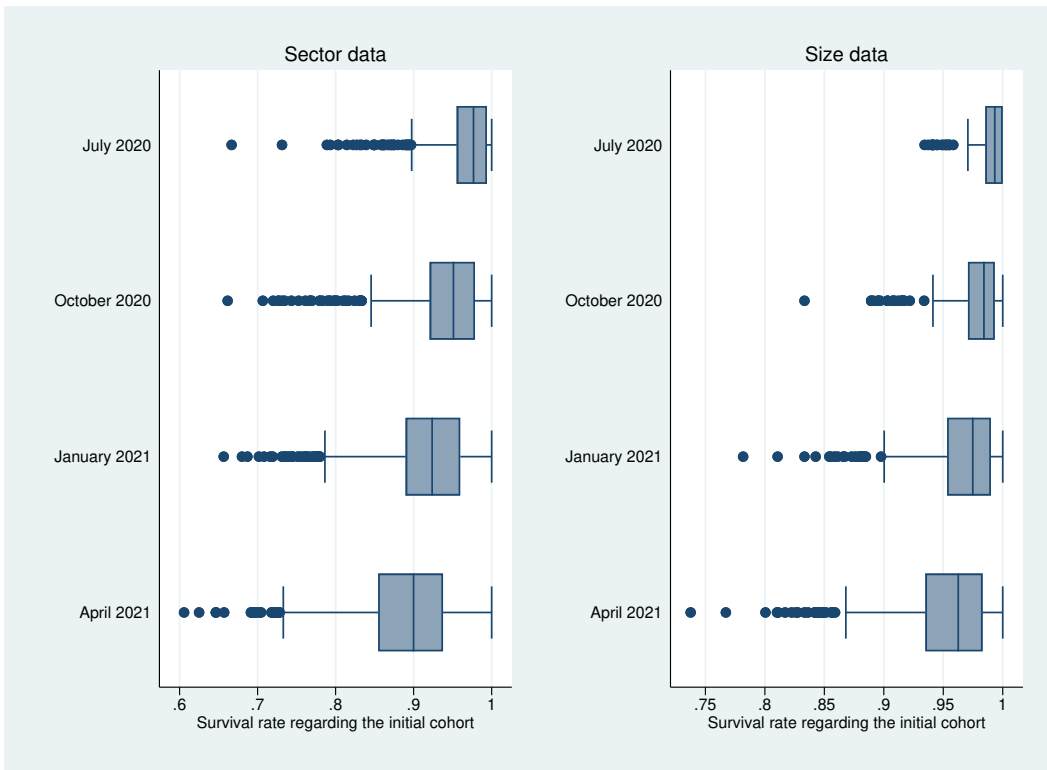


Figure 4: Survival rate by quarters since the initial period (April 1st, 2020).
Data source: CODEM.

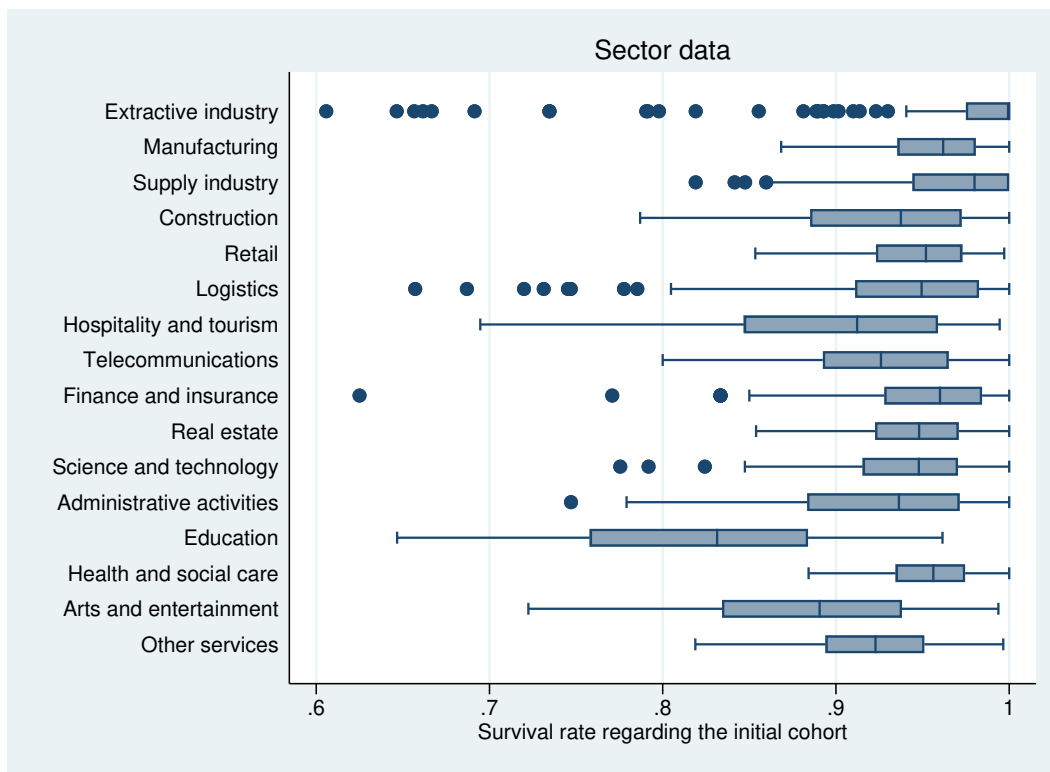


Figure 5: Survival rate by sector. Data source: CODEM.

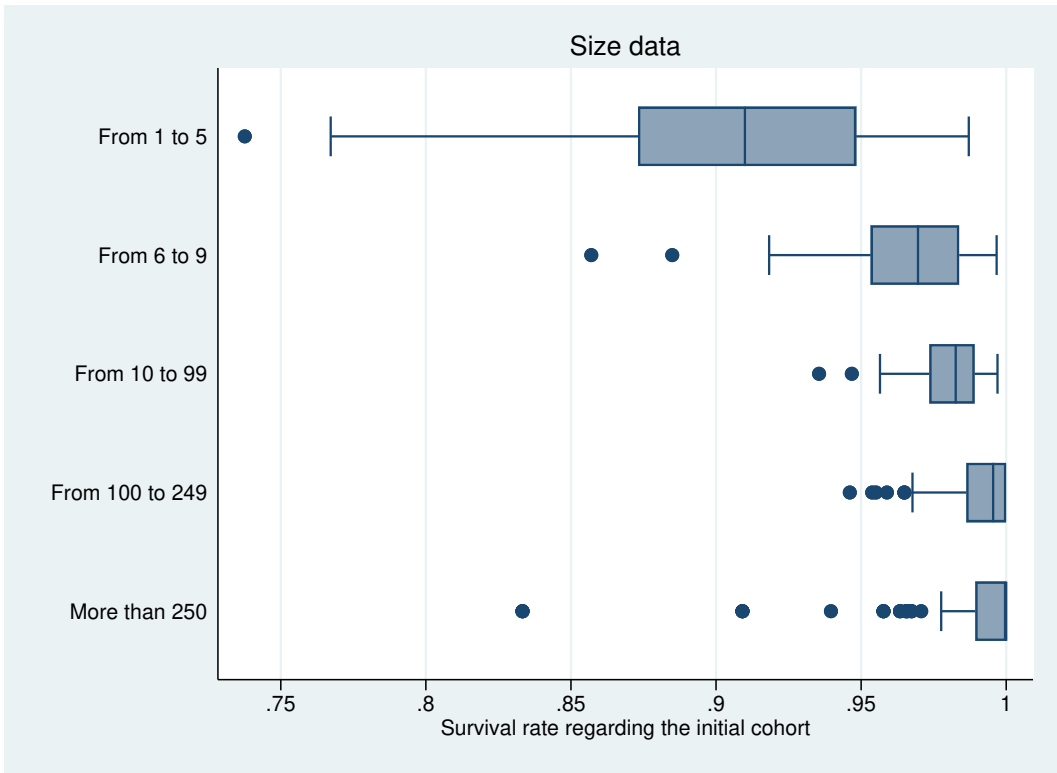


Figure 6: Survival rate by size (number of employees). Data source: CODEM.

3.2. Regressions

As the fractional logit regression output is not directly interpretable, we are focusing on their estimated marginal effects. Table 2 shows the average marginal effects for both regressions. All these effects have been tested significant except for some regional ones and represent the discrete change from the baseline survival outcome since they are associated with factor variables. Thus, multiplied by 100, they can be interpreted as increments or decrements percentage points in baseline survival rate.

Hence, on average, taking up an ERTE increased the survival rate by 5.31 percentage points (henceforth shorten as pp) in the first regression. Nonetheless, in the second regression this effect is attenuated to less than 1pp. Furthermore, the trend effects seems to follow a linear decreasing pattern, proportionally reducing the survival every quarter. The sector average marginal effects confirm the hypothesis of the most vulnerable sectors (education, hospitality/tourism and arts/entertainment), highlighting education as the less likely to survive (7.6pp below hospitality and tourism). On the other hand, extractive and supply industries and health/social services were the most resilient (more than 5pp over hospitality/tourism). In addition, the size effect estimated in the second regression tell us that a company with 6 to 9 employees increases the survival rate by more than 6pp with regard to a 1 to 5 employees firm. However, this increment is marginally declining as the company is larger. Finally, the regional effects point out the expected heterogeneity among regions, highlighting Andalusia and the Balearic Islands as the least surviving regions for the firms.

3.2.1. Deepening into ERTE marginal effect

Although we have found a positive ERTE effect in both regressions, we have only computed the marginal effect on average, this is, considering the average marginal effect over all possible values of the rest of covariates. Therefore, fixing different values of other covariates we may estimate the variation of this effect at different points, interacting the ERTE effect with sectors, size levels or quarters.

From now on, the next presented figures are going to explore the changes in the estimated marginal effect of the Short Time Work Scheme at different values in time, sector and size. This analysis would reveal if the average effects which have been obtained in table 2 are stable over time, sectors and size. As shows figure 7, the ERTE effect is increasing proportionally every quarter. This result suggest that the gap in survival rates between ERTE and non ERTE companies widened every quarter.

By sector, the ERTE effect is larger in the least surviving ones, thus education, hospitality/tourism and arts/entertainment. The huge difference in the ERTE positive effect on survival rates by sector reach almost 10pp, from +2.8pp in the supply industry to +11.4pp in education (Figure 8).

By size, these results are quite relevant as well since the ERTE positive effect lay between 2-3pp of survival rate increase only for the smallest firms, decreasing sharply near zero when the size of the company is greater (Figure 9).

Table 2: Average marginal effects on survival rate.

	(reg. 1)		(reg. 2)	
	Sector data		Size data	
ERTE	0.0531	(0.000)	0.0090	(0.000)
Trend dummy=2	-0.0263	(0.000)	-0.0143	(0.000)
Trend dummy=3	-0.0521	(0.000)	-0.0289	(0.000)
Trend dummy=4	-0.0778	(0.000)	-0.0435	(0.000)
From 6 to 9 employees			0.0609	(0.000)
From 10 to 99 employees			0.0747	(0.000)
From 100 to 249 employees			0.0856	(0.000)
More than 250 employees			0.0824	(0.000)
Extractive industry	0.0611	(0.000)		
Manufacturing	0.0565	(0.000)		
Supply industry	0.0652	(0.000)		
Construction	0.0259	(0.000)		
Retail	0.0449	(0.000)		
Logistics	0.0316	(0.000)		
Telecommunications	0.0228	(0.000)		
Finance and insurance	0.0493	(0.000)		
Real estate	0.0452	(0.000)		
Science and technology	0.0393	(0.000)		
Administrative activities	0.0266	(0.000)		
Education	-0.0764	(0.000)		
Health and social care	0.0546	(0.000)		
Arts and entertainment	-0.0160	(0.000)		
Other services	0.0214	(0.000)		
Aragón	0.0078	(0.095)	0.0079	(0.000)
Asturias	0.0170	(0.000)	0.0123	(0.000)
Baleares	-0.0105	(0.008)	-0.0107	(0.015)
Canarias	0.0084	(0.006)	0.0062	(0.005)
Cantabria	0.0131	(0.007)	0.0025	(0.537)
Castilla y León	0.0174	(0.000)	0.0093	(0.000)
Castilla La-Mancha	0.0077	(0.028)	0.0113	(0.000)
Cataluña	0.0087	(0.020)	0.0063	(0.001)
C. Valenciana	0.0053	(0.058)	-0.0034	(0.189)
Extremadura	-0.0053	(0.397)	0.0088	(0.000)
Galicia	0.0143	(0.000)	0.0101	(0.000)
C. Madrid	0.0090	(0.002)	0.0051	(0.009)
R. Murcia	0.0038	(0.373)	0.0016	(0.490)
C. F. Navarra	0.0051	(0.197)	0.0080	(0.000)
País Vasco	0.0120	(0.000)	0.0043	(0.036)
La Rioja	0.0086	(0.063)	-0.0046	(0.533)
Survival baseline outcome	0.9289		0.9557	

p-values in parentheses.

Baseline categories: ERTE=0; Trend dummy=1; 1-5 employees;

Hospitality and tourism; Andalucía.

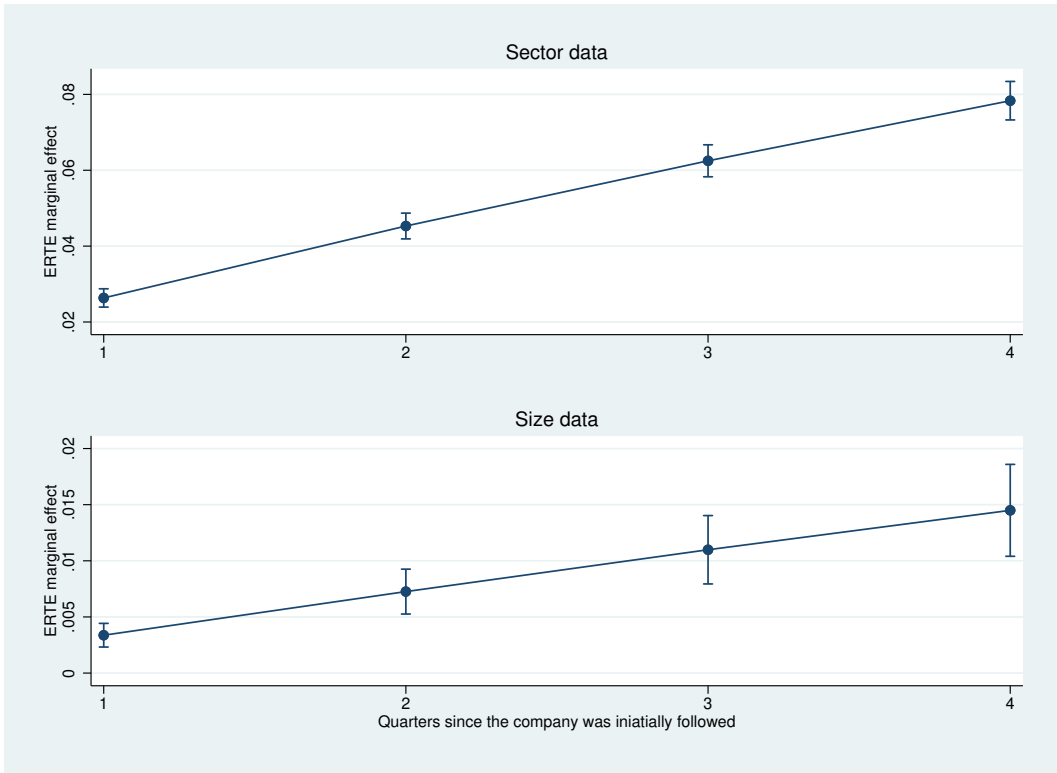


Figure 7: Erte marginal effects on the conditional mean of the survival rate with 95% CIs, by quarter.

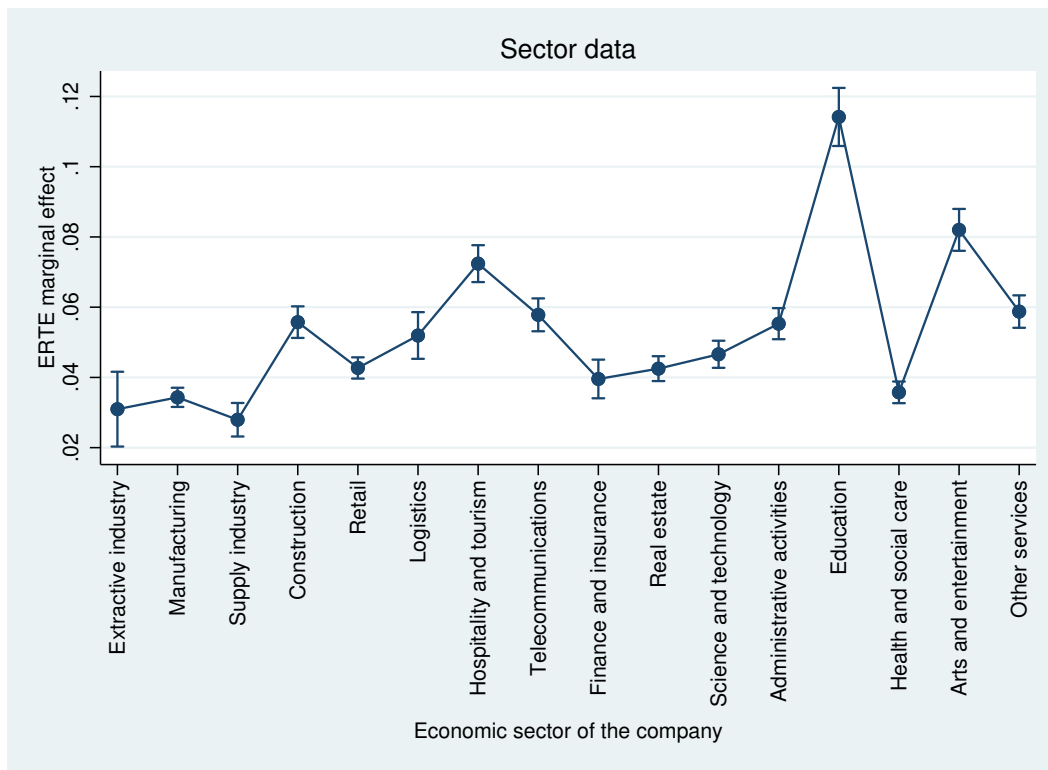


Figure 8: Erte marginal effects on the conditional mean of the survival rate with 95% CIs, by sector.

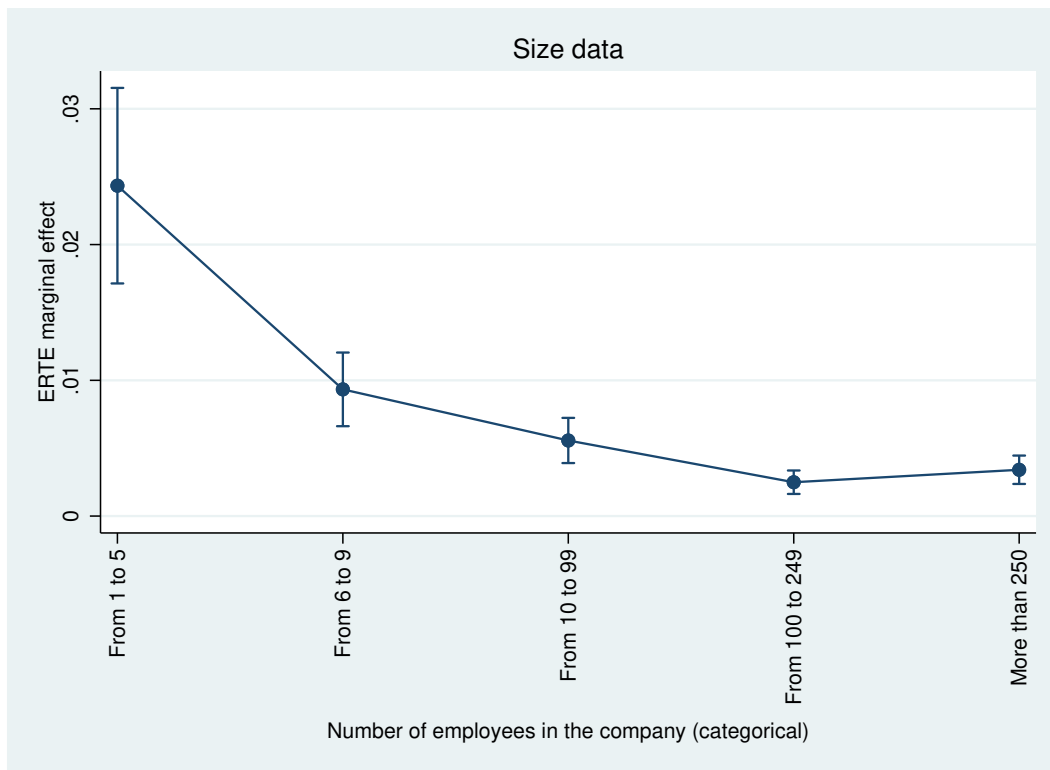


Figure 9: Erte marginal effects on the conditional mean of the survival rate with 95% CIs, by size.

4. Conclusions and discussion

Along this paper we have analyzed the survival rate of companies during the first year of Covid-19 in Spain, trying to measure the heterogeneity among sectors, size, regions and quantifying somehow the ERTE effects on it. For this purpose, we made use of the Spanish Demographic Situation of Companies new database, which imply a methodological contribution to this topic. Then, the main analysis consisted in some fractional logit regressions, performed in two different datasets due to the limitations for combining variables in the aggregated data provided by the source.

The first regression tried to estimate the survival heterogeneity among sectors; remarking education, arts and entertainment, hospitality and tourism as the sectors with less survival, while industries and health care had the highest survival rates, with a gap of 14pp on average from the lowest to the highest. Moreover, a positive survival effect for companies in ERTE situation was detected. In addition, we observed that this effect increased across time and it was significantly different among sectors, laying from +2.8pp in the supply industry to +11.4pp in education. This result, suggest a sort of convergence positive effect of ERTE since it has benefited more the vulnerable sectors, despite also benefiting the strongest sectors to a lesser extent. Regarding the regional effect, the unobserved heterogeneity caught by the regional dummies suggest higher survival rates in Northern regions and less survival in Balears and Andalucía.

Likewise, the second regression quantified the heterogeneous survival by size, highlighting that in the smallest companies (less than 5 employees) the survival rate was on average 6pp lower than 6-9 employees companies. This gap raised up to more than 8pp comparing the smallest with the largest, with more than 250 employees. Nonetheless, the increments in survival rate by size seems to be marginally decreasing, finding a noticeable leap between 1-5 and 6-9 employees firms, but less relevant leaps for the subsequent sizes.

With regard to the ERTE positive effect in the second regression, it seems to substantially depend on the size too. Whereas in the smallest companies the ERTE increased the survival by 2 or 3pp on average, this effect dropped below 1pp in companies with more than 6 employees. However, it should be reminded that an ERTE might be approved only for few employees within a company and also it could be either part or full time. Hence, the different characteristics of this policy may biased this result, since we are assuming an homogeneous ERTE scheme.

Furthermore, we found some other troubles we could not overcome in the analysis. Firstly, we suspect the ERTE adoption may not be exogenous at all since companies with less survival expectations might be more likely to adopt an ERTE at some point than the others. Secondly, there might be relevant omitted variables in our models which cannot have been included due to the few control variables available.

In addition, regarding the ERTE effects, the techniques we have used are not able to infer any causality effect beyond correlation. Therefore, some public evaluation techniques, e.g. the use of counterfactual scenarios, are needed in

order to properly evaluate these effects. On the other hand, using microdata, other techniques like pure survival analysis with duration models would perform better to estimate the survival of any company controlling by its characteristics. Unfortunately, none of these approaches have been possible this time with the available aggregated data.

Being aware of all these limitations, this paper is only aiming to introduce some preliminary insight on the Covid-19 impact in the company survival in Spain, as well as provide useful information about the possible role of the Short Time Work Scheme in this topic. As far as we are concerned, further research is needed as it is a new topic with few available data, but of utmost importance nowadays.

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