Okun's Law: The effects of the COVID-19 pandemic and the temporary layoffs procedures (ERTE) on Spanish regions

Porras-Arena, M. Sylvina and Martín-Román, Ángel L. and Dueñas Fernández, Diego and Llorente Heras, Raquel

Universidad de la República, Montevideo, Uruguay, Universidad de Valladolid, Valladolid, Spain, Universidad de Alcalá, Alcalá de Henares, Spain, Universidad Autónoma de Madrid, Madrid, Spain

2022

Okun's Law: The effects of the COVID-19 pandemic and the temporary layoffs procedures (ERTE) on Spanish regions

M. Sylvina Porras-Arena [α]
Ángel L. Martín-Román [β]
Diego Dueñas Fernández [γ]
Raquel Llorente Heras [δ]

Abstract

Official statistics indicated a break in Okun's law in all the Spanish regions due to the COVID-19 pandemic; however, herein, evidence of the validity of the law is shown. The temporary layoff procedures (ERTE) allowed many workers to maintain their jobs. From the productive point of view, the law remained in effect in the regions, showing a strong relationship between idle labour resources and economic activity, and from the social point of view, the apparent breakdown of the law can be interpreted as the implementation of a policy that mitigated the dramatic impact of the economic crisis.

Keywords: Okun's law, ERTE, expanded unemployment rate

JEL Classification: E23, E24, J64, R23

Acknowledgements

We thank Raul Ramos, Carlos Usabiaga, and Carlos García-Serrano for their comments on an earlier version of the paper. We are also grateful for suggestions from participants in the XV Labour Economics Meeting held on 29, 30 June and 1 July 2022 at the Faculty of Economics and Business Administration in Albacete (Spain).

[α] Facultad de Ciencias Económicas y Empresariales, Universidad de Valladolid, Av. Valle de Esgueva, 6, 47011 Valladolid, España and Facultad de Ciencias Económicas y de Administración, Universidad de la República, Uruguay. Gonzalo Ramírez 1926, CP 11200, Montevideo, Uruguay. sylvina.porras@fcea.edu.uy.

[β] Facultad de CC. Sociales, Jurídicas y de la Comunicación, Plaza de la Universidad, 1, 40005 Segovia, España. almartin@uva.es.

[γ] Universidad de Alcalá (UAH). Pza. San Diego, s/n, 28801 - Alcalá de Henares (Madrid) España. diego.duenas@uah.es.

[δ] Facultad de Ciencias Económicas y Empresariales, C/ Francisco Tomás y Valiente, 5 Universidad Autónoma de Madrid, 28049 Madrid, España and Instituto Universitario de Análisis Económico y Social (IAES) de la Universidad de Alcalá, Pza. San Diego, s/n, 28801 - Alcalá de Henares (Madrid) España. raquel.llorente@uam.es.

1. Introduction

Did Okun's law fail in Spain after the COVID-19 pandemic? Okun's relationship that was known prior to the health crisis unleashed by COVID-19 infections indicated for Spain that, for each percentage point (pp) of growth in economic activity, unemployment dropped by approximately one percentage point. If this relationship had been complied with, the unemployment rate should have increased to 35% in the second quarter of 2020 since economic activity fell by 21.5%. However, the unemployment rate barely increased 1.3 pp and stood at 15.3%.

Unemployment recorded by official statistics is measured from the criteria of the International Labor Organization (ILO) and indicates, from the point of view of people, the total lack of employment and, from the point of view of production, the existence of idle resources. However, as Dolado *et al.* (2021) note, during the COVID-19 pandemic, the unemployment rate has not been a good indicator of the underutilization of labour. Following the methodology of the United States Bureau of Labor Statistics, these authors introduce different alternative indicators to that of the conventional unemployment rate. Added to this measurement, are people who stopped looking for work but were available to start a job, and workers covered by the temporary layoff procedures (called ERTE in Spanish for "*Expediente de Regulación Temporal de Empleo*") for suspension of contract or reduced working day. This unemployment rate, in a broader sense, reached, according to the authors, 40.6% of the economically active population in the second quarter of 2020.

From the perspective of the production function, where there is a positive relationship between the demand for productive factors and production, the variation in economic activity also implies variations in the requirements of productive factors, specifically the labour factor. With the dramatic fall in the level of activity due to the restrictions placed on mobility imposed during the COVID-19 pandemic, some workers lost their jobs, while others, from the implementation of various measures of job retention policies, suffered a partial reduction in their working hours or a complete and temporary suspension of the employment contract. In this way, many resources became idle when economic activity fell, in accordance with this positive relationship between economic activity and the demand of the labour factor, thus validating Okun's law, which is based on production logic, although this was not reflected in the estimated Okun's coefficient based on unemployment statistics due to the implementation of these policies.

It is logical to think that Okun's underlying relationship did not change from the COVID-19 pandemic forward and that, beyond the cyclical variations of the labour supply (Martín-Román, 2022), it is the way in which idle labour resources are measured, which explains why the variable "unemployment rate" would have reflected the evolution of only a part of the resources that were idle over the pandemic. In turn, to the extent that this would respond to the implementation of policy measures protecting jobs and reducing the negative socioeconomic impact on people implied by the COVID-19 pandemic crisis, the difference between the expected impact on unemployment based on the previous estimates of Okun's relationship and what actually happened can be interpreted in part as the positive impact of the economic policy implemented (Leandro, 2020; Barišić & Kovač 2022).

On the other hand, given that the crisis caused by the COVID-19 pandemic had differentiated impacts at the sectoral and territorial levels, the impact of mobility restriction measures and the palliative employment policy measures implemented also had varied intensities in the different regions of Spain. According to Romero et al. (2021), the differential economic impacts in the sector are noticeable, since the most affected sectors have been those involving greater social contact (retail trade, hospitality, restaurants, transport, leisure and cultural activities). As a consequence of the differentiated impact in the sector, effects of different magnitudes were also generated at the territorial level, since the provincial economies most affected by the COVID-19 crisis were those with the highest level of specialization in some of those sectoral activities that were most hit by the crisis. It is therefore not surprising that the regions most affected have been those of the two archipelagos (Balearic and Canary Islands) and some provinces on the Mediterranean.

Therefore, in this research, we try, first, to analyse the validity of Okun's law at the level of the Spanish regions (NUTS II) and to identify the change that occurred since the COVID-19 pandemic. Next, with a broader measure than that of the official statistics that includes the people covered by the ERTE, which also represent idle resources from the productive point of view, we estimated the Okun's relationship for each region of Spain, whose results describe the continuity of this relationship throughout the Spanish territory. Finally, as a way to evaluate the positive impact of the implemented employment protection policy, we projected the unemployment rate of each region for the four quarters of the first year of the COVID-19 pandemic from the pre-pandemic data and compared these results with the real evolution of unemployment and with "extended" unemployment. The results vary according to region, but in all cases, it is

concluded that if this policy had not been mediated, the unemployment rate would have been sitting, depending on the region, between 8 pp and 30 pp above the level recorded by the statistics of the National Institute of Statistics (INE) in the quarter with the greatest negative impact on economic activity due to COVID-19 (2020.Q2).

The article is structured as follows. Section 2 presents a brief description of the evolution of the COVID-19 pandemic and the implementation of ERTE in Spain. The evidence shown in the literature on the application of workforce reduction strategies and their impacts is discussed in section 3. Then, Okun's law and the empirical evidence for Spain are formally presented in section 4. Next, section 5 describes the methodology and data used in this research; in section 6, the results are presented; and finally, the conclusions are presented.

2. COVID-19 and the ERTE

The first case of COVID-19 in Spain was diagnosed in January 2020. After it, and due to its rapid expansion, the government decreed a state of alarm in March, suspending nonessential activity and establishing the confinement of the majority of the population. Limiting mobility, as well as the hibernation of the economy, allowed reducing the number of infections, following successive extensions of the state of alarm, in a process of asymmetric de-escalation in April 2020. The de-escalation gave rise to a certain relaxation of the containment measures during the summer months.

Unfortunately, after the summer, infections increased again, causing the issue of a new state of alarm, albeit of a different nature. In this new stage, health containment measures were decentralized to the regions, establishing a great heterogeneity of action scenarios. Limiting mobility, setting curfews or local confinements were some of the measures applied by the governments of the Spanish regions.

In December 2020, the vaccination process of the population by age group began, and with it, both infections and deaths were gradually reduced, which allowed the progressive lifting of the restrictive measures implemented.

In labour matters, as the health crisis developed, measures were implemented to defend jobs and support the unemployed. **Royal Decree-Law 8/2020** (03/17/2020) allowed the application and development of ERTE. The

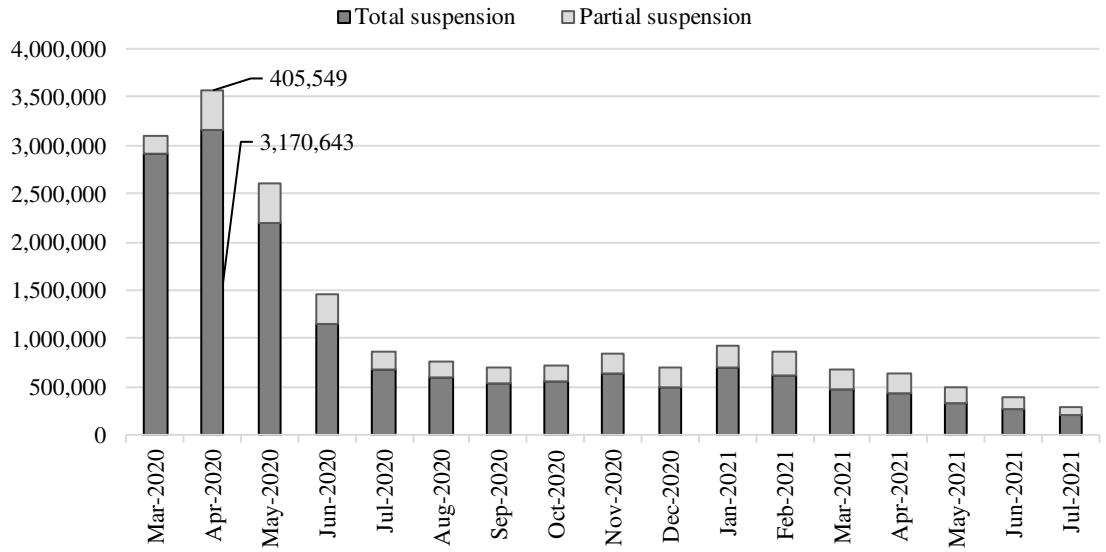
ERTE were established as a procedure that allowed companies the total suspension of contracts or the reduction of the working day on a temporary basis. Therefore, the workers covered by ERTE constitute a group of people who would surely have joined the ranks of the unemployed had this measure not existed. The ERTE born in the pandemic are regulated in Article 47 of the Workers' Statute and update or adapt, due to the exceptional circumstances imposed by the pandemic, the former layoff procedures (ERE) for economic, technical organizational or production (ETOP) reasons. The workers under the ERTE maintain their status as employees both at the level of Social Security and in the statistics of the Labour Force Survey (LFS) of the INE, so they do not become part of the unemployed count.

After the initial establishment of the ERTE in March 2020, successive regulations in the form of the Royal Decree (RD) have been extending their use and extension more or less automatically. Certainly, complex legislation has been established where we highlight the main measures developed.

- **Royal Decree-Law 15/2020** (04/21/2020), on urgent complementary measures to support the economy and employment, modified the regulation of ERTE due to force majeure provided for in Royal Decree-Law 8/2020, of extraordinary urgent measures to address the economic and social impact of COVID-19, establishing that force majeure may be partial.
- **Royal Decree-Law 30/2020** (09/29/2020) made possible the automatic extension of the ERTE in force until January 31, 2021.
- **Royal Decree** (01/26/2021), again extended the ERTE based on a force majeure related to COVID-19, regulated in article 22 of Royal Decree-Law 8/2020 until May 31, 2021.
- **Royal Decree-Law 11/2021** (05/27/2021), on urgent measures for the defence of employment, economic reactivation and protection of self-employed workers, included a series of measures that affect unemployment benefits, as well as the automatic extension until September 30, 2021.
- **Royal Decree-Law 18/2021** (09/28/2021), of urgent measures for the protection of employment, economic recovery and job improvement, established a new extension until February 28, 2022, of the ERTE in accordance with various articulations.

- In short, through successive extensions, the ERTE has been maintained over time, allowing the country to cope with the pandemic, although it is also true that it has been carried out under the public budget and that its management has presented certain inefficiencies. As shown in Figure 1, the ERTE were intensively applied when first established, reaching more than 3 and a half million workers sheltered under this modality, mostly with total suspension; subsequently, it was gradually reduced until reaching the official figure of 292,722 workers in ERTE in July 2021.

Figure 1: **Affiliates in the ERTE linked to the COVID-19 according to type of suspension.**
(Source: Ministerio de Inclusión, Seguridad Social y Migraciones)



3. Evidence on the application of workforce reduction strategies

The academic literature on workforce reduction strategies in times of crisis has focused mainly on the study and analysis of short-time work (STW) tools. This literature arises from analysing the different systems implemented by countries in defence of employment, concluding that these are palliative systems and, in general, of a temporary nature. In the 1990s, these systems were pioneers and focused on reducing the working day. During the 1980s, the systems of reduced working hours were extended, and from the crisis of 2008, they reached a great intensity. Each country has carried out these systems in a different way through subsidies to companies, suspensions of social security contributions, tax exemptions, etc., so international comparisons are complex. Only recently, as a

result of the pandemic have these systems been applied through the total suspension from work.

In the case of the literature that deals with the reduced working time (STW), the first studies arise in the 1990s by the hand of Abraham & Houseman (1994) and Van Audenrode (1994). With comparative analyses between countries and/or against traditional benefit systems, they validate their effectiveness for job retention. On the other hand, the literature on workforce reduction strategies has increased since the 1980s. Fitzroy & Hart (1985) argue that STWs have been efficient in the US not only because of the institutional context but also because of their different application through payroll tax systems.

Burdett & Wright (1989) compare, through a theoretical model and the analysis of statistical evidence, systems based on the perception of unemployment insurance against reduced working hours, showing that the latter, although they preserve employment, can imply inefficient hours per worker. Therefore, the authors advocate the use of STW systems only temporarily.

STW systems were implemented with great enthusiasm worldwide after the Great Recession of 2008. As a result of their dissemination, numerous academic studies considering their validity and effectiveness have emerged. Several studies conclude that STW schemes were useful tools for preserving jobs and overcoming the crisis (Giupponi & Landais. 2020; Pavlopoulos & Chkalova. 2022), and others, in addition to confirming the positive aspects, indicate some of their limitations. In this regard, Hijzen & Venn (2011) indicate that the positive impacts are limited since the segmentation of the labour market increases between workers with full-time jobs and workers with temporary and part-time jobs. In a later study, Hijzen & Martin (2013) state that the positive impact depended on the moment in which the programs were implemented and that their use during the recovery period could have slowed job creation. The study by Boeri & Bruecker (2011) indicates that these systems entail considerable "dead weight" costs, given that, according to the authors' estimates, the number of jobs "saved" is less than the number of jobs covered by the programs. Cahuc & Carcillo (2011) point out that these systems can also induce an inefficient reduction in hours worked, and later Cahuc et al. (2021) argue that they significantly increase the costs of public policies.

With the crisis caused by COVID-19, studies have focused largely on the analysis of the furloughed workers schemes (FWS) or job retention (JR) schemes, both linked to the STW since they share similarities in terms of their form of

development (suspensions of contributions, subsidies to companies, etc.). However, in this case, the working day is completely suspended.

In Lea (2020), we find an analysis of the high diffusion of these systems at the international level. The comparison should be made with caution given that until recently, these types of schemes have not been analysed in depth, and we still do not have sufficient historical perspective for their assessment. For the Norwegian case, Juranek et al. (2020) analyse layoffs during the COVID-19 crisis using administrative data, demonstrating that the *FWS* limited the impact of the pandemic. The work of Stuart et al. (2021) shows that the *FWS* system has served to retain jobs in the United Kingdom and that it should be implemented within the human resources policy of companies as a measure of workforce retention.

Castle et al. (2021), using forecasting techniques, show that unemployment in the United Kingdom has stabilized thanks to the use of furlough policies. Using statistical analysis, Pope et al. (2020) also show for the case of the United Kingdom that job retention schemes have stabilized the negative effects of the pandemic on the labour market, although its extension is uneven in the various sectors analysed.

In the case of Spain, Arranz et al. (2019) analyse the propensity to lay off workers during the crisis of the early 1990s compared to the crisis of the late 2000s, showing that the job preservation policy through STW should focus on the short term and always take into account the composition of the workforce. In a more recent work, Arranz et al. (2021) show that the STW preserved jobs satisfactorily during the 2008 crisis. However, the measure only had some validity in the short term.

Osuna & García-Pérez (2015) evaluate STWs based on the 2012 labour reform through a matching model, demonstrating that STWs do not necessarily reduce unemployment or lost jobs, so that the effectiveness of the system depends on the degree of subsidy implemented. In a more recent work, Osuna & García-Pérez (2021) analysed schemes for reducing working hours during COVID-19, assessing the need to implement these schemes in the face of the increase in the fiscal deficit. The authors state that STWs do not prevent the increase in unemployment and the destruction of jobs, since their adverse effects depend on the degree of subsidies implemented and the design of the norm itself. Likewise, this type of tool or scheme has heterogeneous effects that can increase the duality of the labour market since the redistributive effects fall on the unemployed.

The work of Izquierdo et al. (2021) shows how the FWS was the most used tool for the adjustment of the Spanish labour market in the face of the global pandemic, concentrating especially in the second quarter of 2020 according to the restrictions imposed on economic activity.

In conclusion, from a general perspective, the analysed macroeconomic effects of both measures (STW and FWS) are usually positive in relation to preserving jobs and avoiding being let go, but they also tend to have some adverse effects in relation to labour costs, reduced wages, inefficiencies and dead weights. Likewise, these measures emphasize the segmentation of the labour market between hired and unemployed workers. However, the legislative characteristics of each measure prevent a detailed comparison at the aggregate level so that the legislative framework is decisive in the success of the measures. Finally, we must emphasize that the majority of the authors advocate that this type of measure be of a temporary nature or are established with a certain duration only during periods of economic recession.

This research contributes to the literature for the Spanish case regarding the employment effects of the FWS total suspension systems, where the current literature is still emerging.

4. Okun's law

Okun's law establishes the inverse relationship between unemployment and economic activity (Okun, 1962). This relationship has been estimated in different ways, with the modelling in differences (1) and in gaps (2) being the most used.

$$u_t - u_{t-1} = \beta_0 + \beta_1 g_{yt} \qquad (1)$$

$$(u_t - u_t^*) = \gamma_0 + \gamma_1 (y_t - y_t^*) \qquad (2)$$

where u_t is the unemployment rate, g_{yt} the growth rates of the economy, u_t^* the natural unemployment rate, y_t the logarithm of the output *and* y_t^* the logarithm of the potential output. β_1 in (1) and γ_1 in (2) correspond to the so-called Okun's coefficient, which takes a negative value. In the first case, this coefficient indicates how much the unemployment rate decreases when economic activity grows by 1%, and in the second case, how much the unemployment rate moves away from its potential or natural level when economic activity moves away by 1% from its potential level.

When working with quarterly data, it is common to find dynamic estimates of Okun's law, which include delays of the dependent and independent variables. For the difference model it would be:

$$\Delta u_t = \alpha + \sum_{i=1}^{p} \delta_i \Delta u_{t-i} + \sum_{i=0}^{q} \beta_i g_{yt-i} \qquad (3)$$

In this case, it is not only the coefficient of the contemporary relationship that matters but also the total effect that operates through the lags of the variables, which is the one that is comparable with the effect that is calculated from the variables with annual periodicity. The total effect is calculated as follows:

$$Total\ effect = \frac{\sum_{i=0}^{q} \beta_i}{(1-\sum_{i=1}^{p} \delta_i)} \qquad (4)$$

Table 1 shows the results for Spain of the studies that estimate Okun's law for several developed countries. The values vary depending on the period or the methodology used and are between -0.63 and -0.94. In all cases, the estimated coefficients indicate that Spain's unemployment rate is most sensitive to changes in economic activity.

Table 1: Estimates of Okun's law for Spain

Author	Period	Okun's coefficient
Perman & Tavera (2005)	1970-2002	-0.79
Perman & Tavera (2007)	1970-2002	-0.71
Ball et al. (2017)	1980-2013	-0.94
		-0.82
		-0.80
		-0.74
Jalles (2019)	1978-2015	-0.90
		-0.89
		-0.81
Gil-Alana et al. (2020)	2000-2015	-0.69
		-0.66
		-0.63

In this way, the forecasts on the evolution of unemployment, in the context of the collapse of economic activity due to the health measures imposed by the COVID-19 infection, predicted a dramatic increase in the number of people who would lose their jobs and would swell the ranks of the unemployed.

On the other hand, there are studies that indicate that the Okun's relationship varies at the regional level in Spain (Villaverde & Maza, 2009; Bande & Martín-Román, 2018; Porras-Arena & Martín-Román, 2019), due, among other things, to differential characteristics of their labour markets. This implied at the beginning of 2020 regional differentiated forecasts about what could be the increase in unemployment in the context of a probable fall in economic activity due to COVID-19. In addition, as already indicated, the Government of Spain determined at some point the decentralisation of health containment measures to the regions, establishing a great heterogeneity of action scenarios. That is why the analysis of the effects of the COVID-19 pandemic and of the ERTE on Okun's law is carried out in this research at the level of the Spanish regions (NUTS II).

Several studies report the differences between regions of Spain with respect to the reaction of unemployment to changes in economic activity (or the inverse relationship). Some authors estimated the relationship for one single region and compared it with that of the country as a whole (Pérez et al., 2003; Usabiaga & Hernández-Salmerón, 2021). Other authors estimated the relationship for each region (Villaverde & Maza, 2007, 2009; Bande & Martín-Román, 2018, Porras-Arena & Martín-Román, 2019) and found significant differences in the estimated coefficients. Melguizo (2017), on the other hand, carries out the study of the relationship at the provincial level in Spain, suggesting with the results obtained that it is also appropriate to consider a greater territorial division to analyse Okun's law (50 provinces instead of 17 regions). The results obtained by Clar-López et al. (2014) show additional elements on the relative importance of studying Okun's law at the regional level in Spain, since they found that applying this relationship improves the predictive capacity of econometric models in such a way that the unemployment rate in most regions is predictable.

On the other hand, Usabiaga & Hernández-Salmerón (2021) found that the Okun's coefficients were -0.8 and -0.7 for Spain and Andalusia, respectively, with data up to 2019. However, when re-estimating the relationship incorporating the data since 2020, there is a significant change in the regression results, obtaining relationship coefficients lower in absolute value and lower coefficients of determination (R^2) as well. The new estimates are approximately -0.4 for both cases. According to the authors, the strong shock caused by the pandemic and the widespread use of ERTE would be the factors that would explain these results.

Barišić & Kovač (2022), based on estimations of Okun's law for a total of 26 European countries, including Spain, projected the expected values of the variation in the unemployment rate for the first and second quarters of 2020

compared with real variations. For several countries, the difference between the projected value and the true value shows a positive sign, with Spain standing out among them. These differences are interpreted as the successful application of fiscal policy measures to mitigate the negative impacts of the COVID-19 crisis.

Likewise, with the objective of evaluating the effectiveness of the fiscal effort in times of pandemic by COVID-19, Leandro (2020) estimated Okun's law for several countries in Europe which implemented measures much like those of Spain's ERTE. Based on these models, the respective unemployment rates for the first and second quarters were projected and compared with the current ones, showing that in Spain, the negative effect of the crisis on employment is significantly reduced, mainly in the second quarter of 2020.

5. Methodology and data

The estimation process was carried out in two stages. The first consisted of estimating for each region the dynamic Okun's relationship (3) with pre-pandemic data (2005.Q1-2019. Q4): *Model 1* uses the unemployment rate (UR) of the INE as a dependent variable, and these results were compared with the estimates of *Model 2*, which includes data from the first year of the COVID-19 pandemic (2005.Q1-2020.Q4).

The second stage consisted of using the series of "expanded unemployment rates" (URE) for each region, previously constructed, which included the unemployed and people sheltered by the former ERE and currently by the ERTE:[1]

1) The Okun's relationship was estimated for each region with URE as a dependent variable for the pre-pandemic period (*Model 3*) and for the entire period (*Model 4*). These results were compared with those obtained from *Model 1* and *Model 2*.

2) The unemployment rate was projected for the four quarters of 2020 for each region based on *Model 1,* obtaining the expected values

[1] By using the microdata from the LFS, we identified those individuals who were not classified as unemployed by the INE since they were in furlough schemes. Then we added them to the unemployed persons computed by the INE to obtain the figures relative to "expanded unemployment rates" within each region. Data are available from authors upon request.

of UR given the evolution of the gross domestic product (GDP) during those quarters, and these results were compared with the evolution of INE's UR and with the evolution of the URE.

Regarding the data used, the microdata of the LFS of the INE (2005-2020) were processed to construct the UR and URE series for each region on a quarterly basis. The URE implies a broader notion of unemployment than that established using the ILO criteria, since the latter records the total lack of employment (with availability to work and actively seeking employment).

Regarding the variable related to output, the quarterly GDP series of the regions prepared by the Independent Authority for Fiscal Responsibility (AIREF) were used. According to the methodology, the construction of these variables combines three types of statistical information for regional analysis: the monthly data of economic indicators broken down at the territorial level, the annual data compiled by the Spanish Regional Accounts and the estimates for the national set published by the Quarterly National Accounts.

6. Results

Table 2 shows the results of the Okun's coefficient estimates for each region by period and dependent variable (UR or URE). The coefficients reflect the total effect (equation (4)) of the variations of GDP on unemployment, that is, the one that results once the lagged effects of all the variables (dependent and independent) have operated.

As seen in the first column of this table, the Okun's coefficients were relatively high in absolute value in the different regions before the crisis unleashed by COVID-19 (*Model 1*), although there was great dispersion, oscillating between a coefficient of -0.40 in the Balearic Islands to -1.16 in the Canary Islands. As a point of comparison, Ball et al. (2019) estimated the mean value of the Okun's coefficient in advanced economies at -0.4. On the other hand, in some regions, the adjustment coefficient of the model (R^2) is relatively low, which indicates that the variations in economic activity would not explain all the variability of the unemployment rate.

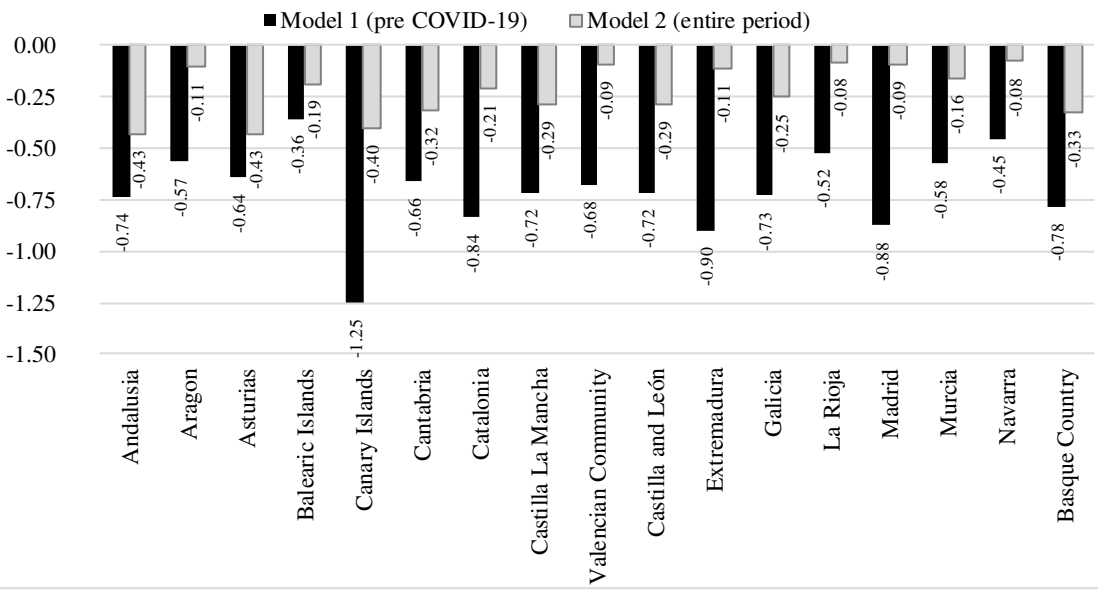
Table 2: Regional Okun's coefficients

	Dependent variable:							
	UR (1)				URE (2)			
	Model 1		*Model 2*		*Model 3*		*Model 4*	
	(3)	R^2	(4)	R^2	(3)	R^2	(4)	R^2
Andalusia	**-0.74**	0.82	**-0.43**	0.75	**-0.72**	0.82	**-0.99**	0.98
Aragon	**-0.57**	0.46	**-0.11**	0.38	**-0.59**	0.47	**-1.06**	0.95
Asturias	**-0.64**	0.47	**-0.43**	0.41	**-0.71**	0.46	**-1.14**	0.93
Balearic Islands	**-0.40**	0.64	**-0.19**	0.65	**-0.46**	0.58	**-0.85**	0.98
Canary Islands	**-1.16**	0.50	**-0.44**	0.25	**-1.26**	0.52	**-1.42**	0.95
Cantabria	**-0.66**	0.16	**-0.32**	0.20	**-0.72**	0.18	**-1.07**	0.93
Catalonia	**-0.85**	0.71	**-0.21**	0.66	**-0.86**	0.64	**-1.06**	0.98
Castilla La Mancha	**-0.79**	0.63	**-0.29**	0.55	**-0.70**	0.36	**-0.81**	0.86
Valencian Community	**-0.92**	0.68	**-0.09**	0.80	**-0.85**	0.64	**-0.92**	0.97
Castile and León	**-0.72**	0.53	**-0.29**	0.46	**-0.75**	0.60	**-0.99**	0.98
Extremadura	**-0.90**	0.33	**-0.11**	0.37	**-0.93**	0.38	**-0.97**	0.84
Galicia	**-0.73**	0.58	**-0.25**	0.52	**-0.74**	0.57	**-0.97**	0.98
La Rioja	**-0.41**	0.20	**-0.08**	0.18	**-0.49**	0.27	**-0.89**	0.86
Madrid	**-0.88**	0.44	**-0.09**	0.31	**-0.91**	0.45	**-0.98**	0.96
Murcia	**-0.61**	0.23	**-0.16**	0.27	**-0.62**	0.31	**-0.69**	0.86
Navarra	**-0.50**	0.18	**-0.08**	0.06	**-0.67**	0.28	**-0.96**	0.91
Basque Country	**-0.66**	0.65	**-0.33**	0.53	**-0.81**	0.50	**-1.03**	0.97

(1) Unemployment rate (UR) of the LFS
(2) Expanded unemployment rate (URE): unemployed + people covered by the ERTE.
(3) Period: 2005.Q1 – 2019.Q4.
(4) Period: 2005.Q1 – 2020.Q4.

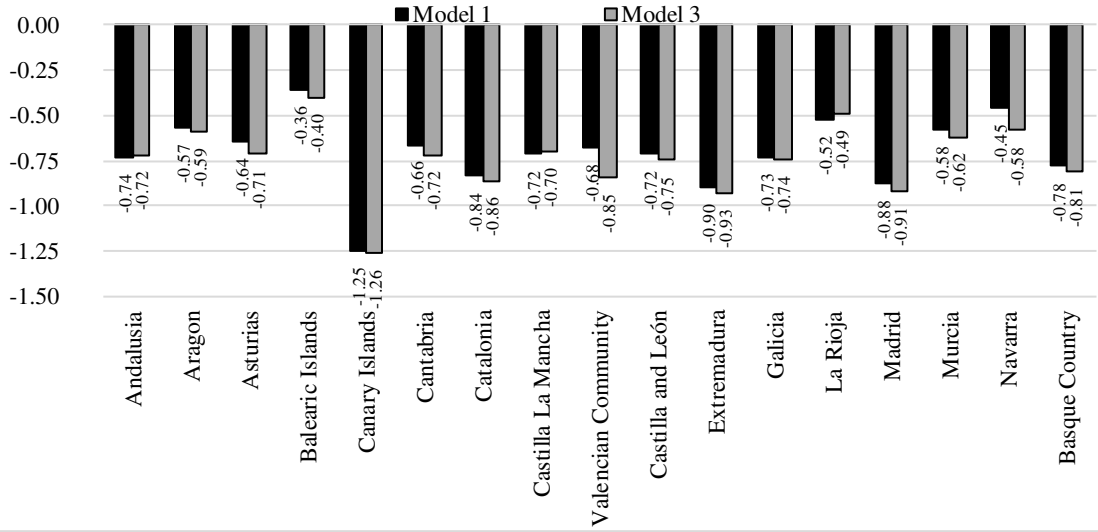
When data from the four quarters of 2020 were included in the estimates (*Model 2*), it is seen that the Okun's coefficients are significantly lower in absolute value (Table 2 and Figure 2), that is, with only four additional data. Moreover, the relationship for the entire period becomes weaker in all regions. The reduction of the estimated coefficient ranges from 0.20pp to 0.83pp in absolute value, depending on the region (on average 0.48). These four additional observations correspond to the period in which, although economic activity was dramatically reduced in all regions, unemployment did not see the expected increase according to the pre-pandemic Okun's relationship. In addition, to achieve significant coefficients and model adjustments, more lags of the variables had to be included in many cases. With these results, it seems that the relationship between unemployment and economic activity would have undergone a structural change in 2020 for all regions of Spain.

Figure 2: Regional Okun's coefficients with the unemployment rate (UR) as dependent variable



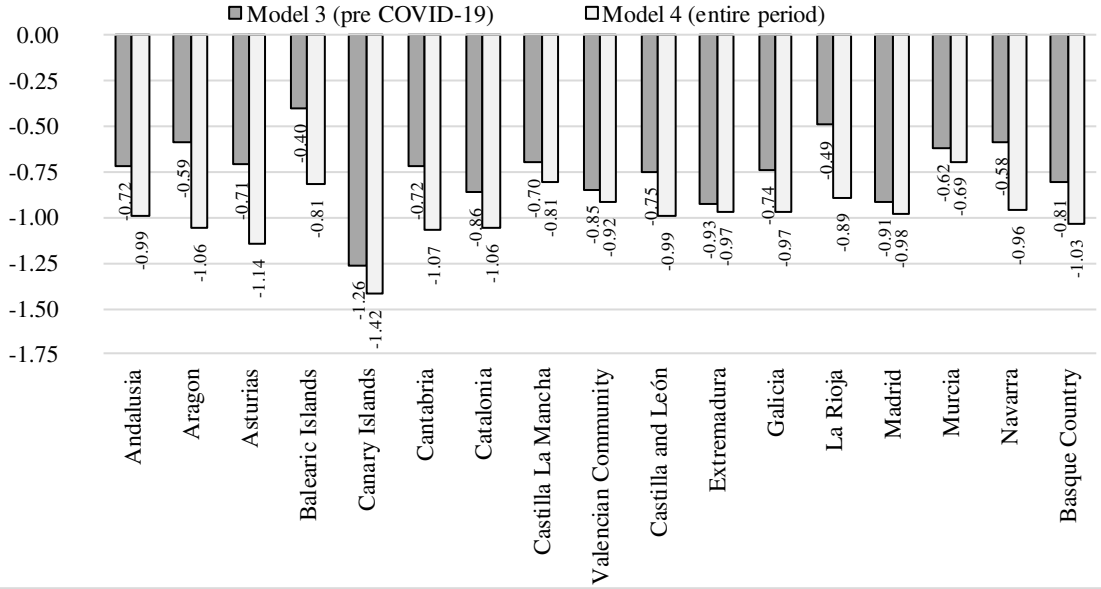
The estimations of the Okun's coefficient with URE as a dependent variable for the same periods (*Model 3* and *Model 4* of Table 2) indicate the following. First, as shown in Figure 3, there are no significant differences in the estimates with pre-pandemic data between the use of UR or URE as a dependent variable in the modelling. This was a predictable result, since the large differences between these two variables are concentrated in the pandemic period, with the implementation and extensive use of ERTE.

Figure 3: Regional Okun's coefficiencts with UR (*Model 1*) and URE (*Model 3*)
(pre-pandemic of COVID-19, with data until 2019.Q4)



Second, when data from the four quarters of 2020 are added to the estimation with URE, it is observed that the relationship becomes even stronger in all regions (Figure 4), and the models offer, in almost all cases, an adjustment coefficient above 0.9. This is because we are adding data that show a period in which economic activity collapsed in each region. At the same time, the URE was subject to a significant increase, mainly in the second quarter of 2020, due to a slight increase in registered unemployment together with a large increase in "hidden unemployment" linked to the containment exercised by the ERTE. Therefore, the doubt arises that if the people who took advantage of the ERTE had been counted as idle resources (unemployed) in the labour market statistics or if they had not mediated these employment containment policies, most of these people would have become strictly unemployed. Therefore, the original Okun's relationship, which takes UR as a dependent variable, not only would not have become weaker but, on the contrary, would have become stronger, showing a solid impact of variations in activity on unemployment.

Figure 4: Regional Okun's coefficients with expanded unemployment rate (URE) as dependent variable



Next, projections for the unemployment rate for the period 2020.Q1 - 2020.Q4 were made for each region based on the pre-pandemic models (*Model 1*) and compared with the real evolution of the UR variable itself and with the URE variable in the same period. This was done as a way to reinforce the previous analysis, to check whether Okun's law continued in force during the crisis caused

by the COVID-19 pandemic and to verify whether this relationship depends on how the unemployment rate is measured.

Figure 5 shows the results. As seen, in all the regions, the pre-pandemic models predicted a significant increase in unemployment, mainly in the second quarter of 2020 (dotted lines), when the greatest fall in economic activity was recorded. Therefore, the expected values for unemployment rates in the regions predicted a dramatic situation in regional labour markets. On the one hand, from the productive point of view, the projections indicated a significant increase in the number of people who would increase the amount of idle resources in the regional economies, and, on the other hand, from the point of view of workers, a high percentage of employed persons would see their employment and source of income disappear.

When comparing these projections with the actual evolution of the INE unemployment rates in that period, it is observed that the official statistics did not reflect these behaviours, registering in all cases a slight increase in unemployment. In effect, the interannual increase in the unemployment rate (INE) in the second quarter of 2020 was between 0.25 pp and 4.75 pp according to regions (La Rioja and Cantabria, respectively), while the gap between the expected value of the unemployment rate from *Model 1* and the real value measured by the INE ranges according to region between 8 pp and 33 pp in the second quarter of 2020 (Castilla La Mancha and Canary Islands, respectively). Initially, this could be interpreted as a "breakdown" of Okun's law in the regions from the COVID-19 pandemic.

However, when we compare these projections with the evolution of the URE variable, it is observed that, although there is not a nearly perfect fit between the two variables in all the regions, in the cases in which this does not occur, the evolution of these variables is much better fit with respect to what was observed with UR, locating the URE variable somewhat above the projections of the models.

Figure 5: Unemployment Rate (UR), Expanded Unemployment Rate (URE) and projected UR with pre-pandemic Okun's law

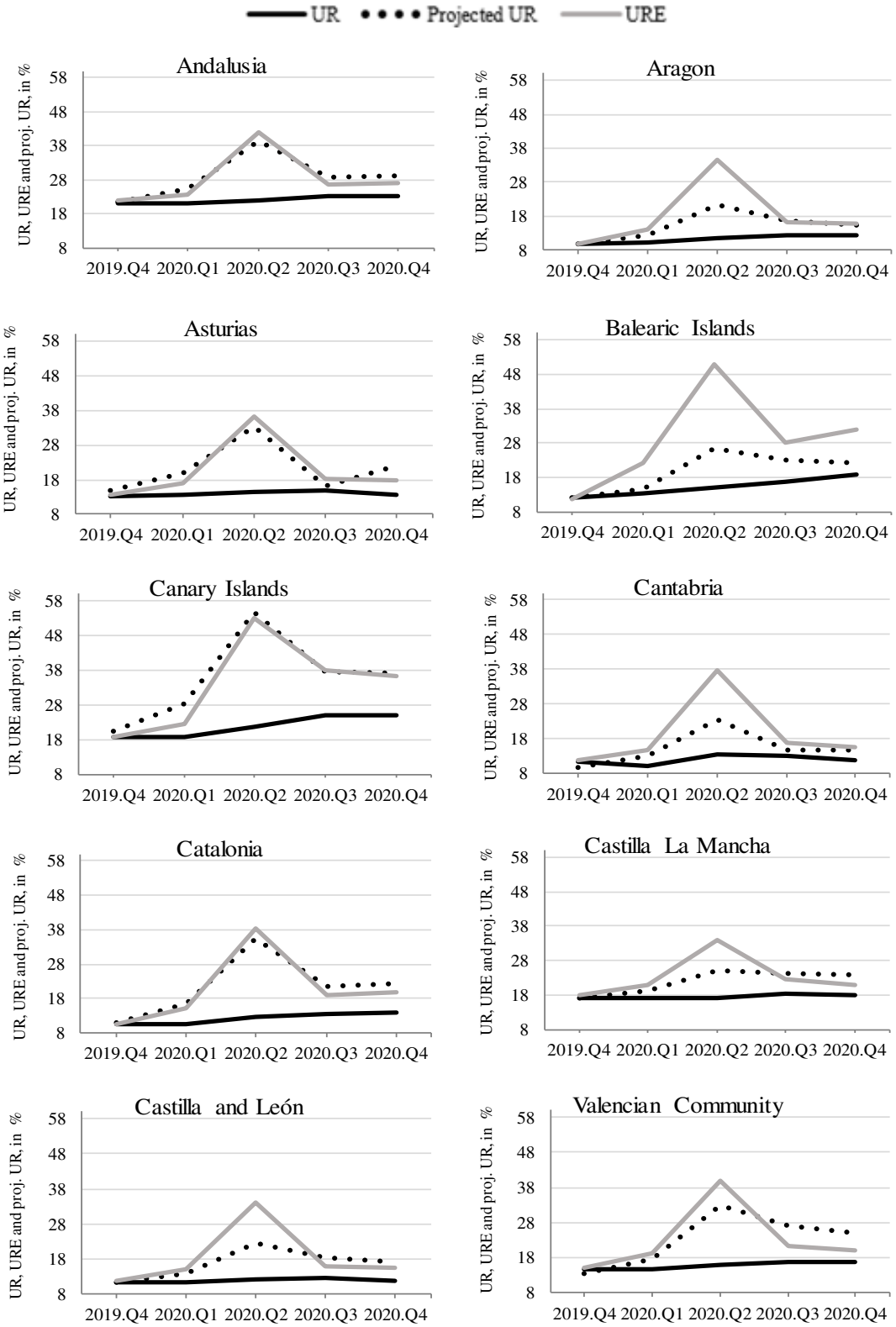
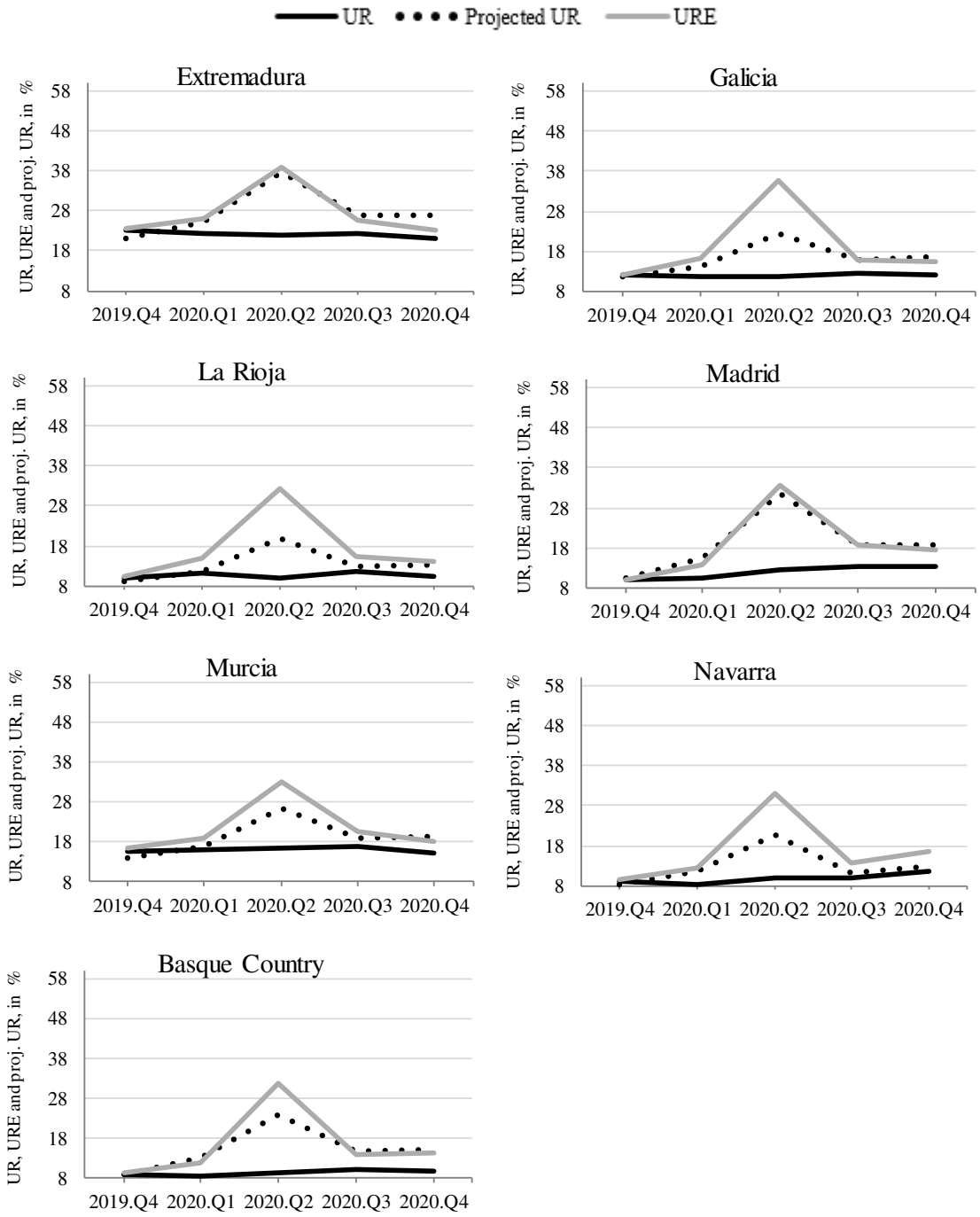


Figure 5 (continued): Unemployment Rate (UR), Expanded Unemployment Rate (URE) and projected UR with the pre-pandemic Okun's law



The fit between the UR and URE projections is almost perfect in some communities (Andalusia, Asturias, Canary Islands, Catalonia, Extremadura and Madrid). This can have two interpretations. On the one hand, if the application of the ERTE had not been mediated, surely the evolution of unemployment would have shown a trajectory as predicted by *Model 1*, which is reflected in the URE variable; that is, unemployment would have grown significantly. The unemployment rate in the second quarter of 2020 would have been between 17pp and 31pp above the levels observed in almost all of these regions. On the other hand, the nearly perfect fit between the UR and URE projections implies that Okun's relationship continued in force even in the pandemic period.

In the other regions, a gap is observed between the URE variables and the UR projections. Within this group, the regions of Murcia, the Valencian Community, the Basque Country and Castilla La Mancha have the best fit between both variables, with gaps lower than 9 pp in the peak of the second quarter of 2020. In this quarter, the unemployment would have been between 8 pp and 15 pp higher than that recorded by labour market statistics if the ERTE had not been mediated.

In the rest of the regions, although the gap between the UR projections and the URE variable is greater than 10 pp in the highest peak, in all of them, the unemployment forecast was approximately 10 pp higher than that recorded by the statistics of the INE.

Therefore, despite the fact that the fits between URE and UR projections are not perfect, the observed evolution allows us to affirm that, although official statistics did not demonstrate the validity of Okun's law with the COVID-19 pandemic, in all regions the idle resources increased with the falling GDP, and although perhaps not all would have become strictly unemployed had the ERTE not been mediated, Okun's relationship continued to be relatively strong in all these regions.

7. Conclusions

From this analysis, we can conclude that Okun's law continues in force in the regions of Spain, although the statistics have not recorded the expected effect of the economic crisis due to COVID-19 on unemployment.

It follows that the estimation of this relationship depends on how unemployment is measured. Under the "promise" of the companies that it would be a temporary situation, the people sheltered by the ERTE were in general people who became part of the idle resources of the economy. In other words, they were unemployed and receiving unemployment insurance due to the limitation of mobility and the consequent hibernation of the economy in order to prevent the spread of the COVID-19 pandemic.

Therefore, from the productive point of view, it seems that Okun's law continued to be met, that is, the relationship between the variation in economic activity and the variation in idle labour resources continued in force. In addition, if the assumption were made that all the people who took advantage of the ERTE would have fallen into unemployment if this containment policy had not been mediated, the relationship between economic growth and unemployment would have become even stronger in all regions.

From the social point of view, this situation can be visualized as the implementation of a policy that managed to mitigate the dramatic impact of the fall in the level of economic activity on people, which if the reception of the ERTE had not been mediated would have meant total loss of their jobs, with the consequent uncertainty about future job placement. In fact, the results of this analysis indicate that if this policy had not been mediated, the unemployment rate would have been, depending on the region, between 8pp and 30pp above the level recorded by the INE statistics.

References

Abraham, K., & Houseman, S. (1994). Does employment protection inhibit labor market flexibility? Lessons from Germany, France, and Belgium. In Rebecca. M. Blank (Eds), *Social Protection versus Economic Flexibility: Is There a Trade-Off?* 59-94. University of Chicago Press.

Arranz, J., García-Serrano, C., & Hernanz, V. (2019). The changing use of short-time work schemes: Evidence from two recessions. *European Journal of Industrial Relations*, 25(1), 5-22.

Arranz, J., García-Serrano, C., & Hernanz, V. (2021). Hope for the best and prepare for the worst. Do short-time work schemes help workers remain in the same firm? *International Journal of Manpower*. 42(5): 935-959.

Ball, L., Leigh, D., & Loungani, P. (2017). Okun's Law: Fit at 50? *Journal of Money, Credit, and Banking,* 49(7): 1413-41.

Ball, L., Furceri, D., Leigh, D., & Loungani, P.. (2019). Does One Law Fit All? Cross- Country Evidence on Okun's Law. *Open Economies Review,* 30(5): 841–87.

Bande, R., & Martín-Román, Á. (2018). Regional Differences in the Okun´s Relationship: New Evidence for Spain (1980-2015). *Investigaciones Regionales-Journal of Regional Research*, 41: 137-165.

Barišić, P., & Kovač, T. (2022). The effectiveness of the fiscal policy response to COVID-19 through the lens of short and long run labor market effects of COVID-19 measures. *Public Sector Economics,* 46(1):43-81.

Boeri, T., & Bruecker, H. (2011). Short-time work benefits revisited: some lessons from the Great Recession. *Economic Policy*, 26(68): 697-765.

Burdett, K., & Wright, R. (1989). Unemployment insurance and short-time compensation: The effects on layoffs, hours per worker, and wages. *Journal of Political Economy,* 97(6): 1479-1496.

Cahuc, P., & Carcillo, S. (2011). Is short-time work a good method to keep unemployment down? *Nordic Economic Policy Review*, 1(1): 133-165.

Cahuc, P., Kramarz, F., & Nevoux, S. (2021). The heterogeneous impact of short-time work: from saved jobs to windfall effects. *IZA DP,*14381.

Castle, J., Doornik, J., & Hendry, D. (2021). The value of robust statistical forecasts in the Covid-19 pandemic. *National Institute Economic Review*, 256: 19-43.

Clar-López, M., López-Tamayo, J. & Ramos, R. (2014). Unemployment forecasts, time varying coefficient models and the Okun's law in Spanish regions. *Economics and Business Letters*, 3(4): 247–262.

Dolado, J., Felgueroso, F., & Jimeno, J. (2021). Past, present and future of the Spanish labour market: when the pandemic meets the megatrend. *Applied Economic Analysis*, 29(85): 21-41.

FitzRoy, F., & Hart, R. (1985). Hours, layoffs and unemployment insurance funding: theory and practice in an international perspective. *The Economic Journal*, 95(379): 700-713.

Gil-Alana, L., Marinko, S., & Buric, S. (2020). Testing Okun's Law: Theoretical and Empirical Considerations Using Fractional Integration. *Applied Economics,* 52(5): 459-74.

Giupponi, G., & Landais, C. (2020). Building effective short-time work schemes for the COVID-19 crisis. VoxEU. https://cepr.org/voxeu/columns/building-effective-short-time-work-schemes-covid-19-crisis

Hijzen, A., & Venn, D. (2011). The role of short-time work schemes during the 2008-09 recession. *OECD Social, Employment and Migration Working Papers*, 115.

Hijzen, A., & Martin, S. (2013). The role of short-time work schemes during the global financial crisis and early recovery: a cross-country analysis. *IZA Journal of Labor Policy*, 2(5).

Izquierdo, M., Puente, S., & Regil, A. (2021). Furlough schemes in the Covid-19 crisis: an initial analysis of furloughed employees resuming work. *Banco de España Article*, 11/ 21.

Jalles, J. (2019). On the Time-Varying Relationship between Unemployment and Output: What Shapes It? *Scottish Journal of Political Economy,* 66 (5): 605-30.

Juranek, S., Paetzold, J., Winner, H., & Zoutman, F. (2020). Labor market effects of COVID-19 in Sweden and its neighbors: Evidence from novel administrative data. *NHH Dept. of Business and Management Science Discussion Paper*, (2020/8).

Lea, R. (2020). Coronavirus crisis: Unemployment and redundancies begin to rise. Arbuthnot Banking Group. https://wwwarbuthnotlathamcouk.azureedge.net/cdn/ff/A9A-ADP2VEviR_4QY7otqL-HVzZ1rXpNRRdplUFfWM0/1600679171/public/documents/21%20September%202020.pdf

Osuna, V., & García-Pérez, J. (2015). On the effectiveness of short-time work schemes in dual labor markets. *De Economist*, 163: 323-351.

Osuna, V., & García Pérez, J. (2021). Temporary layoffs, short-time work and COVID-19: the case of a dual labour market. *Applied Economic Analysis,* Vol. ahead-of-print No. ahead-of-print. https://doi.org/10.1108/AEA-06-2021-0118

Leandro, Á. (2020). La efectividad de la política fiscal en tiempos de COVID. Economía y Mercados. Sector Público. *Caixa Bank Research*. 9 de octubre de 2020. https://www.caixabankresearch.com/es/economia-y-mercados/sector-publico/efectividad-politica-fiscal-tiempos-covid?14

Martín-Román, Á. L. (2022). Beyond the added-worker and the discouraged-worker effects: the entitled-worker effect. *Economic Modelling*, 110, 105812.

Melguizo, C. (2017). An analysis of Okun's law for the Spanish provinces. *Review of Regional Research*, 37: 59–90.

Okun, A. (1962). Potential GNP: its measurement and significance. *In 1962 Proceedings of the Business and Economic Statistics Section of the American Statistical Association*. https://cowles.yale.edu/author/arthur-m-okun.

Pavlopoulos, D., & Chkalova, K. (2022). Short-time work: A bridge to employment security or a springboard to unemployment? *Economic and Industrial Democracy*, 43(1): 168-197.

Pérez, J., Rodríguez, J., & Usabiaga, C., (2003). Análisis dinámico de la relación entre ciclo económico y ciclo del desempleo: Una aplicación regional. *Investigaciones Regionales-Journal of Regional Research*, 2: 141–162.

Perman, R., & Tavera, C. (2005). A Cross-Country Analysis of the Okun's Law Coefficient Convergence in Europe. *Applied Economics*, 37 (21): 2501-13.

Perman, R., & Tavera, C. (2007). Testing for Convergence of the Okun's Law Coefficient in Europe. *Empirica*, 34 (1): 45-61.

Pope, T., Dalton, G., & Tetlow, G. (2020). The Coronavirus Job Retention Scheme. *Institute for Government*, 22.

Porras-Arena, M. & Martín-Román, Á. (2019). Self-employment and the Okun's law. *Economic Modelling,* 77: 253−265.

Romero, M., Sosa, J., & Serrano, J. (2021). Impacto económico asimétrico por provincias de la COVID-19: evolución reciente y proyecciones. *Cuadernos de Información Económica,* 283: 31-36.

Stuart, M., Spencer, D., McLachlan, C., & Forde, C. (2021). COVID-19 and the uncertain future of HRM: Furlough, job retention and reform. *Human Resource Management Journal*, 31(4): 904-917.

Usabiaga, C., & Hernández-Salmerón, M. (2021). Reflections on Idiosyncratic Labour Markets: The Spanish and Andalusian Cases. Chapter 1. *in Progress in Economics Research* 47.

Van Audenrode, M. (1994). Short-time compensation, job security, and employment contracts: evidence from selected OECD countries. *Journal of Political Economy*, 102(1): 76-102.

Villaverde, J., & Maza, A. (2009). The Robustness of Okun's Law in Spain, 1980-2004: Regional Evidence. *Journal of Policy Modelling,* 31(2): 289-97.

Villaverde, J., & Maza, A. (2007). Okun's law in the Spanish regions. *Economic Bulletin* 18: 1–11.