

A first approximation of the firm-level relationship between profit margins and business investment in the Spanish economy

Article 04
29/10/2024

<https://doi.org/10.53479/38219>

Rationale

Business investment and profit margins both declined in 2020, but have been recovering since. Statistical analysis of firm-level data can be used to estimate the relationship between these two variables in the Spanish economy in recent years.

Takeaways

- After a decline in 2020, profit margins in Spain have been rising. This increase has been concentrated among firms that had lower profit margins in 2019. Conversely, firms that had higher margins before the pandemic have, overall, seen profit margins follow a downward trajectory.
- The relationship between profit margins and business investment, calculated drawing on granular firm-level data, takes the form of an inverted-U curve: it is positive for profit margins below a certain threshold, but turns negative above that threshold.
- In the Spanish economy, most firms stand in the section of the curve where the profit margin-investment relationship is positive. Firms in the section where the relationship is negative tend to be smaller, younger and more productive.

Keywords

Profit margin, investment.

JEL classification

L11, E22.

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A FIRST APPROXIMATION OF THE FIRM-LEVEL RELATIONSHIP BETWEEN PROFIT MARGINS AND BUSINESS INVESTMENT IN THE SPANISH ECONOMY

Introduction

Drawing on granular data from the Banco de España's Central Balance Sheet Data Office integrated database (CBI), this article makes a first pass at measuring the relationship between profit margins and business investment in the Spanish economy. First, we document the recent aggregate trends for these two variables based on the CBI data and compare them with those reported by other statistical sources. Second, we analyse the CBI firm-level data to show the non-linear relationship between profit margins and investment in the Spanish economy during the period under review. The article concludes with some final considerations.

The aggregate dynamics of profit margins and investment according to CBI data

The CBI, a database prepared annually by the Banco de España, compiles information on the balance sheets and income statements of a broad spectrum of Spanish non-financial corporations. These statistics mainly draw on two sources of annual information. First, information gathered directly from firms that voluntarily submit their data through a specific questionnaire developed by the Banco de España's Central Balance Sheet Data Office (CBSO). Second, data acquired through collaboration with Mercantile Registries, which forward to the CBSO the annual accounts filed by firms in compliance with financial disclosure regulations.

Drawing on the CBI data, this article constructs measures of profit margins and business investment for more than 300,000 firms for each year from 2008 to 2022 (the last year for which full information is available). Profit margin is defined as the ratio of gross operating profit (GOP) to net turnover. For business investment, two alternative measures are calculated: the investment rate (investment to gross value added (GVA) at factor cost) and the investment ratio (investment to fixed assets in the previous year). In both cases, investment is proxied by the change in the stock of tangible fixed assets, investment property and intangible assets, plus depreciation charges and other adjustments (capital gains/losses from asset disposals, losses or impairments, changes in volume and revaluations).

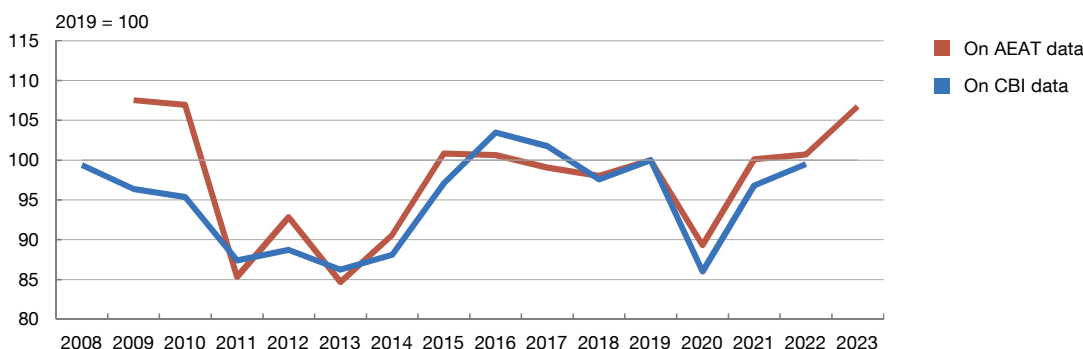
To limit the influence of outliers, the analysis only includes public limited companies (*sociedades anónimas*) and private limited companies (*sociedades de responsabilidad limitada*) with positive GVA and turnover, and profit margins between 0% and 100%. Similarly, the top and bottom 5% of each investment measure and of the turnover-to-assets ratio are excluded. These adjustments yield a sample of more than 300,000 firms per year, representing roughly 70% of the turnover of all public limited and private limited companies.¹

1 Compared with overall turnover for such companies according to the AEAT's sales, employment and wages statistics.

Chart 1

Profit margin of non-financial corporations in Spain

1.a Profit margin (a)



SOURCES: AEAT (Observatorio de Márgenes Empresariales) and Banco de España.

a Profit margin is defined as the ratio between GOP and net turnover.



Chart 1 shows overall profit margin developments for the Spanish economy during the period under review. As can be seen, the performance of this aggregate measure calculated using CBI micro data is qualitatively similar to that calculated based on Spanish tax revenue service (AEAT) data.² In particular, profit margins declined sharply in 2020, associated with the COVID-19 pandemic. Since then, profit margins have steadily recovered, reaching, in aggregate terms, very close to or even above pre-pandemic levels.

The availability of CBI micro data allows us to delve a little deeper into recent developments in aggregate profit margins. In particular, analysing a sample of firms included in the CBI database for the entire period 2019-2022, we see that the recent increase in profit margins has essentially been concentrated among firms that had lower margins in 2019 (see Chart 2). Conversely, firms with higher margins in 2019 (i.e. those in the top quartile of the profit margin distribution before the pandemic) have tended to see their profit margins decline in recent years.³

Chart 3 shows, for recent years, the aggregate nominal developments in business investment, based on the CBI data, and in the nominal gross fixed capital formation of non-financial corporations, based on the National Accounts data compiled by the National Statistical Institute (INE), both normalised to 100 in 2008. Both time series exhibit a very similar pattern over the period under review. In particular, they both show a steep drop in investment in 2020 (which is somewhat more pronounced in the CBI data) followed by a subsequent recovery.

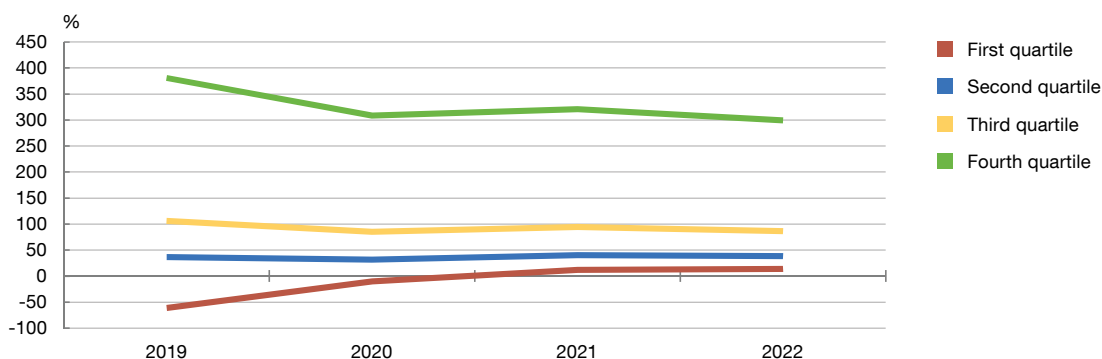
2 Specifically, corporate tax data for the constant total population in the statistics published by the AEAT on its Business Margin Observatory website. The profit margin for each year is obtained by dividing aggregate GOP by the aggregate net turnover of all firms.

3 Previous papers have used CBSO micro data to analyse profit margins, both based on the full annual version (CBI) (e.g. Montero and Urtasun, 2021; García-Perea, Lacuesta and Roldan-Blanco, 2021) and using the quarterly sub-sample (CBQ) (e.g. Menéndez and Mulino, 2022; Blanco, Menéndez and Mulino, 2022).

Chart 2

Profit margin, by quartile

2.a Profit margin of firms, grouped by 2019 profit margin quartiles.
As a percentage of the average profit margin in 2019 (a) (b)



SOURCE: Banco de España.

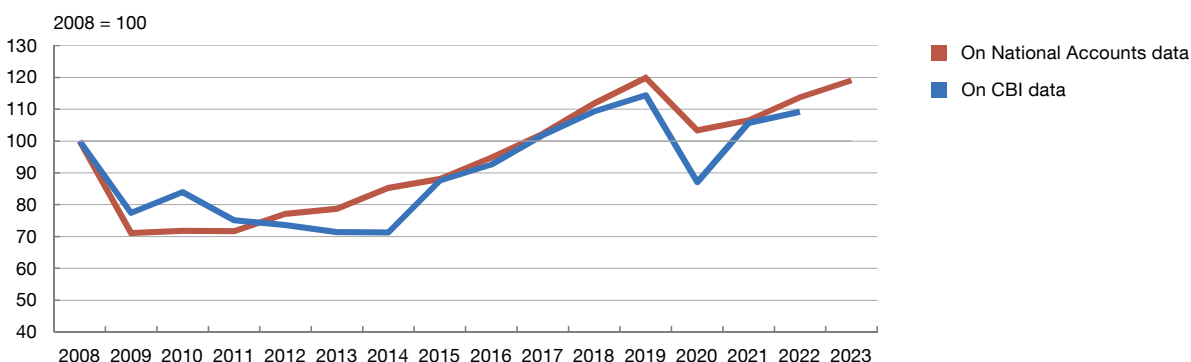
- a Profit margin is defined as the ratio between GOP and net turnover. Holding companies are not included.
b Results obtained from a sample of firms for which information is available for the period 2019-2022. The firms are classified into four quartiles based on their profit margin for 2019. The median profit margin for each quartile is then calculated for the years 2019, 2020, 2021 and 2022.



Chart 3

Investment of non-financial corporations in Spain

3.a Gross fixed capital formation (a)



SOURCES: INE (Cuentas Trimestrales no Financieras de los Sectores Institucionales) and Banco de España.

- a At current prices.



The firm-level relationship between profit margins and investment

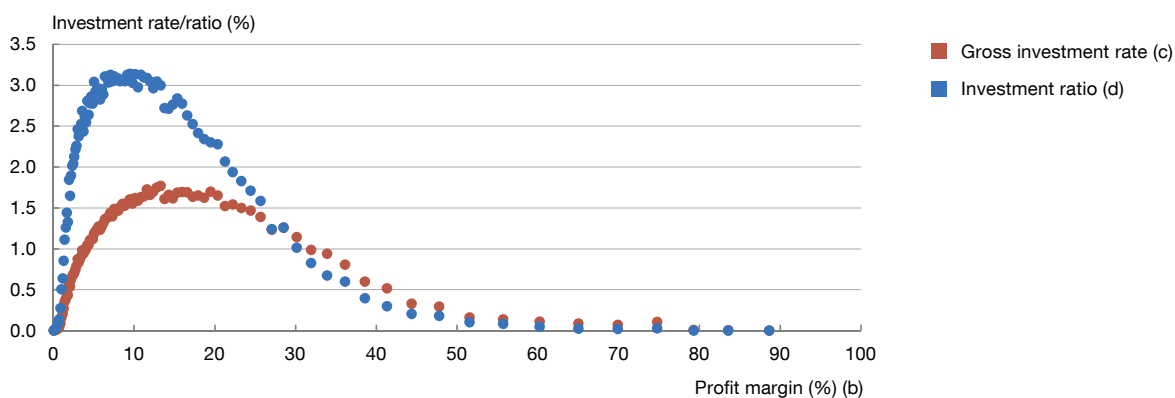
As a first pass at determining the firm-level relationship between profit margins and investment, the sample for each year is sorted into 100 groups of firms by profit margin. The median profit margin and median business investment are calculated for each group, with the average of these medians then calculated for the entire period under review (2008-2022).

The result of this exercise is depicted in Chart 4, which shows that the relationship between profit margin and business investment (irrespective of how the latter is defined) has an inverted-U

Chart 4

Relationship between profit margin and investment

4.a Total firms (a)



SOURCE: Banco de España.

- a Each dot on the chart corresponds to the average of the median values for profit margin and the average of the median values for the gross investment rate or the investment ratio, calculated for the period 2008-2022, for intervals defined by profit margin centiles. Firms with a negative or >100% margin are excluded.
- b Profit margin is defined as GOP/net turnover.
- c Ratio between investment and GVA at factor cost.
- d Ratio between investment and total fixed assets in t-1.

shape: there is a positive correlation between profit margin and investment for low profit margin values that turns negative above a certain profit margin level.

Based on this chart we can also deduce that, since each dot represents the same number of firms, most Spanish firms are on the upward section of the curve, i.e. where there is a positive correlation between profit margin and investment.⁴

The results of the same analysis, but broken down by firm size, are depicted in Charts 5.a and 5.b. The inverted-U shape of the relationship between profit margin and investment holds true for both large firms and SMEs, irrespective of the measure of investment used. In any event, for any profit margin level, large firms have higher investment rates and investment ratios. Broadly speaking, this reflects large firms' greater propensity to invest.

Charts 6.a and 6.b depict the results broken down into two different time periods: 2008-2018 and 2019-2022. The relationship between profit margin and investment is virtually the same in the two periods and in both cases it plots an inverted-U curve.

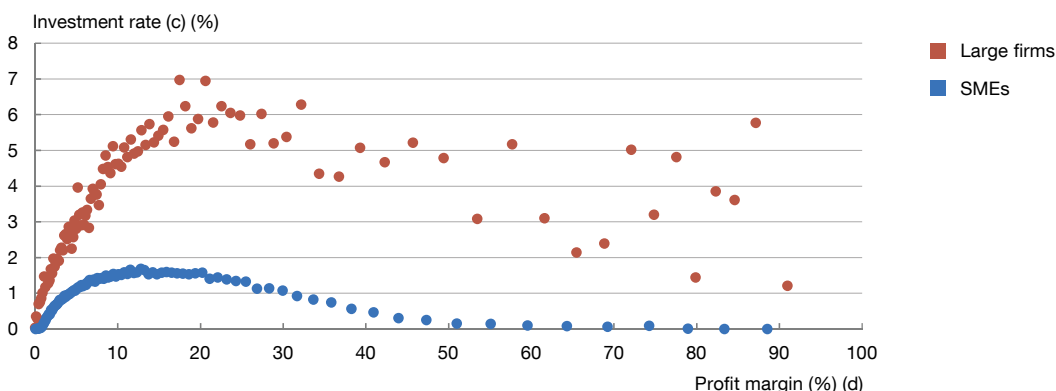
The firm-level relationship between profit margin and investment identified in earlier exercises could be influenced by certain factors (such as sector, firm size or firm age) that could affect the performance of both profit margins and investment. To control for the possible effect of these

⁴ There is evidence of similar results (an inverted-U curve and most firms being on its upward section) for other countries. See, for example, Díez, Leigh and Tambunlertchai (2018).

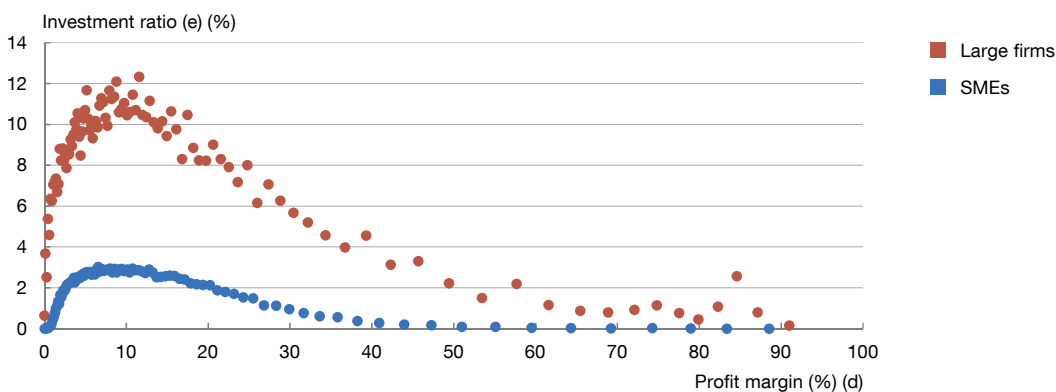
Chart 5

Relationship between profit margin and investment. Firm-size breakdown

5.a Gross investment rate. Firm-size breakdown (a) (b)



5.b Investment ratio. Firm-size breakdown (a) (b)



SOURCE: Banco de España.

- a Each dot on the chart corresponds to the average of the median values for profit margin and the average of the median values for the gross investment rate or the investment ratio, calculated for the period 2008-2022, for intervals defined by profit margin centiles. Firms with a negative or >100% margin are excluded.
- b Firm size defined in accordance with European Commission Recommendation 2003/361/EC.
- c Ratio between investment and GVA at factor cost.
- d Profit margin is defined as GOP/net turnover.
- e Ratio between investment and total fixed assets in t-1.

other factors, in an attempt to more clearly establish the association between profit margins and investment, we estimate a multiple regression model using the following equation:

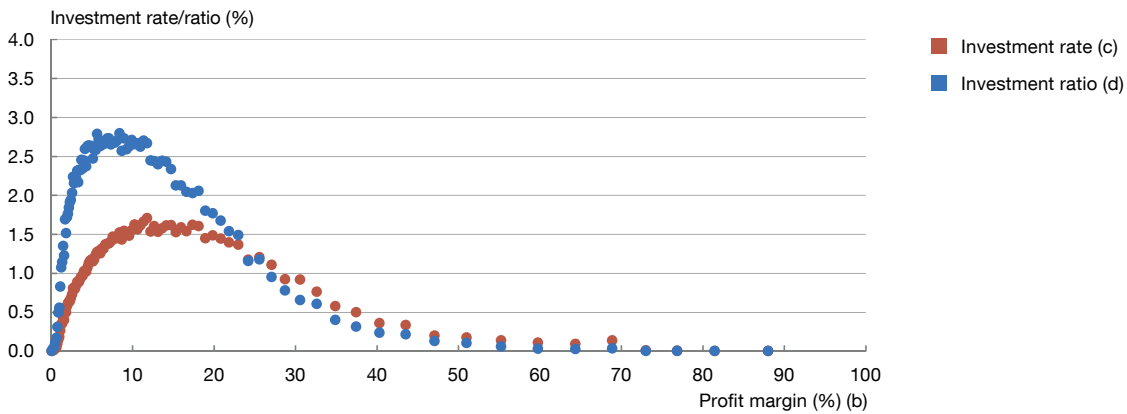
$$I_{it} = \beta_1 M_{it} + \beta_2 M_{it}^2 + \theta' X_{it} + \varepsilon_{it},$$

where I_{it} is the investment (rate or ratio) of firm i in year t , M_{it} is the profit margin and X_{it} is a vector that includes a set of control variables. Specifically, the controls contain indicator variables that cover all combinations of year and sector, the turnover-to-assets ratio in the preceding year, the logarithm of the firm's age and a categorical variable of firm size (large, medium-sized, small and microenterprise). It is important to note that the "profit margin" variable is also included squared so as to capture the possible non-linear relationship between profit margin and investment suggested by the charts above.

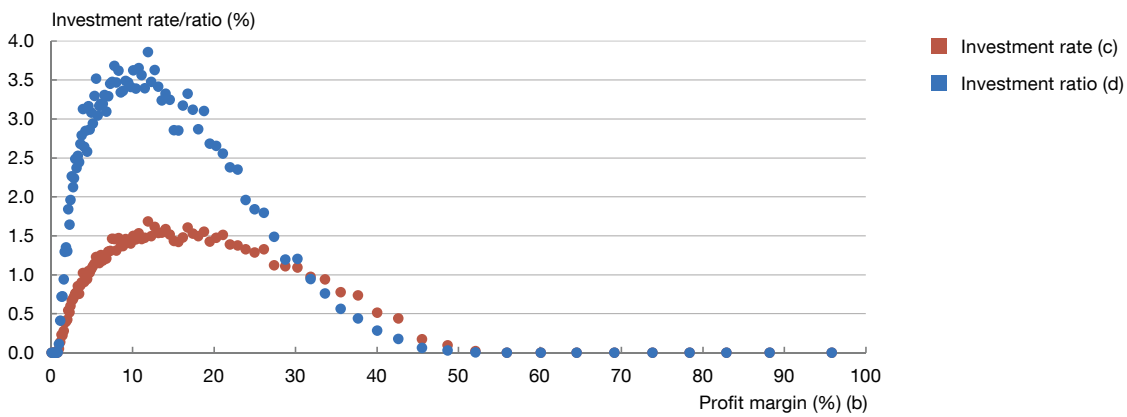
Chart 6

Relationship between profit margin and investment. Breakdown by period

6.a 2008-2018 (a)



6.b 2019-2022 (a)



SOURCE: Banco de España.

- a Each dot on the chart corresponds to the average of the median values for profit margin and the average of the median values for the gross investment rate or the investment ratio, calculated for the corresponding period, for intervals defined by profit margin centiles. Firms with a negative or >100% margin are excluded.
- b Profit margin is defined as $GOP/\text{net turnover}$.
- c Ratio between investment and GVA at factor cost.
- d Ratio between investment and total fixed assets in $t-1$.

Column (1) of Tables 1 and 2 contains the empirical estimate of the proposed equation for the investment rate and the investment ratio, respectively. These estimations confirm the existence of an inverted U-shaped relationship between profit margin and investment that is statistically significant. From this analysis we can also deduce that a vast majority of Spanish firms (over 85%) are on the upward curve of such relationship.⁵ These firms also account for a very high share of total GVA, employment and turnover in Spain.

The remaining columns in Tables 1 and 2 show the result of different robustness checks, all of which confirm the inverted-U curve initially estimated and the preponderance of firms on the

⁵ To estimate these percentages we must first determine the profit margin level at which the relationship between profit margin and investment turns negative. According to the estimated equation, this threshold can be calculated as the ratio between $-\beta_1$ and $2\beta_2$.

Table 1

Relationship between profit margin and investment rate (a)

	Investment rate				
	Total firms			SMEs	Large firms
	(1)	(2)	(3)	(4)	(5)
Profit margin	0.109*** (0.001)	0.195*** (0.002)	–	0.105*** (0.001)	0.155*** (0.013)
Profit margin ²	-0.173*** (0.001)	-0.223*** (0.003)	–	-0.172*** (0.001)	-0.194*** (0.015)
Profit margin / Median profit margin by sector and year	–	–	0.003*** (0.000)	–	–
(Profit margin / Median profit margin by sector and year) ²	–	–	-0.0003*** (0.000)	–	–
Year controls	Yes	Yes	Yes	Yes	Yes
Sector controls	Yes	Yes	Yes	Yes	Yes
Year-sector interaction	Yes	Yes	Yes	Yes	Yes
Weighted by employment	No	Yes	No	No	No
Firms in the upward portion of the curve					
Percentage	86.2	95.5	95.1	85.6	90.7
Share of GVA	84.5	90.8	93.2	89.7	86.1
Share of turnover	93.5	96.6	97.2	95.4	95.1
Share of employment	96.1	98.3	98.1	95.8	97.8
No of observations	4,428,403	4,428,403	4,428,403	4,376,762	51,641

SOURCE: Banco de España.

a Effects estimated using ordinary least square regressions, where the dependent variable is the investment rate, defined as the ratio between fixed asset investment and GVA at factor cost. The explanatory variable of interest is profit margin, defined as the ratio between GOP and net turnover in regressions (1), (2), (4) and (5), and as the ratio of profit margin to median profit margin by sector and year, in regression (3). Ratios expressed on a per unit basis. Column (2) shows the regression weighted by employment. The sectors are defined based on NACE Rev. 2 divisions. Standard errors are indicated in brackets. All regressions include the following controls: turnover-to-assets ratio at t-1, the natural logarithm of firm age and a categorical variable of firm size (large, medium-sized, small and microenterprise). * p < 0.10; ** p < 0.05; ***p < 0.01.

upward curve of the relationship between profit margin and investment. Specifically, column (2) adds weights to the regression, defined according to the firm's level of employment.⁶ This allows us to conclude that the results obtained are not caused by a set of small enterprises that behave atypically. In column (3) we divide profit margin by the median for the sector⁷ and the corresponding year, thereby verifying that the inverted-U curve remains even when comparing the profit margins of firms within the same sector.⁸ Lastly, columns (4) and (5) repeat the original estimation, but divide the sample into two groups: SMEs and large firms.

While not reflected in Tables 1 and 2, we also performed other robustness checks. For instance, we performed estimations for each year separately and they still show the previously identified non-linear relationship between profit margins and investment. This relationship is also observed

6 Turnover and assets cannot be used as weights as these variables are already included as controls.

7 NACE Rev. 2 divisions

8 Alternatively, we estimated the proposed equation for each NACE Rev. 2 section individually and found similar results in all cases, except for Section D, "Electricity, gas, steam and air conditioning supply".

Table 2

Relationship between profit margin and investment ratio (a)

	Investment ratio				
	Total firms			SMEs	Large firms
	(1)	(2)	(3)	(4)	(5)
Profit margin	0.161***	0.264***	–	0.153*** (0.003)	0.097***
Profit margin ²	-0.236***	-0.388***	–	-0.234*** (0.003)	-0.220***
Profit margin / Median profit margin by sector and year	–	–	0.006*** (0.000)	–	–
(Profit margin / Median profit margin by sector and year) ²	–	–	-0.0005*** (0.000)	–	–
Year controls	Yes	Yes	Yes	Yes	Yes
Sector controls	Yes	Yes	Yes	Yes	Yes
Year-sector interaction	Yes	Yes	Yes	Yes	Yes
Weighted by employment	No	Yes	No	No	No
Firms in the upward portion of the curve					
Percentage	86.7	92.5	97.6	86.0	80.4
Share of GVA	85.3	86.1	97.3	90.3	72.2
Share of turnover	94.2	94.4	99.1	95.8	87.4
Share of employment	96.7	96.7	99.5	96.3	92.2
No of observations	4,401,140	4,401,140	4,401,140	4,348,625	52,785

SOURCE: Banco de España.

a Effects estimated using ordinary least square regressions, where the dependent variable is the investment ratio, defined as the ratio between fixed asset investment and fixed assets at t-1. The explanatory variable of interest is profit margin, defined as the ratio between GOP and net turnover in regressions (1), (2), (4) and (5), and as the ratio of profit margin to median profit margin by sector and year in regression (3). Ratios expressed on a per unit basis. Column (2) shows the regression weighted by employment. The sectors are defined based on NACE Rev. 2 divisions. Standard errors are indicated in brackets. All regressions include the following controls: turnover-to-assets ratio at t-1, the natural logarithm of firm age and a categorical variable of firm size (large, medium-sized, small and microenterprise). * p < 0.10; ** p < 0.05; ***p < 0.01.

after introducing in the analysis different variables related to firms' debt and liquidity levels⁹ and when profit margin is replaced by its lag.

Final considerations

As we have seen, in recent years, profit margin and investment at Spanish firms have been positively correlated for low profit margin values. Past a certain profit margin threshold, this correlation becomes negative.

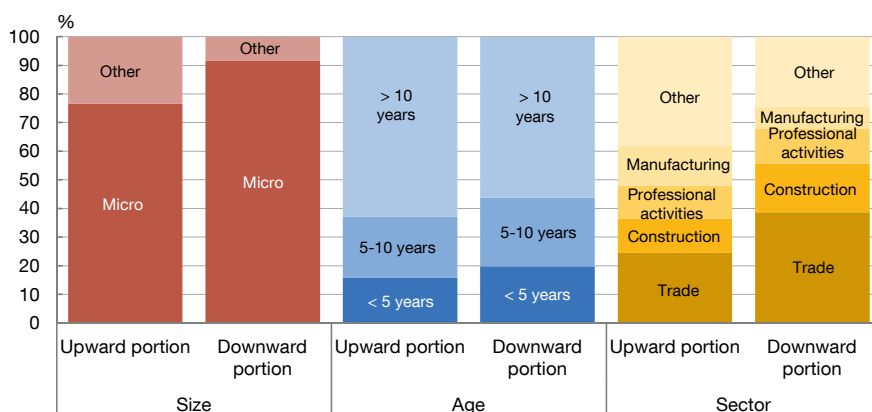
It is important to stress that the evidence presented in this article, in terms of correlations, does not in any way imply the existence of a possible (linear or non-linear) “causal” relationship between

⁹ Specifically, the profit margin and profit margin² ratios are estimated individually based on different debt and liquidity categories. In all cases, the estimated relationship has an inverted-U shape and more than 92% of firms are on the upward portion of the relationship.

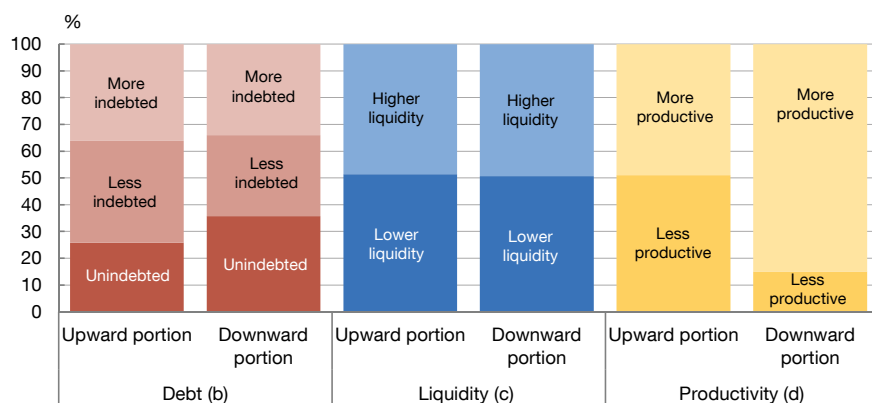
Chart 7

Characteristics of firms on the upward and downward portions of the relationship between profit margins and investment (a)

7.a Distribution of firms by size, age and sector



7.b Distribution of firms by debt, liquidity and productivity



SOURCE: Banco de España.

- a Results obtained from the regression of the investment rate on the ratio of profit margin to median profit margin by sector and year (see regression (3) in Table 1).
- b More (less) indebted firms are defined as those whose debt ratio, calculated as interest-bearing borrowing/total assets, is higher (lower) than the median ratio for their sector and year.
- c Firms with higher (lower) liquidity are defined as those whose liquidity ratio, calculated as cash and other cash equivalents/total assets, is higher (lower) than the median ratio for their sector and year.
- d More (less) productive firms are defined as those whose productivity indicator, calculated as GVA at factor cost/number of employees, is higher (lower) than the median indicator for their sector and year. Firms with no employees are excluded.



profit margins and investment or the directionality of such potential relationship (i.e. from profit margins to investment or from investment to profit margins).

These topics (causality, directionality and non-linearity of the relationship between profit margins and investment) are discussed in a growing body of academic literature, mainly focused on the United States.¹⁰ Future Banco de España research work – that will delve deeper than the

¹⁰ See, for example, Covarrubias, Gutiérrez and Philippon (2019), Gutiérrez and Philippon (2017), Autor, Dorn, Hanson, Pisano and Shu (2020), Syverson (2019) and De Loecker, Eeckhout and Unger (2020).

preliminary evidence included in this article – will also address these matters, but from the perspective of the Spanish economy.

In this regard, it may be useful to drill down into which firms are on the downward portion of the relationship between profit margin and investment identified in this article and why. Chart 7 is a first step in this direction.¹¹ Specifically, it suggests that the few firms in the Spanish economy on the downward portion of the aforementioned relationship tend to be smaller, younger and more productive than the rest. In addition, unindebted firms belonging to the trade sector are overrepresented on such downward section. Again, future research should explore which factors (and through which channels) could be behind these correlations.

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How to cite this document

Puente Díaz, Sergio, and Maristela Mulino Ríos. (2024). "A first approximation of the firm-level relationship between profit margins and business investment in the Spanish economy". *Economic Bulletin - Banco de España*, 2024/Q4, 04. <https://doi.org/10.53479/38219>

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ISSN 1695-9086 (online edition)

¹¹ This chart was constructed using the specification corresponding to column (3) of Table 1 so that differences in the average sectoral profit margin did not affect the results.

