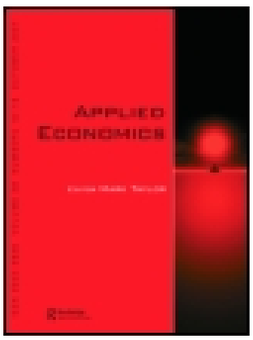

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Firm-level heterogeneity in the impact of the COVID-19 pandemic

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ABSTRACT

This paper explores the heterogeneity across firms in the impact of and response to the COVID-19 shock. It relies on a survey conducted by Banco de España to 4,004 companies in November 2020 matched to very rich balance-sheet information on firm characteristics. According to our results, COVID-19 had a higher impact on the most vulnerable firms (small, young and less productive), and they also found more useful government policy support. Nonetheless, there were some exceptions: public loan guarantees had more difficulties reaching firms with less pre-existing debt; and furlough schemes were not able to fully protect jobs in firms with a higher share of temporary workers, which find firing more useful. While uncertainty is the key factor hindering firms' activity, we use the announcement of the Pfizer vaccine on November 9th 2020 as a natural experiment to provide evidence that the vaccine announcement improved significantly firms' subjective recovery expectations. This points at the importance of the communication of medical advances to guide firms' expectations in pandemic episodes.

KEYWORDS

COVID-19; firms; sales; employment; uncertainty

JEL CODES

D80; D22; L20; L25

I. Introduction

The global spread of the COVID-19 had a significant human toll and represented an unprecedented shock for the economy, affecting negatively production and employment (Apergis and Apergis 2021) and stock markets (Doko Tchatoka, Puellbeck, and Masson 2022), pushing most economies into recession. One of the most salient features of the virus-induced economic crisis was the asymmetry along several dimensions. Although a pandemic represents a text-book example of an ex-ante exogenous and symmetric shock, the actions taken by agents and policymakers resulted in very different economic effects across sectors and regions/countries.[1] For instance, Fairlie and Fossen (2022) find that the businesses most affected by the mandatory lock-down (like those in the accommodation sector) suffered around 91% sale losses. While this heterogeneity is well-documented, much less is known about the asymmetric effects across firms within each sector and region, with a special focus on the different impact by size, age and productivity. The purpose of this paper is to shed light on this issue. In particular, we investigate the heterogeneity of several aspects of the COVID-19 shock across firms: its impact on sales and employment and the firms' use of available policy instruments. Studying the Spanish case is specially relevant for several reasons. First, Spain was one of the European countries that was hit more severely by the COVID-19 shock, with Spanish GDP falling 10.8% in Spain in 2020, compared for instance to a 8.9% and a 4.6% drop in Italy and Germany, respectively. Second, the Spanish government, as many of its peers in Europe, took a wide range of policy measures to support firms and employment, including furlough schemes, public loan guarantees, tax and rental deferrals, etc. Finally, Spain is characterized by having a firm-size distribution particularly skewed towards small and unproductive firms, which arguably makes Spanish firms more vulnerable to the COVID-19 shock and makes it a perfect set-up to study the heterogeneity of the shock.

We use more than 4,000 responses to a new firm-level survey launched by Banco de España, the so-called EBAE (*Encuesta Banco de España sobre Actividad Empresarial* in Spanish). A unique feature of this survey is that we can match these responses to *Central de Balances*, a firm level dataset that contains

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[1]Conceptually, the COVID-19 shock involves simultaneous disruptions to both supply and demand. On the supply side, some workplaces and businesses are shut down to halt the spread of the virus. On the demand side, households are less willing to leave their homes, either because of mobility restrictions or the fear of getting infected, which depresses consumption. Moreover, the fall in demand could be further exacerbated by the increase in unemployment resulting from the supply shocks highlighted above, which represent the so-called Keynesian supply shocks in Guerrieri et al. (2020).

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cash flow and balance sheet information of the quasi-universe of Spanish firms. Therefore, we can investigate the impact of and response to the shock on the basis of the responses to the survey and depending on firms' ex-ante characteristics. In particular, we exploit within-sector-region variation so that identification controls for common sector-region factors, such as different exposure to the COVID-19 shock. We aim to answer three main questions: (i) what the heterogeneous impact of the COVID-19 shock on firms' turnover and employment is; (ii) which policy measures are deemed more useful by firms for sustaining their activity; (iii) understand firms' recovery expectations and perceived uncertainty in pandemic times.

Our first set of results indicates that the COVID-19 shock hit harder small, young and less productive firms within each sector and region. As a consequence, many firms needed to adjust their employment, both in the extensive margin (firing) and/or in the intensive margin (temporary reduction in the staff thanks to the use of furlough schemes - ERTEs). While firms with a larger share of temporary workers decreased more their staff, firms that are larger, more productive and with more savings were able to better sustain employment.

The second set of results explores the role of the COVID-19 policy measures in sustaining firms' activity. Public guaranteed loans (ICOs) was the most useful measure, with nearly 40% of the surveyed firms reporting this policy measure had been important for sustaining activity. Furlough schemes (ERTEs) were important for 29% of the respondents, and tax deferrals and renegotiation of rental payments were deemed useful by 24% and 21% of the respondents, respectively. Turning to firm-level heterogeneity, smaller, less productive, younger, and more indebted firms resorted more intensively to public guaranteed loans (ICOs) and tax deferrals, while medium-sized and less productive firms resorted more intensively to furlough schemes (ERTEs).[2]

Finally, we show that pandemic and political uncertainty are the main perceived factors to affect negatively firms' activity. However, once we account for the size of the shock, observable firm characteristics cannot explain differences in the perception of uncertainty. We make use of the announcement of the Pfizer vaccine effectiveness on 9 November 2020, right in the middle of the survey period, as a natural experiment to compare the recovery expectations of firms that responded to the survey before and after the announcement. We find that this announcement improved significantly their prospects of recovery. This finding provides evidence that during a pandemic firms take into account medical developments when forming their expectations about economic recovery, and hence effective communication during the pandemic can be used as a tool of forward guidance.

Literature review

The paper contributes to the flourishing literature studying the impact of COVID-19 on businesses. The closest papers to ours are those using survey data to understand the impact of the COVID-19 shock on firms (Apedo-Amah et al. 2020; Bartik et al. 2020; Bennedsen et al. 2020; Bloom, Fletcher, and Yeh 2021; or Humphries, Neilson, and Ulyssea 2020, among many others). This paper differs from theirs in that we can match the survey responses to very rich balance sheet data of firms, including small and very small ones, providing us with a variety of firm-level heterogeneity dimensions to look at. There are also several papers making use of survey data linked with balance sheet information with different aims (Balduzzi et al. 2020; Bottone et al. 2021; Belghitar, Moro, and Radic, 2022, Bighelli, Lalinsky, and Vanhala 2022; Brancati et al. 2021, among others). In contrast to them, this paper provides a unified analysis of the impact of COVID-19 on firms' activity and subjective perceptions, how they responded to the shock and the perceived usefulness of the policy support, focusing on different aspects of firm heterogeneity that are relevant for policy analysis.

This paper is also related to the literature dealing with the impact of the COVID-19 shock on subjective perceptions and uncertainty (see for instance Ambrocio 2022; Altig et al. 2020; Barrero and Bloom 2020). Buchheim et al. (2022) show with a panel of German firms that businesses that perceived higher uncertainty, proxied by the perception

[2]Our findings complement those of Belghitar, Moro, and Radić (2022), who find that government support scheme reduces the number of SMEs with negative earnings to 49% and allows extending the residual life for SMEs with negative earnings to 194 days.

of shutdown lasting longer, were more likely to implement strong measures like layoffs or cancelling investments. Our paper contributes to this strand of literature by showing that, once the shock is accounted for, observable characteristics cannot explain any differences in perceived uncertainty. Furthermore, we provide causal evidence of the impact of the vaccine announcement on subjective firm level recovery expectations. We complement the findings of Buchheim, Krolage, and Link (2022) who, using a German business survey, find that the announcement of school closures in Germany during the pandemic led to an acute worsening of business outlook and a large increase in uncertainty.

II. Data

Survey details

The survey was launched by Banco de España in November 2020, the so-called EBAE (*Encuesta Banco de España sobre Actividad Empresarial*), with the purpose of monitoring Spanish non-financial corporations' activity in real time. The participation of companies is voluntary and responses were collected through a questionnaire sent to firms by e-mail. The survey was carried during the fortnight between the 4th and 19th of November 2020. The survey was submitted to a sample of 12,940 Spanish non-financial corporations, and we received 4,004 valid responses, which represents a response rate of 30,9%. Figure A4 of Appendix A.1 shows the responses received by day.[3] There is a slight over-representation of some sectors (e.g. manufacturing) and large firms (see Appendix A.1.) The survey includes a total of 8 questions, see Appendix A.1.2 to read the full questionnaire.

Balance sheet data: Central de Balances Integrada

Data on firm-level responses to the survey is combined with information on firms' characteristics that is available at a yearly frequency from the Central Balance Sheet Data (CBI, Central de Balances Integrada), which is sourced from firms' voluntary responses to Banco de España Central Balance Sheet Data Office (CBSO) surveys and the Spanish Mercantile Registry data; the ultimate sources of the data are therefore the Banco de España and the Spanish Mercantile and Property Registrars' Association. This is an administrative database that contains information on firms' financial statements (required by law to be submitted to the commercial registry) as well as on their income corporate tax returns. The data covers around 90% of firms in the non-financial market economy for all size categories, including both turnover and number of employees. The correlation between micro-aggregated employment and output growth and the National Accounts counterparts is above 0.90 (see Almunia, Lopez Rodriguez, and Moral-Benito 2018 for more details). After matching CBI and EBAE databases, we end up with 3,584 observations. See Appendix A.3 for a detailed description of the variables we use and the summary statistics of the matched CBI-EBAE dataset.

III. Empirical strategy

To analyze the type of firms most impacted by the COVID-19 shock, we use the following cross-sectional regression. The dependent variable y_i is a categorical variable constructed from the survey responses. We are interested in which firm-level characteristic are more relevant for explaining the impact of and response to the COVID-19 crisis. The explanatory variables we are interested in (X_i) are TFP, age, share of temporary workers, intangible assets share, indebtedness, cash ratio and size (see their definition in Appendix A.2, together with a discussion about the choice of these specific heterogeneity traits).

$$y_i = \alpha + \beta' X_i + \gamma_{s,j} + \varepsilon_i \tag{1}$$

Our preferred specification contains sector-region fixed effects $\gamma_{s,j}$.[4] In this way, we aim to compare firms within the same sector-region pair to minimize the differences in their exposure to the COVID-19 shock. For example, in order to assess whether the fall in sales was larger among small firms, it is more informative to compare the evolution of sales in large and small firms operating in the same sector and region because

[3]The distribution of firms that received the survey, the distribution of firms that responded the survey, and its comparison to aggregate data can be found on Appendix A.1.

[4]Where sector s is NACE rev 2-digit and region j is autonomous communities.

they were exposed to a relatively similar shock in terms of demand and lockdown intensity. The inclusion of sector-region fixed effects enhances this comparability and allows shedding light on the differential impact of the pandemic across firms with different characteristics

IV. The impact of the COVID-19 shock across firms

In order to assess the impact of COVID-19 on businesses, we rely on question 6 of the survey, which reads as follows: '*How are your firms' sales/employment in the 4Q20 compared to the same period last year?*', where they had to answer first in terms of sales, and second in terms of employment. The question specifically asked about the total change in employment used, that is, including the extensive margin adjustment (hiring or firing), and the intensive margin adjustment (workers on temporary leave through furlough schemes - ERTEs). Note that the change in sales is a combination of the exogenous change in the demand, and the endogenous response of firms' activity to the shock; while the change in employment is fully a firms' reaction to the shock.[5] There were ten possible answers expressed in intervals, depending on the percentage change decrease/increase. The distribution of responses is shown in Figure 1. A first look at the distribution of the reported year-on-year sales changes (Panel A) reveals that the bulk of firms declared a negative impact of COVID-19 (63%), while 24% report no change. In contrast, Panel B shows that only 38% of respondents report having decreased their employment, and 54% report no change.[6] These patterns suggest that firms have been able to absorb part of the shock, since their employment decreased less than their sales.

Note that in the survey, firms had to answer a interval scale question, i.e. they had to choose among several intervals of changes in sales and employment with respect to the previous year. Hence, for the following empirical analysis, we take the average value of the interval selected by each respondent, and use this numerical variable in the regression.[7] Table 1 shows the estimation results of equation (1). The first four columns use sales growth as dependent variable, whereas the last four columns use employment growth. The four columns for each dependent variable differ in the fixed effects configuration considered. Our preferred specifications is the one that includes a full set of sector-region dummies, and thus the identification relies on comparing different firms within the same sector and region (columns 4 and 8).

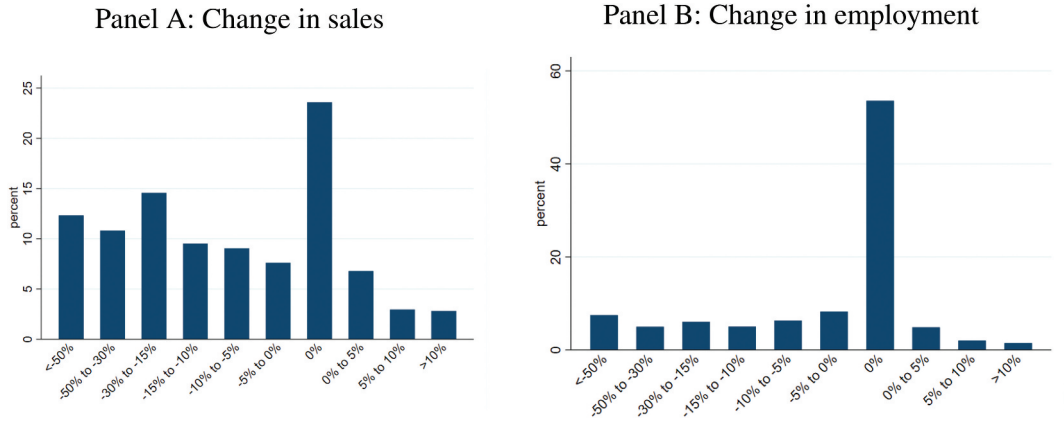

Figure 1. Distribution of responses. Source: EBAE survey Notes: Panel A shows the reported year-on-year change in sales. Panel B shows the reported year-on-year change in employment, taking into account hires/layoffs and workers in a furlough scheme (ERTE)

[5]Because part of this change in sales is endogenous and depends on firm-level responses to the shock and the government support used, we do not include it as control in the main specification.

[6]This 'inaction range' masks a vast heterogeneity between sectors: while only 16.5% of firms in hospitality services claim a no change in their employment with respect to the previous year, 82% of the firms in the real state sector have been able to sustain their employment. Also, around 10% of the respondents of the survey have 0 employees and most of them claim not having changed their employment.

[7]That is, we use a numerical value that is one of the following: −60% (>-50%), −40% (−50 to −30%), −22.5% (−30 to −15%), −12.5% (−15 to −10%), −7.5% (−10 to −5%), −2.5% (−5 to 0%), 0% (0%), 2.5% (0 to 5%), 7.5% (5 to 10%), and 20% (>10%).

Table 1. Impact of the COVID-19 shock on firms.

	(1) Δ Sales	(2) Δ Sales	(3) Δ Sales	(4) Δ Sales	(5) Δ Emp.	(6) Δ Emp.	(7) Δ Emp.	(8) Δ Emp.
TFP	4.74***	2.90**	2.79**	2.90**	3.65***	2.63***	2.47**	2.04**
	(1.20)	(1.18)	(1.16)	(1.23)	(1.08)	(1.01)	(1.00)	(1.01)
Age	0.08**	0.06**	0.04	0.05*	0.08**	0.04*	0.03	0.04
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Rural	3.29***	2.86***	2.66***	2.71***	2.25**	1.62*	1.22	1.52
	(1.08)	(0.87)	(0.90)	(0.97)	(1.02)	(0.85)	(0.89)	(0.93)
Temporary workers (%)	−8.93***	−1.31	−1.17	−1.00	−13.54***	−7.53***	−7.34***	−7.87***
	(2.74)	(1.96)	(2.00)	(2.16)	(2.34)	(1.87)	(1.85)	(1.88)
Intangible	0.09	−1.64	−1.77	−1.34	2.89*	2.11	2.07	1.82
Assets (%)	(1.95)	(1.74)	(1.72)	(1.83)	(1.57)	(1.48)	(1.50)	(1.60)
Debt ratio	−2.00	0.12	−0.22	−0.26	−1.67	0.33	−0.03	0.45
	(1.72)	(1.45)	(1.45)	(1.53)	(1.54)	(1.28)	(1.26)	(1.32)
Cash ratio	−3.48	−1.50	−1.64	−1.22	0.37	2.80	2.75	3.30*
	(2.92)	(2.41)	(2.39)	(2.55)	(2.08)	(1.79)	(1.77)	(1.84)
10–50 emp.	1.09	1.19	1.28	1.16	0.53	0.41	0.59	0.06
	(1.08)	(0.98)	(0.98)	(1.04)	(0.96)	(0.90)	(0.90)	(0.94)
50–250 emp.	6.42***	5.19***	5.34***	4.96***	3.54***	2.48**	2.75***	2.73**
	(1.49)	(1.30)	(1.28)	(1.38)	(1.21)	(1.06)	(1.06)	(1.10)
+250 emp.	6.77***	6.75***	7.75***	8.53***	4.49**	4.25***	5.08***	5.21***
	(2.33)	(1.95)	(2.00)	(2.28)	(1.91)	(1.48)	(1.48)	(1.52)
Observations	2,715	2,715	2,715	2,715	2,715	2,715	2,715	2,715
R^2	0.04	0.27	0.29	0.37	0.05	0.27	0.29	0.39
Sector FE	NO	YES	YES	NO	NO	YES	YES	NO
Region FE	NO	NO	YES	NO	NO	NO	YES	NO
Sect-region FE	NO	NO	NO	YES	NO	NO	NO	YES

Source: EBAE and Central de Balances. Notes: Outcomes of regression (1) using as dependent variable the reported year-on-year change in sales (columns 1–4) and the reported year-on-year change in employment (columns 5–8) from question 6. Each column differs in the set of fixed effects included. Region-sector clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

The differences between columns (1) and (2) in Table 1 are exclusively due to the inclusion of sector fixed effects in the regressions. In particular, there are two findings from the comparison between columns (1) and (2) that point to sector-level heterogeneity playing an important role in explaining differences in firm performance during the most acute phase of the COVID-19 pandemic. On the one hand, the R^2 of the regression increases more than six times, from 0.04 to 0.27, when we include sector fixed effects. This difference implies that there are lots of heterogeneity across sectors in the impact of COVID-19 on firm sales, as shown in Appendix A.3. On the other hand, there are also significant differences across the coefficient estimates for the different firm characteristics. For example, the TFP coefficient estimates indicate that a 1% lower firm TFP is associated to a further reduction of 4.74 percentage points in sales without sector fixed effects (28% of the sample average), but 2.90 pp when including sector fixed effects (17% of the sample average). This difference indicates that sector fixed effects are correlated with firm characteristics, that is, there are significant differences across sectors in firm characteristics, as also shown in Appendix A.3. While these two findings confirm that including sector fixed effects in the regressions is important, interestingly enough, most of the coefficients remain statistically significant, which indicates that firm-level characteristics are also important drivers of the differences in firm performance within sectors during the COVID-19 pandemic.

Next, we analyze in detail the change in sales reported by firms in our preferred specification. Column (4) of Table 1 suggests that firms that are less productive, smaller, younger and in urban areas are the ones that suffered most from the shock, reporting the largest decrease in sales.

Small firms are very different from large firms in its intrinsic characteristics. They are usually single establishment, with limited geographical distribution and limited product range, smaller customer base and less knowledge and access to regulatory information (UNCTAD 2022). Furthermore, there is substantial literature documenting that small firms face larger borrowing constraints and have less access to formal sources of external finance, damaging their growth potential and their maneuvering room when facing a shock (see, for instance, Beck and Demirguc-Kunt 2006). Because of these

characteristics, smaller firms have higher exit rates, and they are more vulnerable to exogenous shocks, like that of COVID-19.[8]

Young firms acknowledged a greater decrease in sales. There are several potential reasons behind this finding. Since they started operating recently, they did not have enough time to build strong relationships with customers and providers, and their customer base is narrower. Furthermore, young firms face more severe information asymmetry, which restricts the amount of bank finance they can get, so they have to restore to informal financing (Chavis, Klapper, and Love 2011). All these characteristics make young firms more exposed to shocks. This is worrisome, since conditional on survival, young firms are key for employment growth (Haltiwanger, Jarmin, and Miranda 2013).

Firms in urban areas reported a higher decrease in sales during the pandemic. Urban areas were more impacted by the COVID-19 shock, especially during the most acute phase of the pandemic. To be more concrete, in early June 2020, the regions of Madrid and Cataluña reported 53.3% of COVID-19 total cases in Spain, despite representing only 30.4% of the overall Spanish population, and their urban areas, which are the largest in Spain, were significantly more affected than the rural ones (Renau and Bovea 2022).[9] This pattern - COVID-19 affecting urban areas more than rural areas - has also been experienced in other countries.[10] There are several potential explanations in urban economics for this development, since urban areas are characterized by having higher population density and having more crowded housing, as well as being interconnected by public transport. While these characteristics are drivers of positive agglomeration externalities in cities (Duranton and Puga 2004), they also help spread the disease faster. The higher incidence of COVID-19 in urban areas may affect the sales of firms located in these areas, both from the demand side (customers being sick and not being able to buy goods) and the supply side (managers and workers getting sick and/or being less productive and not being able to produce). Furthermore, the imposition of strict lockdowns reduced mobility significantly, especially so in urban areas, reducing sales.[11]

Firms with lower TFP stated having a larger decrease in sales, after conditioning for other observables like size or age of the firm. At the firm level, higher TFP can be the result of better products, more efficient processes, higher human capital, better equipment, etc. It is usually the result of past firm-level investments in innovation (R&D) and training of employees and managers. Because of this, firms with higher TFP *before* the shock were more resilient in terms of sales after the COVID-19 shock. This outcome was also present in other countries, such as Portugal, and it can be rationalized by a simple firm dynamics model with decreasing returns to scale and heterogeneous productivity levels can rationalize (see Kozeniauskas, Moreira, and Santos 2022).

Next, we turn to analyze the changes in employment as reported by firms in our preferred specification. Column (8) of Table 1 shows that smaller firms with lower TFP report a significantly larger decrease in employment, which aligns with the findings of these firms having a larger decrease in sales, as shown in column 4, and hence reacting more to it. However, two other interesting findings emerge. First, firms with a larger share of temporary workers decrease their employment levels more, pointing at a larger adjustment of employment of these firms due to lower adjustment costs.[12] This is in line with

[8]During the period 2007–2020, average exit rates of firms with no employees was 12.2%, 8.16% for firms with 1–5 employees, 4.1% for firms with 6–9 employees, 3.2% for firms with 10–19 employees, and 2.1% for firms with more than 20 employees. In the year of the great financial crisis, 2008, exit rates of firms with 1 to 5 employees increased 5 percentage points, while for firms with more than 20 employees this increase was only 0.15 percentage points.

[9]Indeed, Renau and Bovea (2022) show that, in Spain, the pandemic had a higher impact on urban areas with higher population density and pollution levels, while rural areas, despite having a much higher at-risk population and a much more precarious healthcare system, were more resilient to the COVID-19 expansion.

[10]Rodríguez-Pose and Burlina (2021) show that in European countries, the key hotspots of infection and mortality were often large cities, even in countries with a lower incidence of COVID-19.

[11]Pérez-Arnal et al. (2021) show that high density regions related to the large urban centers of Madrid and Barcelona exhibited the largest lag in getting back to a 'new normality', with reductions in mobility being more persistent. Furthermore, they point out that this is related to higher rates of adherence of some regions to the lockdowns imposed: for instance, Madrid was the region with the most cases and with the strongest lockdown adherence.

[12]The Spanish labor market is characterized by its duality, which implies the coexistence of temporary contracts with low firing costs and permanent contracts with high firing costs.

previous findings in the literature, that point at a higher volatility of temporary employment in response to shocks.[13]

Second, firms with a small cash buffer reduced more their employment. After the lockdowns and the decrease in sales, the first lifeline firms have to restore to is their own cash savings. Firms with more cash have been able to cushion the shock better and needed to restore less to adjusting staff to avoid losses.

Interestingly enough, younger firms and firms in urban areas, even though they experience a larger decrease in sales, did not decrease their employment significantly more. The muted effect of the shock on the employment of younger firms can be due to the fact that these are very small, with almost 40% of firms younger than 5 years old reporting having 0 employees. Pre-crisis indebtedness levels and the share of intangible assets do not play a significant role in explaining the heterogeneity in the impact of the COVID-19 shock across firms on sales, nor firms' responses to the shock via changes in employment. Appendix B shows several robustness tests for these results.

As highlighted before, our sample is restricted to active firms that answered our survey, and hence it is biased towards survivors and firms that did have the time or resources to answer the survey, which were probably doing better than the non-respondents. Because of this, we believe that our results on the negative impact of COVID-19 on firms are a lower bound.

Summing up, these findings indicate that smaller, less productive and younger firms were hit relatively harder by the COVID-19 shock within each sector and region. We interpret this result as suggestive evidence in favor of the cleansing effects of the COVID-19 shock, typically associated to crisis episodes not only across sectors but also within sectors.

V. Usefulness of policy support measures across firms

Given the magnitude of the COVID-19 shock, the Spanish government put in place several policy measures with the aim of helping firms in distress due to the pandemic. First, it implemented a scheme of *state-guaranteed credit* through the Instituto de Crédito Oficial (ICO), a Spanish state-owned bank. Firms were eligible if they were not in default and their activity was affected by COVID-19. Credit was provided by private banks, and the state guaranteed from 60% to 80% of the transaction amount depending on its characteristics. The maximum maturity for the debt is 5 years. Second, it implemented a *furlough scheme* through which, for eligible firms that apply for it, social security provided furloughed workers with 70 percent of their base salary for the first six months, before dropping to 50 percent for the following months, without the need of firing them (Expediente de Regulación Temporal de Empleo, or ERTE).[14] Other policy measures included *tax deferral* schemes, and regulation making it easier for firms to *renegotiate rentals*. In this section, we explore which firms found more useful these policy tools, so that policymakers can gauge whether the policies reached their targeted firms.

For this purpose, we use question 7 of the questionnaire, that reads '*Please indicate the extent to which you are currently using the following measures to cushion the impact of COVID-19 on your business*', followed by a list the list of measures. For this section, we focus on the following policy measures: *state-guaranteed credit*, *furlough schemes*, *tax deferrals* and *rental renegotiations*. For each of them, there were four possible answers: '*not at all*', '*somewhat relevant*', '*relevant*' and '*very relevant*'. We construct for each measure an indicator, which takes the value of one if the firm responded the measure is relevant or very relevant, and zero otherwise. Figure 2 shows the distribution of responses. Panel A shows ICO loans are the policy measure deemed most useful, with nearly 43% of respondents stating it was very helpful to deal with the COVID-19 shock, followed by ERTEs (29%), tax deferrals (24%) and renegotiation of rental payments (21%). Firms with a larger decline in sales use all these tools more intensively (Panel B), especially ERTEs.

[13] In a model of job creation and destruction based on Mortensen and Pissarides (1994) calibrated to Spain, Costain, Serrano, and Thomas (2010) find that unemployment fluctuates 33% more under duality than it would in a unified economy with the same average unemployment rate after an exogenous productivity shocks.

[14] Those companies that took part in the scheme were banned from making layoffs in the six months after it ends.

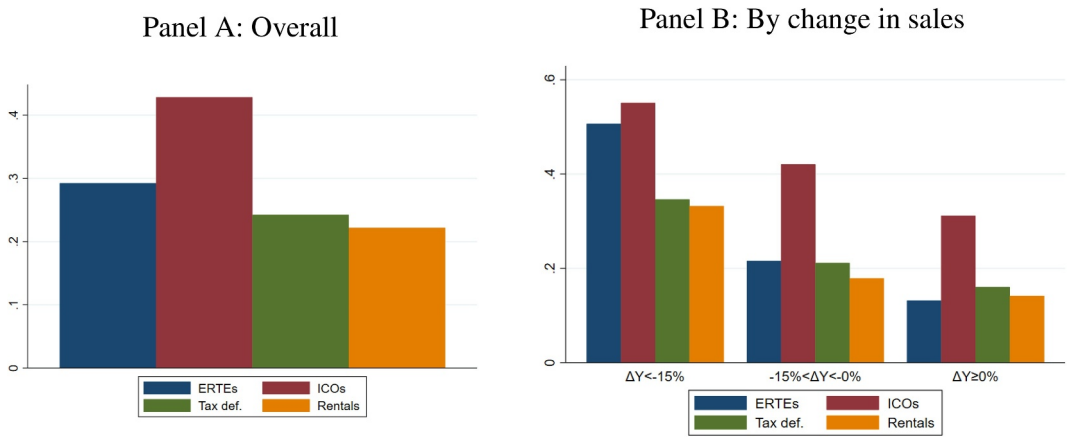

Figure 2. Distribution of usefulness of policy support measures. Source: EBAE survey. Notes: Panel A: Fraction of respondents answering that the policy tool was relevant or very relevant, where policy tools are: furlough schemes (ERTEs - blue), state-guaranteed credit (ICOs - red), tax deferrals (Tax def. - green), and renegotiation of rental contracts (Rentals - yellow). Panel B: Breakdown of responses shown in Panel A by the size of the shock, measured as the year-on-year change in sales (fjfj*Y*).

Looking now at the heterogeneity, we perform again regression (1), using as dependent variables the dummies that take the value 1 if the firm finds the policy tool relevant or very relevant in the alleviation of the COVID-19 shock, and 0 otherwise. Table 2 shows the result of our preferred specification, that is, with a full set of sector-region fixed effects.

Turning to ERTEs in column (1), medium-sized firms (10–50 and 50–250 employees) were more likely to find ERTEs useful than very small firms (0–10 employees) and very large (+250 employees) firms (6.3 and 7.2 percentage points more likely, respectively). Also, less productive and urban firms resorted relatively more to ERTEs than more productive firms in rural areas. It is notable that we do

Table 2. Policy measures to support firms.

	(1) ERTEs	(2) ICOs	(3) Tax def.	(4) Rentals.
TFP	−0.050*	−0.081**	−0.033	−0.077***
	(0.027)	(0.035)	(0.026)	(0.028)
Age	−0.001	−0.002***	−0.002***	−0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Rural	−0.052**	−0.034	−0.028	−0.033*
	(0.024)	(0.025)	(0.019)	(0.019)
Temporary workers	0.044	0.165***	0.088**	0.096**
	(0.049)	(0.054)	(0.044)	(0.044)
Intangible share	−0.016	0.033	0.008	0.027
	(0.051)	(0.050)	(0.042)	(0.036)
Debt ratio	0.037	0.317***	0.062*	0.004
	(0.035)	(0.040)	(0.033)	(0.036)
Cash ratio	−0.060	−0.389***	−0.254***	0.070
	(0.051)	(0.062)	(0.055)	(0.049)
10–50 emp.	0.072***	0.051*	−0.054**	−0.056**
	(0.022)	(0.028)	(0.026)	(0.023)
50–250 emp.	0.063**	−0.028	−0.168***	−0.068***
	(0.031)	(0.034)	(0.025)	(0.026)
+250 emp.	0.031	−0.303***	−0.218***	−0.130***
	(0.047)	(0.046)	(0.042)	(0.045)
Observations	2,715	2,715	2,715	2,715
R^2	0.266	0.261	0.235	0.212
SectXreg FE	YES	YES	YES	YES

Source: EBAE survey and Central de Balances.

Notes: Outcomes of regression (1) using as dependent variable a dummy that takes the value 1 if the firm perceives as very relevant or relevant furlough schemes (ERTEs - column 1), state-guaranteed loans (ICOs - column 2), tax deferrals (Tax def. - column 3), and renegotiation of rental contracts (Rentals - column 4). The regression includes a full set of sector-region fixed effects. Region-sector clustered standard errors in parentheses. *** p<0.01, ** <0.05, * p<0.1.

not find that firms with a higher share of temporary workers made more use of ERTEs, but we find that firms with a higher temporary share found layoffs more useful as a margin to adjust to the shock (see Appendix D). Hence, while ERTEs have been a useful tool to cushion the shock for firms, they have not been able to fully protect the level of employment of temporary workers that existed pre-pandemic. This finding is in line with the results of similar policies implemented in the Great Recession (Hijzen and Venn 2011).

ICO loans (public guaranteed loans), shown in column (2), were perceived as less useful for larger companies within each sector-region pair: large firms (+250 employees) were 30.3 percentage points less likely to find ICOs useful than very small firms (0–10 employees). Firms with larger cash buffers found this tool less useful: a firm with a cash ratio of 0.5 is 19.45 percentage points (−0.389*0.5*100) less likely to find ICOs useful than firms with no cash. Since they have more internal resources to face the shock, they rely less on external financing. For a given region, sector and firm size, these public-guaranteed loans were more useful for less productive and younger firms. For instance, a firm that is 20 years old is 3 percentage points less likely to find ICOs useful than a 5 year old firm (−0.002*(20−5)*100=−3). Interestingly enough, public-guaranteed loans were also deemed more useful for more indebted companies. A firm with a debt ratio of 0.5 is 15.85 percentage points (−0.317*0.5*100) was more likely to find ICOs useful than a firm with no debt. There may be demand and supply reasons to account for this finding. On the demand side, highly indebted firms may have the incentive of taking on more loans due to the higher risk of liquidity shortfalls if the pandemic lasts longer than expected. Furthermore, firms with high leverage and low cash ratios might be willing to take on more debt due to more favorable conditions of state-sponsored credit as compared to regular debt. On the supply side, banks may be more willing to provide loans to clients with high outstanding exposure, thus providing a liquidity cushion against potential short-term defaults on banks' loans.[15] This is in line with the findings of Brülhart et al. (2020) for Swiss firms.

Similar patterns are observed in column (3) for tax deferrals, with the exception that there is no distinction between more/less productive firms in its use. Finally, renegotiation of rental payments was more useful for less productive, small and urban firms, and those with a higher share of temporary workers (column 4).

Overall, we find that the policies implemented in order to mitigate the impact of the shock were more useful for smaller and less productive firms, with a larger share of temporary workers, high debts levels and low cash buffers, although we find substantial heterogeneity depending on the measure.

VI. The role of uncertainty

The COVID-19 shock brought about an unprecedented increase in uncertainty. The sources of this uncertainty are wide ranging. First, on the epidemiological side, uncertainties include the infectiousness of the virus, the development and effectiveness of vaccines, the magnitude of the successive waves of COVID-19, the appearance of new virus strains and the duration and effectiveness of social distancing. Second, on the economic side, the unprecedented nature of the shock creates an uncertain outlook related to the short-term impact of containment measures on business activity, the policy measures and their impact on the economy, the speed of the recovery and the changes in households' spending patterns, among others.[16]

Around 80% of the respondents thought that pandemic uncertainty was affecting their activity negatively, followed by policy uncertainty (77%), and very far from other factors conditioning negatively their activity, such as evolution of demand, unpaid receivables, competition pressures, problems accessing financing, disruptions in supply or availability of workers, which urges us to focus on the determinants of uncertainty.[17]

[15]Disentangling each of these mechanisms is outside the scope of this paper.
[16]This uncertainty has impacted several aspects of the economy, from firms' perceptions to volatility of different stocks and indexes (see, for instance, Liu, Nakajima, and Hamori 2022).
[17]See Appendix C for a detailed description of the answers, and an analysis of the main heterogeneity factors driving these results.

We begin the analysis of heterogeneity by running the same regression as before, equation (1), but adding now a set of week dummies (in order to control for the response date, as new information about the evolution of pandemic may affect the perception of uncertainty). We also add the year-on-year change in sales as control, as in Buchheim et al. (2022). The reason for this is that we want to rule out that our results come from the deviations in sales the firm acknowledges, which very likely may affect the perception of uncertainty, but rather we want to focus on the uncertainty about the future evolution of the economy and firms' activity conditional on the fall in firms' activity.[18]

For the dependent variable, we use question 5, which reads '*How have the following factors affected your firm's activity?*'. There was a list of factors, and to each of them, five possible answers: '*very negative*', '*negative*', '*neutral*', '*positive*' and '*very positive*'. We convert these variables into dummies, taking the value of one if the answer was very negative or negative, and zero otherwise. We show in columns (1) and (2) of Table 3 the results for '*pandemic uncertainty*' and '*policy uncertainty*', respectively. We complement it with the answers to question 8, which reads '*When will your firm's activity return to pre-crisis levels?*'. We construct a dummy that takes the value 1 if the firm replied 'too uncertain' to this question, and zero otherwise. The regression with this variable as dependent variable is shown in column (3) of Table 3.

Turning to uncertainty associated to the pandemic and to policy measures (columns (1) and (2), respectively), it is surprising that there are no significant differences on observable characteristics across firms within each sector-region-week triplet beyond the size of the shock. This finding implies that all firms were equally

Table 3. Reaction to the COVID-19 shock.

	(1) Pandemic uncertainty	(2) Policy uncertainty	(3) Recovery uncertainty
Δ Sales	−0.005***	−0.004***	−0.008***
	(0.000)	(0.001)	(0.001)
TFP	−0.007	−0.023	−0.039
	(0.028)	(0.032)	(0.031)
Age	0.000	−0.001*	0.002*
	(0.001)	(0.001)	(0.001)
Rural	−0.012	−0.024	0.022
	(0.023)	(0.025)	(0.026)
Temporary workers	0.004	0.027	0.069
	(0.045)	(0.046)	(0.061)
Intangible share	0.056	−0.052	−0.041
	(0.039)	(0.048)	(0.056)
Debt ratio	−0.021	−0.039	−0.049
	(0.035)	(0.037)	(0.047)
Cash ratio	−0.039	−0.112*	0.008
	(0.066)	(0.066)	(0.075)
10–50 emp.	0.014	0.008	−0.022
	(0.023)	(0.027)	(0.027)
50–250 emp.	0.031	−0.008	−0.049
	(0.029)	(0.038)	(0.038)
+250 emp.	−0.037	−0.160**	−0.053
	(0.060)	(0.071)	(0.064)
Observations	2,032	2,032	2,032
R^2	0.206	0.198	0.268
SectXreg FE	YES	YES	YES
Week FE	YES	YES	YES

Source: EBAE survey and Central de Balances.

Notes: Outcomes of regression (1) using as dependent variable a dummy that takes the value 1 if the firm perceives that pandemic and political uncertainty is impacting its activity negatively or very negatively (columns 1 and 2 respectively), or if the firms states that there is too much uncertainty to ascertain the time of recovery (column 3). Regressors include size of the shock, proxied by the year-on-year change in sales, and firm observable characteristics (TFP, age, share of temporary workers, share of intangible assets, debt ratio, cash ratio and size bins).The regression includes week fixed effects, a full set of sector-region fixed effects. Region-sector clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

[18]Although the fall in sales can be due to both demand and supply factors, Meyer, Prescott, and Sheng (2022) document that firms' perceive the COVID-19 shock mainly as a demand shock. Furthermore, Dietrich et al. (2022) show how uncertainty like the one brought by the COVID-19 crisis can have large recessionary impact on demand due to household's uncertainty perceptions.

exposed to these sources of uncertainty regardless of their characteristics once we control for the change in sales. Only firms that are older, with more cash holdings, and very large firms (+250 employees) showed a lower concern about the economic policy uncertainty. Regarding the length of the recovery (column (3)), the size of the shock (proxied by the year-on-year change in sales) is associated to the presence of too much uncertainty in the timing of the recovery. Within each sector, region and week of response, old firms are also more prone to answering that uncertainty is too large to provide a meaningful answer.

Summing up, once we control for the change in sales, our results suggest that all firms were impacted relatively homogeneously by the uncertainty brought by the COVID-19 shock, since we find no significant differences across firms' observables in their perception of uncertainty.

VII. The impact of the vaccine announcement on firms' subjective recovery expectations

On 9 November 2020, Pfizer announced that their COVID-19 vaccine was 90% effective in trials.[19] The markets and most economic agents took these news as an indication of the pandemic being closer to an end, stocks market spiked,[20] and news all over the world spread the word that the end of the COVID-19 pandemic was a bit closer. Google searches for vaccine related words skyrocketed that same day (see Appendix E.1., Figure A7), which supports the exogeneity of the announcement shock.

To understand the impact of the vaccine announcement on firms' subjective recovery expectations, we use again question 8, which asks when the firm will recover pre-pandemic activity levels, in order to create two different expected recovery measures to use as dependent variable (y_{it}). First, a dummy taking value 1 when the firm reports to expect a full recovery by the end of 2021. Second, an ordinal variable that captures the timing of the recovery, taking values 1, 2, 3, 4 and 5 if the firm expects recovery "already", in 2020, 2021, 2022 and later than 2022, respectively (excluding firms that answered '*too uncertain*' and '*already recovered*').

In order to estimate the impact of the vaccine news on these firm-level recovery expectations proxies, we consider the following regression:

$$y_{it} = \alpha + \varphi vaccine_{it} + \beta' X_i + \gamma_{s,j} + \varepsilon_{it}, \qquad (2)$$

where the regressor of interest, $vaccine_{i,t}$, takes the value of 1 if the firm submitted its response after the vaccine news on November 9th and 0 otherwise. We also introduce a set of controls X_i, which includes change in sales, size, productivity, temporary workers' share, intangible assets share, rural/urban dummy, cash ratio and indebtedness; and a full set of sector-region FE ($\gamma_{s,j}$). Identification is based on comparing firms with the same observable characteristics operating in the same sector and region, but answering before the vaccine announcement on Nov 9th (control group) and those answering after the announcement (treatment group).[21] Appendix E.2 shows the characteristics of the responses before and after the announcement, which points at no evident selection patterns before/after the vaccine effectiveness announcement.

Table 4 shows the main results.[22] Column (1) shows that firms answering after the announcement date of the vaccine reported a significantly higher probability of full recovery expectations by the end of 2021 than firms answering before, even after accounting for firm characteristics within the same sector-region pair. Answering after the vaccine announcement increases the probability of expected recovery by the end of 2021 in 6.6 pp. Since the average of the dependent variable is 20%, it means that the expected probability would increase from 20% to 26.6% in the average firm as a result of the announcement. This effect is equivalent in magnitude to the effect of a change in sales (size of the shock) of 13.2 pp. (0.066/0.005).

[19]The announcement was made in the afternoon in Europe.
[20]Daily returns in Europe on November 9th 2020: IBEX 35 (+8.57%), DAX (+4.94%), CAC 40 (+7.57%), FTSE 100 (+4.67%), Euro Stoxx 50 (+6.42%).
[21]This empirical strategy is similar to the one of Buchheim, Krolage, and Link (2022). Using a German business survey, they find that the announcement of school closures in Germany during the pandemic led to an acute worsening of business outlook and a large increase in uncertainty.
[22]Table A8 of Appendix B shows all the coefficients of Table 4.

Table 4. The impact of the COVID-19 vaccine on firms' recovery expectations.

	(1) Recovery 2021	(2) Recovery 2021	(3) Recovery 2021	(4) Recovery timing
Vaccine	0.066***	0.074*	0.0823***	−0.266***
	(0.022)	(0.042)	(0.035)	(0.090)
Δ turnover	0.005***	0.005***	0.004***	−0.039***
	(0.001)	(0.001)	(0.001)	(0.002)
Observations	1,565	1,565	617	944
R^2	0.263	0.263	0.276	0.482
Sample	4–19 Nov	4–19 Nov	6–12 Nov	4–19 Nov
Controls	YES	YES	YES	YES
SectXreg FE	YES	YES	YES	YES
Time trend	NO	YES	NO	NO

Source: EBAE survey and Central de Balances.

Notes: Outcomes of regression (2) using as dependent variable a dummy taking value 1 when the firm reports a full recovery by the end of 2021 (columns 1, 2 and 3); an ordinal variable that captures the timing of the recovery, taking values 1, 2, 3, 4 and 5 if the firm expects recovery "already", in 2020, 2021, 2022 and later than 2022, respectively (column 4). The variable *vaccine* takes the value 1 if the firm replied after the vaccine announcement on 9 November 2020, and 0 otherwise. The regression includes a full set of sector-region, controls for the size of the shock, proxied by the year-on-year change in sales, and for all the observables we have been using in the previous sections: size, age, TFP, rural status, temporary workers, intangible share, debt and cash ratio. Column 2 also includes a linear time trend. Region-sector clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Column (2) runs the same regression as column (1), but adding a linear time trend to capture any trend in recovery expectations other than the vaccine announcement.[23] We see that the coefficient is still significant and of similar magnitude. Since other news while the survey was taking place might have also impacted firms' recovery expectations, we narrow down the time span and consider only responses submitted three days before and three days after the announcement date, i.e. between November 06 and 12. Column (3) shows that the impact is still positive and significant, and even of larger magnitude. Column (4) shows the impact of the vaccine announcement on the timing of the recovery. The coefficient is negative and significant, meaning that firms expect a shorter recovery time after the vaccine announcement.

Summing up, this section exploits the announcement of the effectiveness of Pfizer's vaccine during the EBAE survey to show that the vaccine announcement increased recovery expectations of all firms, hence providing evidence that during a pandemic firms incorporate developments in the medical field into their expectations formation.

VIII. Conclusions and policy implications

The COVID-19 pandemic and its associated containment measures caused an unprecedented economic shock. The purpose of this paper is to provide a better understanding of the firm-level heterogeneity in the impact of and response to the COVID-19 shock. We show that small, young urban and less productive firms were the ones most affected by the COVID-19 shock, after taking into account the common sector-region level shock. Firms reacted to the shock decreasing their employment, but our results seem to indicate that that occurred mostly via the intensive margin (use of furlough schemes -ERTEs) rather than the extensive margin (firing of workers). This finding seems to point at ERTEs being able to preserve the relationships firm-worker, with one notable exception: firms with a higher share of temporary workers, who rather use firing to mitigate the COVID-19 crisis. Firms with a higher share of temporary workers find it cheaper to fire workers, and hence they adjust via the extensive margin of labor when facing a negative shock. Public guaranteed loans (ICOs) was the government support perceived the most useful, and it has been mostly found useful by firms that are small, less productive, younger and with a higher share of temporary workers, which are in general the firms that experienced a larger decrease in their sales. Interestingly, firms with higher cash buffers did not find very relevant the public guaranteed loans, arguably because they had more internal resources to face the shock.

[23]The linear time trend is added to control for any trends brought by other information about the evolution of pandemic that may affect the recovery expectations. This time trend is a variable that takes the value 1 for the first day of the survey, 2 for the second, and so on. Since there are two weekends in our sample, we assign the (very few) responses received on weekends to Friday, and take into account only work days (from Monday to Friday).

However, firms with a larger debt ratio found this government support more useful, even though they were not relatively more affected by the decrease in sales, and after controlling for cash holdings. This piece of evidence suggests that previous bank-firm relationships are important when assessing the reach of this policy support, and highlights the difficulties of reaching firms that were less reliant on debt pre-COVID-19.

One of the salient characteristics of the COVID-19 shock is the huge uncertainty that surrounded it: nearly 80% of firms think it affected their activities negatively, and this uncertainty is very homogeneous once you take into account the fall. However, there is a silver lining: the announcement of the effectiveness of the Pfizer vaccine improved firms' recovery expectations. Given that investment and growth plans at the firm level are based on their perceptions and forecasts (Bloom, Bond, and Van Reenen 2007), this piece of evidence points at the power of transmitting the right information to foster a faster recovery, in a similar way forward guidance from Central Banks communicates about the state of the economy and the likely future course of monetary policy, guiding expectations of economic agents.

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Disclosure statement

The views expressed in this paper are those of the authors and do not necessarily reflect those of the Banco de España or the Eurosystem.

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Availability of data and material

We use two datasets for this paper (Central de Balances Integrada -CBI-, and Encuesta del Banco de España sobre Actividad Empresarial -EBAE-), both are owned and stored physically by Banco de España (BdE), and they are both accessible for Banco de España researchers. External researchers might also access this dataset under the following conditions:

- *Central de Balances Integrada (CBI)*. This dataset contains balance sheet and cash flow information of the quasi universe of firms at the yearly frequency. Recently, Banco de España has created a data lab (which is in pilot phase) so that outside researchers can access this dataset for their own projects. They can do so by asking for access, and if access is granted, accessing it in the secure premises of Banco de España. This website contains all the information regarding how to request access, the data available, etc. https://www.bde.es/bde/en/areas/analisis-economi/otros/que-es-belab/datos-disponible/microdatos-de-empresas/microdatos-de-empresas.htmlhttps://www.bde.es/bde/en/areas/analisis-economi/otros/que-es-belab/datos-disponible/microdatos-de-empresas/microdatos-de-empresas.html
- Encuesta del Banco de España sobre Actividad Empresarial (EBAE). This is a survey conducted by Banco de España to 4,004 firms in November 2020. It also has the firm identifier, so we can match the survey responses to CBI. So far, given how recent it is and for confidentiality reasons, this survey is not public via the BdE lab as CBI is. However, for replication purposes, it is possible to allow external researchers to access the data at Banco de España premises accompanied by a Banco de España researcher

Code availability

All the codes used for this paper can be made available public when published.

Consent for publication

All authors give consent for publication.

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Appendices

A: Data

A.1. Survey

A.1.1. Coverage and representativeness

The survey was submitted to a sample of 12,940 Spanish non-financial corporations, of which 46% cooperate regularly with the Banco de España's Central Balance Sheet Data Office (CBBE). The survey focuses on the non-financial market economy, hence, we exclude firms in the following sectors: agriculture, utilities, financial services and non-market services. Figure A1 shows the sectoral distribution of the sample of firms that received the survey compared to the one observed in the economy, using the information from the Central Business Register (DIRCE in Spanish), available at the National Statistics Institute (INE). It can be shown that the sectoral distribution of the sample partially over-represents some sectors of the economy, mainly manufacturing, which reflects the higher coverage of this sector in the CBBE.

Out of these, we received 4,004 valid responses, which represents a response rate of 30,9%. As expected, the response rate was higher among the companies that collaborate with the CBBE (49%) than among those that have not been collaborated to date (15.5%). Figure A2 compares the sectoral distribution of the final sample of the survey with the one observed in DIRCE. There is some over-representation of the manufacturing sector (see Panel A), which is slightly lower when we compare the employment distribution by sector using the information from Social Security Registers (Panel B).

Turning to representativeness in terms of firm size, the survey over-represents large firms. In particular, the shares

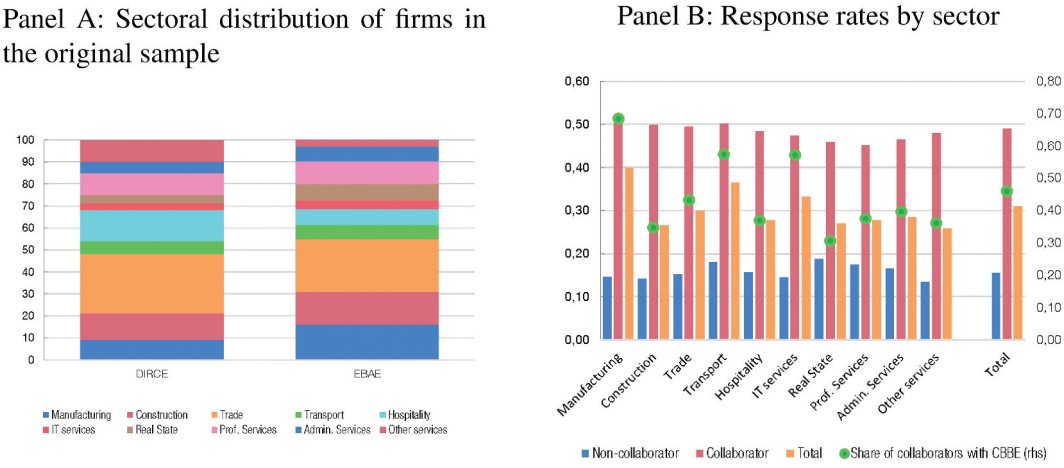

Figure A1. Comparison of sectoral distribution in the original sample. Source: INE and Banco de España Notes: Panel A shows the sectoral distribution of firms in the Spanish economy according to DIRCE (left column), and the sectoral distribution of our original sample of firms from the EBAE survey (right column). Panel B shows the response rate and the degree of collaboration with the CBBE by sector.

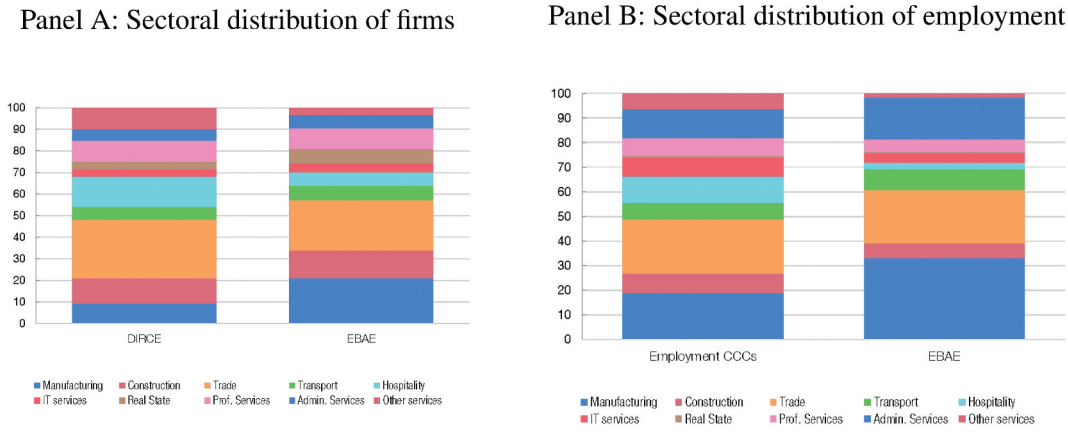

Figure A2. Comparison of sectoral distribution in the final sample. Source: INE, Ministry of Social Security and Banco de España Notes: Panel A shows the sectoral distribution of firms in the Spanish economy according to DIRCE (left column), and the sectoral distribution of our final sample of firms from the EBAE survey (right column). Panel B shows the sectoral distribution of employment in the Spanish economy according to social security data (left column), and the sectoral distribution of employment of our final sample of firms from the EBAE survey (right column).

of very small (1–9 employees), small (10–49), medium (50–249), and large (+250) firms in the sample are 36.5%, 40.2%, 18.5%, and 4.8%, respectively. According to DIRCE, the corresponding shares in the population of Spanish firms are 85.7%, 12.0%, 1.9%, and 0.4%. It is worth mentioning that this under-representation of small firms is not a source of concern for our main results because of two reasons: (i) Identification in our preferred specifications comes from variation within each sector-region pair and size bin. For instance, in the case of impact of the shock, we compare the drop in sales of two firms with different TFPs but operating in the same sector-region and the same size category. (ii) Still, the concern could be that the survey over-represents high-TFP/good firms within the small size categories because low-TFP/bad firms are not even able to answer the survey properly or they are in distress. If this is the case, our estimated differences could be considered a lower bound to the extent that these missing firms are presumably more negatively affected by the COVID-19 shock.

In any event, survey responses aggregated at the sectoral and regional level capture well the recent developments in the Spanish economy. For instance, Figure A3 shows that survey figures on employment growth are highly correlated with those of other sources, even at a high degree of disaggregation at the regional or the industry level. In particular, the correlation between firm's responses to the year-on-year variation in employment and the same rate provided by Social Security Registers is 0.6 at the province level and 0.7 at the 2-digit industry level.

Figure A4 shows the number of responses by day. Panel A shows the responses by natural day, and marks with a vertical red line the announcement of the Pfizer vaccine. The 7th, 8th, 14th and 15th were weekends, and hence the number of responses these days are very low. Panel B shows the number of responses by day, but not taking into account these weekends, and assigning the very few responses on the weekend to that Friday. Note in this figure we call 1 the first workday of the survey, 2 the second, and so on. The announcement of the Pfizer vaccine was made on the 3rd weekday of the survey.

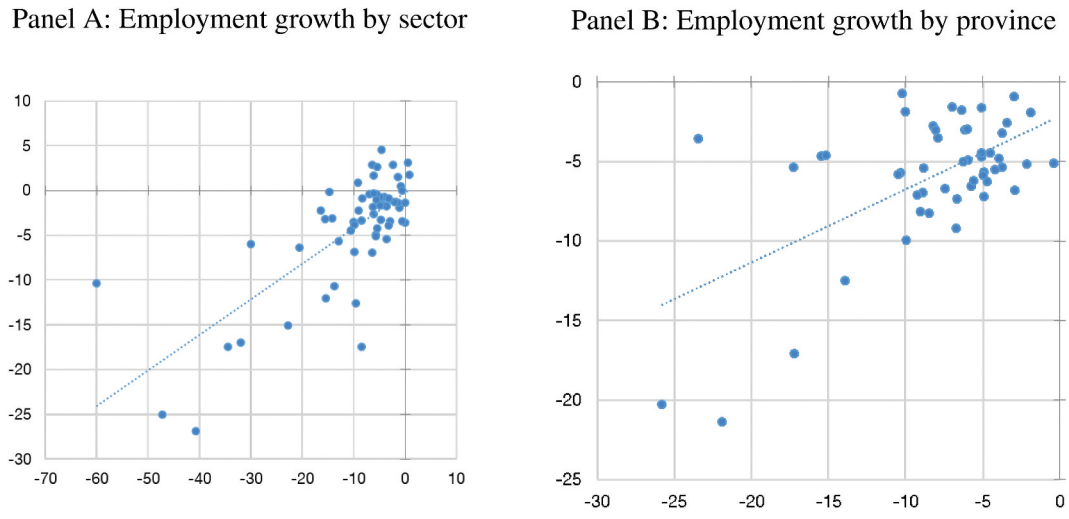

Figure A3. Employment growth of final sample compared to other sources. Source: Ministry of Social Security and Banco de España Notes: Panel A shows a scatterplot with 2-digit sector employment growth using the survey (x-axis), and social security data (y-axis). Panel B shows a scatterplot with employment growth by province using the survey (x-axis), and social security data (y-axis).

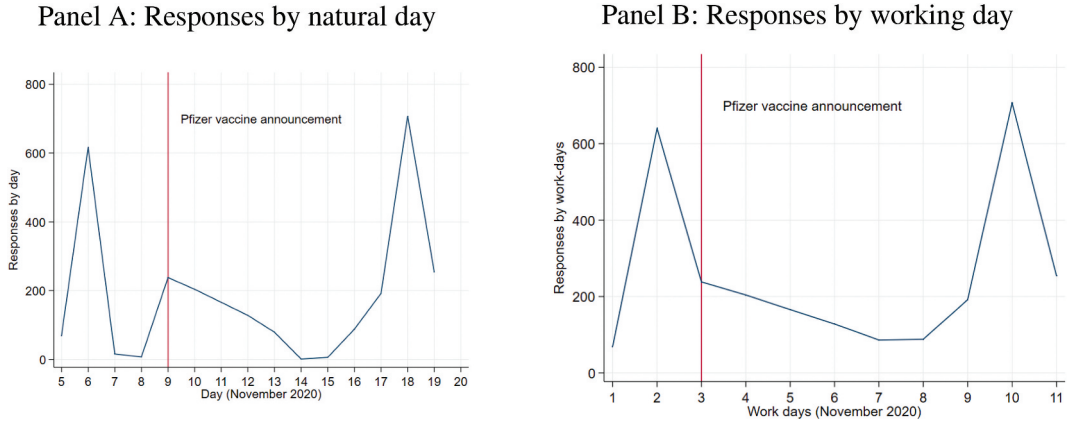

Figure A4. Number of responses by day. Source: EBAE Notes: Panel A shows the number of responses received by day. Panel B shows the number of responses received by each working day, assigning the very few responses during the weekend to the previous Friday. Vertical red line signals the announcement of the Pfizer vaccine on the 9th November.

A.1.2. *Questionnaire*

This appendix presents the questionnaire of the survey translated to English. The original questionnaire (in Spanish) can be found https://www.bde.es/f/webbde/SES/cenbal/destacados/ficheros/CuestionarioEBAE_nov2020.PDF.pdfhere.

A.2. *Central de Balances Integrada*

Firms' balance sheet data come from *Central de Balances Integrada*, the business registry data available at the Bank of Spain which contains the quasi universe of incorporated Spanish firms. We drop firms in agriculture, mining, energy and FIRE. We define sector as the 2-digit CNAE. Region is defined at the Comunidad Autónoma level. The exact definition of the variables are the following:

- **Employment** is the average number of employees during the year. This variable is introduced as a categorical variable for different size groups: micro firms 0–10 employees; small firms 10–50 employees; medium size firms 50–250 employees; and large firms +250 employees.
- **Capital** is the sum of tangible and intangible capital stock.
- **Age** is computed as the difference between the current year and incorporation year.
- **Debt ratio** is computed as external interest-bearing funds to (gross operating profit + financial revenue). We winsorize the values above +100% or below −100%.
- **TFP** is computed using sector-specific OLS regression of the log of value added on intermediates,capital and employment. We winsorize both tails of TFP at the 1% level.
- **Temporary workers share** is computed as the average number of temporary workers to average total employment.
- **Intangible share** is computed as intangible capital to total capital (tangible + intangible). We winsorize the values above 1 or below 0.
- **Rural status** (dummy 0/1) is defined according the location of the headquarters of the firm. We consider a firm is rural if the headquarters are located in a municipality that is not a 'functional urban area' as defined by Eurostat.[24]
- **Cash ratio** is the ratio of the stock of cash over total assets.

We introduce size as a categorical variable instead of a continuous variable, since we are particularly interested in size and we want to allow for the heterogeneous response of micro, small, medium and large enterprises. Heterogeneity in age captures the fact that firms at different stages of their life cycle might face different financial frictions (Cloyne et al., 2019), and hence respond differently to the shock. Firms with a higher share of temporary workers have more flexibility in adjusting their staff (Caggese & Cuñat, 2008), and hence might react differently to the shock. Firms with a higher share of intangible capital are usually more technology oriented and finance mainly with internal funds (Caggese & Pérez-Orive, 2022), so they might behave differently when hit by a shock. Having a higher share of debt might also make firms react differently: on the one hand, having a larger debt stock, they might be severely affected by the shock since they need to meet their debt repayments and interests and they are closer to default (Ottonello & Winberry, 2020), but on the other hand these firms have already relationships with their banks so getting new loans might be easier for them (Gatchev, Spindt, and Tarhan, 2009). Finally, firms with a higher share of cash in their balance sheet might react less to shocks since they have more internal resources (Jeenas, 2019). We are interested in understanding how the COVID-19 shock impacted firms depending on their heterogeneity along these margins, and whether they find that government support helped them through the crisis.

A.3. *Summary Statistics: Matched CBI-EBAE*

some descriptive statistics at the sector level for the main variables of interest in our analysis. In particular, it provides figures on two sets of variables: responses to the survey (columns 1 and 2), and firm characteristics (columns 3–10). From Panel A, it is worth emphasizing the wide heterogeneity across sectors in both the average impact of the shock and the average firm characteristics. For instance, the average firm in manufacturing experienced a fall of −12.66% in sales against the −45.53% fall for the average firm operating in the hospitality sector (−5.49% and −34.97% for employment, respectively). Also, the average firm in manufacturing is 33% more productive than that of hospitality (log TFP 1.28 versus 0.95), 8 years older, more rural (26% hospitality firms are out of cities against 44% manufacturing firms), less indebted, holds less cash and are much larger in terms of employees.

Panel B of Table A1 uncovers a huge variation across firms within each sector as measured by the interquartile range (IQR) given by the difference between the 75th and the 25th percentiles. For example, the TFP difference between the 75th percentile and the 25th in the administrative services sector is even larger than the difference between the average firm in manufacturing and hospitality from the table above: 0.54 against 0.33 (0.33=1.28–0.95). This indicates that, while the average manufacturing firm is 33% more productive that the average hospitality firm, the 75th percentile firm in administrative services is 54% more productive than the 25th percentile firm in the same sector. In terms of age, the manufacturing-hospitality average gap is 9 years, while the 75th-25th gap within admin. services is 17 years. Regarding the cash holdings of firms, and hence the starting buffer against the shock, there is also substantial heterogeneity, with the 75th percentile of firms in the IT services holding a share that is 10 times larger than that of the 25th percentile (0.36 vs 0.03).[25] We show in Table A3 on that these summary statistics remain qualitatively similar if we use weights to match the sector-size distribution.

The following table reports the descriptive statistics (average and inter-quartile range) for the whole sample and by

[24]https://ec.europa.eu/eurostat/web/cities/spatial-units.

[25]Note that the number of observations differs depending on which explanatory variable we look at. We show in Table A2 on that the results are qualitatively similar if we keep only the observations for which we have all the regresors of interest (2,715 observations).

Table A1. Summary statistics by sector.

PANEL A

	Δ Sales	Δ Emp	log TFP	Age	Rural	Temp. Workers	Intangible capital	Debt Ratio	Size (Emp)	Cash ratio
Averages										
Manufacturing	−12.66	−5.49	1.28	29.03	0.44	0.12	0.09	0.31	142.34	0.12
Construction	−12.23	−5.20	1.18	21.86	0.27	0.30	0.16	0.28	39.58	0.15
Trade	−15.55	−7.34	0.84	25.67	0.26	0.13	0.13	0.30	63.37	0.15
Transport	−16.34	−8.34	1.99	24.15	0.29	0.20	0.11	0.35	119.90	0.14
Hospitality	−45.53	−34.97	0.95	20.76	0.26	0.29	0.10	0.36	38.02	0.17
IT services	−11.33	−3.29	1.51	18.57	0.08	0.16	0.42	0.22	78.38	0.22
Real estate	−10.27	−3.23	1.11	23.37	0.14	0.05	0.05	0.26	6.03	0.12
Prof. services	−10.03	−5.01	1.70	19.34	0.13	0.12	0.25	0.24	45.68	0.24
Admin. services	−16.84	−11.92	1.77	17.98	0.16	0.22	0.26	0.31	254.79	0.23
Other services	−32.23	−19.42	1.30	19.36	0.21	0.24	0.19	0.28	50.50	0.24
Total	−16.10	−8.58	1.25	23.71	0.27	0.17	0.15	0.29	85.32	0.16
Obs	3,523	3,457	3,161	3,584	3,584	3,160	3,584	3,584	3,584	3,582
PANEL B										
IQRs										
Manufacturing	22.50	7.50	0.20	17.00	1.00	0.17	0.04	0.45	65.62	0.16
Construction	22.50	2.50	0.36	16.00	1.00	0.50	0.03	0.48	31.06	0.21
Trade	22.50	7.50	0.17	18.00	1.00	0.18	0.06	0.53	36.00	0.19
Transport	22.50	7.50	0.39	16.00	1.00	0.26	0.02	0.56	43.00	0.16
Hospitality	20.00	52.50	0.23	17.00	1.00	0.30	0.01	0.61	31.80	0.20
IT services	22.50	2.50	0.52	14.00	0.00	0.21	0.96	0.40	63.00	0.33
Real estate	12.50	0.00	0.71	14.00	0.00	0.00	0.00	0.42	2.05	0.14
Prof. services	22.50	2.50	0.36	14.00	0.00	0.15	0.39	0.41	29.88	0.35
Admin. services	40.00	12.50	0.54	17.00	0.00	0.32	0.50	0.53	47.76	0.31
Other services	52.50	40.00	0.50	16.00	0.00	0.30	0.14	0.53	45.00	0.32
Total	22.50	7.50	0.64	17.00	1.00	0.24	0.07	0.51	42.25	0.21
Obs	3,523	3,457	3,161	3,584	3,584	3,160	3,584	3,584	3,584	3,582

Source: EBAE survey and Central de Balances Integrada.

Panel A shows the averages and Panel B the interquantile ranges (measured as p75-p25 within the industry). The first column of both tables corresponds to yearly change in sales, and the second column to the yearly change in employment. Column 3, 4 and 5 correspond to log TFP, age of the firm, and the dummy variable indicating the headquarters are in rural areas. Column 6 shows the share of temporary workers. Column 7, 8 and 10 show the share of intangible capital (intangible capital over total capital), the debt ratio (total debt over total assets), and the cash ratio (cash over total assets) respectively. Column 9 shows size, measured by the number of employees.

Table A2. Summary statistics by sector for sample used in regressions.

PANEL A

	Δ Sales	Δ Emp	log TFP	Age	Rural	Temp. Workers	Intangible capital	Debt Ratio	Size (Emp)	Cash ratio
Averages										
Manufacturing	−12.80	−5.49	1.28	29.25	0.44	0.12	0.07	0.31	136.40	0.12
Construction	−13.06	−6.02	1.20	23.15	0.26	0.30	0.05	0.27	55.21	0.16
Trade	−15.51	−7.73	0.84	26.87	0.27	0.13	0.07	0.31	70.20	0.13
Transport	−16.31	−8.15	1.98	24.73	0.29	0.20	0.08	0.36	134.71	0.14
Hospitality	−47.93	−37.78	0.94	21.52	0.28	0.29	0.05	0.37	45.54	0.16
IT services	−9.21	−3.83	1.56	19.46	0.08	0.15	0.35	0.22	100.69	0.22
Real estate	−12.78	−4.72	1.11	26.58	0.12	0.04	0.02	0.21	10.57	0.12
Prof. services	−11.43	−5.74	1.73	19.65	0.13	0.12	0.14	0.24	50.55	0.25
Admin. services	−17.00	−13.47	1.79	18.53	0.15	0.20	0.15	0.35	122.30	0.19
Other services	−34.17	−19.32	1.36	20.51	0.15	0.24	0.11	0.29	67.06	0.22
Total	−16.86	−9.34	1.25	24.98	0.28	0.17	0.09	0.30	86.43	0.15
Obs	2,715	2,715	2,715	2,715	2,715	2,715	2,715	2,715	2,715	2,715
PANEL B										
IQRs										
Manufacturing	22.50	7.50	0.19	17.00	1.00	0.16	0.03	0.44	63.00	0.15
Construction	22.50	7.50	0.33	16.00	1.00	0.47	0.01	0.44	34.59	0.20
Trade	22.50	7.50	0.17	17.00	1.00	0.18	0.03	0.53	36.25	0.17
Transport	22.50	7.50	0.35	15.00	1.00	0.29	0.01	0.53	47.88	0.16
Hospitality	20.00	47.50	0.23	18.00	1.00	0.29	0.01	0.58	35.09	0.19
IT services	12.50	2.50	0.46	12.00	0.00	0.20	0.76	0.41	72.12	0.33
Real estate	22.50	0.00	0.61	16.00	0.00	0.00	0.00	0.33	5.00	0.15
Prof. services	22.50	2.50	0.34	12.00	0.00	0.15	0.13	0.41	29.70	0.34
Admin. services	40.00	22.50	0.55	16.00	0.00	0.31	0.07	0.64	56.50	0.27
Other services	52.50	40.00	0.50	13.00	0.00	0.31	0.03	0.60	50.75	0.27
Total	22.50	12.50	0.63	17.00	1.00	0.24	0.03	0.51	43.00	0.20
Obs	2,715	2,715	2,715	2,715	2,715	2,715	2,715	2,715	2,715	2,715

Source: EBAE survey and Central de Balances Integrada.

Notes: This table keeps only the 2,715 observations that are later used in the regression analysis, which are the observations for which we have data on all the variables of interest. Panel A shows the averages and Panel B the interquantile ranges (measured as p75-p25 within the industry). The first column of both tables corresponds to yearly change in sales, and the second column to the yearly change in employment. Column 3, 4 and 5 correspond to log TFP, age of the firm, and the dummy variable indicating the headquarters are in rural areas. Column 6 shows the share of temporary workers. Column 7, 8 and 10 show the share of intangible capital (intangible capital over total capital), the debt ratio (total debt over total assets), and the cash ratio (cash over total assets) respectively. Column 9 shows size, measured by the number of employees.

Table A3. Summary statistics weighted.

PANEL A	Δ Sales	Δ Emp	log TFP	Age	Rural	Temp. Workers	Intangible capital	Debt Ratio	Size (Emp)	Cash ratio
Averages										
Manufacturing	−18.93	−10.29	1.29	25.36	0.50	0.12	0.03	0.29	25.50	0.15
Construction	−15.33	−6.33	1.22	21.97	0.25	0.24	0.04	0.25	12.19	0.18
Trade	−17.10	−8.90	0.85	21.19	0.32	0.10	0.05	0.31	10.99	0.15
Transport	−14.62	−5.56	1.99	20.04	0.29	0.17	0.08	0.27	17.89	0.17
Hospitality	−43.82	−34.27	0.91	18.51	0.38	0.29	0.05	0.36	10.29	0.18
IT services	−12.41	−4.44	1.65	18.08	0.14	0.20	0.24	0.18	30.49	0.23
Real estate	−13.21	−4.02	1.10	25.67	0.14	0.03	0.01	0.21	3.69	0.12
Prof. services	−11.30	−5.06	1.75	18.43	0.17	0.12	0.08	0.19	10.78	0.30
Admin. services	−20.00	−15.47	1.84	18.37	0.18	0.14	0.09	0.30	40.30	0.20
Other services	−34.00	−19.03	1.47	18.63	0.14	0.23	0.15	0.26	9.18	0.24
Total	−22.49	−13.57	1.20	20.71	0.30	0.16	0.06	0.29	14.13	0.18
Obs	3,523	3,457	3,161	3,584	3,584	3,160	3,584	3,584	3,584	3,582
PANEL B										
IQRs										
Manufacturing	37.50	12.50	0.29	16.00	1.00	0.17	0.01	0.47	16.31	0.20
Construction	22.50	2.50	0.39	15.00	1.00	0.46	0.00	0.43	9.00	0.23
Trade	40.00	7.50	0.19	18.00	1.00	0.15	0.01	0.58	6.00	0.19
Transport	22.50	2.50	0.44	16.00	1.00	0.26	0.01	0.49	7.00	0.21
Hospitality	20.00	52.50	0.22	15.00	1.00	0.42	0.01	0.67	5.91	0.18
IT services	22.50	2.50	0.56	16.00	0.00	0.20	0.50	0.39	20.58	0.33
Real estate	22.50	0.00	0.65	15.00	0.00	0.00	0.00	0.32	2.00	0.15
Prof. services	22.50	0.00	0.34	14.00	0.00	0.12	0.03	0.31	4.88	0.39
Admin. services	40.00	40.00	0.50	17.00	0.00	0.22	0.01	0.57	16.04	0.27
Other services	52.50	40.00	0.41	18.00	0.00	0.32	0.03	0.37	6.14	0.29
Total	40.00	22.50	0.68	17.00	1.00	0.24	0.01	0.52	6.70	0.24
Obs	3,523	3,457	3,161	3,584	3,584	3,160	3,584	3,584	3,584	3,582

Source: EBAE survey and Central de Balances Integrada.

Notes: This table keeps only the 2,715 observations that are later used in the regression analysis, which are the observations for which we have data on all the variables of interest. We use 60 size-sector grids to compute elevation weights that match the distributional data from the Social Security dataset. Panel A shows the averages and Panel B the interquantile ranges (measured as p75-p25 within the industry. The first column of both tables corresponds to yearly change in sales, and the second column to the yearly change in employment. Column 3, 4 and 5 correspond to log TFP, age of the firm, and the dummy variable indicating the headquarters are in rural areas. Column 6 shows the share of temporary workers. Column 7, 8 and 10 show the share of intangible capital (intangible capital over total capital), the debt ratio (total debt over total assets), and the cash ratio (cash over total assets) respectively. Column 9 shows size, measured by the number of employees.

broad sectors. It includes the survey responses on the impact of COVID-19 (first two columns) and CBI ex-ante characteristics of the firm (from column three to column ten).

B. Robustness

We explore if the severity of the impact of the COVID-19 shock on firms' activity is correlated with the pre-pandemic trends and capital intensity (see Table A8). The past evolution of each firm is proxied by the average annual growth rate of both sales and employment over the period 2017-2019, but they are not statistically significant, so we conclude that the role of pre-COVID-19 firm performance is muted. The capital intensity is measured by the capital-to-labor ratio. Firms that are more capital intensive tend to destroy less employment, as they may have little to gain by decreasing their workforce. In a Cobb-Douglas production function with Hicks neutral technical change, labor productivity can be decomposed in two components: TFP plus capital-to-labor ratio, so that one can interpret this result as evidence that both components of labor productivity play a role in cushioning the impact of the COVID-19 shock.

In Table A5, we control for the actions taken by firms to cushion the COVID-19 shock, according to their answers to the survey. Even after controlling for these endogenous choices, we find most of the heterogeneity documented in Section IV still survive, pointing at the results not being driven by firms' endogenous reaction to the shock.

We also explore the existence of non-linearities in the sales-employment relationship by including the sales change and its square to the baseline specification. Interestingly enough, although small, the square term is strongly significant and indicates that the larger the drop in sales, the higher the impact on employment (see Table A6).

Since the data shows that firms have been able to absorb part of the shock (employment declined far less than sales), we investigate which firms have been more or less able to do so. With this purpose, first we regress the employment change on sales change, and second we study which firm characteristics predict the inverse of the residual from that regression, which could be interpreted as a measure of the ability of firms to cushion the sales shock. The results are in Table A7, and they show that the

[25]Note that the number of observations differs depending on which explanatory variable we look at. We show in Table A2 on that the results are qualitatively similar if we keep only the observations for which we have all the regresors of interest (2,715 observations).

Table A4. Impact of the COVID-19 shocks on firms - Further mechanisms.

	(1) Sales	(2) Sales	(3) Sales	(4) Emp.	(5) Emp.	(6) Emp.
Average annual sales growth 2017–2019		0.02			0.00	
		(0.02)			(0.02)	
TFP	2.90**	1.98	2.89**	2.04**	1.78*	1.97**
	(1.23)	(1.21)	(1.23)	(1.01)	(1.01)	(0.99)
Age	0.05*	0.06*	0.05*	0.04	0.04	0.04
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Rural	2.71***	2.49**	2.70***	1.52	1.22	1.49
	(0.97)	(0.98)	(0.97)	(0.93)	(0.93)	(0.92)
Temporary workers	−1.00	−1.57	−0.99	−7.87***	−7.97***	−7.83***
	(2.16)	(2.20)	(2.16)	(1.88)	(1.87)	(1.87)
Intangible share	−1.34	−1.82	−1.36	1.82	1.91	1.73
	(1.83)	(1.93)	(1.83)	(1.60)	(1.66)	(1.60)
Debt ratio	−0.26	−0.52	−0.25	0.45	0.06	0.50
	(1.53)	(1.57)	(1.53)	(1.32)	(1.34)	(1.33)
Cash ratio	−1.22	−0.40	−1.08	3.30*	3.85**	4.13**
	(2.55)	(2.44)	(2.53)	(1.84)	(1.83)	(1.83)
10–50 emp.	1.16	1.51	1.21	0.06	0.09	0.41
	(1.04)	(1.06)	(1.05)	(0.94)	(0.98)	(0.94)
50–250 emp.	4.96***	5.19***	5.01***	2.73**	2.75**	3.04***
	(1.38)	(1.37)	(1.39)	(1.10)	(1.10)	(1.09)
+250 emp.	8.53***	8.77***	8.56***	5.21***	5.28***	5.39***
	(2.28)	(2.29)	(2.29)	(1.52)	(1.55)	(1.50)
Capital intensity			0.01			0.07***
			(0.03)			(0.02)
Observations	2,715	2,641	2,715	2,715	2,641	2,715
R-squared	0.37	0.38	0.37	0.39	0.39	0.39
Sector FE	NO	NO	NO	NO	NO	NO
Region FE	NO	NO	NO	NO	NO	NO
SectXreg FE	YES	YES	YES	YES	YES	YES

Source: EBAE survey and Central de Balances.

Notes: Outcomes of regression (1) using as dependent variable the reported year-on-year change in sales (columns 1–3) and the reported year-on-year change in employment (columns 4–6) from question 6. Columns (1) and (4) are analogous to column (4) and (8) of Table 1, respectively. All regressions include a full set of sector-region fixed effects.

Table A5. Impact of the COVID-19 shocks on firms.

	(1) Sales	(2) Sales	(3) Emp.	(4) Emp.
TFP	2.90**	1.58	2.04**	1.04
	(1.23)	(1.17)	(1.01)	(0.86)
Age	0.05*	0.04	0.04	0.03
	(0.03)	(0.03)	(0.03)	(0.02)
Rural	2.71**	2.56***	1.52	1.21
	(0.97)	(0.90)	(0.93)	(0.79)
Temporary workers	−1.00	1.57	−7.87***	−5.44***
	(2.16)	(1.83)	(1.88)	(1.64)
Intangible share	−1.34	−1.81	1.82	1.30
	(1.83)	(1.72)	(1.60)	(1.54)
Debt ratio	−0.26	0.85	0.45	1.02
	(1.53)	(1.39)	(1.32)	(1.21)
Cash ratio	−1.22	−2.29	3.30*	3.02*
	(2.55)	(2.40)	(1.84)	(1.71)
10–50 emp.	1.16	1.57*	0.06	0.66
	(1.04)	(0.90)	(0.94)	(0.80)
50–250 emp.	4.96***	4.25***	2.73**	2.79***
	(1.38)	(1.14)	(1.10)	(0.94)
+250 emp.	8.53***	6.95***	5.21***	4.49***
	(2.28)	(2.26)	(1.52)	(1.44)
WFH		2.55***		1.35**
		(0.78)		(0.57)
Online		2.10***		1.58**
		(0.79)		(0.78)
Firing		−6.38***		−8.28***
		(1.14)		(1.15)
Investment		−6.49***		−2.89***
		(0.80)		(0.65)
Rentals		−4.09***		−3.52***
		(1.10)		(0.91)
ERTEs		−10.85***		−10.18***
		(0.96)		(0.92)
ICOs		−0.51		0.16
		(0.89)		(0.73)
Tax deferrals		−1.31		0.38
		(1.02)		(0.86)
Observations	2,715	2,715	2,715	2,715
R^2	0.04	0.49	0.39	0.51
Response controls	NO	YES	NO	YES
SectXreg FE	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1.

Source: EBAE survey and Central de Balances.

Notes: Outcomes of regression (1) using as dependent variable the reported year-on-year change in sales (columns 1–2) and the reported year-on-year change in employment (columns 3–4) from question 6. Column 2 and 4 include as controls the responses to question 7. All regressions include a full set of sector-region fixed effects.

Table A6. Impact of the COVID-19 shocks on firm employment - Non-linearities.

	(1) Emp.	(2) Emp.
ΔSales		0.30***
		(0.04)
$(\Delta Sales)^2$		−0.004***
		(0.000)
TFP	2.04**	0.49
	(1.01)	(0.83)
Age	0.04	0.00
	(0.03)	(0.02)
Rural	1.52	0.19
	(0.93)	(0.67)
Temporary workers	−7.87***	−6.63***
	(1.88)	(1.37)
Intangible share	1.82	2.50*
	(1.60)	(1.30)
Debt ratio	0.45	0.64
	(1.32)	(1.05)
Cash ratio	3.30*	4.09***
	(1.84)	(1.54)
10–50 emp.	0.06	−0.65
	(0.94)	(0.77)
50–250 emp.	2.73**	0.30
	(1.10)	(0.84)
+250 emp.	5.21***	0.99
	(1.52)	(1.40)
Observations	2,715	2,715
R-squared	0.39	0.63
Sector FE	NO	NO
Region FE	NO	NO
SectXreg FE	YES	YES

Source: EBAE survey and Central de Balances.

Notes: Outcomes of regression (1) using as dependent variable the reported year-on-year change in employment from question 6. Columns (1) is analogous to column (8) of Table 1. Column (2) adds the year-on-year change in employment from question 6 and its square. All regressions include a full set of sector-region fixed effects. *** p<0.01, ** p<0.05, * p<0.1.

Table A7. Impact of the COVID-19 shocks on firms - Firm absorption of the shock.

	(1) Firm Absorption
TFP	0.64**
	(0.29)
Age	−0.02
	(0.02)
Rural	−0.11
	(0.28)
Temporary workers	0.04
	(0.49)
Intangible share	−1.33
	(1.88)
Debt ratio	0.20
	(0.63)
Cash ratio	−0.70
	(0.69)
10–50 emp.	−0.52
	(0.44)
50–250 emp.	−0.15
	(0.38)
+250 emp.	−0.26
	(0.60)
Observations	2,673
R-squared	0.09
Sector FE	NO
Region FE	NO
SectXreg FE	YES

Source: EBAE survey and Central de Balances.

Notes: Outcomes of regression (1) using as dependent variable the firm absorption capacity, computed as follows. First, we regress the employment change on sales change, and second we compute the absorption capacity as the inverse of the residual from that regression, which could be interpreted as a measure of the ability of firms to cushion the sales shock. Regressions includes a full set of sector-region fixed effects. *** p<0.01, ** p<0.05, * p<0.1.

Table A8. The impact of the COVID-19 vaccine on firms' recovery expectations.

	(1) Recovery 2021	(2) Recovery 2021	(3) Recovery 2021	(4) Recovery timing
vaccine	0.066***	0.074*	0.083**	−0.266***
	(0.022)	(0.042)	(0.035)	(0.090)
Δ turnover	0.005***	0.005***	0.004***	−0.039***
	(0.001)	(0.001)	(0.001)	(0.002)
TFP	0.020	0.020	0.013	−0.163
	(0.039)	(0.039)	(0.060)	(0.111)
Age	−0.002***	−0.002***	−0.002	0.002
	(0.001)	(0.001)	(0.001)	(0.003)
Temporary workers	0.020	0.020	0.003	−0.204
	(0.068)	(0.068)	(0.105)	(0.206)
Intangible share	0.028	0.029	0.109	0.204
	(0.063)	(0.063)	(0.108)	(0.161)
Debt ratio	0.010	0.010	−0.013	−0.207
	(0.044)	(0.044)	(0.067)	(0.137)
Cash ratio	−0.048	−0.048	−0.000	−0.676**
	(0.072)	(0.072)	(0.105)	(0.268)
10–50 emp.	0.028	0.027	−0.011	0.122
	(0.026)	(0.026)	(0.045)	(0.112)
50–250 emp.	0.034	0.034	0.039	0.024
	(0.030)	(0.031)	(0.054)	(0.137)
+250 emp.	0.091*	0.091*	0.091	0.447**
	(0.055)	(0.055)	(0.094)	(0.184)
Time trend		−0.001		
		(0.005)		
Observations	1,565	1,565	617	944
R^2	0.263	0.263	0.276	0.482
Controls	YES	YES	YES	YES
SectXreg FE	YES	YES	YES	YES
Time trend	NO	YES	NO	NO

Source: EBAE survey and Central de Balances.

Notes: Outcomes of regression (2) using as dependent variable a dummy taking value 1 when the firm reports a full recovery by the end of 2021 (columns 1, 2 and 3); an ordinal variable that captures the timing of the recovery, taking values 1, 2, 3, 4 and 5 if the firm expects recovery "already", in 2020, 2021, 2022 and later than 2022, respectively (column 4). The variable *vaccine* takes the value 1 if the firm replied after the vaccine announcement on November 9th 2020, and 0 otherwise. The regression includes a full set of sector-region, controls for the size of the shock, proxied by the year-on-year change in sales, and for all the observables we have been using in the previous sections: size, age, TFP, rural status, temporary workers, intangible share, debt and cash ratio. Column 2 also includes a linear time trend. Region-sector clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

only firm characteristic that seems to explain the absorption capacity is productivity. Higher TFP firms present lower pass-through of the sales shock to employment.

Finally, for completeness Table A8 shows the same results as Table 4 of Section VII, but including the coefficients of all the variables of the regression.

C. Heterogeneity in factors affecting firms' activity as a result of the COVID-19 shock

We aim to understand here which are the factors of the shock that are affecting firms the most. To this purpose, we use question 5, which reads '*How have the following factors affected your firm's activity?*'. There was a list of factors, and to each of them, five possible answers: '*very negative*', '*negative*', '*neutral*', '*positive*' and '*very positive*'. We also convert these variables into dummies, taking the value of one if the answer was very negative or negative, and zero otherwise. Figure A5 shows the summary statistics of these responses. Panel A shows that uncertainty is the factor conditioning firms' activity the most, with nearly 80% of firms stating pandemic uncertainty was affecting their activity negatively, followed by policy uncertainty (77%). The next factor in importance is the evolution of demand (48%), unpaid receivables (34%) and competition pressures (33%), followed by problems accessing financing (17%), disruptions in supply (13%) and availability of workers (10%). Looking at which factors affect more firms depending on the fall in their sales (Panel B of Figure A5), political and pandemic uncertainty still are the most important negative factor. For firms suffering the largest drop in sales, demand is a very relevant factor, while it is less so for firms receiving a smaller shock.

Given the utmost importance of uncertainty of the COVID-19 shock, we devote an entire section in the main text entirely to explore this margin. Table A9 shows the result of regression (1), where the dependent variable is the dummy response for each of the factors. Rural and large businesses were less affected by demand factors. Larger firms are less affected by problems related to accessing financing, while firms that were previously indebted find that this factor affected them more negatively. This is in line with the findings in the previous section that more indebted companies are more likely to ask for loans with public guarantees (ICOs). Supply disruptions affect less negatively large and more productive firms, while firms with larger cash holdings find this factor affects them more negatively. Increased competition affects less negatively large, indebted and productive firms.

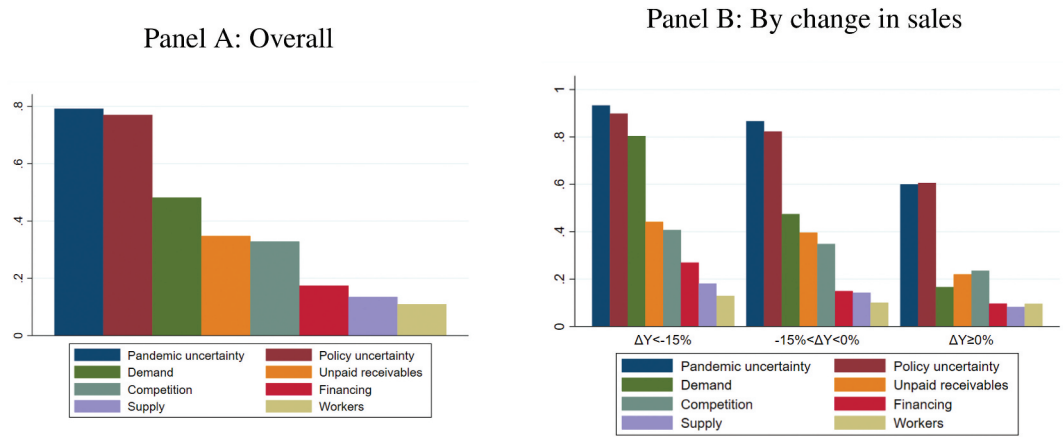

Figure A5. Distribution of main factors conditioning firms' activity due to COVID-19 shock. Source: EBAE survey. Notes: Panel A: Fraction of respondents answering that the factor affected firms' activity negatively or very negatively, where these factors are: pandemic uncertainty (blue), policy uncertainty (red), demand disruptions (green), unpaid receivables (yellow), competition pressures (grey), problems accessing financing (bright red), supply disruptions (purple) and availability of workers (beige). Panel B: Shows the breakdown of responses shown in Panel A by the size of the shock, measured as the change in year-on-year sales (Δ*Y*).

Table A9. Factors affecting firms' activity as a result of the COVID-19 shock.

VARIABLES	(1) Demand	(2) Financing	(3) Unpaid rec.	(4) Supply	(5) Workers	(6) Competition
TFP	−0.03	−0.02	0.02	−0.05***	−0.02	−0.05*
	(0.03)	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)
Age	0.00	−0.00	−0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Rural	−0.09***	−0.02	0.01	−0.00	0.02	−0.03
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Temporary workers	0.01	0.03	0.06	−0.03	0.07*	0.05
	(0.05)	(0.04)	(0.06)	(0.03)	(0.04)	(0.05)
Intangible share	0.00	−0.03	0.07	0.03	−0.04	0.02
	(0.05)	(0.04)	(0.06)	(0.04)	(0.03)	(0.06)
Debt ratio	−0.01	0.07**	−0.05	0.00	−0.02	−0.06*
	(0.04)	(0.03)	(0.04)	(0.03)	(0.03)	(0.04)
Cash ratio	0.05	0.03	−0.13**	0.10**	0.04	−0.05
	(0.07)	(0.05)	(0.06)	(0.04)	(0.04)	(0.07)
10–50 emp.	−0.02	−0.04*	0.03	−0.02	−0.00	−0.03
	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
50–250 emp.	−0.04	−0.09***	0.04	−0.05**	−0.01	−0.07**
	(0.04)	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)
+250 emp.	−0.11*	−0.14***	0.00	−0.11***	−0.02	−0.14***
	(0.06)	(0.04)	(0.05)	(0.03)	(0.03)	(0.05)
Observations	2,715	2,715	2,715	2,715	2,715	2,715
R^2	0.20	0.20	0.14	0.15	0.15	0.16
SectXreg FE	YES	YES	YES	YES	YES	YES
Robust standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1.						

Source: EBAE survey and Central de Balances.

Notes: Outcomes of regression (1) using as dependent variable a dummy that takes the value 1 if the factor affected firms' activity negatively or very negatively, where these factors are: demand disruptions (column 1), problems accessing financing (column 2), unpaid receivables (column 3), supply disruptions (column 4), availability of workers (c), and competition pressures (column 6). The regression includes a full set of sector-region fixed effects.

D. Firm responses to cushion the shock

This section focuses on which margins firms have used to mitigate the COVID-19 shock. We rely on question 7, that reads '*Please indicate the extent to which you are currently using the following measures to cushion the impact of COVID-19 on your business*', followed by a list of measures, and to each there were four possible answers: '*not at all*', '*somewhat relevant*', '*relevant*' and '*very relevant*'. Next, we construct for each measure an indicator, which takes the value of 1 if the firm responded the measure is relevant or very relevant, and 0 otherwise.

Figure A6 shows the percentage of respondents that indicated the measure is relevant or very relevant for them, both for the overall sample (Panel A) and disaggregated by the change in

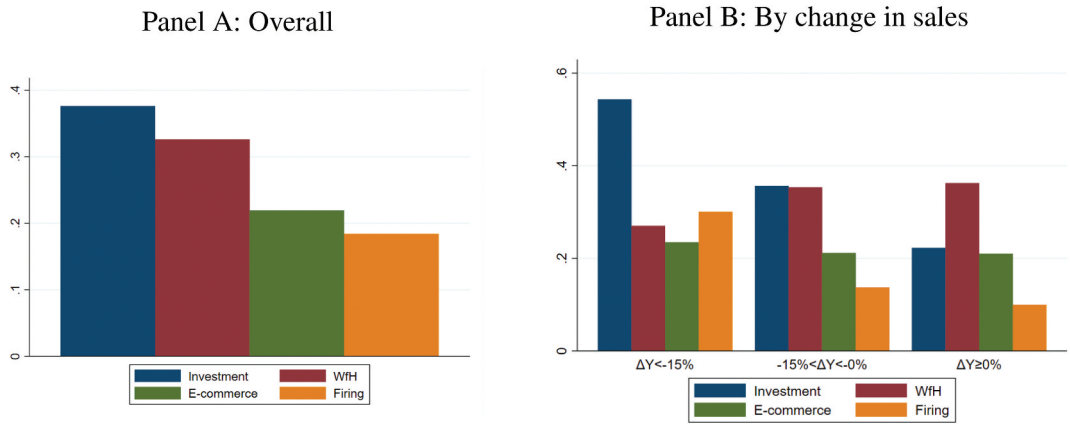

Figure A6. Distribution of firms' responses to COVID-19 shock. Source: EBAE survey. Notes: Panel A: Fraction of respondents answering that the margin of adjustment was '*relevant*' or '*very relevant*', where these margins are: reductions in planned investment (Investment - blue), implementation of working from home schemes (WfH - red), reinforcement of e-commerce (E-commerce - green), and firing of workers (Firing - yellow). Panel B: Breakdown of responses shown in Panel A by the size of the shock, measured as the change in year-on-year sales (ΔY).

sales they reported in the previous section (Panel B). Overall, Panel A shows the most used margin is a reduction in investment (38%), followed by the implementation of working from home (WfH, 32%), reinforcing of e-commerce (22%) and firing employees (18%). Note that firing in this question refers strictly to layoffs, while the employment measure studied in detail in the previous sections refers to the reduction of employment used, i.e. layoffs *and* workers included in the furlough schemes. There is heterogeneity depending on the magnitude of the shock received as shown in Panel B: firms that received a larger shock find decreasing investment, firing and the renegotiation of rental contracts more relevant than firms that suffered a lower decrease in sales. However, e-commerce was implemented more or less symmetrically in all firms, and working from home was implemented more in firms that suffered a *lower* decrease in sales.

Next, we turn to the heterogeneity of these responses. In order to do so, we run the same specification as before, Equation (1), but use as dependent variables the dummies we constructed for each of the responses showed above. We use our preferred specification, i.e. including sector-region fixed effects. Results are shown in Table A10.

Column (1) shows which firms resorted more intensively to working from home schemes during the pandemic. Within the same sector and region, larger firms resorted more intensively to working-from-home schemes (note that the omitted category is 0-10 employees). For a given size and within the same sector and region, younger firms in urban areas resorted more intensively to WfH schemes. Finally, WfH was also used more intensively by firms with less temporary workers and more intangible capital even after accounting for other factors such as size, sector, geographical location and age. These findings complement that of Zhang et al. (2021), who find that in states with higher ex-ante WfH rates, small businesses performed better overall, although with differences by industry.

Column (2) shows that less productive companies reported higher efforts in reinforcing e-commerce. These findings are in line with those of Alfonso et al. (2021). One possible rationale for this finding is that less productive firms used less intensively the e-commerce channel before the pandemic so that the COVID-19 shock induced a within-sector catch-up process of less productive firms with respect to more productive firms that were already using e-commerce even before the pandemic.

Reductions in planned investments, shown in Column (3), were more useful for firms located in rural areas, with lower productivity, and medium-sized (50-250 employees). Finally, Column (4) shows the use of firing as a margin to adjust, where we find the only significant coefficient is the share of temporary workers of the firm. It is interesting to note that very few firms fired workers to adjusts to the shock, and only the temporary share is significant in this regression, which suggests that the adjustment of labor was mainly made along the intensive margin with the use of furlough schemes (ERTEs), something we explore in the next section.

E. Further evidence: impact of the announcement of the Pfizer vaccine on firms' expectations

E.1. *Google searches*

Figure A7 shows the interest in the word vaccine (and related words) on Google searches during the period the survey was open. We can observe a clear spike on the 9th of November, the day the vaccine was announced, which supports the exogeneity of the shock. Our survey was conducted between the 5th and the 18th of November 2020, so we use the fact that Pfizer's announcement was made while the survey was open as

Table A10. Reaction to the COVID-19 shocks.

	(1)	(2)	(3)	(4)
	WfH	e-COMM	Invest.	Firing
TFP	−0.002	−0.059**	−0.058*	−0.019
	(0.027)	(0.026)	(0.030)	(0.023)
Age	−0.002***	−0.002**	−0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Rural	−0.060***	−0.025	0.058**	0.003
	(0.019)	(0.020)	(0.024)	(0.019)
Temporary workers	−0.224***	−0.071*	−0.050	0.173***
	(0.047)	(0.040)	(0.049)	(0.042)
Intangible share	0.172***	0.062	0.052	−0.032
	(0.046)	(0.051)	(0.053)	(0.044)
Debt ratio	−0.046	0.004	0.043	0.008
	(0.035)	(0.030)	(0.035)	(0.027)
Cash ratio	−0.073	0.036	−0.047	0.003
	(0.050)	(0.053)	(0.060)	(0.049)
10–50 emp.	0.044*	0.003	−0.016	0.019
	(0.025)	(0.021)	(0.023)	(0.020)
50–250 emp.	0.190***	0.042	−0.057**	0.009
	(0.032)	(0.028)	(0.028)	(0.027)
+250 emp.	0.304***	−0.010	0.013	−0.041
	(0.044)	(0.045)	(0.052)	(0.038)
Observations	2,715	2,715	2,715	2,715
R^2	0.327	0.191	0.167	0.200
SectXreg FE	YES	YES	YES	YES

Source: EBAE survey and Central de Balances.

Notes: Outcomes of regression (1) using as dependent variable a dummy that takes the value 1 if the firm perceives as very relevant or relevant working from home schemes (column 1), reinforcing of e-commerce (column 2), the reduction in planned investment (column 3) and the firing of workers (column 4). The regression includes a full set of sector-region fixed effects. Region-sector clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

an identification strategy to provide causal evidence of the impact of the announcement of the vaccine on firms' recovery expectations.[26]

E.2. *Answers before and after the vaccine announcement*

Figure A8 shows the average response pre-vaccine (0) and post-vaccine (1) with the 90% confidence interval, of the variables proxying recovery expectations (*recovery timing* and *recovery in 2021*), the size of the shock received (proxied by the decrease in sales) and the main firm characteristics (employment, age and TFP). We can observe that firms were more likely to respond that they expected to have recovered by 2021 after the announcement of the vaccine, and that they expected a shorter time for recovery. However, firm characteristics are in general not significantly different before and after the vaccine. To further ease concerns that firms responding later in the survey might have different characteristics, and this might be driving the results, we regress the dummy $vaccine_{i,t}$ on each of the regressors of interest adding a full set of sector-region fixed effects (see Table A11). We find that all of them have no significant correlation with the timing of the response (with the exception of the cash ratio, which has a positive and significant coefficient), hence pointing at the pool of firms responding before and after the announcement of the vaccine to have the same ex-ante characteristics. Nonetheless we control by all firm observables and the size of the shock received when running Equation (2) to minimize any possible concern regarding the correlation of the timing of the response with any firm-level characteristics.

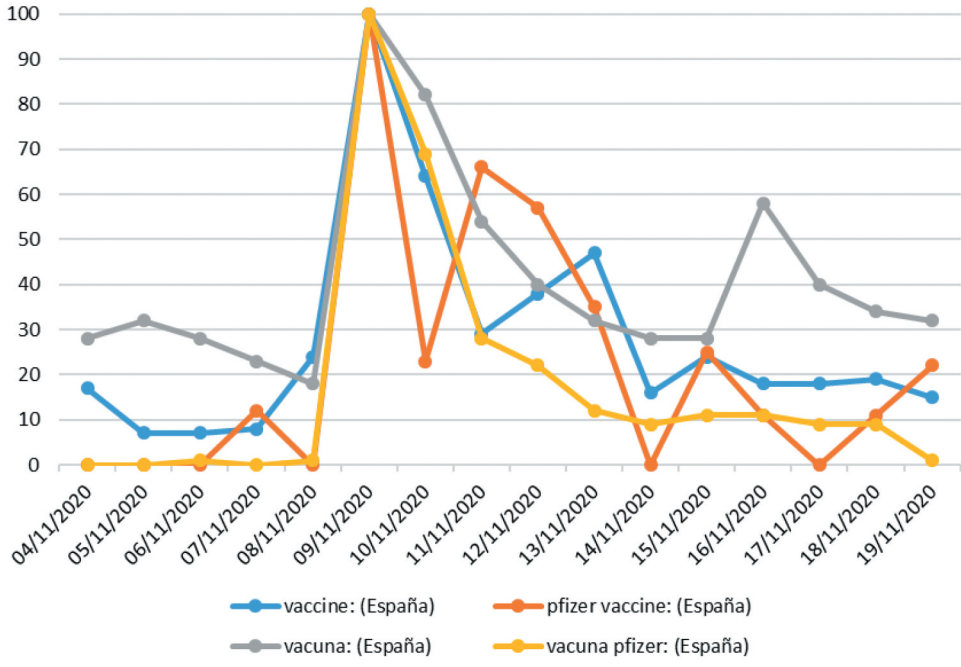

Figure A7. Google searches of the word 'vaccine'. Source: GoogleTrends. Notes: The figure shows the 'regional interest' in Spain of the searches *vaccine*, *pfizer vaccine*, *vacuna* and *vacuna pfizer* (the two latter are the Spanish translations of the former). Regional interest is computed by Google as a proportion of all searches on all topics on Google at that time and location, normalized so that 100 is the maximum.

[26]Figure A3 of Appendix A.1 shows the responses received by day.

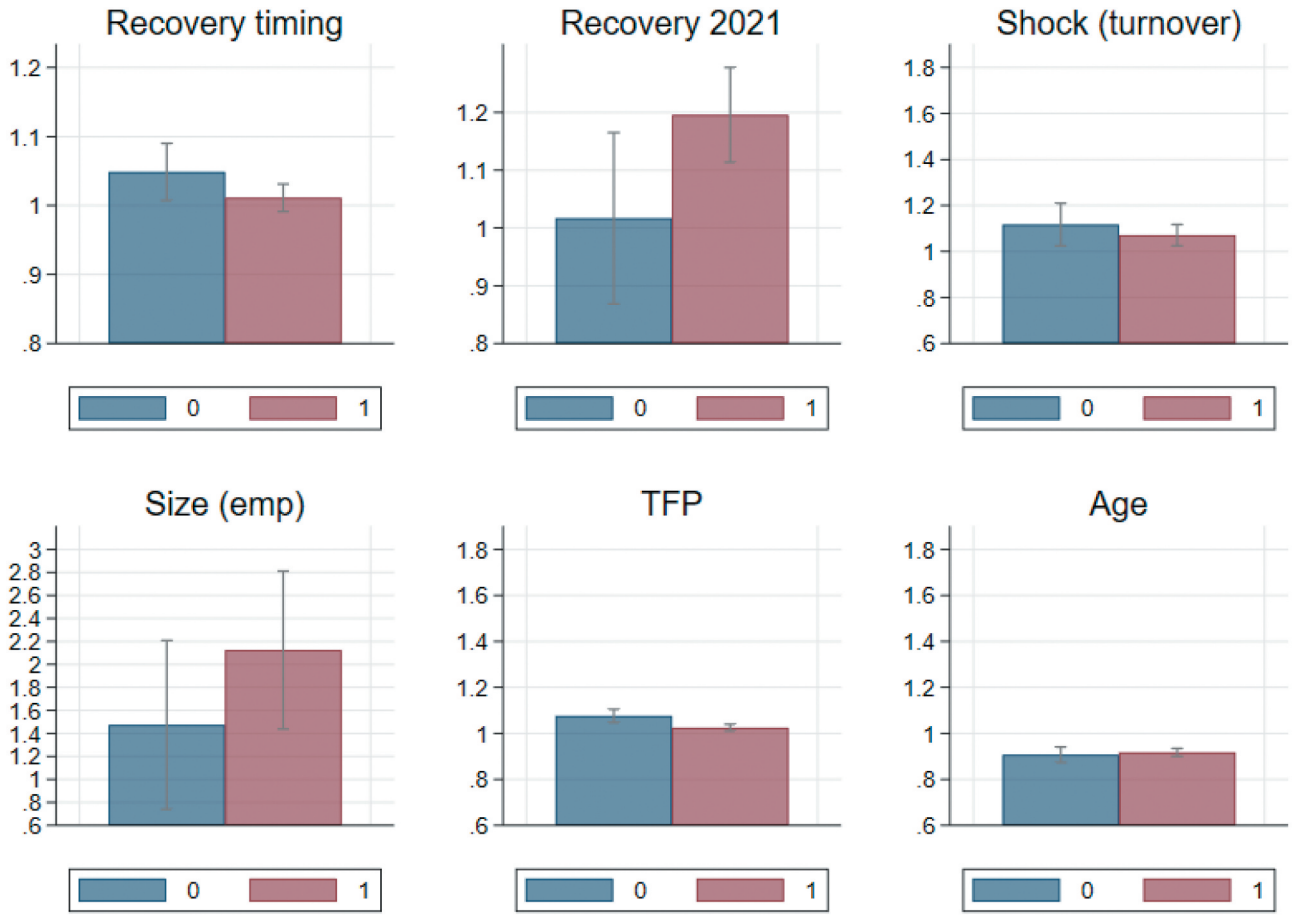

Figure A8. Average of responses before and after the vaccine announcement. Source: EBAE survey and Central de Balances. Notes: Average response pre-vaccine (0) and post-vaccine (1) with the 90% confidence interval, of the variables proxying recovery expectations (*recovery timing* and *recovery in 2021*), the size of the shock received (proxied by the decrease in sales) and the main firm characteristics (employment, age and TFP). All the variables are normalized so that the average response on the day of the vaccine announcement takes the value 1.

Table A11. Relationship of the timing of response to survey with the regressors of interest.

	(1) Δ Turnover	(2) TFP	(3) Age	(4) Temp. workers	(5) Intang. share	(6) Debt ratio	(7) Cash ratio	(8) Log Empl.
vaccine	0.79	−0.03	−0.07	0.00	0.01	0.02	−0.03***	0.04
	(1.06)	(0.02)	(0.87)	(0.01)	(0.01)	(0.02)	(0.01)	(0.08)
Obs	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119
R^2	0.37	0.62	0.24	0.34	0.26	0.18	0.21	0.30
Sect-reg FE	YES	YES	YES	YES	YES	YES	YES	YES

Source: EBAE survey and Central de Balances.

Notes: Outcomes of regressing the dummy variable $vaccine_{i,t}$ individually on the Y-o-Y change in sales, proxy for the size of the shock (column 1), TFP (column 2), age (column 3), share of temporary workers (column 4), share of intangible assets (column 5), debt ratio (column 6), cash ratio (column 7) and log employment (column 8). All columns include full set of sector-region fixed effects. Region-sector clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.