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# The unemployment effects of closing non-essential activities during the COVID-19 lockdown: the Spanish municipalities<sup>ℵ</sup>

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## Abstract

We study the labour market impact of the confinement measures implemented in Spain to halt the spread of the COVID-19 pandemic in the first quarter of 2020. We use data from 8,108 municipalities to quantify the impact of the shutdown of non-essential activity on local unemployment. Ordinary least squares regressions show that an increment of 10 percentage points in the share of firms performing non-essential activities increased the unemployment-population ratio by between 0.032 and 0.148 percentage points. We only find this positive effect in municipalities with more than 2,395 inhabitants. The lockdown explains between 25% and 40% of the observed increase in the unemployment within these municipalities. We also look at the impact of the lockdown by gender and age, and find that the impact of these closures was felt relatively more by males and workers above 45 years old.

Keywords: COVID-19, lockdown, unemployment, non-essential activities, municipalities.

JEL classification: J18, J64, R23

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## 1. Introduction

As COVID-19 spread across European countries during the first quarter of 2020, authorities adopted a series of measures to mitigate the harmful health effects of the pandemic. Governments defined a set of occupations considered essential while forcing those who worked in non-essential activities to stay at home in “lockdown”. The lockdown measures taken to contain the spread of COVID-19 generated important labour market effects beyond the immediate contraction of GDP. For example, Palomino et al. (2020) estimated for 29 European countries an average increase of around 5 percentage points in the headcount poverty index during the first two months of the lockdown. Similarly, Bauer and Weber (2021) use a difference-in-difference approach at the federal state level to evaluate the short-term labour market impact of the COVID-19 lockdown measures in Germany, distinguishing industries that were subject to closure from other industries. They found that 60 percent of the increase of inflows into unemployment in April 2020 were due to these shutdown measures. In turn, Guven et al. (2020) studied the short-term labour market effects of COVID-19 and the associated national lockdown in Australia. They found that the national lockdown decreased labour force participation by 3.3%, increased unemployment by 1.7%, and decreased weekly working hours by 2.5%. Similarly, Kong and Prinz (2020) and Dreger and Gros (2021) provided US state-level evidence on the short run impact of social distancing measures on unemployment and found that the lockdown had a strong and positive impact on unemployment.<sup>1</sup>

Using data from European Union (2020), Torrejon et al (2020) and Palomino et al. (2020) showed that the labour market impact of COVID-19 associated with the lockdown measures

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<sup>1</sup> See Brodeur A. et al. (2021) for a recent survey of the empirical literature on the socioeconomic consequences of the COVID-19 and its contingent measures.

was higher in countries in which the share of employment in sectors forcefully closed was higher. Thus, we expect that the pre-pandemic distribution of firms across different sectors will have played an important role in determining labour market outcomes during the lockdown.

In this paper we study the labour market impact of the confinement measures that were implemented in Spain during the first quarter of 2020 to halt the spread of COVID-19. More in detail, we quantify the short-term impact of the temporary shutdown of non-essential activity on local unemployment in Spain. Specifically, we run a set of OLS cross-section regressions to estimate the effect of the percentage of firms directly affected by the lockdown on the change of unemployment across 8,108 Spanish municipalities.<sup>2</sup>

As Torrejon et al (2020) noted, Spain is an interesting case to study because it was the country which adopted the most restrictive measures when distinguishing between essential and non-essential jobs. According to these authors, around 56% of Spanish employment was in sectors that were considered non-essential and, therefore, were forced to close during the lockdown. This proportion was much lower in Germany (45%) or Italy (38%).

Our key regressor is the percentage of firms in the area not providing essential services in 2019. We expect a positive relationship between the share of firms not providing essential services and local unemployment during the lockdown. We use this variable to identify the effect of closing non-essential activities on unemployment because we show that it had no impact on unemployment before the implementation of the Spanish lockdown.

The national lockdown was imposed on March 14<sup>th</sup> while the shutdown of non-essential activities was implemented between March 30<sup>th</sup> and April 12<sup>th</sup> of 2020. Thus, we consider two different periods in our analysis: from February to April of 2020, and, to avoid seasonality, the period between April of 2019 and April 2020. We also control for the initial level of unemployment, the share of temporary employment contracts, the percentage of population

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<sup>2</sup> Our database covers 99.7% of the existing municipalities in Spain. There is no statistical information for the remaining 0.3%.

above 70 years old, province fixed effects and the change in the number of employment contracts at the municipality level.

We run OLS regressions for five groups of municipalities based on their number of inhabitants. The five groups are defined as: less than 152 inhabitants; from 153 to 516 inhabitants; from 517 to 2,394 inhabitants; from 2,395 to 9,266 inhabitants and, finally, more than 9,267 inhabitants. Each of the first three groups correspond to 25% of the municipalities. The largest 25% of municipalities is split into two groups because there is significant variation in their numbers of inhabitants. These two groups correspond to 15% and 10% of the sample of municipalities, respectively.

The main contribution of this paper to the literature is that we depart from aggregate data and use a municipality database to analyse the impact of the lockdown on unemployment. In contrast to our analysis, Bauer and Weber (2020) Dreger and Gros (2021), Guven (2020) and Kong and Prinz (2020) study the unemployment effect of the lockdown at the state level.

To our knowledge, our paper is not only the first that uses data at the municipality level to study the unemployment effects of shutting down non-essential activities during the COVID-19 lockdown, but it is also the first to look at the differing effects across municipalities of different population size. Additionally, our paper contributes to the existing literature by analysing the asymmetric responses experienced by genders and age groups across municipalities.

We apply a standard OLS methodology because the lockdown measures in Spain were implemented in all municipalities equally and introduced at the same time. Moreover, and in contrast to Bauer and Weber (2021) who apply a difference-in-difference approach, there is not data desegregated by industry at the municipality level in Spain that helps to distinguish unemployment flows affected by the economic closures from other industries.

We find that, depending on the population size of the municipality, an increase in 10-percentage points in the share of firms performing non-essential activities increases the unemployment-population ratio by between 0.032 and 0.148 percentage points. We also show

that the unemployment effect is positive and significant only in those municipalities with more than 2,395 inhabitants. The non-significant results in small municipalities remain even if we merge small municipalities into areas of mobility with higher number of inhabitants, and control for variables of mobility across areas.

To put these numbers in perspective, given that 34.7% of non-essential activities were forced into lockdown in municipalities with more than 9,266 inhabitants, we observe that this policy increased the average unemployment-population ratio of these municipalities by  $34.7\% \times 0.0148 = 0.514$  percentage points. This represents 40% of the average increase (1.29 percentage points) observed in these municipalities.

One reason why we believe the lockdown had no impact on unemployment in the smallest municipalities is because the agricultural sector, which was considered an essential sector during that period, has higher importance in their economic activity. More precisely, the share of employment contracts in agriculture falls from 36.3% to 16.8% when the municipality size increased from less than 152 inhabitants to more than 9,266.

Finally, we find the lockdown of non-essential activities increased unemployment of both males and females only in those municipalities with more than 2,395 inhabitants, and this effect was larger for males. In turn, a 10-percentage increase in the share of firms performing non-essential activities increased unemployment of older workers (more than 45 years old) by 0.162 percentage points. The effect is not significant for the groups of workers below that age. Finally, we also observe bigger effects in municipalities above 2,395 inhabitants.

Our work is somewhat related to Gutiérrez and Moral-Benito (2020), who also used municipal-level information to quantify the short-term effects of the Spanish lockdown on employment. They showed that the municipalities most affected by the non-essential activity shutdown suffered higher reductions in employment. In contrast to these authors, we look at the local impact on unemployment, capturing both the labour supply and demand effects of shutting down non-essential activities during the lockdown. Moreover, they do not study the

importance of the population size of these municipalities and do not analyse the asymmetric response across gender and age groups.

Our results could help to guide policies when planning other lockdowns in times of disaster, pandemics, or social upheaval. As Bailey et al. (2020) mention, a regional analysis is essential to fully understand and manage the unequal impacts of the current pandemic, not least because COVID-19 is unlikely to be the last crisis of its kind. Therefore, policy makers should evaluate the relative importance to the economy of the activities that they are planning to lock-down as well as the heterogeneous effects across municipalities. This heterogeneous impact also calls for territorialised policy responses and for inter-municipal coordination.

The rest of the paper is organised as follows. Section 2 presents the data and section 3 the methodology. Then, section 4 displays the results and section 5 presents a robustness analysis across small municipalities. Finally, section 6 concludes.

## **2. Data**

We consider 8,108 Spanish municipalities. The descriptive analysis has been split according to gender, age, and the number of inhabitants of the municipalities. We split the municipalities into five groups based on the size of their population, ranking them from smallest to largest. The first three groups each contain 25% of the municipalities. The remaining 25% is split into two groups because there is considerable variation in the number of inhabitants in this subset of municipalities. These two groups contain 15% and 10% of the sample, respectively. The groups are defined as: less than 152 inhabitants; from 153 to 516 inhabitants; from 517 to 2,394 inhabitants; from 2,395 to 9,266 inhabitants and, finally, more than 9,267 inhabitants.

The dependent variable of the study is the percentage points change in unemployment between February 28<sup>th</sup> and April 30<sup>th</sup> of 2020.<sup>3</sup> This variable is taken from the Spanish Public Employment Service (SEPE). Unemployment is calculated as the percentage of total

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<sup>3</sup> For robustness analysis, we also look at the percentage change in unemployment between April 30<sup>th</sup>, 2019, and April 30<sup>th</sup>, 2020, and observe that the descriptive analysis does not change. In the empirical part, we study this issue in more detail.

population by dividing the number of unemployed workers registered at the Spanish Employment Office by the total population in 2019.<sup>4</sup> Our dependent variable is called change in unemployment (pp) in Table 1. This table shows an average increase of 0.85 percentage points during the lockdown, and it is clearly positively correlated with the size of the municipality. For example, the average increase in unemployment of municipalities with more than 9,267 inhabitants is more than double that observed in those with less than 152 inhabitants (1.29 versus 0.52 percentage points).

This increase in unemployment occurred despite the Spanish Government introducing a furlough scheme for workers affected by the lockdown during the pandemic. It provided furloughed workers with 70 percent of their base salary for the first six months, before dropping to 50 percent for the following months. This policy affected around 25% of paid workers during the lockdown. Moreover, the affected workers were considered employed workers during the duration of the furlough.

Like Gutiérrez and Moral-Benito (2020), our main regressor of interest is the percentage of firms in each municipality not providing any type of essential services in January 2019. The Spanish Institute of Statistics (Instituto Nacional de Estadísticas, INE) created this variable to provide an indicator of the percentage of economic activity that was affected by the lockdown.<sup>5</sup> This variable is called firms with non-essential activities (%) in Table 1. Given the unexpected and short run duration of the lockdown, we assume that the share of firms providing essential services was similar to that observed in January 2019. On average, 21% of the firms did not provide any type of essential services. Likewise, this rate clearly has a positive relationship with the population size, increasing from 10.74% in the smallest municipalities to 34.74% in the largest ones. In turn, Figure 1 shows important differences in the percentage of firms providing essential services across the Spanish municipalities,

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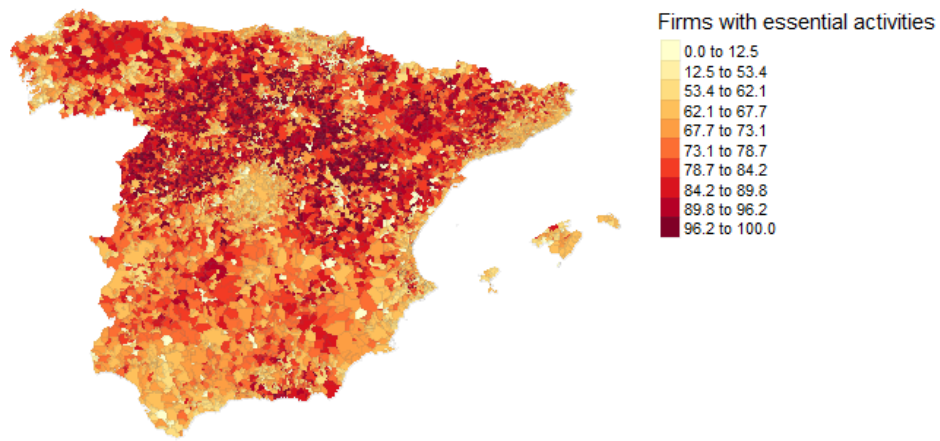
<sup>4</sup> We do not use the unemployment rate because there is no information on the labour force by municipality.

<sup>5</sup> See the technical note (Spanish version only) at [https://www.ine.es/covid/nota\\_tecnica\\_dirce.pdf](https://www.ine.es/covid/nota_tecnica_dirce.pdf). Unfortunately, this variable is only available for January 2019. The INE creates the percentage of firms providing essential services using the Central Business Register (CBR). The CBR includes all the enterprises that carry out one or more economic activities, contributing to gross domestic product at market prices in Spain. According to The European Regulation, all these enterprises must be registered at the CBR. The CBR is generated using firms' administrative records and other statistical sources.



suggesting the likely presence of heterogeneous effects of the lockdown on local unemployment.

**Figure 1 Percentage of firms with essential services at municipal level (January 2019)**



Source: Own elaboration based on Spanish National Institute of Statistics (INE) data.

We also include the percentage change in the Social Security registrations taken from SEPE between February 28<sup>th</sup> and April 30<sup>th</sup> of 2020 to control for the evolution of employment during the lockdown. Like unemployment, this variable is also expressed as a percentage of the total population in 2019 and is called change in contracts (pp) in Table 1. This table shows an average reduction of 1.45 percentage points in the number of employment contracts, with somewhat higher reductions in municipalities with bigger populations. In this case, the number of contracts fell by 1.21 percentage points in the smallest municipalities and 1.64 percentage points in those with the largest populations.

**Table 1. Key descriptive Statistics at municipal level**

Municipalities	n	Change in unemployment (percentage points) February 2020-April 2020				Change in employment contracts (percentage points) February 2020-April 2020				Firms with non-essential activities (%) January 2019			
		Mean	sd	Min	Max	Mean	sd	Min	Max	Mean	sd	Min	Max
Total	8108	0.85	2.58	-16.67	96.81	-1.45	7.49	-258.70	89.71	20.99	13.21	0.00	100.00

Less than 152 inhabitants	2033	0.52	4.08	-16.67	91.11	-1.21	12.70	-258.70	89.71	10.74	13.70	0.00	100.00
From 153 to 516 inhabitants	2023	0.75	2.55	-3.08	96.81	-1.41	6.14	-181.74	25.88	17.59	11.35	0.00	66.67
From 517 to 2394 inhabitants	2026	0.95	1.66	-1.39	49.12	-1.44	4.22	-52.81	64.98	23.60	9.43	0.00	63.91
From 2395 to 9266 inhabitants	1215	1.12	0.67	-0.74	5.55	-1.78	3.10	-36.06	23.30	30.20	7.48	5.95	49.63
More than 9266 inhabitants	811	1.29	0.72	-0.65	5.69	-1.64	1.91	-29.91	8.87	34.70	5.06	4.55	50.34

Sources: The Spanish Employment Public Service (SEPE) and The Spanish Institute of Statistics (INE). Both unemployment and contracts are expressed as percentage of the total population in each municipality.

In turn, Table 2 shows the average change in unemployment by gender and for three different age groups (less than 25, from 25 to 44 and more than 45 years old). It shows that the increase in the unemployment during the lockdown for males (0.94 percentage points) was higher than for females (0.74 percentage points). This relatively higher increase in males' unemployment with respect to females also applies when considering municipalities with different population sizes. We observe a higher increase in unemployment of people aged between 25 and 44 (0.83 percentage points) with respect to the other two groups (0.46 and 0.25 percentage points higher than in those aged less than 25 and those more than 45 years old, respectively).

**Table 2 Change in unemployment at municipal level: by Gender and Age**

Municipalities	n	Change in unemployment (percentage points) February 2020-April 2020			
		Mean	sd	Min	Max
<b>Females</b>	<b>8105</b>	<b>0.74</b>	<b>2.45</b>	<b>-33.33</b>	<b>87.50</b>
Less than 152 inhabitants	3305	0.59	3.46	-33.33	87.50
From 153 to 516 inhabitants	1772	0.73	1.99	-3.11	63.31
From 517 to 2394 inhabitants	1698	0.80	0.92	-1.76	18.91
From 2395 to 9266 inhabitants	881	0.97	0.62	-0.82	5.32
More than 9266 inhabitants	449	1.18	0.67	-0.52	4.33
<b>Males</b>	<b>8107</b>	<b>0.94</b>	<b>2.55</b>	<b>-23.08</b>	<b>84.62</b>
Less than 152 inhabitants	3092	0.57	3.54	-23.08	84.62
From 153 to 516 inhabitants	1907	0.93	2.05	-4.74	65.42
From 517 to 2394 inhabitants	1771	1.23	1.54	-2.27	46.39
From 2395 to 9266 inhabitants	898	1.39	0.85	-0.51	6.23
More than 9266 inhabitants	439	1.56	0.79	-0.14	4.62
<b>Less than 25 years old</b>	<b>7763</b>	<b>0.46</b>	<b>3.15</b>	<b>-10.00</b>	<b>81.00</b>
Less than 152 inhabitants	1937	0.01	0.17	-1.00	5.00
From 153 to 516 inhabitants	1942	0.04	0.26	-1.00	5.50
From 517 to 2394 inhabitants	1943	0.11	0.64	-4.00	13.00
From 2395 to 9266 inhabitants	1169	0.56	1.90	-9.00	21.00
More than 9266 inhabitants	770	3.34	9.15	-10.00	81.00
<b>Between 25 and 45 years old</b>	<b>8068</b>	<b>0.83</b>	<b>4.66</b>	<b>-10.00</b>	<b>99.00</b>

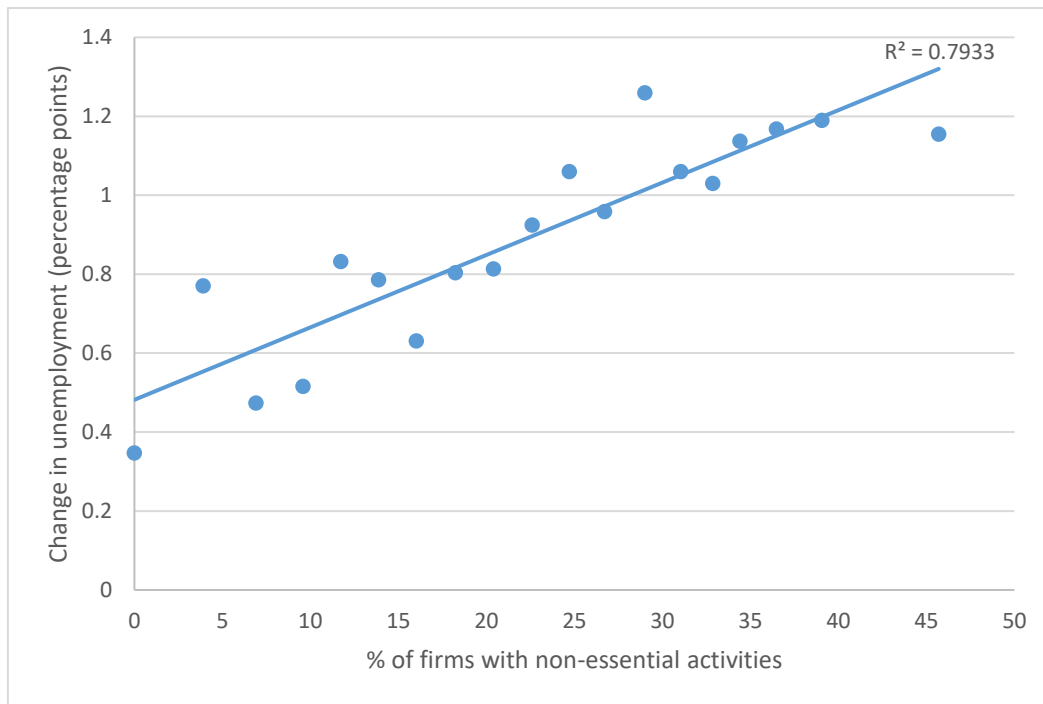
Less than 152 inhabitants	2031	0.02	0.36	-1.00	13.75
From 153 to 516 inhabitants	2020	0.05	0.31	-5.00	9.17
From 517 to 2394 inhabitants	2021	0.27	1.02	-2.00	18.00
From 2395 to 9266 inhabitants	1207	1.19	4.20	-1.00	64.00
More than 9266 inhabitants	787	5.81	12.80	-10.00	99.00
<b>More than 45 years old</b>	<b>8102</b>	<b>0.25</b>	<b>1.97</b>	<b>-1.45</b>	<b>82.58</b>
Less than 152 inhabitants	2033	0.00416	0.07	-0.25	2.00
From 153 to 516 inhabitants	2023	0.01	0.11	-0.5	3.96
From 517 to 2394 inhabitants	2026	0.05	0.17	-1.33	2.25
From 2395 to 9266 inhabitants	1214	0.26	0.62	-1.14	8.17
More than 9266 inhabitants	804	1.94	5.92	-1.45	82.58

Sources: The Spanish Employment Public Service (SEPE) and The Spanish Institute of Statistics (INE). Both unemployment and contracts are expressed as percentage of the total population in each municipality.

To sum up, we observe an average reduction in the number of employment contracts as well as an increase in unemployment across the Spanish municipalities during the lockdown. This increase in unemployment is not homogenous across municipalities, but increases by relatively more in larger municipalities, affects more males than females and is worse for workers aged between 25 and 45 years old. The descriptive statistics show that the percentage of firms not providing essential services also increases with the population size of the municipality.

The descriptive statistics also suggest that the municipalities with a higher proportion of firms in non-essential activities experienced higher increases in unemployment during the lockdown. Along this line, Figure 2 presents a scatter diagram that grouped the 8,108 observations in 20 quantiles according to the share of firms providing non-essential services. We can observe a strong unconditional positive correlation between the percentage of firms non providing essential services and unemployment variation (with an  $R^2$  of 0.793 from the regression line). Next, we explore this relationship in detail using regression analysis.

**Figure 2 Firms with non-essential services and change in unemployment during the lockdown (Binned data)**



Sources: The Spanish Employment Public Service (SEPE) and The Spanish Institute of Statistics (INE). Change in unemployment between February and April 2020, expressed as percentage of the total population in each municipality. Firms with non-essential services are expressed as a percentage of all firms in each municipality in January 2019. Each point in the scatter diagram shows the average of the x-axis and y-axis values within a group. The groups are defined using 20 quantiles of the x variable.

### 3. Methodology

To analyse the relationship between non-essential services and variations in unemployment we performed ordinary least squares (OLS) regression analysis. As discussed in the previous section, the dependent variable is the change in unemployment as a percentage of the total population in each municipality. In turn, the main explanatory variable is the share of firms with non-essential activities expressed as a percentage of the total number of firms.<sup>6</sup> In the analysis, municipalities who experienced changes in the unemployment-population ratio greater than 100% were excluded as they skewed the results. Thus, the total sample is reduced from 8,108 to 8,090 municipalities.

In the previous section, differences were observed in the provision of non-essential services and unemployment that varied according to the population size of the municipalities. For this reason, we split the analysis into samples of municipalities based on their populations as discussed in section 2. We run cross-section OLS regressions for two different time periods and for each of the five groups of municipalities as defined by the number of residents. The first time-period considers the cumulative changes in unemployment and employment

<sup>6</sup> Unfortunately, we do not have information related to the size of the firms, which will be an important control variable to consider in the analysis.

contracts between 28<sup>th</sup> February and 30<sup>th</sup> April 2020. The second period removes any potential seasonal effect by looking at the annual change of these two variables between 30<sup>th</sup> April 2019 and 30<sup>th</sup> April 2020.

The empirical OLS model estimated for each of the two periods and each of the five groups of municipalities considered is:

$$\Delta u_i = \beta_0 + \beta_1 u_i + \beta_2 n_i + \beta_3 \Delta c_i + \beta_5 X_i + \epsilon_i \quad (1)$$

The variable  $\Delta u_i$  corresponds to the change in unemployment-population ratio in percentage terms, where the sub index  $i$  refers to the municipalities. The variable  $u_i$  is the initial level of unemployment-population ratio during the period considered,  $n_i$  is the percentage of firms with non-essential activities and  $\Delta c_i$  is change in the contracts divided by the total population in each municipality. The vector  $X_i$  includes three additional control variables, namely a dummy variable for each of the 50 Spanish provinces, the percentage of population aged more than 70 years old and the share of temporary contracts in 2019.<sup>7</sup>

Our central hypothesis is that the coefficient  $\beta_2 > 0$  captures the effect on local unemployment of forcing non-essential businesses to close. We assume that the share of firms not providing essential services can be used to identify the effect of closing non-essential activities on unemployment because it did not affect unemployment before the lockdown. In particular, and for the objective of validating our identification strategy, we also estimate equation (1) considering the change in unemployment and contracts from February 2019 to April 2019. In this case, we expect that the percentage of firms not providing essential services has no effect on unemployment before the closure of these sectors ( $\beta_2 = 0$ ).

Regarding the other control variables, the initial unemployment-population ratio  $u_i$  is introduced to capture the presence of convergence or divergence in unemployment across local labour markets during the lockdown (See, e.g., Blanchard and Katz (1992), Overman and Puga (2002) and Beyer and Stemmer, 2016). The change in contracts  $\Delta c_i$  is included as a measure of economic activity. Economic activity is growing in areas where employment is

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<sup>7</sup> Both variables are taken from the Social Security registrations for March 2019 at SEPE.

growing and therefore those areas are less likely to suffer from unemployment. In turn, the population above 70 years old is included because local area age structure is a demographic feature that affects unemployment (Nordstrom, 2002). Finally, we include the share of temporary employment to capture the idea that unemployment should increase in areas with a higher incidence of temporary employment (See, e.g., Blanchard and Landier (2002) and Silva and Grenno, 2013).

#### 4. Results

Table 3 shows the estimated cross-section results for the two time periods and for the five groups of municipalities considered in our regressions. The standard errors are reported in parentheses and are robust to the presence of heteroscedasticity. Starting with the whole sample, we find that an increase in the percentage of non-essential firms implies a statistically significant increase in the unemployment after controlling for the initial level of unemployment, province fixed effects, the change in the number of employment contracts at the municipality level, the percentage of the population above 70 years old and the share of temporary contracts. More precisely, considering the period from February 2020 to April 2020 (column 1 in Table 3), an increase of 10 percentage points in the share of firms with non-essential activities increases the unemployment-population ratio by 0.032 percentage points (coefficient  $\beta_2$  in equation (1)). However, this effect is only significant at the 5% level for the largest municipalities, specifically for those with 2,395 to 9,266 inhabitants and those with more than 9,266 inhabitants. In these two samples the effect on the unemployment is larger (0.096 and 0.148 percentage points for an increase of 10 percentage points in the number of firms with non-essential activities respectively) than we observe in the regression considering the whole sample. Therefore, we conclude that closing non-essential activities during the two months of the lockdown increased unemployment, particularly for those municipalities with more than 2,395 inhabitants.

To avoid the effects of seasonality, we also consider the period from April 2019 to April 2020 (column 2 in Table 3). As with the two previous regressions, a 10 percent increase in the percentage of firms with non-essential activities only significantly increases unemployment in municipalities with between 2,395 and 9,266 inhabitants and with more than 9,266 inhabitants (0.125 and 0.128 percentage points, respectively).

Given that 34.7% of the non-essential activities were placed in lockdown in municipalities with more than 9,266 inhabitants (see Table 1), using the estimated coefficient of  $\hat{\beta}_2 = 0.0148$  in column 1 of table 2, we can infer that this policy increases the average unemployment-population ratio of these municipalities by  $34.7\% \times 0.0148 = 0.514$  pp. This number accounts for 39.8% of the observed average increase of this ratio in these municipalities (1.29 percentage points). In the case of municipalities with between 2,395 and 9,266 inhabitants, the estimated impact of the policy is equal to  $30.2\% \times 0.0096 = 0.290$  (25.9% of the 1.12 percentage points increase observed in the average unemployment).

**Table 3 Determinants of change in unemployment at municipal level**

Municipalities	(1) February 2020 April 2020	(2) April 2019 April 2020
<b>Total</b>		
Unemployment (t-1)	0.1187*** (0.0092)	0.0954*** (0.0195)
% Firms with non essential activities	0.0032* (0.0018)	0.0018 (0.0031)
Change in contracts in percentage points	-0.133*** (0.0051)	-0.0532** (0.0267)
Observations	8090	8091
R <sup>2</sup>	0.777	0.483
<b>Less than 152 inhabitants</b>		
Unemployment (t-1)	0.1303*** (0.0062)	0.1164*** (0.0085)
%Firms with non essential activities	0.0006 (0.0034)	-0.0019 (0.0048)
Change in contracts in percentage points	-0.0079** (0.0038)	-0.0064 (0.0115)
Observations	1981	1980
R <sup>2</sup>	0.806	0.495
<b>From 153 to 516 inhabitants</b>		
Unemployment (t-1)	0.0979*** (0.0022)	0.0515*** (0.0120)
%Firms with non essential activities	-0.0016 (0.0024)	-0.0023 (0.0065)
Change in contracts in percentage points	-0.0092 (.0087)	-0.2075 * (0.1108)
Observations	2018	2018
R <sup>2</sup>	0.842	0.605
<b>From 517 to 2394 inhabitants</b>		
Unemployment (t-1)	0.1846*** (0.0100)	0.2174*** (0.0172)
%Firms with non essential activities	0.0023 (0.0024)	0.0046 (0.0031)
Change in contracts in percentage points	-0.0459*** (0.0097)	-0.0641*** (0.0139)
Observations	2048	2048
R <sup>2</sup>	0.813	0.695

<b>From 2395 to 9266 inhabitants</b>		
Unemployment (t-1)	0.0987*** (0.0123)	0.1009*** (0.0264)
%Firms with non essential activities	0.0096*** (0.0027)	0.0125*** (0.0039)
Change in contracts in percentage points	-0.0387*** (0.0086)	-0.0565*** (0.0143)
Observations	1220	1220
R <sup>2</sup>	0.552	0.527
<b>More than 9266 inhabitants</b>		
Unemployment february (t-1)	0.1143*** (0.0178)	0.0964*** (0.0326)
%Firms with non essential activities	0.0148*** (0.0055)	0.0128** (0.0066)
Change in contracts in percentage points	-0.0605*** (0.0150)	-0.1283*** (0.0223)
Observations	803	806
R <sup>2</sup>	0.695	0.683
<b>Other control variables</b>	<b>Yes</b>	<b>Yes</b>

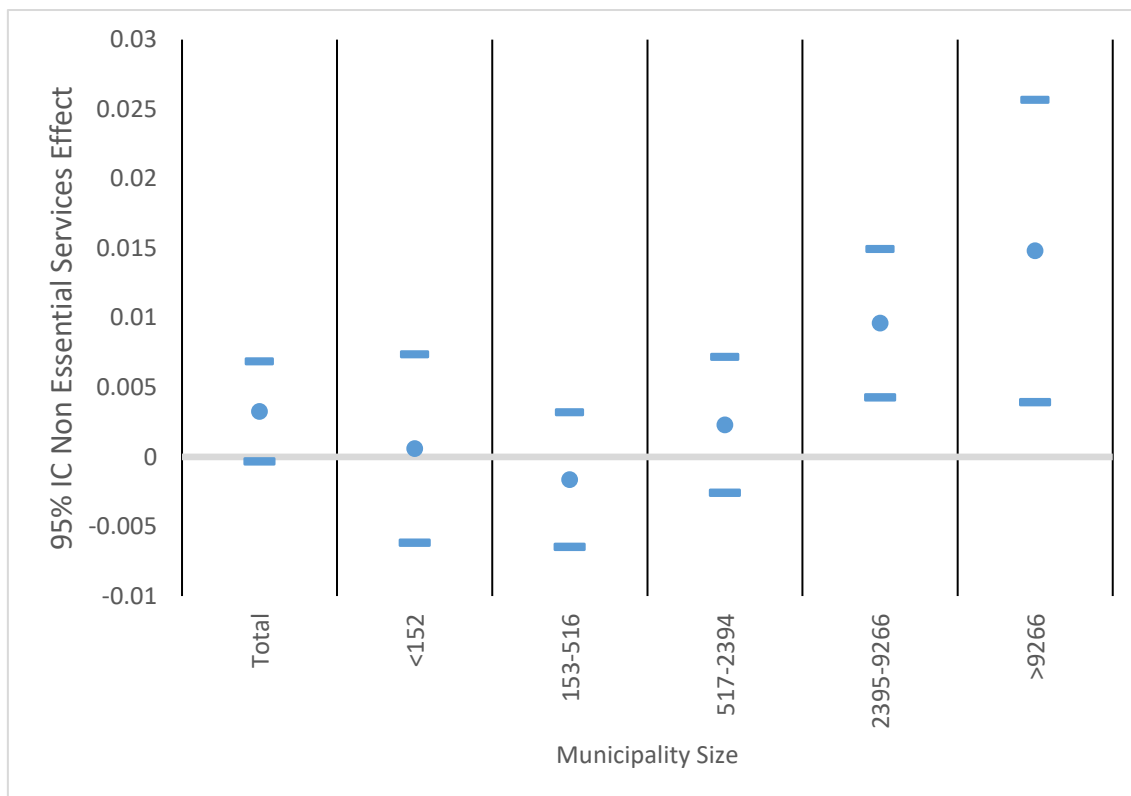
Note: We estimate OLS regressions using equation (1). Percentage change of unemployment-population ratio is the dependent variable. Both unemployment and contracts are expressed as percentage of the total population in each municipality. Robust standard errors are in parentheses and \*, \*\*, \*\*\* measures statistical significance at 10, 5 and 1 percent levels, respectively. All regressions control for regional (province) fixed effects and report robust standard errors. Other control variables include the share of temporary contracts as well as the share of the population over 70 years old.

Additionally, we note that the variation in the number of employment contracts is statistically significant in almost all regressions. An increase in the number of employment contracts reduces unemployment. Finally, the estimated coefficient for the unemployment-population ratio at the beginning of each period considered is positive, implying the presence of polarization during the lockdown. Note that this variable is always statistically significant for municipalities of any size.

Figure 3 displays the confidence intervals of non-essential services  $\beta_2$  in equation (1) (95% CI) for the impact of closing non-essential services during March and April 2020. It clearly shows that the policy only had a statistically significant and positive effect on unemployment (i.e., the confidence interval is above zero) in the relatively largest municipalities (those with more than 2,395 inhabitants)

**Figure 3 The effect of non-essential services on unemployment at municipal level (Period February 2020 – April 2020)**





Note: The points correspond to the coefficient  $\beta_2$  of the non-essential services estimated using equation (1) for the period February-April 2020, while the dashes correspond to the 95% confidence interval (IC) with robust standard errors.

One reason why the lockdown in non-essential activities had little-to-no impact on unemployment in the smallest municipalities is because the agricultural sector, which was considered an essential sector during the lockdown, tends to play a larger role in the economic activity of these areas. Table 4 shows that not only does the percentage of firms with essential activities decrease as municipalities get larger but so too does the proportion of employment contracts in agriculture relative to the total number of employment contracts. For example, in April 2020 the average share of contracts in agriculture was 36.3% in municipalities of less than 152 people compared to 16.8% in those with populations greater than 9,266. In the case of firms providing essential services, the relative values were 89.2% and 65.3%, respectively. Moreover, the evidence suggests that agriculture gained importance during the lockdown, as the share of contracts in the agriculture sector increased from 16.6% in April 2019 to 29.9% in April 2020.

**Table 4 The agricultural sector during the lockdown**

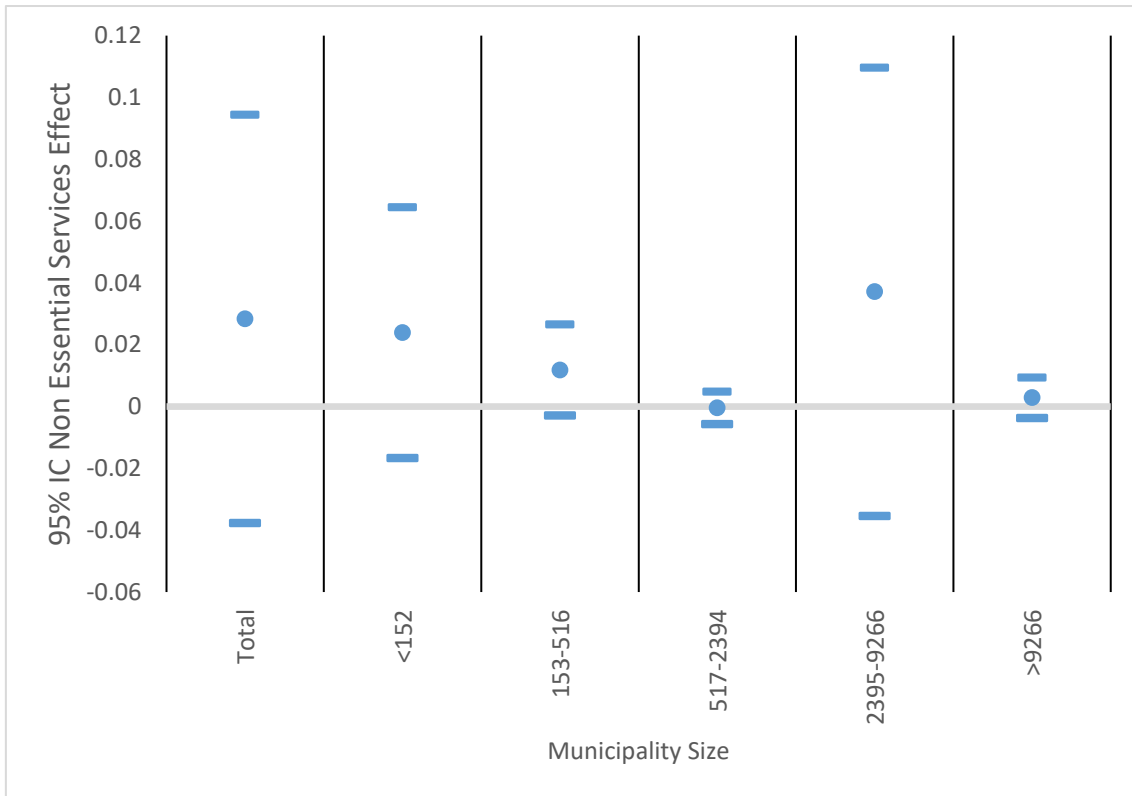
Municipalities	Contracts in agriculture: April 2019 (% of total contracts)	Contracts in agriculture: April 2020 (% of total contracts)	Firms with essential activities (%)
<152	36.3%	29.9%	89.2%
>9266	16.6%	16.8%	65.3%

	Mean	Mean	Mean
<b>Total</b>	<b>16.56</b>	<b>29.87</b>	<b>79.01</b>
Less than 152 inhabitants	18.91	36.32	89.26
From 153 to 516 inhabitants	17.91	36.65	82.41
From 517 to 2394 inhabitants	18.40	32.98	76.40
From 2395 to 9266 inhabitants	14.42	25.11	69.80
More than 9266 inhabitants	9.72	16.82	65.30

Sources: The Spanish Employment Public Service (SEPE) and The Spanish Institute of Statistics (INE). Contracts in agriculture correspond to both April of 2019 and April of 2020. The share of firms with essential activities is expressed as a percentage of the total number of firms (January 2019).

To validate our identification strategy, we also estimate equation (1) considering the change in unemployment and contracts from February 2019 to April 2019. We expect that the percentage of firms not providing essential services has no effect on unemployment before the restrictions were imposed on these sectors ( $H_0: \beta_2 = 0$ ). Our test in Figure 4 shows that the percentage of firms providing non-essential services did not have statistically significant effects on unemployment just one year before the lockdown. That is, the confidence interval contains the value zero in all cases. Thus, the results that we identify using data from February to April of 2020 are not capturing trends that had previously existed at the municipality level.

**Figure 4 Falsification Test: The effect of non-essential services on unemployment at municipal level (Period February 2019 – April 2019)**

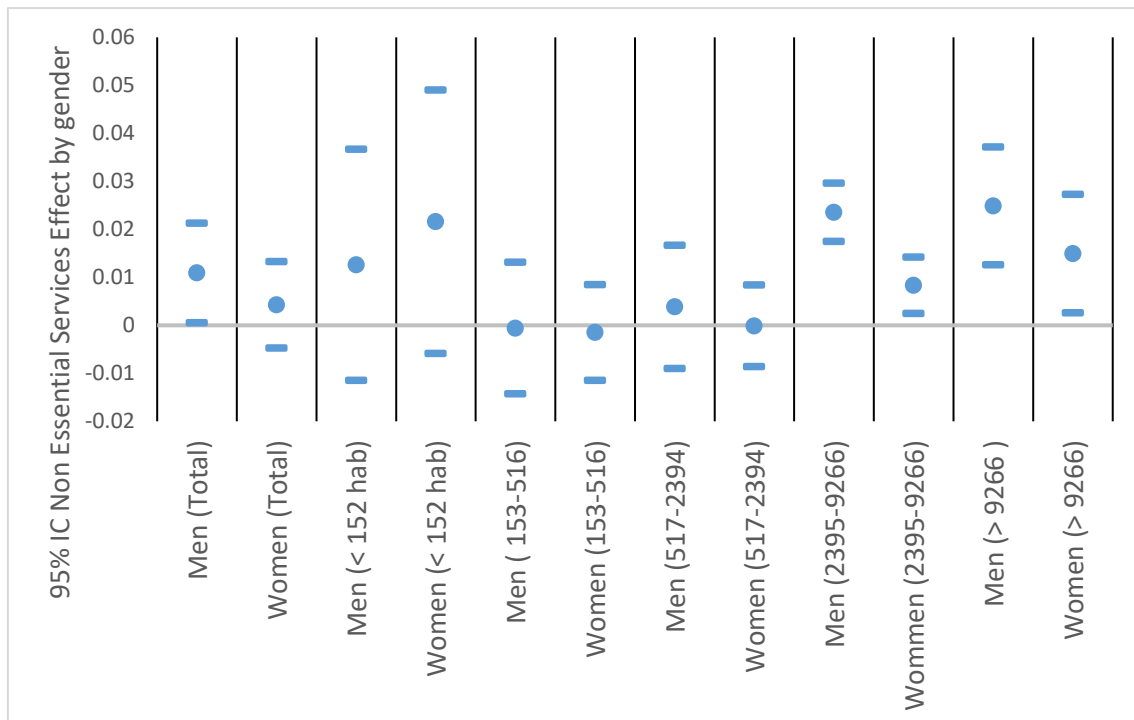


Note: The points correspond to the coefficient  $\beta_2$  of the non-essential services estimated using equation (1) for the period February-April of 2019, while the dashes correspond to the 95% confidence intervals (CI) with standard errors robust to the presence of heteroskedasticity.

Figure 5 shows the confidence intervals of the coefficient of non-essential services on unemployment ( $\beta_2$ ) at the 95% level for each category of municipality size when the estimation is performed for males and females separately.<sup>8</sup> This shows that the total effect of the lockdown on unemployment is only statistically significant and positive amongst males. More specifically, a 10-percent increase in the percentage of firms with non-essential activities increases unemployment of males by 0.109 percentage points. When considering the municipality size, the lockdown increased unemployment of both males and females only in those municipalities with more than 2,395 inhabitants. Although the average effect in these municipalities is larger amongst males, the confidence intervals only show a clearly larger positive effect on males living in municipalities with between 2,395 and 9,266 inhabitants.

**Figure 5 The effect of non-essential services on unemployment at municipal level by Gender (Period February 2020 – April 2020)**

<sup>8</sup> We run regressions separately by gender and by each age group.

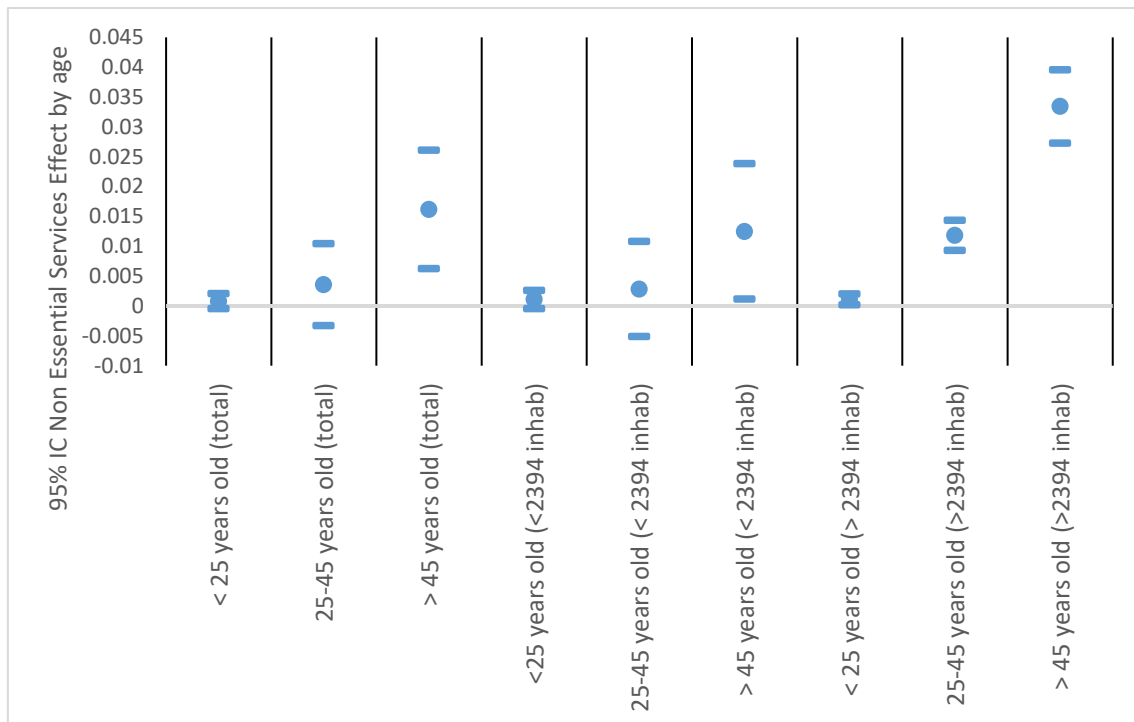


Note: The points correspond to the coefficient  $\beta_2$  of the non-essential services estimated using equation (1) by gender for the period February-April 2020, while the dashes correspond to the 95% confidence interval (CI) with robust standard errors.

In turn, Figure 6, shows the lockdown impact in unemployment when equation (1) was estimated for three different age groups. We find statistically positive effects in those individuals aged over 45 years and non-significant effects for the two age groups under 45. That is, the confidence interval includes the value of zero for the age groups below 25 years old and between 25-45 years old.<sup>9</sup> Under this specification, a 10-percentage increase in the share of firms with non-essential activities increases unemployment of older workers (more than 45 years old) by 0.162 percentage points. When looking at the municipality size, we only observe significantly positive effects in municipalities with more than 2,394 inhabitants.

**Figure 6 The effect of non-essential services on unemployment at municipal level by Age (Period February 2020 – April 2020)**

<sup>9</sup> Due to limitations with the sample size, we only split the municipality size into groups below and above 2,395 inhabitants.



Note: The points correspond to the coefficient  $\beta_2$  of the non-essential services estimated using equation (1) by age for the period February-April 2020, while the dashes correspond to the 95% confidence intervals (CI) with robust standard errors. With respect to the number of inhabitants and age: < means less than; > means more than; - means between. IC refers to Confidence intervals while y/o refers to years old.

## 5. Robustness analysis for small municipalities

In the previous section, we saw that, during the Spanish lockdown, the percentage of firms providing non-essential activities did not have a significant relationship with unemployment in municipalities that had less than 2,395 inhabitants. We argued that one reason why the lockdown in non-essential activities had little-to-no impact on unemployment in the smallest municipalities is because the agricultural sector tends to have higher importance in the economic activity of these municipalities. There are, however, other reasons why the lockdown policy had no significant relationship with unemployment in small municipalities. One possibility is that it could have been harder to enforce a lockdown in them. It may be harder to accurately measure unemployment in very small municipalities, especially as the importance of the informal economy in these municipalities may increase the volatility of unemployment. Finally, inhabitants of small municipalities may be more likely to work in other municipalities, reducing the importance of the structure of employment in the municipality of residence on its level of unemployment. Unfortunately, we have no source of information at the municipality level to determine if inhabitants of small municipalities are commuting to other municipalities. Neither do we have information regarding the enforceability of the lockdown in small municipalities relative to larger ones.

To test for these alternative explanations, we redefine the geographical area of analysis for municipalities with less than 2,395 inhabitants and introduce additional explanatory variables. First, we combine municipalities with less than 2,395 inhabitants that are geographically close to each other. To do this we use the definition of mobility areas from The Mobility Study on Mobile Telephony conducted by the Spanish Institute of Statistics (INE) between 2019 and 2021.<sup>10</sup> This merging reduces the sample size from 6,084 municipalities with less than 2,395 inhabitants to 565 areas of mobility. Each area of mobility includes several municipalities that possess less than 2,395 inhabitants. Finally, we only consider areas of mobility with more than 2,395 inhabitants.

Table 5 shows the descriptive statistics of the main variables of interest for these merged areas of mobility relative to the original municipality-level data for the same municipalities. Table 5 shows much higher standard deviations in municipalities with less than 2,395 inhabitants (see first line) relative to the areas of mobilities created by merging these small municipalities (see second line). For example, the standard deviation of the percentage change in unemployment observed falls from 2.94 when considering municipalities with less than 2,395 to 0.84 when we consider the areas of mobility we create. Thus, by merging small municipalities geographically connected into areas of mobility, we reduce considerably the volatility of the key variables.

**Table 5. Key descriptive statistics at municipal level or mobility area**

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<sup>10</sup> The INE defines 3,214 mobility areas that contains municipalities or districts (in the case of big cities) which are geographically connected. The population scope consists of the mobile phones of the resident population in Spain with service from one of the three biggest mobile operators in Spain. For more information see [https://www.ine.es/en/experimental/movilidad/experimental\\_em4\\_en.htm](https://www.ine.es/en/experimental/movilidad/experimental_em4_en.htm).

Sample	n	Change in unemployment (percentage points) February 2020-April 2020				Change in employment contracts (percentage points) February 2020-April 2020				Firms with non-essential activities (%) January 2019			
		Mean	sd	Min	Max	Mean	sd	Min	Max	Mean	sd	Min	Max
Municipalities with less than 2,395 inhabitants	6,084	0.74	2.94	-16.67	96.81	-1.35	8.51	-258.7	89.71	17.33	12.75	0	100
Areas of mobility (Small municipalities)	565	0.85	0.84	-1.02	11.61	-1.41	2.21	-17.54	8.88	20.45	7.90	3.41	45.05

Sources: The Spanish Employment Public Service (SEPE) and The Spanish Institute of Statistics (INE). Both unemployment and contracts are expressed as percentage of the total population in each municipality. Note: Each area of mobility includes several municipalities with less than 2,395 inhabitants. Each area of mobility has more than 2,395 inhabitants.

The use of these areas of mobility facilitates the use of two additional control variables in the analysis. Both variables are calculated by The Mobility Study on Mobile Telephony conducted by INE. The first variable is the share of residents that leave their area of residence during a typical working day in November 2019. We call this variable the daily leave share in 2019. This variable can help to control for the link between unemployment and economic activity in the area of residence. Table 6 shows that, on average, 25.5% of the residents in these mobility areas leave their area of residence to work elsewhere.

**Table 6. Daily leave statistics in the mobility areas**

Sample	n	Daily leave share (%) (November 2019)				Ratio of daily leave share (%)			
		Mean	sd	Min	Max	Mean	sd	Min	Max
Areas of mobility (Small municipalities)	565	25.48	6.85	7.86	53.48	44.86	12.32	10.58	84.64

Sources: The Pilot Study on Mobility based on Mobile Phone Positioning from The Spanish Institute of Statistics (INE). Note: The daily leave share corresponds to the share of residents that usually leave their area of residence during a working day from 10 am to 4 pm in November 2019. The ratio of daily leave divides the daily leave share on April 1 by the corresponding share on June 26. Both variables are expressed as a percentage of the total population in each area of mobility. Each area of mobility includes several municipalities with less than 2,395 inhabitants. Each area of mobility has more than 2,395 inhabitants.

The second variable is the ratio of daily leave share, which divides the daily leave share during a day of the lockdown (April 1, 2020) by the corresponding daily leave share during a day after removing the mobility restrictions (June 26, 2020). This ratio captures either the vulnerability of the area to the effects of the lockdown or the difficulty to enforce it. The higher this ratio, the less impact the lockdown had because more people were leaving their area of residence either to work in essential industries or because they did not follow the lockdown rules. Table 6 shows that, on average, the daily leave share during the lockdown represents 44.9% of that observed after the mobility restrictions were removed.

Table 7 presents the results estimated using equation 1 when considering two different samples and adding the two additional control variables of mobility explained above. The first sample includes 6,067 municipalities with less than 2,395 inhabitants (regression 1), while the second sample considers 565 areas of mobility created by merging the small municipalities that are geographically connected (regression 2). Regressions 1 and 2 in Table 3 shows that the share of firms not providing essential services remains non-significant when we consider these two samples. Moreover, the two variables of mobility considered show negative coefficients, but only the ratio of daily leave is significant. More specifically, a 10-percentage increase in this ratio decreases the unemployment-population ratio by 0.07 percentage points. Thus, the higher the share of workers who leave their area of residence on working days during the lockdown, the lower the unemployment-population ratio.

**Table 7 Determinants of change in unemployment in small municipalities**

	(1) Small municipalities (Less than 2,395 inhabitants)	(2) Areas of mobility (Small municipalities)
<b>Total</b>		
Unemployment (t-1)	0.1186*** (0.0092)	0.1643*** (.01265)
% Firms with non essential activities	0.0022 (0.0020)	.00135 (0.0038)
Change in contracts in percentage points	-0.0123** (0.005)	-0.09829*** (0.01723)
% population over 70 years old	-0.0057** (0.0027)	-0.01538*** (0.00506)
% temporal workers	0.0000 (0.0005)	-0.00375* (0.00227)
Daily leave share in 2019 (%)	-	-0.00070 (0.00428)
Ratio of daily leave (%)	-	-0.00711*** (.002577)
Observations	6,067	565
R2	0.782	0.733

Note: We estimate OLS regressions using equation (1). Percentage change of unemployment-population ratio is the dependent variable. Robust standard errors are in parentheses and \*, \*\*, \*\*\* measures statistical significance at 10, 5 and 1 percent levels, respectively. All regressions control for regional (province) fixed effects and report robust standard errors. The daily leave share corresponds to the share of residents that usually leave their area of residence during a working day from 10 am to 4 pm in November 2019. The ratio of daily leave divides the daily leave share on April 1 by the corresponding share on June 26. Both variables are expressed as a percentage of the total population in each area of mobility. Each area of mobility includes several municipalities with less than 2,395 inhabitants. Each area of mobility has more than 2,395 inhabitants.

## 6. Conclusions



Many governments defined a set of non-essential occupations and enforced a lockdown on workers in these sectors as a way of trying to limit the spread of COVID-19 during the first quarter of 2020. Some recent empirical studies show that the labour market impact of these lockdown measures was higher in countries in which the share of sectors forced to close was higher.

In this paper we study the unemployment impact of the measures implemented in Spain to halt the spread of the COVID-19 pandemic in the first quarter of 2020. In contrast with most of the existing papers who use aggregate data, we use 8,108 municipalities to quantify the short-term impact of the temporary shutdown of non-essential activity on local unemployment. The main explanatory variable is the percentage of non-essential firms as of January 2019. We show that this variable can be used to identify the effect of closing non-essential activities on unemployment since it was not related to unemployment before the lockdown. In OLS regressions, we find that a 10 percentage points increase in the share of firms with non-essential activities increases the municipality unemployment-population ratio by between 0.032 and 0.148 percentage points, depending on the population of the municipality. We find no significant effects in municipalities with less than 2,395 inhabitants and positive significant effects for the larger municipalities. Given that around 30% of the non-essential activities were locked down in municipalities with more than 2,394 inhabitants, we suggest that this policy was responsible for between 25% and 40% of the average observed increase in their unemployment-population ratio.

We also show that the non-significant results in small municipalities remain even if we merge small municipalities into areas of mobility with higher number of inhabitants, and control for variables of mobility across areas in estimations of unemployment in these areas. We propose that one of the main reasons why the lockdown in non-essential activities had no impact on unemployment in the smallest municipalities is that they are more dependent on agriculture, a sector which was considered as essential during the lockdown. We show not only that the percentage of firms with essential activities decrease as municipalities grow, but so too does the percentage of employment contracts in agriculture as a proportion of total contracts.

From a policy perspective, our results could be useful in identifying and implementing policies in other lockdown situations. In particular, the observed heterogeneous effect across municipalities calls for more localised policy responses and for inter-municipal coordination.

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