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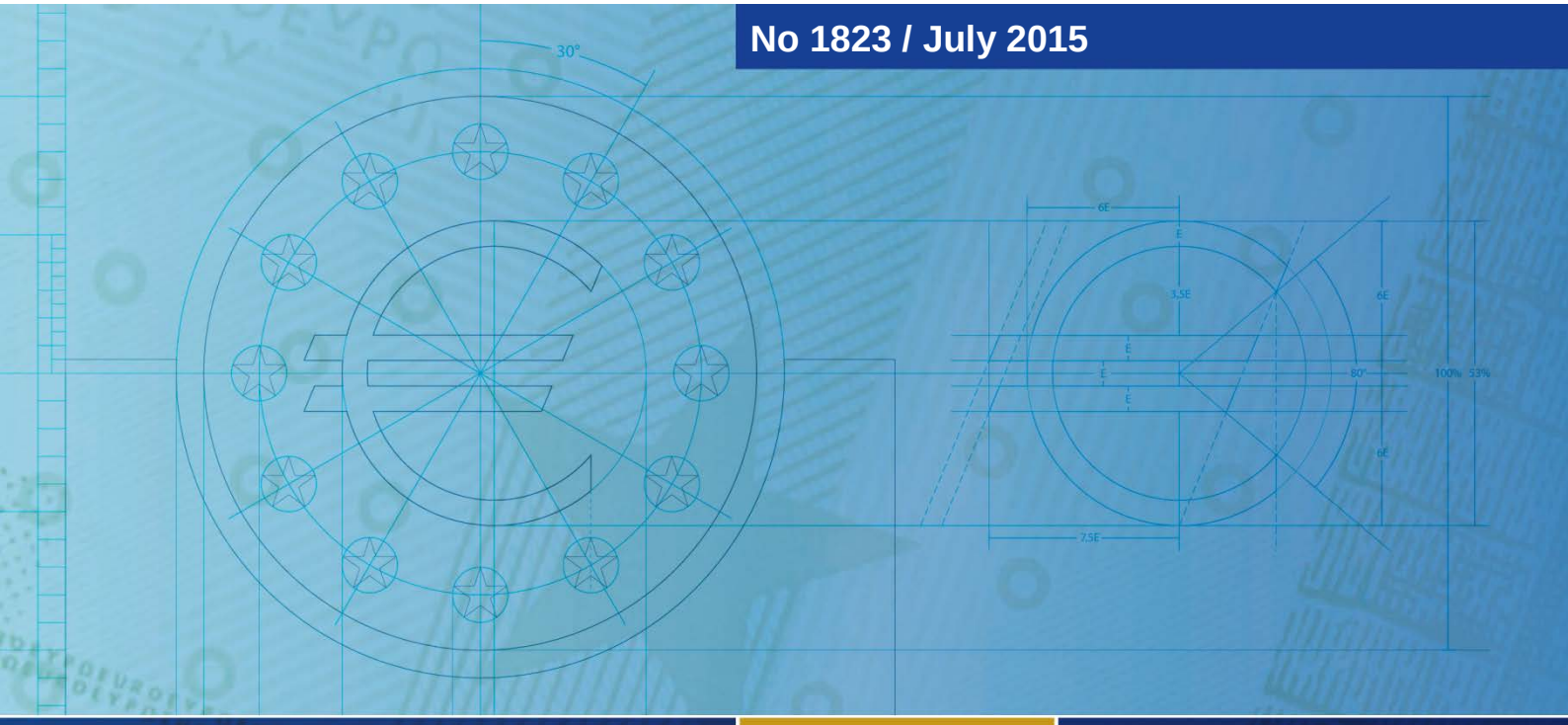
Financial constraints and productivity: evidence from euro area companies



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Abstract

We study the relation between firms financial structure, access to external finance and labor productivity using a unique dataset of firm-level data for several euro area countries during the period 1995-2011. The empirical strategy is twofold. First we build a synthetic indicator of financial constraints using an a-priori classification based on specific firm characteristics and various measures of financial pressure. Therefore we augment a firm-level production equation with our indicator to estimate the direct impact of access to finance to firm-level productivity. We find negative and significant effects in the majority of countries and industries, with marginal impacts considerably higher in industries that innovate the most, like "Energy, Gas and Water Supply" and "R&D, Communication and Information". Counter-factual exercises show that, as opposed to Germany and Netherlands, countries like Italy and Portugal are the most affected by financial constraints, with an estimated loss of around 21% of their labor productivity. In addition, each country would gain on average between one and two percent of their labor productivity by expanding the access to finance of small firms to that of the average large firm.

Keywords: financial constraints, productivity, SMEs, cross-country, sectoral analysis
JEL Classification: D24, G32, O16.

Non Technical Summary

This paper aims to provide new evidence on the link between financial variables and productivity. While it is widely documented that firms financing decisions are crucial in determining investment decisions, few studies analyze in detail how the financial position of a firm and the access to external finance determine firm′ performance in terms of value added generated and productivity. Moreover the empirical evidence on the link between financial constraints and labor productivity at microeconomic level is mixed and mostly confined to either single countries or to few specific production sectors. Our paper goes a step further as it takes a multi-country dimension in the investigation of this link by looking at a large sample of enterprises in eight euro area countries (Belgium, Germany, Spain, Finland, France, Italy, Netherlands and Portugal) and for a time span that takes into account the impact of two financial crisis and economic recessions (1995-2011). We contribute to the existing literature by following a twofold empirical strategy. First we developed an indicator of financial constraints at firm level and second we included this indicator to a firm-level production equation to assess the direct impact of access to finance to firm-level productivity. In the first step we construct an indicator of firm-specific financial constraints based on a classification scheme of firms financing conditions, taking into account information derived from balance sheet and profit and loss accounts. We distinguish between absolutely constrained, relatively constrained and unconstrained firms according to different scenarios based on the relation among total investment, financing gap, financial debt, equity issuance and average interest payment on debt compared to the rate charged in the local credit market. Then, we relate this index to specific firm characteristics, which are extensively used in the literature to proxy financial constraints, such as age, size and sector and some additional measures of financial pressure, and using a non-linear estimation, we predict for each firm in our sample the probability of belonging to one of the aforementioned ranking. In the second part of our empirical analysis, we measure the reaction of firm-level productivity to the probability of accessing external finance as measure by our predicted index. Our results show that financial constraints do significantly lower productivity in the majority of sectors across countries and the impact is heterogeneous across sectors. From a cross-country perspective, Italy and Portugal are the most affected by financial constraints, while Germany and Netherlands are the most immune.

"...in times of severe financial constraints, there is no other choice than to address the structural losses in competitiveness in an urgent and decisive manner."
M.Draghi, at the colloquium "Les défis de la compétitivité", Paris, 13 March 2012

1 Introduction

Do financial constraints affect firm-level labour productivity? In the literature it's widely accepted that firms financing decisions are crucial in determining investment decisions, and that the existence of frictions in accessing external sources of finance (due for instance to the existence of credit risk or information asymmetries) significantly affects the ability of management of exploiting productive investment opportunities.[1] However the empirical evidence on the link between financial constraints and labor productivity at microeconomic level is mixed and mostly confined to either single countries or to few specific production sectors.

Part of the literature reports positive and significant estimates for the effect of financial constraints on long-term productivity-enhancing investments and real value added. For instance, Gatti and Love (2008) use data from a cross-section of Bulgarian firms to study whether having larger access to credit lines or to overdraft facilities foster productivity and find credit to be positively and strongly associated with TFP. Butler and Cornaggia (2011) use county-level data of US mid-western states farmers during the period 2000-2006 to study the productivity response of an exogeneous shift in demand for corn in areas with different access to finance and find that production increased the most in those areas with relatively strong access to finance. Chen and Guariglia (2013) exploits a panel of Chinese manufacturing firms over the period 2001-2007 to investigate the link between cash flow and firm-level productivity and find that TFP is strongly constrained by the availability of firms′ internal finance. Levine and Warusawitharana (2014) find a strong positive relationship between debt growth and future productivity growth for a broad set of firms in four European countries. On the other hand, Moreno-Badia and Slootmaekers (2009) use Estonian firm-level data covering the period 1997-2005 and find that a number of proxies for financial constraints do not have any impact on productivity for most sectors. Similarly, Nunes et al. (2007) apply a quantile approach to a panel data of 162 Portuguese firms between 1999 and 2003 and show that leverage tends to negatively af-

[1] For a theoretical study on the channels linking credit conditions and long-term productivity losses, see, among the others, Aghion et al. (2005) and Moll (2014). For a macro-level empirical analysis on the role of financial development in fostering economic growth, see Levine (1997), Beck et al. (2000) and Khan and Senhadji (2003).

fect labour productivity in firms with relatively low labour productivity. Using data from the 2007 World Bank Enterprise Survey, Mwangi (2014) report a negative but insignificant effect of access to credit on firm productivity for a sample of micro and small enterprises in Kenya.

Within this debate, this paper aims at providing new insights and evidence on the relation between firms financial structure, access to external finance and measures of firm-level productivity. To this extent, we exploit a unique panel of firm-level data, tracking eight euro area countries (Belgium, Germany, Spain, Finland, France, Italy, Netherlands and Portugal) and nine broad economic sectors (Accommodation and Food Service, Construction, Energy, Communication, Manufacturing, Retail trade, Wholesale trade, Transports and Other Business Service) during the period 1995-2011. The sample is derived from the Bureau van Dijk-*Amadeus* database which collects accounting data of non-financial corporations across Europe. Compared to previous contributions, this paper takes a multi-country dimension as it investigates the role of financial constraints on real value added and productivity looking at a sample of enterprises in several European countries and for a time span that takes into account the impacts of two financial crisis and economic recessions.[2]

One of the biggest issues facing empirical works in this literature is to objectify financial constraints and to construct a clean measurement, as they are empirically not observable.[3] Moreover, because access to finance and productivity are endogenously determined as equilibrium outcomes, a further hurdle is a clear identification of the causal direction of impact. To this regard, we conduct our analysis adopting a novel empirical strategy. First we build a firm-level indicator of financial constraints and second we apply this indicator to a production equation to assess the direct impact of financial constraints on productivity. As first step, we construct a semi-parametric index of firm-specific financial constraints, as originally developed by Pal and Ferrando (2010). This indicator is based on a classification scheme of firms′ financing conditions, taking into account information derived from balance sheets and profit and loss accounts. We distinguish between absolutely constrained, relatively constrained and unconstrained firms according to different scenarios based on the relation among total investment, financing gap, financial debt, equity issuance and average interest payment on debt compared to the rate charged in the local credit market. The index gives us some hints on the heterogeneity in financial constraints across firms and euro area countries. To obtain a synthetic value, we relate our indicator to a number of specific firm-level characteristics, like age, size and cash holding, which are extensively used in the literature to proxy financial constraints, and we use a ordered probit estimation to predict the probability of belonging to one of the aforementioned

[2]To the best of our knowledge, this is the first paper trying to study the role of access to finance in enhancing labour productivity using such large panel of firm-level data.

[3]See Silva and Carreira (2012) for a survey of works related to firm-level financial constraints.

groups for each firm in the sample. The resulting predicted index, i.e. a continuous variable with higher values associated with more constrained firms, will represent our core measure of financial constraints: differently from the existing literature, this index takes into consideration a broader set of firm-level factors affecting access to external source of finance, rather than a single proxy. In the second part of the analysis, we estimate the reaction of companies′ labour productivity to financial constraints. Acknowledging the presence of endogeneity in assessing the causal impact, we exploit the nature of our index of financial constraints, which by construction is an additional state variable in the firm-level production function (together with capital stock) and we modify the Wooldridge-Levinsohn-Petrin methodology to accordingly account for that.[4] We use panel generalized method of moments of Arellano and Bond (1991) and Blundell and Bond (1998) to estimate a firm-level production function equation which directly includes our index of financial constraints as one of the regressors, assuming productivity to evolve as a first-order autoregressive process. To provide robustness, we carry out this estimation for each country and sector separately while controlling for time-effects.

Our main findings are the following ones. Financial constraints do lower productivity in most sectors across countries: in the great majority of the estimations, the direct impact of financial constraints is statistically and economically significant. The coefficient estimates are significantly higher in industries that innovate the most, like "Energy, Gas and Water Supply" and "R&D, Communication and Information", while turn to be lower in "Construction and Real Estate", a sector that have benefited more than others from low interest rates along the period 2001-2007. From a cross-country perspective, Italy and Portugal are the most affected by financial constraints, with an estimated counter-factual loss in their average labor productivity of about 21% due to limited access to finance; Germany and Netherlands are the most immune countries, with counter-factual losses of around 11 and 15 percent. In addition, each country would gain on average between one and two percent of their labor productivity by expanding the access to finance of small firms to that of the average large firm. All these results are robust to a number of robustness checks, including alternative econometric specifications, and to several sub-samples.

This paper relates to a number of literature. First, it contributes to the literature that tries to detect and measure the degree of financial constraints from a firm-level perspective. Since the ICFS (investment cash-flow sensitivity) measure proposed by Fazzari et al. (1988), the debate over the consistency in measuring financial constraints has been vivid and has resulted to an extensive empirical work related to this topic. Among the others, the Kaplan and Zingales (KZ) index of financial constraints (Lamont et al., 2001), the CCFS (cash flow sensitivity of

[4] See Fernandes (2007) for a similar application on the effect of trade policies on productivity gains for Colombian manufacturing plants.

Appendix A
Descriptive Statistics

We report descriptive statistics of all variables included in our analysis. European firms in our sample have an average investment rate (defined as the change in tangible fixed assets plus depreciation over fixed assets of the beginning of the year) of around 31%; Italian and Belgian firms show the highest level of investment rate, Spanish and Portuguese firms have the lowest one. On average, sampled firms hold around 15% of their total assets in cash and cash equivalents (Finnish and French firms hoard the highest amount relatively to their total assets) and their sales grow at a rate of around 8% per year. From the liability side, financial leverage (defined as the sum of short-term loans and long-term debt over total assets) is on average 16%: German, Portuguese and Finnish firms show the highest level of leverage, as opposed to French and Dutch firms. Looking at the financial pressure on firms, German firms are in a better position to service their debt although they are the most levered companies in our sample: both the interest payments burden (defined as the ratio of interest payments to earnings before interest, taxes, depreciation and amortization plus financial revenues) and the overall interest rate paid for their total debt are on average the lowest in the sample, amounting respectively to 26% and 9%. The data show also substantial cross-country heterogeneity in production efficiency. In Table 3 we report mean, median and standard deviation of labor productivity, computed as the ratio of firm-level real value added over number of employees. Real value added is constructed as the difference between operative turnover and intermediate inputs (expressed both in euros), deflated using country-sectoral output deflators. Intermediate inputs are proxied by material and energy costs. Significant differences arise both between and within countries. On average, Germany and the Netherlands feature the highest average and median levels, with values that are roughly in line with the empirical findings of Bartelsman et al. (2013) and with the evidence provided by Lopez-Garcia et al. (2015). On the opposite, Spain and Portugal stand as the least productive countries. From a sectoral perspective, companies whose business involves either "Information, Communication and R&D" or "Energy, Gas and Water Supply" activities are able to produce, on average, greater real value added per number of employee, highlighting the ability for firms that innovate the most of generating larger surplus. Overall, our descriptive statistics are in line with those in the analysis by the ECB (2013) which refer to a larger dataset for the whole Euro-area.

TABLE 1 - Descriptive statistics

		Variables								
Countries		Investment Rate	Cash Holding	Cash Flow	Sales Growth	Profitability	Leverage	Maturity	Interest Payment Burden	Interest Paid
Belgium	Mean	0.33	0.12	0.09	0.06	0.11	0.2	0.6	0.3	0.1
	Median	0.21	0.06	0.08	0.04	0.1	0.15	0.7	0.13	0.07
	St.dev.	0.39	0.15	0.1	0.26	0.12	0.2	0.39	0.41	0.12
Germany	Mean	0.28	0.11	0.09	0.06	0.13	0.26	0.76	0.26	0.09
	Median	0.17	0.05	0.08	0.03	0.11	0.2	0.94	0.14	0.06
	St.dev.	0.35	0.15	0.1	0.24	0.14	0.24	0.32	0.31	0.11
Spain	Mean	0.27	0.15	0.08	0.09	0.09	0.17	0.85	0.35	0.14
	Median	0.12	0.08	0.07	0.04	0.09	0.1	1	0.18	0.08
	St.dev.	0.41	0.17	0.1	0.39	0.14	0.2	0.29	0.41	0.17
Finland	Mean	0.32	0.2	0.16	0.1	0.2	0.21	0.75	0.22	0.1
	Median	0.18	0.13	0.15	0.05	0.19	0.16	0.81	0.08	0.07
	St.dev.	0.44	0.2	0.15	0.34	0.19	0.21	0.27	0.33	0.12
France	Mean	0.34	0.2	0.1	0.06	0.12	0.11	0.31	0.23	0.18
	Median	0.19	0.14	0.09	0.03	0.11	0.05	0	0.09	0.11
	St.dev.	0.43	0.2	0.12	0.25	0.14	0.14	0.4	0.32	0.19
Italy	Mean	0.36	0.08	0.06	0.07	0.1	0.17	0.28	0.33	0.12
	Median	0.22	0.03	0.05	0.04	0.09	0.1	0.12	0.2	0.08
	St.dev.	0.44	0.12	0.08	0.31	0.1	0.19	0.33	0.4	0.13
Netherlands	Mean	0.3	0.11	0.11	0.08	0.12	0.12	0.42	0.32	0.13
	Median	0.2	0.05	0.1	0.05	0.11	0	0.41	0.15	0.08
	St.dev.	0.36	0.15	0.1	0.26	0.14	0.17	0.37	0.42	0.14
Portugal	Mean	0.25	0.14	0.07	0.06	0.09	0.21	0.53	0.39	0.13
	Median	0.09	0.07	0.07	0.02	0.08	0.16	0.64	0.19	0.08
	St.dev.	0.41	0.19	0.13	0.37	0.14	0.22	0.44	0.47	0.15
TOTAL	Mean	0.31	0.15	0.08	0.08	0.11	0.16	0.55	0.31	0.14
	Median	0.16	0.08	0.07	0.04	0.09	0.09	0.67	0.15	0.08
	St.dev.	0.42	0.17	0.11	0.33	0.14	0.19	0.44	0.39	0.17

Note: This table reports summary statistics at country level of the variables included in the construction of the measure of financial constraints and in the financing constraints and productivity models. All variables are winsorized at the 1st and 99th percentiles of their distribution within each country and sector across time.

TABLE 2 - Labor Productivity by Countries and Sectors: Descriptive Statistics.

	Belgium			Germany			Spain			Finland		
	Mean	Median	St.Dev.	Mean	Median	St.Dev.	Mean	Median	St.Dev.	Mean	Median	St.Dev.
Accommodation and Food	4.04	3.98	0.51	3.43	3.52	0.54	3.15	3.15	0.51	3.38	3.42	0.51
Construction and Real Estate	4.28	4.03	0.75	4.72	4.79	0.91	3.55	3.44	0.68	3.85	3.81	0.55
Electricity, gas and water supply	4.62	4.5	0.77	4.75	4.72	0.57	3.96	3.8	0.91	4.49	4.43	0.68
Information and R&D	4.43	4.37	0.58	4.4	4.4	0.59	3.52	3.51	0.63	3.92	3.95	0.6
Manufacturing	4.22	4.16	0.51	4.14	4.13	0.44	3.43	3.41	0.53	3.78	3.78	0.47
Other business activities	4.45	4.32	0.78	4.22	4.19	0.65	3.45	3.43	0.63	3.83	3.85	0.55
Retail trade	4.08	4.04	0.51	3.76	3.75	0.56	3.2	3.19	0.5	3.63	3.64	0.45
Transportation and storage	4.38	4.25	0.58	4.04	3.99	0.54	3.6	3.61	0.53	3.83	3.85	0.45
Wholesale trade	4.42	4.34	0.54	4.22	4.15	0.57	3.52	3.48	0.56	3.98	3.95	0.54
	France			**Italy**			**Netherlands**			**Portugal**		
	Mean	Median	St.Dev.	Mean	Median	St.Dev.	Mean	Median	St.Dev.	Mean	Median	St.Dev.
Accommodation and Food	3.59	3.58	0.48	3.44	3.51	0.72	3.97	3.96	0.91	2.42	2.41	0.53
Construction and Real Estate	3.83	3.78	0.47	3.89	3.86	0.63	4.46	4.25	0.86	2.75	2.65	0.71
Electricity, gas and water supply	4.03	3.97	0.59	4.25	4.15	0.75	5.04	5.07	0.76	3.84	3.72	1.08
Information and R&D	4.06	4.03	0.6	3.86	3.81	0.6	4.32	4.23	0.68	3.32	3.3	0.73
Manufacturing	3.76	3.73	0.44	3.9	3.87	0.49	4.27	4.21	0.58	2.79	2.75	0.59
Other business activities	3.98	3.99	0.58	3.82	3.8	0.66	4.26	4.17	0.81	2.96	2.92	0.65
Retail trade	3.67	3.65	0.46	3.72	3.73	0.53	3.81	3.76	0.6	2.8	2.78	0.63
Transportation and storage	3.77	3.73	0.42	3.93	3.95	0.59	4.4	4.18	0.91	3.12	3.13	0.63
Wholesale trade	3.89	3.84	0.48	4.04	4	0.55	4.37	4.26	0.66	2.18	1.95	0.96

Note: The measure of labor productivity is computed by taking the ratio of the firm-level real value added (deflated by sectoral-country specific deflator.) over the number of firm-employees. In this table, we report the statistics for the log of the ratio.

Appendix B
Comparison of Financial Constraints Indexes

In this section, we compare the two indicators of financial constraints we have introduced, meaning, the score based on the a-priori classification and the predicted index from the Probit estimation, with an indicator derived from survey data. In particular, we consider the new indicator of credit constraints (ICC) calculated for the CompNet database.[1] The ICC is constructed using the information derived from a firm-level survey (Survey of Access to Finance for Enterprises) regularly conducted by the ECB-EC since 2009. From the survey data it is possible to construct an index indicating whether firms are credit constrained, according to whether they report that: 1) their loan applications were rejected; 2) only a limited amount was granted; 3) they themselves rejected the loan offer because the borrowing costs were too high; 4) they did not apply for a loan for fear of rejection (i.e. discouraged borrowers). The survey-based index is regressed on a set of financial indicators (financial leverage, financial pressure, profit margin, collateral and cash holdings) to estimate the probability of a firm to be credit constrained given the financial situation and characteristics (like size and sectors). In a third step, the estimated coefficients are applied out-of-sample for the period before 2009, in order to construct backward the time series of the index. More importantly, the CompNet methodology is based on specific thresholds, always derived from the survey data, that are used to calibrate the new index with the aim of deriving the percentages of credit constrained firms across countries over time.[2][3] We have applied the same thresholds to our two indexes of financial constraints in order to compare them with the ICC. Figure A reports the three indexes across countries since 1995. In all countries, the indicator based on the a-priori classification reports consistently higher percentages of financially constrained firms. Differently from the ICC indicator, the a-priori indicator cannot exploit the information on whether firms indeed applied for external funds or whether they have been objectively rejected. Moreover, it cannot control for interactions between the financial position of firms and other characteristics used in the literature to signal financial constraints, such as size or structural differences related to

[1] See Ferrando et al. (2015), "Assessing the financial and financing conditions of enterprises in Europe: the Financial Module in CompNet", ECB-WP, No. 1836.

[2] $SAFEscore = -1.88 + 0.71finlev + 0.28debtburden - 0.51profitability - 0.21tangible - 1.20cashholding - 0.05ln(totalassets)$. The analysis is run from the second quarter of 2010 till the first quarter of 2013 and for seven Euro-area countries: Belgium, Germany, Finland, France, Italy and Portugal.

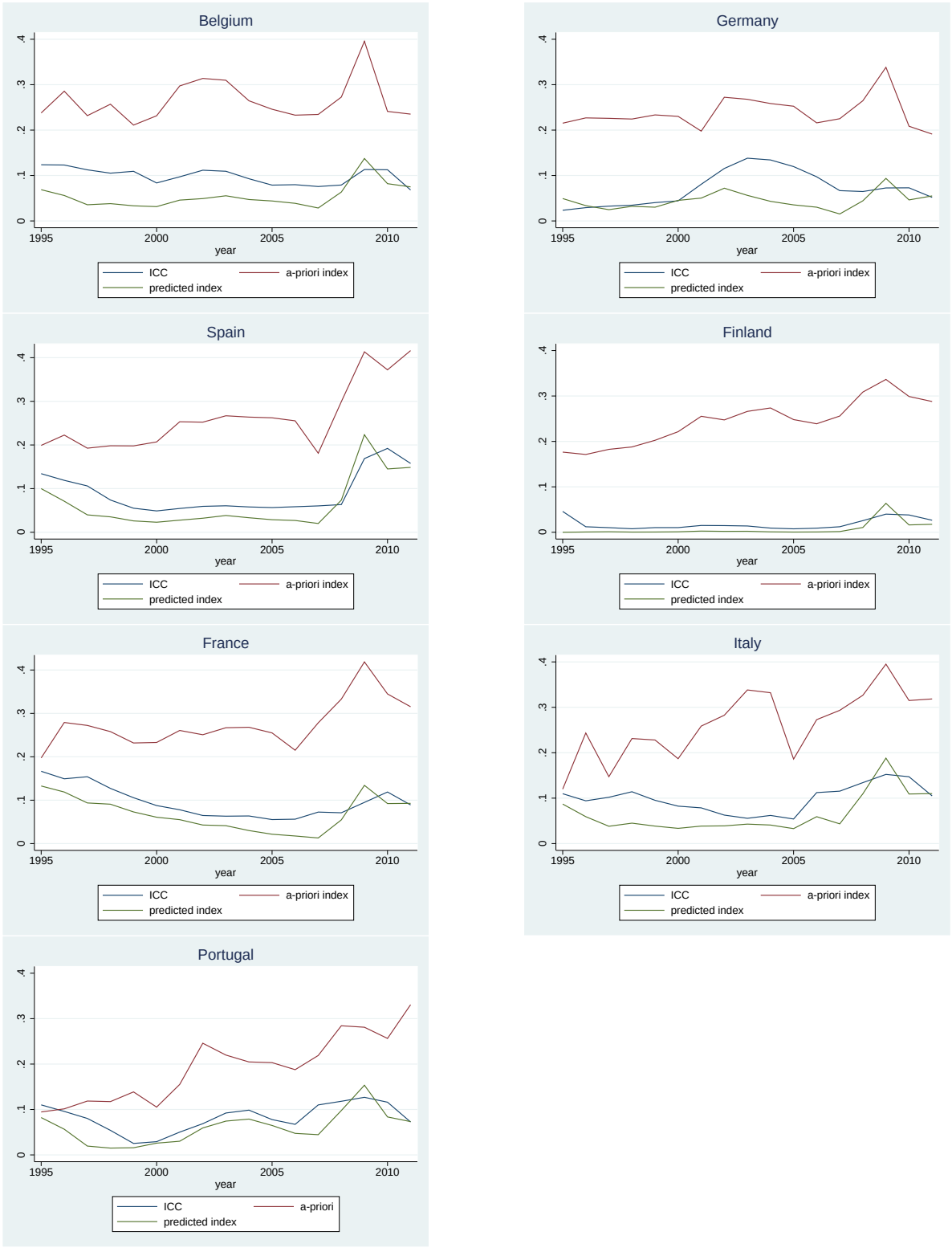
[3] In order to define the country thresholds, CompNet uses the percentage of credit constrained firms in the economy calculated directly from the SAFE survey. For each year, constrained firms are identified as those with a value of the SAFE score greater than the threshold. The ICC indicator will be equal to 1 for them and zero otherwise.

the economic sector. On the other hand, the ICC is closer to the predicted indicator and this reinforces our view that it is necessary to go beyond the a-priori classification in order to detect financially constrained firms.

Firms′ characteristics and financial constraints.

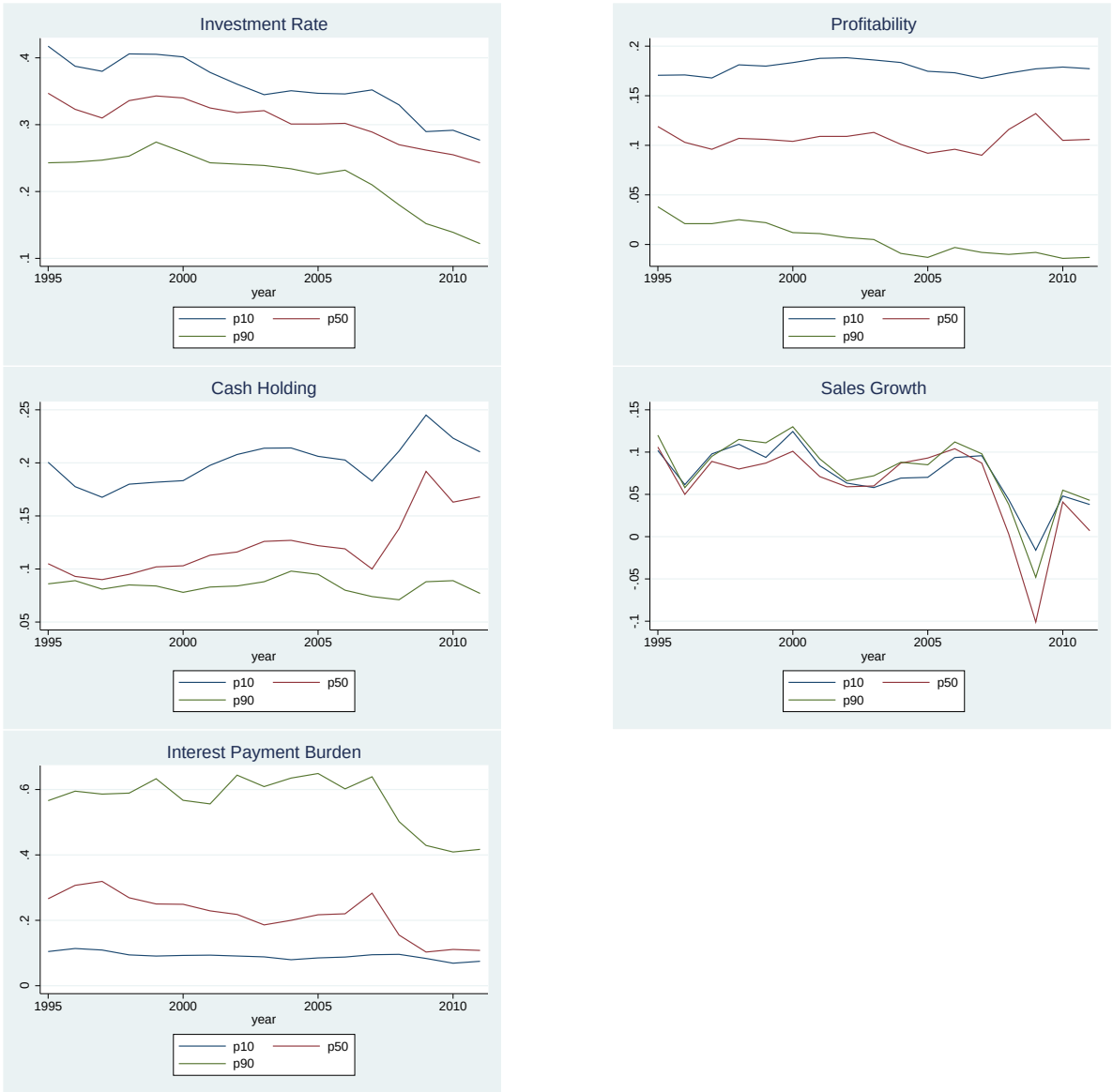
In this section, we use the synthetic indicator developed in section 3 to compare the developments over time of a number of firms characteristics conditional on different degrees of financial constraints. As the predicted index is a continuous variable, we split the sample into the three categories. The first category includes firms for which the predicted index is below the 10th percentile (the p10 line in Figure 2). According to the results of our ordered Probit specification, these are firms that are not financially constrained. The second group includes firms whose predicted index takes values around the median (the p50 line in Figure 4, which comprises values between the 45th and the 55th percentile). These firms should be more constrained than the p10 group but less constrained than those with values above the 90th percentile (p90 in Figure 2). Starting from the upper left side of Figure 2, we see that firms facing the highest level of financial constraints are investing less, indicating their difficulties in acceding external finances. This is in line with the evidence given by Whited and Wu (2004) and Carpenter et al. (1998), who show that constrained firms are more likely to give up profitable investment projects because of insufficient funds. By contrast, the largest share of investment is undertaken by unconstrained firms, which are on average the most profitable over time, where profitability is measured by the ratio of earnings before taxes and over total assets. By construction, unconstrained firms keep more cash in their balances. As suggested in Pal and Ferrando (2009), this could be the results of a financial system where most of the non-financial companies get external source of finance through financial intermediation instead of capital markets, as it is the case in Europe. In this setting, liquid assets might help firm to reduce the burden from penalty cost for delayed repayments of the interest rates. Looking at the growth rate of sales, which is often used in the literature to detect financial health, our predicted measure is not giving a clear picture. Firms′ sales growth rates across different percentiles of financial constraints are moving closely together over time, with no significant difference. Nonetheless, they are still correlated with the business cycle, showing a strong drop in 2009 and a mild recovery since then. In our sample, constrained firms face relatively higher interest payment burden. These are firms that in order to continue to invest have to finance themselves at unfavorable conditions. This positive relationship might be driven by the high costs of financing induced by high leverage ratios: as high leverage is likely to increase the risk of bankruptcy, this has to be compensated by higher financing costs.

Figure 1 - Financial constraints: the ICC index, the a-priori index and the predicted indicator (% of absolutely constrained firms)



Note: This figure reports the percentage of constrained firms using three alternative measures of financial constraints. The first is the ICC index, which is an index based on a combination of survey data and financial statements (CompNet database). The second is the a-priori index which is based on the classification scheme in Table 3. The third index is based on the Probit regression presented in Table 7, column 1. For all of them, the same thresholds are used to define the percentages of constrained firms across time and countries. The thresholds are originally calculated for the ICC index in the CompNet database. The ICC index is not available for the Netherlands.

Figure 2 - Financial indicators at different degrees of financial constraints.



Note: This figure displays the financial indicators for firms with different levels of financial constraints, based on the predicted index. P10 refers to firms below the 10th percentile, P50 refers to firms between 45th and 55th percentile, P90 refers to firms above the 90th percentile of financial constraints.

Appendix C

Definition and construction of row variables

All variables used in this paper are in real terms. Sales, turnover and value added are deflated using time-varying country-sectoral output deflators (source: Eurostat). Intermediate inputs are deflated by the intermediate inputs deflator. Financial variables (assets, liabilities and investment) are deflated with the gross capital formation price index.

- **Total fixed assets**: Tangible, intangible and other fixed assets
- **Other current assets**: Current assets - Trade debtors - Total inventories.
- **Total assets**: Total fixed assets + current assets.
- **Cash and cash equivalents**: Cash and balances at banks.
- **Cash holding**: Cash and cash equivalent over total assets.
- **Cash flow**: Net income + depreciation + extraordinary income.
- **Depreciation**: Depreciation on intangible assets and tangible assets.
- **Investment Rate**: Change in tangible fixed assets plus depreciation over fixed assets at the beginning of the period.
- **Sales Growth**: Annual growth rate of sales.
- **Liquidity**: Current assets - current assets stock over current liabilities.
- **Inventories**: Total inventories and consumable biological assets.
- **Capital stock**: Total fixed assets.
- **Working Capital**: Current assets - current liabilities over total assets.
- **Financing Gap**: Fixed Investment plus change in the net increase in working capital minus cash flow.
- **Financial Leverage**: Ratio of financial debt to total assets, where financial debt includes non-current liabilities (long term debt) and current liabilities (loans) and total assets is the sum of fixed and current assets.
- **Interest paid**: Interest on financial debts + other financial expenses.

- **Debt Burden**: Ratio of interest payments to earning before interest, taxes, depreciation and amortization plus financial revenues.
- **Profitability**: Ratio of earnings before interest, taxes and depreciation to total assets.
- **Size**: Continuous measure of firm size, measured by total assets, expressed in real values.
- **Age**: Continuous measure of firm age, measured by the ge of the firm at the beginning of period t, based on the entry date in the registry .
- **Turnover**: Total Sales.
- **Value Added**: Turnover - intermediate inputs
- **Number of employees**: Total employment, full-time and part-time
- **Labor productivity**: Real value added over number of employees.

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