DETERMINANTS OF INVESTMENT IN TANGIBLE AND INTANGIBLE FIXED ASSETS

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Abstract

We investigate which firm characteristics are associated with investment in tangible and intangible fixed assets, paying special attention to the case of R&D, and which funding sources are used for each type of investment. Regarding firm characteristics, we find that younger and more profitable firms tend to invest more in all asset types. In the case of size, larger firms invest more in R&D and intangibles but less in tangible fixed assets. In addition, there is a concave relationship between leverage and investment. Regarding funding sources, we find that cash flow is the most important source of funding for intangibles and R&D, whereas financial debt is the most important funding source for tangible fixed assets. Stock issues are used to fund R&D and, especially, tangible fixed assets. Firms use cash holdings to smooth investment in R&D.

Keywords: investment, tangible fixed assets, R&D, intangibles.

JEL classification: G31, G32, O32.

Resumen

En este documento investigamos las características empresariales que están asociadas con la inversión en activos fijos tangibles e intangibles, prestando especial atención al caso de la I+D, y las fuentes de financiación que se utilizan en cada tipo de inversión. Respecto a las características empresariales, encontramos que las empresas más jóvenes y más rentables tienden a invertir más en todo tipo de activos. En el caso del tamaño, las empresas más grandes invierten más en I+D e intangibles, pero menos en activos tangibles. Además, detectamos que hay una relación cóncava entre endeudamiento e inversión. Respecto a las fuentes de financiación, encontramos que los flujos de caja son la fuente de financiación más importante para intangibles e I+D, mientras que la deuda financiera es la fuente de financiación más importante para activos tangibles. La emisión de acciones se usa para financiar I+D y, especialmente, activos tangibles. Las empresas utilizan las tenencias de efectivo para suavizar la inversión en I+D.

Palabras clave: inversión, activos tangibles, I+D, intangibles.

Códigos JEL: G31, G32, O32.

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1 Introduction

Business investment is one of the main engines of economic activity and, at the same time, a key conditioning factor of business productivity and, therefore, of future growth. It is thus important to know how it behaves over time, understand what are its main determinants, and identify the source of the resources with which it is financed. Among the various items in which firms may invest, recent years have seen growing interest in the study of intangible assets, considering that a portion of these intangibles may exert a notable effect on business productivity. In line with this interest, this article aims to press ahead with the study of firms' investment in assets of this type, particularly where they have to do with research, development and innovation. We also study the investment in tangible fixed assets as a benchmark, to see whether there are important differences between the patterns of these assets and those of intangible assets and R&D.

Before moving on the more purely analytical considerations, we wish to clarify some matters concerning the terminology used to define, from different standpoints, the assets known as intangibles. Intangible assets can be classified in three groups or categories: a) computer software and databases, b) research and development or other activities that may give rise to intellectual property rights of a scientific or artistic nature, and c) economic competencies, such as improvements in employee skills, in organisational structure or brand reputation development. In business accounting, intangibles comprise the assets belonging to the first of the above three categories (software and databases), plus some elements from the other two categories, such as research and development (R+D), mineral exploration and original recreational, literary and artistic works and others relating basically to economic competencies, such as exclusive rights to future goods and services, or licences to exploit resources or to pursue specific activities.

It is also important to define "research, development and innovation" (R+D+i), and how it is measured and accounted for, since it is the principal object of analysis in this article. The three concepts making up R+D+I are closely related to each other and include expenses incurred by firms in order to make improvements or introduce new features giving rise to greater future benefits for the company and optimal use of its resources. Throughout the article we will refer to "research and development" or R+D, but will do so broadly to include the concept of innovation. As regards measuring and accounting for these assets, the Spanish chart of accounts specifies that "research (and development) expenses shall in general be period expenses and may only be capitalised if they are individually specified by project, their cost is clearly established (so it can be allocated over time) and there is sound evidence for the technical success and the financial and commercial profitability of the project". If the project is successful and produces a patent or similar outcome, the amounts invested, which are recorded in the related research and development items, must be reclassified to "industrial property rights", which also form part of intangible assets.

Against this background, in this paper we investigate which firm characteristics are associated with investment in tangible and intangible fixed assets, paying special attention

to the case of R&D, and which funding sources are used for each type of investment. Regarding firm characteristics, we find that younger and more profitable firms tend to invest more in all asset types. In the case of size, larger firms invest more in R&D and intangibles but less in tangible fixed assets. However, the probability of investing in all types of assets, including tangible assets, is increasing in size. In addition, there is a concave relationship between leverage and investment: beyond some optimal threshold, higher leverage decreases investment. Regarding funding sources, we find that cash flow is the most important source of funding for intangibles and R&D, whereas financial debt is he most important funding source for tangible fixed assets, probably because tangible assets can be pledged as collateral. Stock issues are used to fund R&D and, especially, tangible fixed assets. Firms use cash holdings to smooth investment in R&D, probably because of the high adjustment costs of this type of investment.

The rest of the article is structured as follows. The second section briefly describes the data source and the construction of the main variables. The third section explains the empirical analyses, and it is divided into two subsections. First, it characterises firms by type of investment, distinguishing between tangible, intangible and R+D, regression exercises being used for this purpose. Second, it looks in more depth at the main sources of financing used by firms when investing in those assets. Finally, the fourth section concludes.

2 Data

In drafting this article, we made use of the CBI (Integrated Central Balance Sheet Data Office Survey), which contains a large database on non-financial corporations. The CBI has two separate sources. Firstly, it draws on the annual accounts (basically the balance sheet and income statement, although also significant additional information) which some firms, mostly the larger ones, report to the Banco de España's Central Balance Sheet Data Office when they voluntarily fill out a yearly questionnaire. Secondly, this database also includes information from the annual accounts which firms obligatorily deposit with the Mercantile Registers. In all, aggregating these two sources results in microeconomic information from around 600,000 firms each financial year, covering, in GVA terms, roughly 50% of the total non-financial corporations sector, according to National Accounts data. For the firms included in the study, we constructed the actual flows of the asset items to be used in our analysis, calculating the difference between the opening balance and the closing balance (taken from the balance sheet) and applying the expense and revenue adjustments applicable in each case (basically amortisation, provisions and gains/losses on sales of these assets[1]).

1 In some expenses and revenues, since there was not a sufficient level of detail, we made estimates to approximate the actual flow. This estimate was based on the share of each intangible asset item whose flow was to be calculated (research, development, other) in the total of those intangible assets.

3 Empirical analysis

3.1 Descriptive evidence: firm characteristics correlated with investment

In a first step, we provide some descriptive evidence on which firm characteristics are correlated with investment. Descriptive statistics of those characteristics can be found in Panel A of Table 1. In particular, we run OLS regressions of investment on firm age, size (logarithm of total assets), leverage, squared leverage (to account for non-linearities) and return on assets (ROA) (Table 2). All regressions include industry-year dummies to control for the business cycle and industry-specific developments such as technological shocks. We also control for the legal form of the company with legal form dummies, for instance, whether the firm is a limited liability company *(sociedad anónima or sociedad de responsabilidad limitada)* or a cooperative. The dependent variables are investment in R&D (column 1), investment in intangible fixed assets (column 2) and investment in tangible fixed assets (column 3), in all cases divided by total assets.

In the case of R&D (Table 2, column 1), we find positive correlations between investment and size and between investment and ROA: larger and more profitable firms invest more in R&D. The relationship between R&D and leverage is concave, implying that there is an optimum level of leverage that maximises investment in R&D; beyond that point, further increases in leverage

Table 1
DESCRIPTIVE STATISTICS

Units of total assets: million of euros

Variable	Obs	Mean	Std. Dev.	Min	Max
Panel A: all firms					
rd	100,538	0.03	0.11	-0.02	0.45
investment intangibles	10,176,700	0.17	0.63	-0.31	2.61
investment tangibles	10,176,700	3.79	8.04	-1.45	30.23
age	10,242,548	10.66	9.09	0.00	1,002.00
log(age+1)	10,242,548	2.13	0.89	0.00	6.91
total assets	10,176,700	2.31	104.75	0.00	76,904.23
size	10,176,700	5.33	1.84	-4.61	18.16
leverage	10,176,700	21.67	28.61	0.00	91.60
ROA	10,176,312	1.97	14.99	-40.07	29.04
Panel B: only firms with non-missing information on R&D					
rd	100,538	0.03	0.11	-0.02	0.45
investment intangibles	100,538	0.24	0.65	-0.31	2.61
investment tangibles	100,538	3.15	5.07	-1.45	30.23
sales	100,538	143.21	103.21	0.00	478.08
cashflow	100,538	6.46	8.99	-40.07	29.04
stock_issues	100,538	0.05	0.23	-0.11	0.99
D.cash holdings	100,538	0.38	7.09	-27.40	34.73
financial debt	100,538	0.17	7.75	-13.65	17.70

SOURCE: Devised by authors.

Table 2

FIRM CHARACTERISTICS CORRELATED WITH INVESTMENT

The dependent variable is investment in R&D over total assets (%) in column (1), investment in intangible fixed assets over total assets (%) in column (2) and investment in tangible fixed assets over total assets (%) in column (3). Sample period: 2001-2017. All estimations by OLS. Specifications include industry-year dummies and legal form dummies. Cluster-robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)	(3)
Variables	rd	investment intangibles	investment tangibles
age	0.0002	-0.0408***	-1.2538***
	(0.0015)	(0.0005)	(0.0058)
size (t-1)	0.0026***	0.0019***	-0.0691***
	(0.0005)	(0.0002)	(0.0023)
leverage (t-1)	0.0009***	0.0022***	0.0294***
	(0.0001)	(0.0000)	(0.0004)
ROA (t-1)	0.0002***	0.0006***	0.0423***
	(0.0001)	(0.0000)	(0.0003)
squared leverage (t-1)	-0.0000***	-0.0000***	-0.0004***
	(0.0000)	(0.0000)	(0.0000)
Industry-year dummies	Yes	Yes	Yes
Observations	61,816	6,748,288	6,748,288
R-squared	0.2085	0.0628	0.0748

SOURCE: Devised by authors.

Table 3

FIRM CHARACTERISTICS CORRELATED WITH POSITIVE INVESTMENT

The dependent variable is a dummy for positive investment in R&D in column (1), for positive investment in intangibles in column (2) and for positive investment in tangible fixed assets in column (3). Sample period: 2001-2017. All estimations by OLS. Specifications include industry-year dummies and legal form dummies. Cluster-robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)	(3)
Variables	rd>0	investment intangibles>0	investment tangibles>0
age	0.0070	-0.0179***	-0.0433***
	(0.0049)	(0.0004)	(0.0004)
size (t-1)	0.0248***	0.0301***	0.0652***
	(0.0020)	(0.0002)	(0.0002)
leverage (t-1)	0.0033***	0.0018***	0.0033***
	(0.0003)	(0.0000)	(0.0000)
ROA (t-1)	0.0006**	0.0001***	0.0030***
	(0.0003)	(0.0000)	(0.0000)
squared leverage (t-1)	-0.0000***	-0.0000***	-0.0000***
	(0.0000)	(0.0000)	(0.0000)
Industry-year dummies	Yes	Yes	Yes
Observations	61,816	6,748,288	6,748,288
R-squared	0.1910	0.0819	0.1187

SOURCE: Devised by authors

decrease R&D. Same results hold for the case of intangible fixed assets (Table 2, column 2), but now age is also significant, with a negative sign: younger firms invest more in intangible fixed assets. Similar results also hold for tangible fixed assets (Table 2, column 3), with a key difference: the coefficient on size is negative, implying that smaller firms invest more on tangible assets.

A complementary analysis can be found in Table 3, in which we run linear probability models to model the probability than investment in R&D/intangibles/tangibles is positive. Most coefficients have the same sign and statistical significance as in Table 1, with a remarkable exception: the impact of size on the probability of positive investment in tangibles is now positive. This means that, while in the intensive margin larger firms invest less proportionally in tangible fixed assets, in the extensive margins larger firms are more likely to invest in those assets.

3.2 Causal evidence: funding sources and investment

In a second step, we provide causal evidence on the impact of several funding sources on investment by estimating dynamic investment regressions. These equations are:

$$I_{i,t} = \beta_1 I_{i,t-1} + \beta_2 I^2_{i,t-1} + \beta_3 Sales_{i,t} + \beta_4 CashFlow_{i,t} + \beta_5 StockIssues_{i,t} + \\ + \beta_6 \Delta CashHoldings_{i,t} + \beta_7 FinancialDebt_{i,t} + d_t + \alpha_i + v_{i,t}$$

$I_{i,t}$ is investment in tangible fixed assets, intangible fixed assets or R&D. We follow Brown *et al.* (2012) and include both the lagged value and the lagged squared value of the dependent variable. $Sales_{i,t}$ is a control for demand. $CashFlow_{i,t}$ is measured as net income plus depreciation, and captures the internally generated resources that can be used to fund investment. $StockIssues_{i,t}$ are funds from stock issues net of repurchases. $\Delta CashHoldings_{i,t}$ are changes in cash holdings. $FinancialDebt_{i,t}$ is the flow of bank loans and debt issues. All variables are scaled by total assets. The model includes a firm-specific effect (α_i) to control for all unobserved time-invariant determinants of investment at the firm level, such as the technology of the firm and industry characteristics. The model also includes a time-specific effect (d_t) to control for aggregate changes that could affect the demand for investment, such as the state of the macro economy.

We estimate the above equation with the system GMM estimator [Arellano and Bover, 1995; Blundell and Bond, 1998] that uses lagged levels dated t-3 and t-4 as instruments for the equation in differences and lagged differences dated t-2 as instruments for the equation in levels. We treat all right-hand side variables as potentially endogenous. The instruments must be lagged at least three periods if the error term follows a firm-specific MA(1) process (Bond *et al.*, 2003, p. 159). This might be our case, since the Arellano and Bond (1991) test for serial correlation rejects the null of no second-order serial correlation in the first-differenced errors, which implies the existence of first-order serial correlation in the errors in levels. According to the Hansen J-test, we cannot reject the null hypothesis that the over-identifying restrictions are valid in our main specifications.

We only observe investment in R&D for a subsample of all the firms in the sample. To make the different regressions comparable, we limit all estimations to firms with non-missing

Table 4

DETERMINANTS OF INVESTMENT IN R&D, TANGIBLE AND INTANGIBLE FIXED ASSETS

Dynamic investment regressions. All variables are standardised to have mean zero and standard deviation equal to one. The dependent variables are investment in R&D over total assets, in % (column 1), investment in intangible fixed assets over total assets, in % (column 2), investment in tangible fixed assets over total assets, in % (column 3). Y(t-1) is the lagged dependent variable and Y^2(t-1) is the squared lagged dependent variable. Sample period: 2001-2017. Firms with investment in R&D / intangible fixed assets / tangible fixed assets equal to zero in all years are excluded from the sample. System GMM uses lagged levels dated t-3 and t-4 as instruments for the equation in differences and lagged differences dated t-2 as instruments for the equation in levels. m1 and m2 are the Arellano-Bond tests for serial correlation, which test the null of no first-order and second-order autocorrelation in the first-differenced residuals. Hansen is a test of the null that the overidentifying restrictions are valid. Two-step GMM with Windmeijer correction. Cluster-robust standard errors in parentheses. All specifications include year dummies. *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)	(3)
Variables	rd	intangibles	tangibles
Y (t-1)	0.9212***	0.6017***	0.5653***
	(0.2646)	(0.1182)	(0.1068)
Y^2 (t-1)	-0.2879	-0.0420	-0.1884
	(0.2645)	(0.1218)	(0.1209)
sales (t)	-0.0211***	-0.0278	0.0486
	(0.0059)	(0.0362)	(0.0325)
cashflow (t)	0.0263***	0.1167***	0.0831**
	(0.0067)	(0.0342)	(0.0347)
stock_issues (t)	0.0160***	0.0174	0.0880**
	(0.0061)	(0.0427)	(0.0438)
D.cash_holdings (t)	-0.0222***	-0.0003	0.0702
	(0.0062)	(0.0527)	(0.0436)
financial_debt (t)	0.0248***	0.0647	0.1018**
	(0.0064)	(0.0545)	(0.0514)
Year dummies	Yes	Yes	Yes
m1 (p-value)	0.000	0.000	0.000
m2 (p-value)	0.000	0.000	0.037
Hansen (p-value)	0.138	0.107	0.309
Observations	28,410	55,322	59,793

SOURCE: Devised by authors.

information on R&D. Descriptive statistics of this sample can be found in Panel B of Table 1. In addition, for each specification we drop the firms whose investment in R&D/intangibles/tangibles is zero in all years.

The results are displayed in Table 4. To compare the size of the coefficients across different specifications we have standardised all variables to have mean zero and standard deviation equal to one.

The coefficients, when significant, have the expected sign. The coefficients on the lagged dependent variables are positive and significant, indicating a high persistence of the three types of investment, probably due to adjustment costs. The coefficient on $CashFlow_{i,t}$ is positive and statistically significant in the three specifications. This means that more

Table 5

DETERMINANTS OF INVESTMENT IN R&D

Dynamic investment regressions. All variables are standardised to have mean zero and standard deviation equal to one. The dependent variable is investment in R&D over total assets, in %. Sample period: 2001-2017. Firms with investment in R&D equal to zero in all years are excluded from the sample. System GMM uses lagged levels dated t-3 and t-4 as instruments for the equation in differences and lagged differences dated t-2 as instruments for the equation in levels. m1 and m2 are the Arellano-Bond tests for serial correlation, which test the null of no first-order and second-order autocorrelation in the first-differenced residuals. Hansen is a test of the null that the overidentifying restrictions are valid. Two-step GMM with Windmeijer correction. Cluster-robust standard errors in parentheses. All specifications include year dummies. *** p<0.01, ** p<0.05, * p<0.1.

	(1) Low leverage	(2) High leverage
Variables	rd	rd
rd (t-1)	0.5533* (0.3245)	0.4646 (0.3333)
rd^2 (t-1)	0.0426 (0.3180)	0.0409 (0.3333)
sales (t)	-0.0144** (0.0070)	-0.0399*** (0.0101)
cashflow (t)	0.0216** (0.0091)	0.0325*** (0.0093)
stock_issues (t)	0.0137 (0.0084)	0.0167** (0.0077)
D.cash_holdings (t)	-0.0260*** (0.0065)	-0.0116 (0.0107)
financial_debt (t)	0.0236** (0.0101)	0.0291*** (0.0074)
Year dummies	Yes	Yes
m1 (p-value)	0.000	0.000
m2 (p-value)	0.005	0.014
Hansen (p-value)	0.660	0.011
Observations	14,654	13,756

SOURCE: Devised by authors.

internally generated resources translate into more investment. The coefficient is greatest in equation (2), implying that the cash flow sensitivity of investment in intangibles is the highest. No other coefficient, apart from that of the lagged dependent variable, is significant in equation (2), which means that firms exclusively rely on internally generated resources to fund their investment in intangibles.

The coefficient on $StockIssues_{i,t}$ is positive and significant in equations (1) and (3), implying that higher funds from equity issues are associated with more investment. It is much larger in equation (3) than in equation (1), which means that investment in tangible assets is particularly sensitive to this funding source. The same occurs with $FinancialDebt_{i,t}$: higher funds from debt finance are associated with more investment, particularly in the case of tangible fixed assets. The reason why this sensitivity is substantially higher in tangible assets may be the high collateral requirements of debt finance, as tangible assets are easily collateralised, at variance with intangible assets or R&D.

Table 6

DETERMINANTS OF INVESTMENT IN INTANGIBLES

Dynamic investment regressions. All variables are standardised to have mean zero and standard deviation equal to one. The dependent variable is investment in intangible assets over total assets, in %. Sample period: 2001-2017. Firms with investment in intangible assets equal to zero in all years are excluded from the sample. System GMM uses lagged levels dated t-3 and t-4 as instruments for the equation in differences and lagged differences dated t-2 as instruments for the equation in levels. m1 and m2 are the Arellano-Bond tests for serial correlation, which test the null of no first-order and second-order autocorrelation in the first-differenced residuals. Hansen is a test of the null that the overidentifying restrictions are valid. Two-step GMM with Windmeijer correction. Cluster-robust standard errors in parentheses. All specifications include year dummies. *** p<0.01, ** p<0.05, * p<0.1.

	(1) Low leverage	(2) High leverage
Variables	intangibles	intangibles
intangibles (t-1)	0.4054*** (0.1384)	0.3971*** (0.1450)
intangibles^2 (t-1)	0.0399 (0.1555)	-0.0111 (0.1452)
sales (t)	0.0300 (0.0427)	-0.0647 (0.0489)
cashflow (t)	0.1044** (0.0437)	0.1727*** (0.0399)
stock_issues (t)	0.0040 (0.0472)	0.0221 (0.0438)
D.cash_holdings (t)	-0.0681* (0.0395)	-0.0280 (0.0658)
financial_debt (t)	0.1248* (0.0696)	0.0923** (0.0432)
Year dummies	Yes	Yes
m1 (p-value)	0.000	0.000
m2 (p-value)	0.011	0.001
Hansen (p-value)	0.370	0.464
Observations	28,431	26,891

SOURCE: Devised by authors.

By contrast, the coefficient on $\Delta CashHoldings_{i,t}$ is negative and significant in equation (1) and insignificant in (2) and (3). The reason is that high adjustment costs in R&D lead firms to aggressively buffer investment from transitory volatility in internally generated cash flow. The most plausible way for firms to maintain a smooth path of investment is to build and employ buffer stocks of liquidity (cash and cash equivalents). Therefore, we should observe a negative within-firm link between R&D and changes in cash holdings as firms draw on cash reserves for investment smoothing.

All in all, our results suggest that both internal (cash flow, cash holdings) and external (stock issues, financial debt) funding sources play an important role in funding investment. The sensitivity of investment to each funding source depends on the type of investment (tangible assets, intangible assets, R&D).

Table 7

DETERMINANTS OF INVESTMENT IN TANGIBLE FIXED ASSETS

Dynamic investment regressions. All variables are standardised to have mean zero and standard deviation equal to one. The dependent variable is investment in tangible fixed assets over total assets, in %. Sample period: 2001-2017. Firms with investment in tangible fixed assets equal to zero in all years are excluded from the sample. System GMM uses lagged levels dated t-3 and t-4 as instruments for the equation in differences and lagged differences dated t-2 as instruments for the equation in levels. m1 and m2 are the Arellano-Bond tests for serial correlation, which test the null of no first-order and second-order autocorrelation in the first-differenced residuals. Hansen is a test of the null that the overidentifying restrictions are valid. Two-step GMM with Windmeijer correction. Cluster-robust standard errors in parentheses. All specifications include year dummies. *** p<0.01, ** p<0.05, * p<0.1.

	(1) Low leverage	(2) High leverage
Variables	tangibles	tangibles
tangibles (t-1)	0.5516***	0.5479***
	(0.1056)	(0.1291)
tangibles^2 (t-1)	-0.4482***	-0.2363*
	(0.1230)	(0.1360)
sales (t)	0.0421	0.0365
	(0.0324)	(0.0492)
cashflow (t)	0.0658*	0.1755***
	(0.0397)	(0.0386)
stock_issues (t)	0.1340***	0.0637
	(0.0372)	(0.0408)
D.cash_holdings (t)	0.0370	-0.1121*
	(0.0326)	(0.0669)
financial_debt (t)	0.0853	0.1478***
	(0.0577)	(0.0422)
Year dummies	Yes	Yes
m1 (p-value)	0.000	0.000
m2 (p-value)	0.377	0.344
Hansen (p-value)	0.719	0.208
Observations	30,654	29,139

SOURCE: Devised by authors.

In addition, we provide evidence on heterogeneous effects by splitting the sample between high leverage firms (leverage ratio above the median) and low leverage firms (leverage ratio below the median). Tables 5, 6 and 7 display the results for R&D, intangibles and tangible fixed assets, respectively. In the three tables we can observe that the cash-flow sensitivity is higher in the group of high leverage firms. This makes sense, as high-leverage firms are more likely to be credit constrained, which implies that they need to rely more on internally generated resources. By contrast, there is no clear pattern for stock issues across the three tables. The coefficient on cash holdings in only significant and negative for low-leverage firms in the case of R&D (Table 5), suggesting that smoothing in R&D only occurs in this type of firms. Finally, the coefficient of financial debt is significant in 5 out of the 6 cases, and especially large for high-leveraged firms in the regression for tangible fixed assets, because those are the assets that can be collateralised to obtain debt finance.

4 Conclusions

In this paper we have investigated which firm characteristics shape investment in tangible and intangible fixed assets, paying special attention to the case of R&D. We find that younger and more profitable firms tend to invest more in all asset types. In the case of size, larger firms invest more in R&D and intangibles but less in tangible fixed assets. However, the probability of investing in all types of assets, including tangible assets, is increasing in size. This is an important finding, because in Spain the majority of firms are remarkably small according to international standards. This means that size is a barrier to investment, especially in the case of R&D and intangibles. Therefore, public policies aimed to increase the size of Spanish firms would also promote investment. In addition, there is a concave relationship between leverage and investment: beyond some optimal threshold, higher leverage decreases investment.

In addition, we have investigated whether different funding sources matter for different investment types. We find that cash flow is the most important source of funding for intangibles and R&D, whereas financial debt is the most important funding source for tangible fixed assets. Stock issues are used to fund R&D and, especially, tangible fixed assets. Finally, firms use cash holdings to smooth investment in R&D.

This is a first step in understanding the numerous factors that influence investment, and the differences between tangible and intangible assets. More work is required to acquire a deep knowledge of the topic, which is very important given the influence of investment on firm performance, productivity and ultimately economic growth.

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