The real effects of credit constraints: Evidence from discouraged borrowers in the euro area

Abstract

This paper uses a new survey-based data set and a model with strong theoretical underpinnings to explain the characteristics and behaviour of discouraged borrowers in the euro area. The results show that more borrowers are discouraged when the average interest rate charged by banks in a country is higher. Higher corporate tax rates, on the other hand, lead to lower discouragement. We show that discouragement has strong negative effects on investment growth (-4.7pp), employment growth (-2.7pp) and asset growth (-2.9pp) due to the lack of access to bank finance in the two years following the discouragement. Furthermore, we estimate that the majority of discouraged borrowers would be unable to get a loan if they would apply. Consistent with this low loan approval likelihood, discouraged borrowers tend to be relatively risky firms.

1 Introduction

During the recent crisis we have witnessed a fragmentation of the financial markets in the euro area which has disrupted the traditional transmission channels of monetary policy and which has put severe pressure on firms in need of external finance in the stressed countries. This not only translated into a larger number of firms with rejected loan applications, but also into a larger number of discouraged borrowers, especially in the stressed countries.

Following Jappelli (1990), discouraged borrowers are firms that need external finance but do not apply for a bank loan because they fear that their application will be rejected. Such type of borrowers can exist when banks cannot perfectly screen the firms that are applying and when the application costs for the firms are strictly positive (Kon and Storey, 2003). Previous research by Levenson and Willard (2000) and Freel et al. (2012) has shown that discouraged borrowers are twice as prevalent as rejected (denied) borrowers in both the US and the UK, respectively. Discouraged borrowers thus appear to be a non-negligable group. Yet, to the best of our knowledge, there exist no studies that empirically validate a structural model for the widespread existence of discouraged borrowers, nor studies that estimate the real effects of discouragement. Therefore, in this paper we take the theoretical model of Kon and Storey (2003) to the data to explain the characteristics and behaviour of discouraged borrowers in the euro area.

In a nutshell, the model of Kon and Storey (2003) states that firms will be discouraged to apply for a bank loan when their expected profits of investing the bank loan do not exceed the total effective costs of borrowing. To empirically validate this prediction we use a unique data set from the European Central Bank, which matches firms that participated in the Survey on Access to Finance of small and medium sized Enterprises (SAFE) with their financial statements for 9 euro area countries from the second quarter of 2010 till the first quarter of 2014 (i.e. from wave 3 of SAFE till wave 10). The empirical results are in line with the predictions of the model and show that more firms are discouraged when the average interest rate charged by banks is higher, when the potential return on investment of the firm is lower, and when the application costs and opportunity costs of bank lending are higher. Further, we augment the model with the effective tax rates that firms pay. The static trade-off theory states that firms have a preference to finance

themselves with debt instead of capital when interest payments are tax deductible, because this decreases the effective borrowing cost. The tax rates can as such be straightforwardly incorporated in the discouragement model in order to take into account the incentive from the tax deductibility of interest payments. The results show that, in line with the trade-off theory, higher tax rates lead to lower discouragement.

After knowing which factors are important drivers of discouragement, a natural question that arises is what the consequences of discouragement are? The second contribution of the paper is that we test whether discouragement has real effects on firm outcomes compared to non-discouraged (i.e. applying) firms. The estimations, using the two-stage least squares estimator to take into account endogeneity between discouragement and growth, show that discouragement has large negative effects on investment, employment and asset growth, which are statistically and economically significant. We estimate that investment growth is up to 4.7 percentage points lower for the average discouraged borrower than for the applying firm in the two years following the discouragement. The employment growth and total asset growth is, respectively, 2.7 and 2.9 percentage points lower for the average discouraged borrower than for the applying firm in the two years following the discouragement. We argue that this is due to lack of access to bank finance implied by the discouragement. We corroborate this statement with two pieces of evidence. First, a placebo test shows that these negative real effects are not present during a placebo period. Second, we show that these negative real effects are present when comparing discouraged borrowers to applying-and-approved firms and absent when comparing discouraged borrowers to applying-and-rejected firms.

Next, given these strong negative real effects we try to estimate the probability of discouraged borrowers to get a loan if they would apply. We find that the vast majority of discouraged borrowers would be rejected if they would apply, however, there also exist some discouraged borrowers with a high likelihood to get their loan application approved. The results come from a model on loan approval where we make an in-sample prediction for applying-and-approved firms and an out-of-sample prediction for discouraged firms, and compare the predicted values of both groups. Further analysis indicates that the banking sector in the euro area might not be strongly integrated. We namely find that the approval likelihood of discouraged borrowers is low

but similar across countries, when the discouraged firms are compared to applying-and-approved firms in the same country. On the other hand, the approval likelihood of discouraged borrowers shows a different story when they are compared to applying-and-approved firms from all the countries in our sample. In Belgium, Germany and Finland for instance, the approval likelihood of discouraged borrowers increases significantly now that they are also compared with firms in countries like Greece or Spain, and, vice versa.

Finally, the model allows to distinguish between "good" (safe) and "bad" (risky) firms among the discouraged borrowers, depending on the screening error of banks. We find that discouraged borrowers are mainly risky firms consistent with low screening errors and reflecting the "bad" borrowers in the model. We show that discouraged firms have a significantly lower Altman Z-score, use a higher fraction of EBITDA for interest payments and signal more often a deteriorating firm outlook, over and above the factors of the model. The fact that discouraged borrowers appear to be riskier and of lower quality than non-discouraged borrowers can explain their low estimated likelihood of obtaining a bank loan.

This paper contributes to the literature in a number of ways. First, we contribute to the literature on discouraged borrowers by estimating a structural model of discouragement. This literature largely uses the Survey of Small Business Finances data set and recently also the EBRD/WB BEEPS data set, and has found that in particular the firm size, the owner and ownership characteristics and the relationship with the bank matter for discouragement (Levenson and Willard, 2000; Cavalluzzo et al., 2002; Cole, 2008; Chakravarty and Yilmazer, 2009; Brown et al., 2011; Freel et al., 2012; Popov and Ongena, 2015). Using a unique survey-based data set of the European Central Bank, we show that the structural model of Kon and Storey (2003) can indeed explain the widespread existence of discouraged borrowers. Moreover, we also show that the impact of the tax deductibility of interest payments on discouragement is important, which is neglected by the existing literature. In this way, the paper provides support for the static trade-off theory literature. Further, in line with Cole (2008) and Han et al. (2009), our results add evidence to the hypothesis that discouraged borrowers are risky firms.
Secondly, this paper adds to recent studies that try to measure real effects of frictions in credit markets, where the link between the firm and frictions in the credit market is directly observed

(Campello et al., 2010; Amiti and Weinstein, 2013; Chodorow-Reich, 2014). In line with these studies, our results indicate that also reduced access to finance due to self-rationing has significant effects on real economic outcomes, such as investment, employment and asset growth.

Finally, our findings are relevant for the growing literature that uses survey data to analyse loan dynamics and includes discouraged borrowers when measuring financial constraints. These papers classify firms as financially unconstrained when their loan application is granted and as financially constrained when their loan application is either rejected or when they are discouraged (Beck et al., 2014; Bircan and De Haas, 2015; Popov, forthcoming). The results in this paper confirm that such practice of combining discouraged firms with rejected firms is valid.

The rest of the paper is structured as follows: Section 2 briefly describes the dataset. The empirical analysis is done in Section 3, where first the structural model of Kon and Storey (2003) is summarized and augmented taking into account insights from the static trade-off theory (Section 3.1). Section 3.2 measures if discouragement has real effects on economic decisions. The following two subsections estimate whether discouraged borrowers would be likely to get loan application approved (Section 3.3) and make an assessment of the risk of discouraged borrowers (Section 3.4). Finally, Section 3.5 performs some robustness checks and Section 4 concludes.

2   Data

The dataset, compiled by the ECB and Bureau van Dijk, augments the responses of the firms to the Survey on the Access to Finance of small and medium sized Enterprises (SAFE) with their detailed balance sheet and profit & loss information for 2004-2013. The data are available from the third wave of the survey (Q2-Q3 2010) until wave 10 (Q4 2013 - Q1 2014) for on average 6500 firms in each wave, of which 90 percent are SMEs. The dataset allows us to investigate how relevant discouraged borrowers are within the euro area and whether there are significant differences across countries (as is the case for financial constraints (Ferrando and Mulier, 2015)). However, Bureau van Dijk is not able to match every firm in SAFE with their balance sheet. The matching is on average around 80%, but varies accross countries and sectors. As the matched dataset represents a subsample of the information derived from the SAFE, we apply a calibration

scheme to reproduce the characteristics of the main sample in terms of discouragement. In particular our aim is that the ratio of discouraged borrowers to applicants in the matched sample reflects the one in the total sample at country-wave level. Our routine randomly drops firms in the overrepresented group (either applicants or discouraged firms) until the ratio falls within 10% of the actual range. We test that the (non)-financial characteristics of firms in the remaining sample are not significantly different from those before applying the calibration scheme.

Figure 1: Discouraged firms, applying firms and rejected firms (as % of total firms)
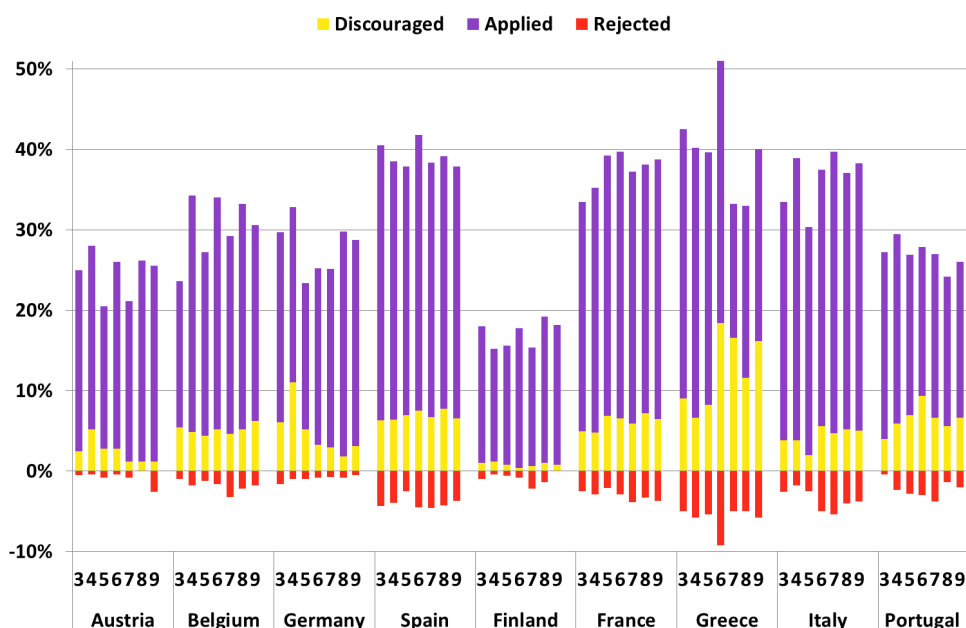
Notes: The Figure shows the evolution over time and across countries of the discouraged firms, the applying firms and the rejected firms. All are presented as a percentage of total firms in each country in a given wave in the calibrated sample. The percentage of rejected firms is shown with a reversed scale as they are a subgroup of the applying firms.

The final sample consist of 7739 observations. This relative small number can be explained by the fact that discouraged plus applying firms are only a small fraction ($\pm$ 30 %) of the firms in the euro area (See Figure 1). The majority of the firms in the SAFE answer that they did not need bank loans because they have sufficient internal funds. Another characteristic of our final sample (but also the SAFE in general) is that the panel component is very low: only around 20% of the firms are present in more than one survey wave. The percentage drops to less than 7% for

those present in more than two survey waves. This limits the application of any analysis based on panel estimation techniques.

The yellow bars in Figure 1 show that the percentage of discouraged borrowers varies significantly across countries. In Germany during wave 7 (Q2-Q3 2012), for instance, 20% of the firms applied for a bank loan, while only 4% of the firms were discouraged and 1% of the firms was rejected. During the same wave in Greece about 16% of the firms were discouraged which roughly equals the number of firms that actually applied in that period and which is about 3 times larger than the number of firms that were actually rejected. Thus, discouraged borrowers also represent a significant number of firms in the euro area, especially in the stressed countries.

Table 1: Descriptive statistics

The Table shows the number of observations in the sample with the mean, standard deviation, minimum and maximum value for each of the variables used in the analyses. See Table 7 in the Appendix for a definition of the variables.

| | (1) | (2) | (3) | (4) | (5) |
VARIABLES	N	mean	sd	min	max
discouraged borrowers	7,739	0.156	0.363	0	1
male	7,739	0.895	0.306	0	1
family	7,739	0.795	0.404	0	1
age	7,739	23.45	16.70	1	106
ln(TA)	7,739	8.239	1.934	1.609	16.91
trade credit	7,739	0.177	0.157	0	0.820
financial independence	7,662	0.150	0.162	-0.300	0.875
financial pressure	7,315	0.438	0.495	0	2.824
tax rate	7,739	0.193	0.252	-0.406	1
general economic outlook	7,739	0.532	0.499	0	1
firm specific outlook	7,739	0.367	0.482	0	1
profit margin	7,739	-0.0125	0.118	-0.635	0.291
Altman Z-score	7,739	1.884	1.274	-3.427	9.372
gdp growth	7,739	-0.349	2.089	-8.730	5.460
R	7,739	3.541	1.196	1.900	6.850
employment growth	4,061	-0.009	0.178	-0.350	0.500
total asset growth	5,489	0.039	0.196	-0.339	0.571
investment growth	5,431	0.076	0.371	-0.500	1.333

Table 1 reports some descriptive statistics of our sample. An exact definition of the variables is provided in Table 7 in the Appendix. Starting from the firms' characteristics, on average 16% of firms are discouraged borrowers, the majority of the firms are run by a family (almost 80%) and the owner is a male (90%). As mentioned before, our analysis starts in the second quarter of 2010 and includes the macroeconomic effects of the financial crisis of 2007-2008 as well as of the different phases of the sovereign debt crisis and the economic recession. In this context, we first used the answers from the survey to detect the impact of economic factors on the availability of external financing. Almost 53% of firms reported a deterioration in the general economic outlook, while 37% of firms reported a deterioration in their firm specific outlook in terms of sales, profitability or business plan, in so far that it has negatively affected their access to finance. The economic and financial difficulties encountered by firms are also reflected in their financial ratios. On average, the representative firm in our sample is not making profits out of its business during the period under analysis; and its likelihood of going bankrupt is quite high as indicated by the low score (1.88) of the Altman Z-index. The average firm in the sample finances 18% of its assets with trade credit. We consider also an indicator of financial independence, computed as the sum of capital and cash flows divided by total assets, which measures the extent to which a firm self-finances its long-term economic activity. Our firms are highly dependent on external finance and their interest rate burden is quite high as pointed out by the financial pressure variable. The tax rate is on average around 19%. The average total assets are just below 4 million euro and the average age is 23 years. The mean employment growth is almost -1 percent. The asset growth and investment growth are respectively 3.9 and 7.6 percent. For our analysis we consider also two aggregated country variables: the GDP growth, which is slightly negative over the period, and the average interest rate on new loans charged to non-financial corporations which is around 3.5%.

3 Empirical analysis

3.1 The model of Kon and Storey (2003)

In the theoretical model of Kon and Storey (2003) discouraged borrowers basically exist because firms have strictly positive application costs and because banks make screening errors. Their model is simple and straightforward and can be summarized by the equations (1) and (2) below. In their model all firms need external funds to finance an investment project. For good (G) firms the expected return for the bank is always positive, for bad (B) firms the expected return for the bank is negative. This means that banks will approve the loan application when firms are perceived as good, but reject the loan application when firms are perceived as bad, however, banks make screening errors (se). The screening error can be thought of as the probability that a good firm will be perceived as a bad firm by the bank, and vice versa for the bad firms. For our purpose we have simplified the model of Kon and Storey (2003) a little, namely that we assume the screening error to be the same for good as for bad firms.

$$
\begin{aligned}
ROI_G &> R + OC + \frac{AC}{1 - se} \qquad (1) \\
ROI_B &> R + OC + \frac{AC}{se} \qquad (2)
\end{aligned}
$$

A firm will apply for a bank loan when the above stated inequality holds (eq (1) for good firms and eq (2) for bad firms); thus, a firm will apply for a loan when the firm's total return on investment is higher than it's total effective borrowing cost. The effective borrowing cost is the sum of the interest payments on the bank loan (R), the opportunity cost of the bank loan (OC) and the effective application cost. It can be seen that the effective application cost differs between good firms and bad firms, namely by the way the screening error shows up in the denominator. Suppose that the probability that a good firm will be perceived by the bank as a bad firm is very low, and thus the probability that a bad firm will be perceived as a good firm by the bank is also very low; then the effective application cost of a good firm will be very close to the 'nominal' application cost (AC), while for a bad firm the effective application cost will be almost infinitely

high. The total number of discouraged borrowers in an economy observed by the econometrician will thus be the sum of all good and bad firms for which the inequality does not hold.

A factor that has been neglected by Kon and Storey (2003) and the literature, is the impact of the tax rate. In many countries the cost of the debt is tax deductable, and so, when corporate profits are taxed firms can reduce their taxes by financing themselves with debt. The static trade-off theory states that for this reason firms have a preference to finance themselves with debt instead of capital (including internally generated retained earnings). This implies that when the tax rate is higher, the tax deductibility of the cost of debt will also be higher, making debt more attractive. As a result, the true model for discouraged borrowers is summarized by equations (3) and (4).

$$ROI_G > (1-\tau)R + OC + \frac{AC}{1-se} \tag{3}$$

$$ROI_B > (1-\tau)R + OC + \frac{AC}{se} \tag{4}$$

Where τ stands for the tax rate on corporate profits, implying that only the fraction $(1-\tau)$ of the total interest payments is an effective cost of borrowing. We calculate τ as the ratio of taxes paid to profits before taxes but after interest payments. Hence, when firms make losses for instance, they do not have to pay taxes, and as such they will not be incentivized by the tax deductibility of the cost of debt.[1]

From this theoretical model we derive the empirical model (5). We expect that the number of discouraged borrowers will be higher when the firms' profit margins are lower. We see the profit margin as a proxy for the potential return on investment of firms. Firms need loans to invest and generate more sales; then, those firms with lower profit margins on sales will have the lowest return on their investment. And, lower return on investment makes it more likely that

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[1]Note that τ should be thought of as the effective tax rate that firms pay on their profits and not the official tax rate on corporate profits in a given country. Table 8 in the Appendix gives an overview of the official corporate tax rates and the average effective tax rate paid by the firms in the sample in a given wave. As can be seen, the effective tax rates are on average lower than the official tax rate, due to for instance a number of firms that make losses and hence do not need to pay taxes. In Italy, however, there exist increased rates which are applicable to, amongst others, utility firms which can explain why the average effective tax rate is higher than the official tax rate.

the inequality in equations (3) and (4) will not hold and hence more firms will be discouraged. Further, we predict that the number of discouraged borrowers will be higher when the interest rate R charged by the bank is higher. We take the average interest rate charged by Monetary Financial Institutions (MFIs) to non-financial corporations as a proxy for the expected interest payments of firms. Given the fragmentation of the financial markets in the euro area during the sample period, we should have sufficient heterogeneity in the interest rates to exploit. Next, we assume that the number of discouraged borrowers will be higher when trade credit is more available. If trade credit is more commonly used, the opportunity cost of applying for bank lending is likely to be higher, because for any effort to obtain bank loans it might be easier to obtain additional trade credit. There are quite large differences in the use of trade credit in the euro area (see Ferrando and Mulier (2013)) that should allow us to test this hypothesis. The next testable hypothesis, which followed from the trade-off theory of capital structure, is that higher effective tax rates are correlated with a lower likelihood of being discouraged. Finally, we expect that the number of discouraged borrowers will be higher when the firms are smaller and younger. This comes from the assumption that application costs of firms decrease with age and size, because firms get more experienced with age and fixed costs are relatively lower for larger firms. We estimate equation (5) with a linear probability model using only the cross-sectional variation in the data, given that the panel component is very weak in our sample (see Section 2 above).

$$
\begin{aligned}
DB_{icst} \quad = \quad & \alpha_1\ PM_{icst-1} + \alpha_2\ TC_{icst-1} + \alpha_3\ R_{ct} + \alpha_4\ tax\ rate_{icst-1} + \alpha_5\ age_{icst-1} + \\
& \alpha_6\ ln(TA)_{icst-1} + \beta_1\ X^1_{icst} + \beta_2\ X^2_{icst-1} + \beta_3\ gdp^{growth}_{ct} + \upsilon_c + \upsilon_t + \upsilon_s + \epsilon_{icst}
\end{aligned}
\tag{5}
$$

Where DB_{icst} takes the value of 1 if a borrower is discouraged and 0 if a borrower applied; PM_{icst-1} is the lagged profit margin; TC_{icst-1} is the lagged ratio of accounts payable to total assets; R_{ct} is the interest rate that MFIs on average charge to non-financial corporations; $tax\ rate_{icst-1}$ is the ratio of taxes paid to profits before taxes and after interest payments; age_{icst-1} is the lagged age of the firm; $ln(TA)_{icst-1}$ is the natural logarithm of the firm's lagged total assets (in thousand euros). X^1_{icst} is a vector of firm level control variables: an indicator whether the CEO is male, an indicator whether the firm is family owned, the general economic outlook which is a dummy equal to 1 if the firm reports that the general economic outlook has deteriorated and

0 otherwise, and the firm specific outlook which is a dummy which equals 1 if the firm reports that the firm specific outlook has deteriorated and 0 otherwise. X^2_{icst-1} is a vector of lagged firm level control variables: the Altman Z-score of the firm, the financial pressure of the firm which measures the firm's interest payments relative to its EBITDA, and the financial independence which measures the sum of the firm's equity and cash flow relative to its total assets. gdp^{growth}_{ct} is the gdp growth. v_c is a country fixed effect, v_t is a time fixed effect and v_s is a sector fixed effect, ϵ_{icst} is the error term; subscript i indicates firm, subscript c indicates country, subscript s indicates sector and subscript t indicates time (i.e. wave of the survey).

Table 2 shows the probit regression results (Columns 1 to 3) and OLS regression results as robustness (Column 4) of equation (5) and tests the model of Kon and Storey (2003). The first results confirm the hypotheses. Firms with higher profit margins are less likely to be discouraged. The less trade credit is available to firms, the less alternative financing options firms have, the less likely firms are to be discouraged. The lower the interest rates charged on loans, the less likely firms are to be discouraged. The results in Table 2 further show that higher tax rates have a negative effect on discouragement. The tax deductibility of interest payments seems to encourage firms that need external finance to actually apply for a bank loan. Also older and larger firms are less likely to be discouraged. These effects are strong and significant over a number of specifications and control variables. In line with previous research, we find that firms with male CEOs and firms that are family owned are less likely to be discouraged (Cole, 2008; Freel et al., 2012). Finally, the firm specific and general economic outlook but not the gdp growth seem to be correlated with discouragement. Firms that indicate that the general economic outlook or their firm specific outlook is deteriorating also have a higher likelihood of being discouraged.

Overall, the empirical results show that more borrowers are discouraged when the average interest rate charged by banks in their country is higher, when the tax deductibility of interest payments is lower (proxied by the effective tax rate), when the potential return on their investment is lower (proxied by the profit margin), when the opportunity cost of bank lending is higher (proxied by trade credit), and when the application costs are higher (proxied by age and size).

Table 2: Explaining discouragement among firms in the euro area

The Table shows marginal effects of the probit regressions of the empirical model (equation (5)). The dependent variable *DB* equals 0 if the firm applied for a bank loan and equals 1 if the firm did not apply because it feared that it would be rejected. The *profit margin* is the lagged profit margin; *trade credit* is the lagged ratio of the accounts payable to total assets; *R* is the interest rate that MFIs on average charge to non-financial corporations; *tax rate* is the firm's effective tax rate; *age* is the lagged age of the firm; *ln(TA)* is the natural logarithm of the firm's lagged total assets (in thousand euros). *Male* is a dummy equal to 1 when the CEO is male; *family* is a dummy equal to 1 when the firm is family owned; *gdp growth* is the year-on-year gdp growth; *firm specific outlook* is a dummy equal to 1 if the firm reports that the firm specific outlook has deteriorated and 0 otherwise; *general economic outlook* is a dummy equal to 1 if the firm reports that the general economic outlook has deteriorated and 0 otherwise; and *financial independence* measures the sum of the firm's equity and cash flow relative to its total assets. See Table 7 in the Appendix for a definition of the variables used. Robust standard errors in parentheses are clustered at the country-wave level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

VARIABLES	(1) probit	(2) probit	(3) probit	(4) OLS
profit margin	-0.322***	-0.112***	-0.111***	-0.210***
	(0.0499)	(0.0328)	(0.0327)	(0.0472)
trade credit	0.0663**	0.105***	0.104***	0.129***
	(0.0306)	(0.0287)	(0.0292)	(0.0357)
R	0.0559***	0.0628***	0.0694***	0.0693***
	(0.0154)	(0.0140)	(0.0147)	(0.0140)
tax rate	-0.0972***	-0.0534***	-0.0535***	-0.0491***
	(0.0245)	(0.0193)	(0.0195)	(0.0184)
age	-0.00112***	-0.000979***	-0.00100***	-0.000760***
	(0.000361)	(0.000336)	(0.000334)	(0.000262)
ln(TA)	-0.0242***	-0.0274***	-0.0272***	-0.0285***
	(0.00431)	(0.00316)	(0.00318)	(0.00343)
male		-0.0309**	-0.0313**	-0.0335**
		(0.0145)	(0.0144)	(0.0166)
family		-0.0233**	-0.0228**	-0.0242**
		(0.0108)	(0.0108)	(0.0106)
financial independence		0.00756	0.00828	0.0185
		(0.0304)	(0.0299)	(0.0376)
financial pressure		0.0550***	0.0537***	0.0575***
		(0.00658)	(0.00674)	(0.00940)
Altman Z-score		-0.0328***	-0.0323***	-0.0351***
		(0.00456)	(0.00457)	(0.00457)
firm specific outlook		0.0407***	0.0300***	0.0316***
		(0.00802)	(0.00774)	(0.00892)
gdp growth			0.00393	0.00685
			(0.00381)	(0.00470)
general economic outlook			0.0290***	0.0285***
			(0.00884)	(0.00905)
Country FE	YES	YES	YES	YES
Wave FE	YES	YES	YES	YES
Sector FE	YES	YES	YES	YES
Observations	7,739	7,300	7,300	7,300
(Pseudo) R-squared	0.105	0.128	0.129	0.112

3.2 Real effects of discouragement

A natural question that arises is whether discouragement has real effects on economically relevant firm outcomes such as employment or growth. To answer this question we try to investigate the differential impact on firm decisions after discouragement given that pre-discouragement decisions were indifferent. Because the financial accounts data are available for the entire 2004-2013 period, we can use a simple growth model (6) to estimate the real effects of discouragement.

$$
\begin{aligned}
Growth^K_{icst+1} &= \alpha_0 \ DB_{icst} + \alpha_1 \ Growth^K_{icst-1} + \alpha_2 \ age_{icst-1} + \alpha_3 \ ln(TA)_{icst-1} + \\
&\quad \alpha_4 \ Growth \ opportunities_{icst} + \upsilon_c + \upsilon_t + \upsilon_s + \epsilon_{icst}
\end{aligned}
\tag{6}
$$

We calculate the average growth of key variables ($Growth^K_{icst+1}$) as the difference between the average value of variable K in periods t+1 and t+2 and the value of variable K in period t, and scaled by the value of K in period t to obtain a percentage. As such we can relate the future growth to the discouraged borrowers status. By including time fixed effects (υ_t) in all our specifications, the identification only comes from differences in growth between discouraged and non-discouraged borrowers at the same point in time. Another important step is controlling for pre-treatment trends, which we do by keeping the lagged growth of the key variables fixed. The lagged growth ($Growth^K_{icst-1}$) is calculated as the difference between the value of K in period t and the average value of variable K in periods t-1 and t-2, scaled by the average value in periods t-1 and t-2 to obtain a percentage. Lastly, we need to take into account the endogeneity between discouragement and growth in model (6) in order to isolate the impact of discouragement on growth coming from the lack of access to bank finance rather than the lack of profitable investment opportunities. We solve this issue by instrumenting discouraged borrowers by a firm-level indicator of financing constraints available in the survey and estimate model (6) with the Two-Stage Least Squares (2SLS) estimator. We measure firm-level financing constraints using question Q0 of the SAFE survey, where firms are asked what is currently their most pressing problem. They need to choose among the following set of problems: finding customers, availability of skilled staff, access to finance, competition, costs of production or labour, regulation, or other. We create a dummy *fincon*, which equals 1 if the firm chose access to finance as most pressing problem, and 0 otherwise. Additionally, we control for growth opportunities in the regression by

including an indicator whether the firm has specified that it's specific outlook has deteriorated in the past six months.

Table 3: The real effects of discouragement

The Table shows the output of 2SLS regressions of empirical model (6). The endogenous variable DB is instrumented by *fincon*, an indicator of financial constraints. *Fincon* is a dummy which equals 1 if a firm states that 'access to finance' is its most pressing problem, and 0 otherwise in question q0 of the SAFE survey. See Table 7 in the Appendix for a definition of the variables used. Robust standard errors in parentheses are clustered at the country-wave level. *** p<0.01, ** p<0.05, * p<0.1

VARIABLES	(1) 2SLS	(2) 2SLS PLACEBO	(3) 2SLS	(4) 2SLS PLACEBO	(5) 2SLS	(6) 2SLS PLACEBO
	Investment growth		Employment growth		Asset growth	
DB	-0.504***	0.567**	-0.291**	-0.0949	-0.298***	0.0304
	(0.150)	(0.240)	(0.111)	(0.0885)	(0.0824)	(0.0746)
lagged investment growth	0.0677***	0.0256				
	(0.0140)	(0.0162)				
lagged employment growth			0.0267	0.186***		
			(0.0203)	(0.0266)		
lagged asset growth					0.0463***	0.0985***
					(0.0142)	(0.0165)
age	-0.000842***	-0.00414***	-0.00102***	-0.00223***	-0.000904***	-0.00284***
	(0.000263)	(0.000510)	(0.000170)	(0.000179)	(0.000183)	(0.000237)
ln(TA)	-0.0207***	0.0347***	-0.00481	0.00456*	-0.0148***	0.0119***
	(0.00516)	(0.00869)	(0.00300)	(0.00269)	(0.00277)	(0.00304)
firm specific outlook	-0.00209	-0.0703***	-0.0302***	-0.0180*	-0.0333***	-0.0219**
	(0.0129)	(0.0202)	(0.00703)	(0.00977)	(0.00743)	(0.00861)
Country FE	YES	YES	YES	YES	YES	YES
Wave FE	YES	YES	YES	YES	YES	YES
Sector FE	YES	YES	YES	YES	YES	YES
First-stage F-statistic	27.2	55.5	25.2	49.2	27.4	57.1
Observations	5,431	6,457	5,038	5,924	5,489	6,487
R-squared	0.051	0.052	0.120	0.150	0.110	0.119

The key variables that we consider are fixed assets, employment and total assets. The results are shown in Columns 1, 3 and 5 of Table 3. Column 1 shows that discouragement has a large negative effect on investment growth and is statistically and economically significant. The economic impact of the estimated -0.504 implies that the investment growth of the average discouraged borrower is around 4.71 percentage points lower than non-discouraged borrowers in the two years following the discouragement.[2] Similar, for employment growth (Column 3), we estimate that the average discouraged borrower has around 2.66 percentage points lower employment growth than non-

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[2]To analyse the economic impact of discouragement on investment growth we need to calculate the

discouraged borrowers in the two years following the discouragement. And for asset growth growth this is around 2.86 percentage points. It is clear that discouragement has strong and undesired economic consequences. The F-statistic is above 25 in Columns 1, 3 and 5 of Table 3, indicating that our instrument is not weak and that the IV relative bias is likely to be negligable (Stock et al., 2002).

To provide further evidence of the causal impact of discouragement on real firm outcomes, we perform two additional tests. First, a placebo test where we estimate model (6) but explain the average growth two years prior to the discouragement and use the average growth four years prior to the discouragement to control for pre-discouragement trends. Given that the discouraged firms were not yet discouraged at that time (at least not that we know of), we should not find significant lower growth for discouraged firms vis-à-vis applying firms in the placebo test. The results shown in Columns 2, 4 and 6 of Table 3 confirm that discouraged borrowers do not have a significant lower investment, employment or asset growth than applying firms in the placebo period, indicating that the lower growth of discouraged borrowers that we find in Columns 1, 3 and 5 of Table 3 is in fact caused by the self-rationed access to bank finance. The F-statistic is around 50 in all placebo tests, indicative of the strength of our instrument in the first-stage regression and implying a low IV relative bias (Stock et al., 2002).

As a second piece of corroborating evidence on the causal impact of the self-rationed access to bank finance on real firm outcomes, we examine whether the effect of discouragement differs from the effect of bank loan rejection. In Columns 1, 3 and 5 of Table 4 we exclude the borrowers that succesfully applied for a bank loan, and, as such the variable DB only compares discouraged borrowers with rejected borrowers. In Columns 2, 4 and 6 of Table 4 we restrict the estimation sample in the other direction and exclude borrowers that got their loan application rejected. As such the variable DB only compares discouraged borrowers with approved borrowers. In general, the results show that the effect of discouragement on growth is statistically indistinguishable from the effect of a rejection on growth; and that the lower growth of discouraged borrowers compared to non-discouraged borrowers is driven by the higher growth of borrowers that succesfully applied

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standard deviation of the values of the instrumented DB, i.e. the predicted DB after the first stage regression of the 2SLS. In this case the standard deviation is 0.0935, making the impact of a standard deviation increase in predicted DB on growth: -0.504*0.0935=-0.0471.

for a bank loan. The F-statistic is above 25 in all columns of Table 4, indicating that our instrument is not weak and that the IV relative bias is likely to be negligable (Stock et al., 2002).

Table 4: The real effects of discouragement

The Table shows the output of 2SLS regressions of empirical model (6). The endogenous variable DB is instrumented by *fincon*, an indicator of financial constraints. *Fincon* is a dummy which equals 1 if a firm states that 'access to finance' is its most pressing problem, and 0 otherwise in question q0 of the SAFE survey. The following variables fall under the scope of the term Control VARs: *age*, *ln(TA)*, and *firm specific outlook*. See Table 7 in the Appendix for a definition of the variables used. Robust standard errors in parentheses are clustered at the country-wave level. *** p<0.01, ** p<0.05, * p<0.1

VARIABLES	(1) 2SLS	(2) 2SLS	(3) 2SLS	(4) 2SLS	(5) 2SLS	(6) 2SLS
	Investment growth		Employment growth		Asset growth	
DB vs Rejected	0.0235		0.160		0.105	
	(0.140)		(0.102)		(0.0842)	
DB vs Approved		-0.218***		-0.0971*		-0.0875**
		(0.0703)		(0.0513)		(0.0359)
lagged investment growth	0.116***	0.0808***				
	(0.0282)	(0.0177)				
lagged employment growth			0.0904**	0.0473**		
			(0.0340)	(0.0182)		
lagged asset growth					0.113***	0.0588***
					(0.0230)	(0.0144)
Control VARs	YES	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES	YES
Wave FE	YES	YES	YES	YES	YES	YES
Sector FE	YES	YES	YES	YES	YES	YES
First-stage F-statistic	31.2	71.6	29.0	69.8	33.6	73.9
Observations	2,016	4,409	1,799	4,122	2,035	4,460
R-squared	0.071	0.058	0.138	0.122	0.128	0.110

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3.3 Would discouraged firms get a loan if they would apply?

Given the strong negative effects of discouragement on investment, employment and growth caused by the lack of access to bank loans, we try to predict how likely discouraged borrowers are to be approved if they would apply for a loan.

We do this in three steps. First, we estimate the probability of applying firms to have their loan application approved (equation 7). In the second step we use the model parameters to predict the approval likelihood of approved applicants and of discouraged firms. In the final step we compare the predicted values of discouraged borrowers with the predicted values of approved applicants.

$$
\begin{aligned}
Approval_{icst} \quad = \quad & \alpha_0 \ tax \ rate_{icst-1} + \alpha_1 \ PM_{icst-1} + \alpha_2 \ TC_{icst-1} + \alpha_3 \ R_{ct} + \alpha_4 \ age_{icst-1} + \\
& \alpha_5 \ ln(TA)_{icst-1} + \beta_1 \ X^1_{icst} + \beta_2 \ X^2_{icst-1} + \beta_3 \ gdp^{growth}_{ct} + \upsilon_c + \upsilon_t + \upsilon_s + \epsilon_{icst}
\end{aligned}
\tag{7}
$$

Where $Approval_{icst}$ takes the value of 1 if a borrower i in sector s is has received more that 75% a of loan amount requested in country c at time t and 0 if a borrower gets less than 75%, or gets nothing, or the borrower refused the offer from the bank because the costs where too high. The estimation results of equation 7 are shown in Table 9 in the Appendix.

For the comparison in the third step we apply two different approaches, both based on the full sample estimation results of model 7. First, we compare the predicted values of discouraged borrowers with the predicted values of all approved applicants in the sample. We do this by calculating the distribution of the predicted values for all approved applicants; and see in which percentile of this distribution the predicted value of each discouraged borrower would be situated (approach 1). In the second approach we compare the predicted values of discouraged borrowers in a given country and wave with the predicted values of approved applicants in the same country and wave. We do this by calculating the distribution of the predicted values for all approved applicants in that country and wave; and see in which percentile of this distribution the predicted value of each discouraged borrower in that same country and wave would be situated (approach 2).

If the predicted values of the discouraged borrowers are situated in the highest percentiles of these distributions, it means that -according to our model where higher predicted values are associated

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with higher chances of approval- the discouraged borrowers would be likely to be approved if they would apply. Figure 2 shows the histogram of the percentiles to which discouraged borrowers in the euro area belong using approach 2. The figure can thus be interpreted as the hypothetical likelihood that a discouraged borrowers would get a loan application approved. As can be seen, the highest fraction of discouraged borrowers is situated in the lowest percentile, implying that the predicted value of these discouraged borrowers is lower than the predicted value of all approved applicants. Overall, most discouraged borrowers are situated in the lower percentiles of the distribution, indicating higher risk and higher likelihood of being potentially rejected. Slightly more than 61% of the discouraged borrowers have a predicted approval likelihood lower than the 25th percentile of the approved applicants. However, Figure 2 also indicates that there are some discouraged borrowers with a high likelihood of approval. About 8% of the discouraged borrowers have a predicted approval likelihood higher than the 75th percentile of the approved applicants.

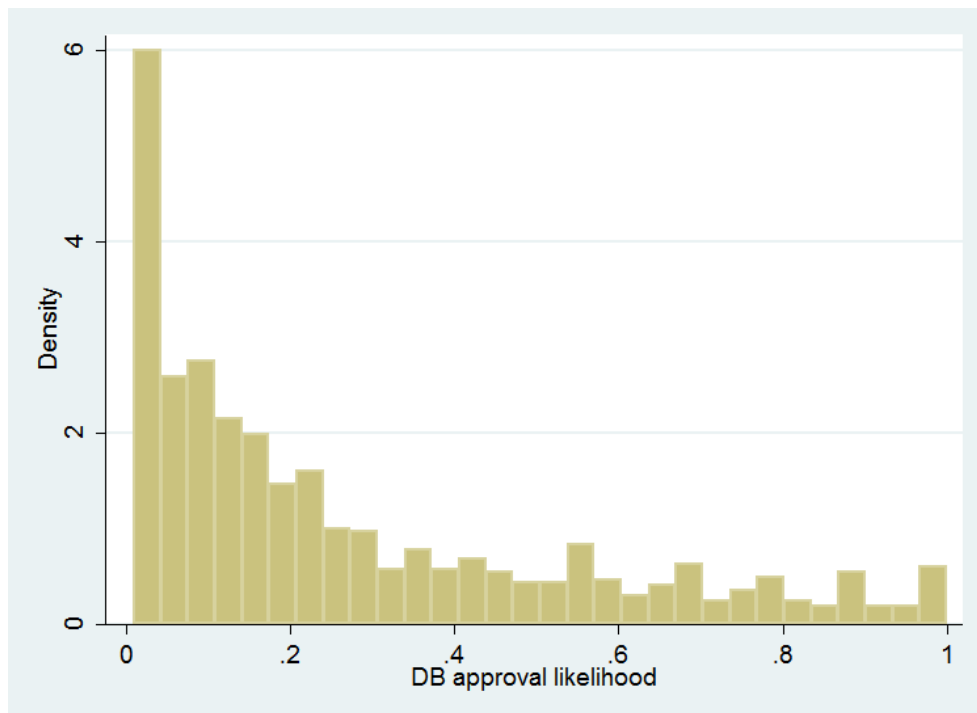**Figure 2: Hypothetical approval likelihood**

Figure 3 reports the approval likelihood of discouraged borrowers in the selected euro area countries, with 2 graphs for each country, showing the hypothetical approval likelihood for discouraged

borrowers in that country. The left hand side graph for each country is based on the overall approval likelihood in the euro area without distinction across country (approach 1). The right hand side graph instead is based on the approval likelihood in the same country and the same wave (approach 2).

This allows us to put more perspective on the quality of discouraged borrowers in a given country, vis-à-vis approved applicants in the euro area and vis-à-vis approved applicants in their own country. Firms considered risky at euro area level could be less risky once we consider the distribution within country or vice versa. A first observation from Figure 3 is that when discouraged borrowers are compared with approved applicants in the same country and wave, the hypothetical approval likelihood is very comparable across countries, namely that the majority of discouraged borrowers have a high likelihood of being rejected, and only some are likely to be approved. A second observation is that when discouraged borrowers are compared to all approved applicants in the euro area, the hypothetical approval likelihood is no longer comparable across countries. If discouraged borrowers would be competing with approved applicants in the entire euro area, then their hypothetical approval likelihood would become even more unlikely in some countries (Greece, Itlay, Portugal and Spain) or become much more likely in other countries (Austria, Belgium, Germany, Finland and France).[3] These results seem to suggest that discouraged borrowers in the latter countries are unlikely to be approved in their own country-level banking sector, but that their approval chances increase significantly if they would apply in a euro area banking sector.

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[3]For Greece, Italy, Portugal and Spain, the percentage of discouraged borrowers with an approval likelihood higher than the 75th percentile of approved applicants decreases from 7.9% to 2.7%. For Austria, Belgium, Germany, Finland and France, the percentage of discouraged borrowers with an approval likelihood higher than the 75th percentile of approved applicants increases from 8.3% to 17.3%.

Figure 3: Hypothetical approval likelihood
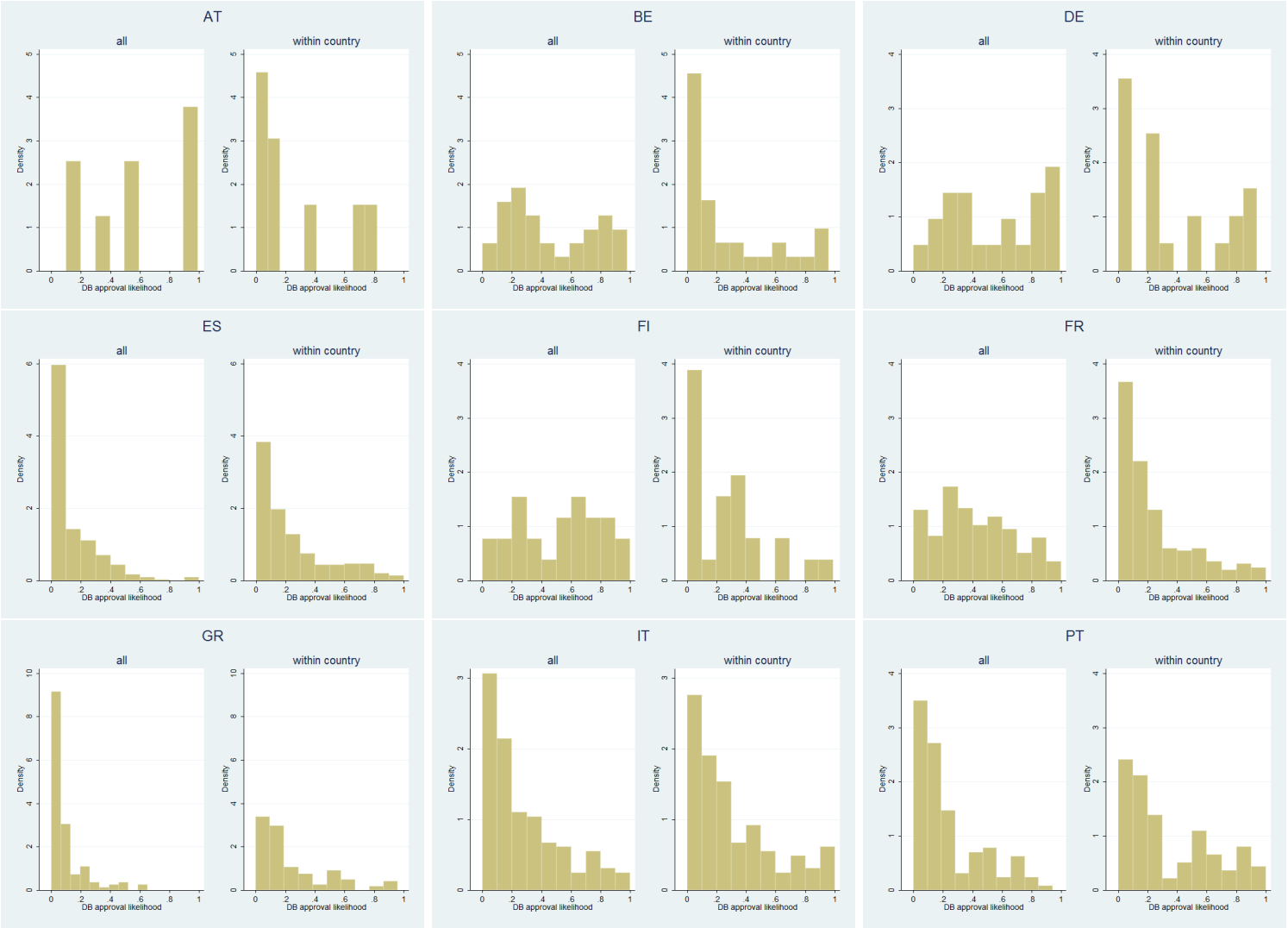
Can this be seen as a signal that the European banking sector is not really integrated? Does this finding signal that banks apply different standards in different countries? Or is this finding driven by the country fixed effect in model 7, indicating that some countries have higher average rejection rates which could not be explained by the economic and financial factors in the model? Figure 4 in the Appendix shows that only a limited part of the effect was driven by the country fixed effect. The left hand side graph is constructed using approach 1, but without using the country fixed effect to get the predicted values, the right hand side is approach 2 and is thus the same as in Figure 3.[4] Finally, we split the euro area in two areas and re-estimate model 7 for the two areas seperately to test whether the results are driven by different approval standards (or credit standards in general) in the two areas.[5] Area 1 consists of Austria, Belgium, Germany, Finland and France; area 2 consists of Greece, Italy, Portugal and Spain. Figure 5 in the appendix is constructed using approach 1, but in the left hand side (right hand side) graph discouraged borrowers in a given country are compared with the predicted values of the euro area approved applicants, based on the estimation results from firms in area 1 (area 2). The results in Figure 5 show that the approval standards differ a little, but that whether the standards from area 1 or area 2 are applicable is unimportant for the main finding that the approval chances of discouraged borrowers in for instance Germany would increase if they would apply in a euro area banking sector where they would also compete with Spanish firms rather than only with German firms.

3.4 Are discouraged borrowers risky firms?

Now that it appears that the majority of discouraged borrowers would be unable to get a bank loan, we go back to the model in equations (3) and (4). The model allows to make a prediction

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[4]Note that the country fixed effect is irrelevant in approach 2 as discouraged firms are compared with applicants of the same country. So both have the same country fixed effect, which has no impact on the relative ranking of discouraged borrowers in the distribution.

[5]So far we have used the same estimation at euro area level in all approaches, meaning that we have assumed that the marginal effect of the economic and financial variables on approval is the same in all the countries. We could not do the estimation at country level because we have insufficient observations in some countries to run the estimations.

on the expected quality of the discouraged borrowers, i.e. good or bad borrowers.

Keeping the return on investment, the interest payments, the opportunity costs and the application costs constant, then the composition (G or B) of the number of discouraged borrowers will depend on the screening error of banks. When the probability that a good firm will be perceived by the bank as a bad firm is very low (and thus the probability that a bad firm will be perceived as a good firm by the bank is also very low), then the effective application cost of a good firm will be very close to the 'nominal' application cost (AC), while for a bad firm the effective application cost will be almost infinitely high. The latter implies that the inequality will almost never hold for bad firms and hence, the lower the screening error, the more bad firms will be discouraged relative to good firms (see equations (3) and (4)). Given that, in the last decades, financial reporting of firms as well as monitoring technologies of banks have improved, we believe that screening errors by banks are quite low. Financial reporting ameliorated because the reporting standards have improved and apply to a wider set of firms. The considerably better and cheaper monitoring technologies follow from improved models to measure risk on the one hand and the giant leap of IT on the other hand.

In order to make a comprehensive assessment of the quality of borrowers and the correlation between the quality and the discouragement of the borrower, one requires very detailed financial information which is usually unavailable in most surveys, but which is included in our dataset. In this way we contribute to the literature on whether discouraged firms are high or low quality firms, and as argued above we expect that they will be risky firms.

Table 5 descriptively shows that discouraged borrowers are on average riskier than applying borrowers. Discouraged borrowers have on average a lower Altman Z-score, their firm specific outlook is deteriorating more often and they also use about 24% more of their EBITDA for interest payments, than applying firms. Adding all this up gives a strong indication that the existing discouraged borrowers in the euro area can be more related to the bad firms in the model of Kon and Storey (2003) than to the good firms in their model, implying that screening errors of banks are indeed likely to be low. It could however be that these risk measures are correlated with other important factors from the model. We find that the average profit margin during the sample period is about 5 percentage points lower for discouraged borrowers than for applying

Table 5: T-test on equality of means: applying firms vs. discouraged firms

The Table shows the number of observations in the sample of firms that are discouraged with the mean for each of the variables for this subsample, as well as the number of observations in the sample of firms that applied for a bank loan with the mean for each of the variablies for this subsample, together with a t-test on the equality of these means. See Table 7 in the Appendix for a definition of the variables. *** p<0.01, ** p<0.05, * p<0.1

VARIABLES	DB=0		DB=1		t-test
	N	mean	N	mean	mean DB1 - mean DB0
profit margin	5,522	-0.00306	1,042	-0.0562	-0.053***
Altman Z-score	5,522	1.968	1,042	1.490	-0.475***
age	5,522	23.90	1,042	19.01	-4.921***
ln(TA)	5,522	8.336	1,042	7.522	-0.822***
financial pressure	5,249	0.408	949	0.646	0.238***
general economic outlook	5,522	0.542	1,042	0.652	0.111***
firm specific outlook	5,522	0.367	1,042	0.509	0.142***

firms. Further, discouraged borrowers are on average 5 years younger, 50% smaller and indicate more often that the general economic outlook is deteriorating. To find out whether discouraged borrowers are riskier over and above the other factors that drive discouragement, we regress in the empirical model (8) several risk measures on basically the same model as in equation (5) and add discouraged borrowers as independent variable. The risk measures are the Altman Z-score, the firm's financial pressure and the probability of having a deteriorating firm specific outlook and the output is shown in Table 6.

$$
\begin{aligned}
Risk_{icst} \quad = \quad & \alpha_0 \, DB_{icst} + \alpha_1 \, tax \, rate_{icst-1} + \alpha_2 \, PM_{icst-1} + \alpha_3 \, TC_{icst-1} + \alpha_4 \, R_{ct} + \alpha_5 \, age_{icst-1} + \\
& \alpha_6 \, ln(TA)_{icst-1} + \beta_1 \, X^1_{icst} + \beta_2 \, X^2_{icst-1} + \beta_3 \, gdp^{growth}_{ct} + v_c + v_t + v_s + \epsilon_{icst}
\end{aligned}
\tag{8}
$$

Columns 1, 4 and 7 of Table 6 reveal that even after keeping the return on investment, the interest rate, the opportunity costs and the application costs constant, discouraged borrowers are more risky than firms that do apply for bank loans. Discouraged borrowers have a significantly lower Altman Z-score, significantly higher financial pressure and are significantly more likely to have a

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deteriorating firm specific outlook. Moreover, discouraged borrowers are particularly riskier than applying-and-approved firms (Columns 3, 6 and 9), and on average discouraged borrowers even appear to be at least equally risky than applying-and-rejected firms: they have lower Altman Z-scores, slightly higher financial pressure and are equally likely to have a deteriorating firm specific outlook (Columns 2, 5 and 8 of Table 6).

Table 6: Are discouraged borrowers risky firms?

The Table shows the output of OLS regressions, or the marginal effects of a probit regression of empirical model (8). The respective dependent variable is one of the following risk measures: *Altman Z-score*, *financial pressure* or *firm specific outlook*. The following variables fall under the scope of the term Control VARs: *profit margin*, *trade credit*, *R*, *tax rate*, *age*, *ln(TA)*, *male*, *family*, *financial independence*, *gdp growth* and *general economic outlook*. See Table 7 in the Appendix for a definition of the variables used. Robust standard errors in parentheses are clustered at the country-wave level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	OLS	OLS	OLS	OLS	OLS	OLS	probit	probit	probit
Dependent var		Altman Z-score			financial pressure			firm specific outlook	
DB	-0.270***			0.0837***			0.0425***		
	(0.0371)			(0.0132)			(0.0128)		
DB vs Rejected		-0.122***			0.0373*			0.0185	
		(0.0408)			(0.0190)			(0.0158)	
DB vs Approved			-0.325***			0.114***			0.0636***
			(0.0445)			(0.0134)			(0.0140)
Control VARs	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Wave FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Sector FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	7,346	2,772	5,963	7,346	2,772	5,963	7,325	2,761	5,942
(Pseudo) R-squared	0.430	0.424	0.437	0.317	0.277	0.331	0.201	0.193	0.202

3.5 Robustness tests

In this section we test how robust our findings in Section 3.2 are to only using a subsample of the discouraged borrowers. The subsample that we are interested in, is the sample of discouraged borrowers that have a relatively high predicted probability of getting a loan application approved (DB^{ALH}) as estimated in Section 3.3. We thus want to see if discouragement still has real economic consequences for those firms that could obtain a loan if they would just apply. If so, this would call for policy intervention to induce these firms to apply for a bank loan. To investigate

this we reestimate model (6) but leave out those discouraged borrowers with a predicted approval likelihood below the median predicted approval likelihood of all discouraged borrowers in the sample.

The results are shown in Table 10 in the Appendix. Columns 1, 4 and 7 are similar to Columns 1, 3 and 5 of Table 3 and Columns 2, 3, 5, 6, 8 and 9 are similar to those presented in Table 4. Table 10 shows that discouragement also has strong negative effects on investment, employment and asset growth for discouraged borrowers with a high loan approval likelihood. The economic impact on the investment growth of the average discouraged borrower with a high approval likelihood is around 6.26 percentage points lower than non-discouraged borrowers in the two years following the discouragement, which is in fact stronger than the estimated effect for all discouraged borrowers (4.71). The employment growth and asset growth is, respectively, 2.89 and 3.21 percentage points lower for the average discouraged borrower with high approval likelihood than for the applying firm in the two years following the discouragement, which is again stronger than the effect in the total sample (2.66 and 2.86). Again, the evidence suggests that this effect is coming from the lack of access to banks loans by comparing the discouragement effect with applying-and-rejected firms and with applying-and-approved firms.

Lastly, in Section 3.4 we made the assumption that the errors that banks make when screening loan applications are low. As a result, and in line with the model's expectations, we found that discouraged borrowers are relatively risky firms. This riskiness is evidenced by their lower Altman Z-score, their higher financial pressure and their higher likelihood of having a deteriorating firm specific outlook. In this Section we want to test whether these conclusions hold by comparing a subsample of firms where we expect that banks' screening errors are relatively high with a subsample of firms where we expect banks' screening errors to be particularly low. We assume that banks find it relatively difficult to screen firms that are both young and small, while banks find it relatively easy to screen firms that are both old and large. The model predicts that under low screening errors mainly risky firms are discouraged, while under high screening errors also less risky firms can be discouraged. To test this, we reestimate model (8) twice. Once where we only include firms with above median age and above median size and once where we only include firms with below median age and below median size.

The results are presented in Table 11 in the Appendix and show that discouragement of borrowers

is indeed particularly correlated with the risk of the borrowers when firms are old and large (i.e. when banks' screening errors are expected to be low), while this is much less true when firms are young and small (i.e. when banks' screening errors are expected to be higher).

4 Conclusion

In this paper we present results on the characteristics and behaviour of discouraged borrowers in the euro area using a unique and confidential dataset from the European Central Bank. This dataset matches firms that participated in the Survey on Access to Finance of small and medium sized Enterprises (SAFE) with their financial statements for nine euro area countries from the second quarter of 2010 till the first quarter of 2014 (i.e. from wave 3 of SAFE till wave 10). We define discouraged borrowers as borrowers that do not apply for a bank loan because they expect that the application will be rejected and compare them with firms that *did* apply. The aim is to take the theoretical model of Kon and Storey (2003) to the data to explain the widespread existence of discouraged borrowers, test whether discouragement has real economic consequences, make a prediction on their approval likelihood if they would have applied, and understand whether discouraged borrowers are risky firms or not.

The empirical results are in line with the predictions of the model and show that more firms are discouraged when the average interest rate charged by banks is higher, when the potential return on investment is lower, and when the application costs and opportunity costs of bank lending are higher. Next, we augment the model with the effective tax rates that firms pay to take the incentive from the tax deductibility of interest payments into account. Indeed, in line with the static trade-off theory, higher tax rates lead to lower discouragement.

Further, we find that discouragement has real effects on firm investment, employment and growth. We estimate that investment growth is 4.7 percentage points lower for the average discouraged borrower than the non-discouraged borrower in the two years following the discouragement. The employment growth and total asset growth is, respectively, 2.7 and 2.9 percentage points lower in the two years following the discouragement. We show that this is due to lack of access to bank finance implied by the discouragement.

Next, using the results from a model on loan approval for firms in our sample, we find that the vast majority of discouraged borrowers would be rejected if they would apply. However, there also exist some discouraged borrowers with a high loan approval likelihood. Additionally, we find indications that the banking sector in the euro area might not be strongly integrated. On the one hand, the approval likelihood of discouraged borrowers is similar across countries when the

discouraged firms are compared to approved firms in the same country only. On the other hand, the story is different when they are compared to approved firms from all the countries in our sample. In some countries (Belgium, Germany, Finland) the approval likelihood of discouraged borrowers increases significantly now that they have also been compared with applying firms in countries like Greece or Spain, and, vice versa.

Finally, we show that discouraged borrowers are mainly risky firms, consistent with the "bad" borrowers in the model and in line with their low approval likelihood. Discouraged firms have a significantly lower Altman Z-score, use a higher fraction of EBITDA for interest payments and signal more often a deteriorating firm outlook, over and above the factors of the model.

One important limitation of our study is that we could not control for the bank-firm relationship. We do not know whether the firm has been long familiar with a bank, nor whether banks in his proximity are relationship banks, which also value soft information, and which could influence the discouragement of firms.

Even though we find that only few discouraged borrowers would be likely to get an application approved, policy measures to help inform discouraged borrowers about their approval likelihood could be desirable if the cost of these measures is lower than the value that these borrowers would create if they get their application approved. We briefly show that the negative effects appear to be even stronger for discouraged borrowers with a high approval likelihood, but a more in depth analysis of this value loss for these discouraged borrowers and making a cost-benefit analysis of potential policy measures are definitely two interesting avenues for future research.

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Appendix

Table 7: Variable definitions

VARIABLE	DEFINITION	SOURCE
DB	dummy equal 1 if a firm said not to have applied for a bank loan because it feared rejection and 0 if the firm said to have applied for a bank loan	SAFE
Approval	dummy equal 1 if the firm received more than 75% of the loan amount that it applied for and 0 if the firm received less than 75%, or if the firm refused to loan offer because the costs were too high	SAFE
Fincon	dummy equal 1 if the firm replied that 'access to finance' was it's most pressing problem and 0 otherwise; i.e. the firm replied 'finding customers', 'availability of skilled staff', 'competition', 'costs of production or labour', 'regulation' or 'other'	SAFE
profit margin	profit or loss of the period / total sales	AMADEUS
tc_ta	accounts payable / total assets	AMADEUS
R	average MFI interest rate charged on new loans to non-financial corporations	ECB
age	number of years since the incorporation of the firm	AMADEUS
ln(TA)	natural log of total assets (in thousands of euros)	AMADEUS
Altman Z-score	$0.717 * \frac{working\ capital}{TA} + 0.847 * \frac{retained\ earnings}{TA} + 3.107 * \frac{EBIT}{TA} + 0.420 * \frac{equity}{debt} + 0.998 * \frac{sales}{TA}$	AMADEUS
gdp growth	gdp growth	ECB
financial dependence	(equity + cash flow) / total assets	AMADEUS
financial pressure	total interest payment / EBITDA	AMADEUS
general economic outlook	dummy equal 1 if a firm said that the general economic outlook is deteriorating and 0 otherwise	SAFE
firm specific outlook	dummy equal 1 if a firm said that its firm specific outlook is deteriorating and 0 otherwise	SAFE
male	dummy equal 1 if a firm's CEO is male and 0 otherwise	SAFE
family	dummy equal 1 if a firm is family owned, or if the owner is still the entrepreneur (a natural person) and 0 otherwise	SAFE
taxrate	taxes paid / profit before taxes after interest payment	AMADEUS
investment growth	$(0.5 * (fixed\ assets_{t+1} + fixed\ assets_{t+2}) - fixed\ assets_t)/fixed\ assets_t$	AMADEUS
employment growth	$(0.5 * (cost\ of\ employees_{t+1} + cost\ of\ employees_{t+2}) - cost\ of\ employees_t)/cost\ of\ employees_t$ $(0.5 * (employees_{t+1} + employees_{t+2}) - employees_t)/employees_t$	AMADEUS
total asset growth	$(0.5 * (total\ assets_{t+1} + total\ assets_{t+2}) - total\ assets_t)/total\ assets_t$	AMADEUS

Table 8: Average tax rate

The first column of the Table shows the official tax rates on corporate profits. Columns 2 to 8 show the average effective tax rate that the firms in a given wave and country pay. See Table 7 in the Appendix for a definition of the tax rate.

	official tax rate	wave 3 mean	wave 4 mean	wave 5 mean	wave 6 mean	wave 7 mean	wave 8 mean	wave 9 mean
AT	0.250	0.106	0.155	0.089	0.099	0.092	0.123	0.178
BE	0.339	0.089	0.150	0.170	0.183	0.117	0.191	0.130
DE	0.295	0.182	0.157	0.320	0.219	0.180	0.280	0.208
ES	0.300	0.139	0.138	0.170	0.161	0.135	0.149	0.142
FI	0.253	0.124	0.193	0.125	0.170	0.123	0.161	0.148
FR	0.333	0.121	0.109	0.147	0.116	0.133	0.124	0.110
GR	0.220	0.078	0.185	0.201	0.209	0.137	0.104	0.101
IT	0.314	0.340	0.335	0.402	0.401	0.418	0.413	0.393
PT	0.250	0.214	0.194	0.185	0.237	0.231	0.207	0.247

Table 9: Loan approval likelihood conditional on application

The Table shows the output of probit regressions of empirical model (7). The dependent variable in these regression is *Approval*, which takes the value of 1 if a borrower has received more that 75% a of loan amount requested, and 0 if a borrower gets less than 75%, or gets nothing, or the borrower refused the offer from the bank because the costs where too high. See Table 7 in the Appendix for a definition of the variables used. Robust standard errors in parentheses are clustered at the country-wave level. *** p<0.01, ** p<0.05, * p<0.1

|	(1)	(2)	(3)
VARIABLES	Full sample	AREA1	AREA2
profit margin	0.0857	-0.136	0.209
	(0.227)	(0.500)	(0.270)
trade credit	-0.445***	-1.240***	-0.150
	(0.161)	(0.356)	(0.158)
R	-0.128*	-0.531*	-0.0881
	(0.0717)	(0.310)	(0.137)
tax rate	0.253***	0.846***	0.0897
	(0.0909)	(0.206)	(0.0733)
age	0.00412***	0.00323	0.00416***
	(0.00138)	(0.00301)	(0.00158)
ln(TA)	0.0649***	0.110***	0.0469***
	(0.0141)	(0.0268)	(0.0166)
male	-0.0341	-0.193*	0.0306
	(0.0703)	(0.109)	(0.0919)
family	0.0798	0.233**	0.0172
	(0.0518)	(0.0965)	(0.0580)
financial independence	0.0471	-0.0781	0.0995
	(0.147)	(0.205)	(0.206)
gdp growth	0.0217	-0.0330	0.0134
	(0.0196)	(0.0584)	(0.0240)
general economic outlook	-0.407***	-0.349***	-0.428***
	(0.0451)	(0.0782)	(0.0561)
financial pressure	-0.339***	-0.430***	-0.268***
	(0.0436)	(0.0867)	(0.0567)
firm specific outlook	-0.176***	-0.176*	-0.185***
	(0.0442)	(0.0931)	(0.0536)
Altman Z-score	0.160***	0.150***	0.182***
	(0.0254)	(0.0443)	(0.0351)
Country FE	YES	YES	YES
Wave FE	YES	YES	YES
Sector FE	YES	YES	YES
Observations	5,803	2,088	3,715
Pseudo R-squared	0.143	0.174	0.106

Figure 4: Hypothetical approval likelihood
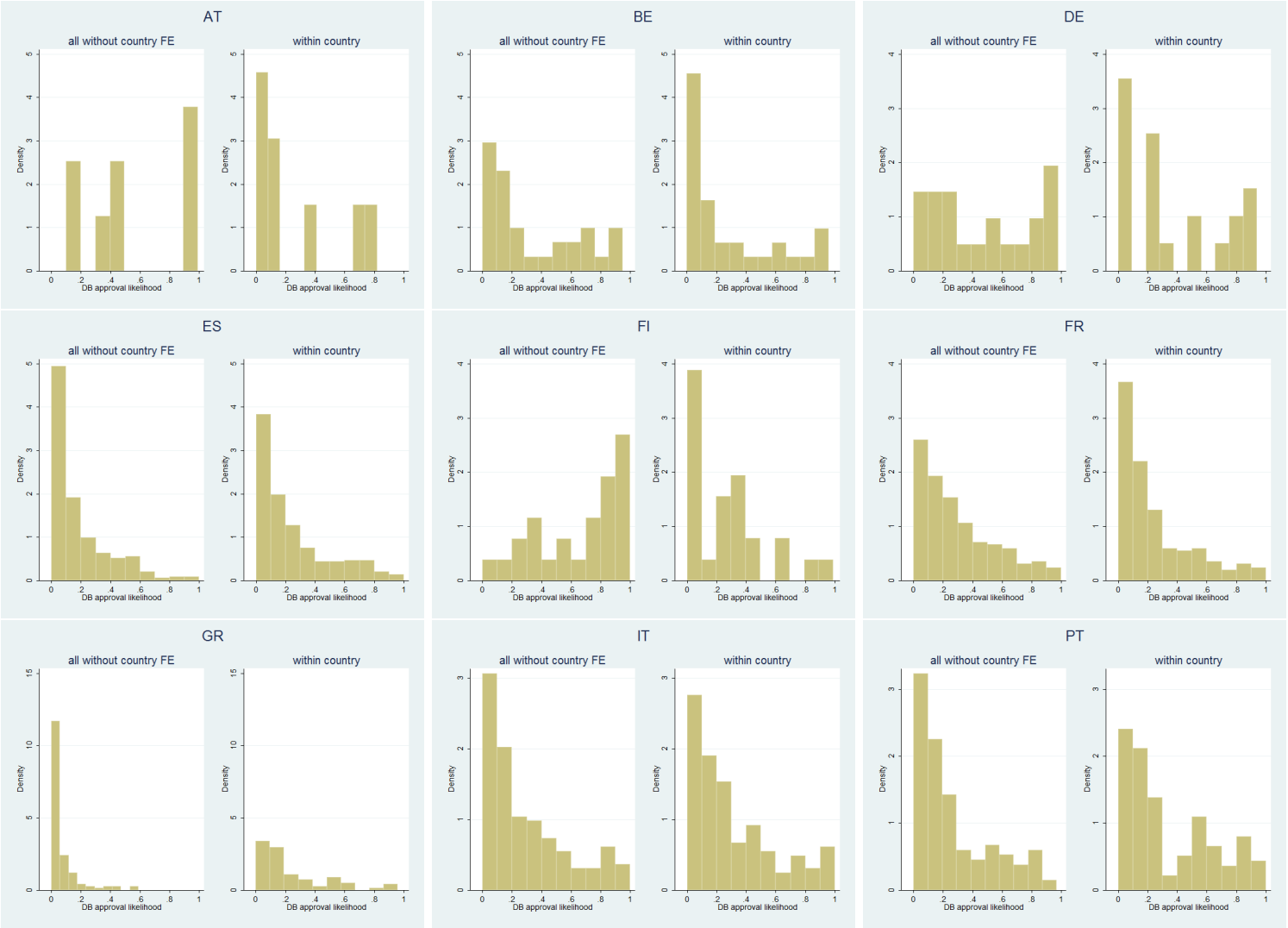
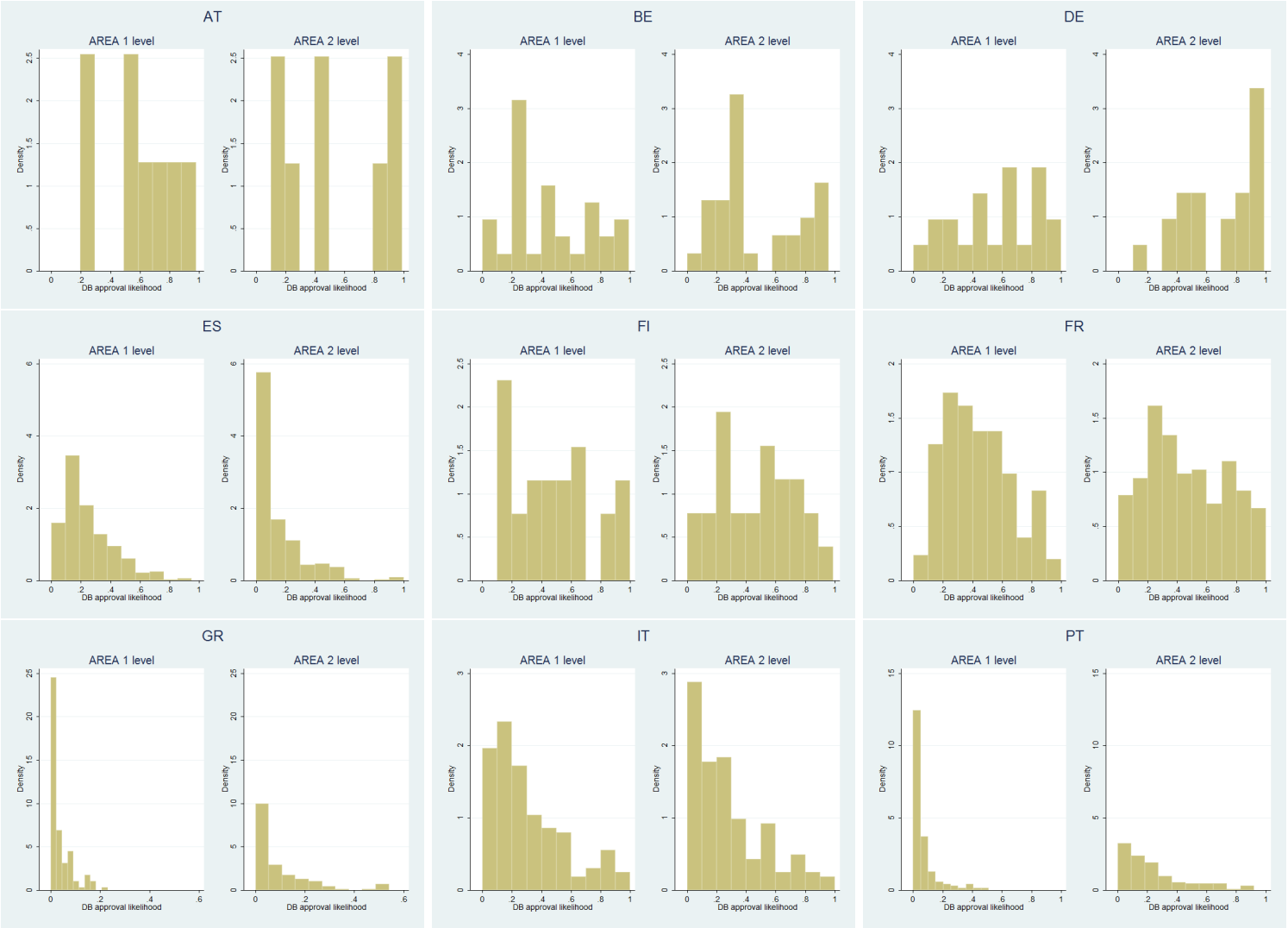Figure 5: Hypothetical approval likelihood

Table 10: The real effects of discouragement when the approval likelihood is high (ALH)

The Table shows the output of 2SLS regressions of empirical model (6). The endogenous variable DB^{ALH} is instrumented by *fincon*, an indicator of financial constraints. DB^{ALH} equals 1 if DB=1 and the predicted approval likelihood of the firm is higher than median predicted approval likelihood of discouraged borrowers, and equals 0 if DB=0. *Fincon* is a dummy which equals 1 if a firm states that 'access to finance' is its most pressing problem, and 0 otherwise in question q0 of the SAFE survey. See Table 7 in the Appendix for a definition of the variables used. Robust standard errors in parentheses are clustered at the country-wave level. *** p<0.01, ** p<0.05, * p<0.1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS
Dependent var	Investment growth			Employment growth			Asset growth		
DB^{ALH}	-1.148***			-0.534**			-0.585***		
	(0.315)			(0.219)			(0.168)		
DB^{ALH} vs Rejected		0.235			0.268*			0.205	
		(0.195)			(0.153)			(0.127)	
DB^{ALH} vs Approved			-0.493***			-0.139			-0.146*
			(0.152)			(0.105)			(0.0797)
lagged investment growth	0.0555***	0.114***	0.0713***						
	(0.0148)	(0.0305)	(0.0181)						
lagged employment growth				0.0379**	0.0780**	0.0501**			
				(0.0187)	(0.0356)	(0.0200)			
lagged asset growth							0.0539***	0.122***	0.0612***
							(0.0137)	(0.0234)	(0.0152)
Control VARs	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Wave FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Sector FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
First-stage F-statistic	12.9	11.6	30.9	12.8	10.3	30.6	12.9	11.5	31.9
Observations	5,083	1,668	4,061	4,719	1,480	3,803	5,138	1,684	4,109
R-squared	0.052	0.068	0.060	0.112	0.136	0.111	0.106	0.124	0.103

Table 11: Are discouraged borrowers risky firms? The role of bank screening errors?

The Table shows the output of OLS regressions, or the marginal effects of a probit regression of empirical model (8). The respective dependent variable is one of the following risk measures: *Altman Z-score*, *financial pressure* or *firm specific outlook*. The following variables fall under the scope of the term Control VARs: *profit margin*, *trade credit*, *R*, *tax rate*, *age*, *ln(TA)*, *male*, *family*, *financial independence*, *gdp growth* and *general economic outlook*. See Table 7 in the Appendix for a definition of the variables used. Robust standard errors in parentheses are clustered at the country-wave level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	OLS	probit	probit
Dependent var	Altman Z-score		financial pressure		firm specific outlook	
	≥ median age & size	< median age & size	≥ median age & size	< median age & size	≥ median age & size	< median age & size
DB	-0.227***	-0.285***	0.120***	0.0255	0.228**	0.0914
	(0.0611)	(0.0630)	(0.0450)	(0.0196)	(0.0909)	(0.0606)
Control VARs	YES	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES	YES
Wave FE	YES	YES	YES	YES	YES	YES
Sector FE	YES	YES	YES	YES	YES	YES
Observations	2,422	2,349	2,422	2,349	2,366	2,331
(Pseudo) R-squared	0.504	0.387	0.361	0.307	0.212	0.204