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Judicial Inefficiency and The Default of Zombie Firms

Serena Fatica*, Tommaso Oliviero†, and Michela Rancan‡

Abstract
Using a large sample of European enterprises, we document that companies' default probability is significantly larger when they experience negative end-of the year equity (zombie status) in the year prior to default. Zombie firms are more likely to default in the short run in countries with more efficient judicial insolvency procedures. To establish a causal link between judicial efficiency and the default probability of zombie firms, we exploit a reform of the court districts in Italy that generates exogenous variation in trial lengths. This country-level analysis corroborates the findings of a cleansing effect of judicial efficiency that limits the persistence of zombie firms in the economy.

JEL Classification: G33; K22; L25; O52

Keywords: Default; Zombie Firms; SMEs; EU-27; Judicial Efficiency.

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1 Introduction

In recent decades, the share of zombie firms, risky and unviable companies that manage to avoid immediate default, has increased throughout the world (Altman *et al.*, 2024; Albuquerque and Iyer, 2024), and especially in advanced economies (Adalet McGowan *et al.*, 2018; Banerjee and Hofmann, 2022). The rise and persistence of zombie firms in the economy is the result of several factors. Poor bank health creates conditions that sustain lending to zombie firms (Peek and Rosengren, 2005), in particular during periods of low interest rates (Andrews and Petroulakis, 2019; Acharya *et al.*, 2024) or in the presence of weak insolvency regimes (Ponticelli and Alencar, 2016; Becker and Ivashina, 2022). Although insolvent, zombie firms normally survive due to inefficient credit market conditions or government support, and weigh heavily on economy-wide outcomes, decreasing aggregate productivity and creating negative spillovers to other viable companies (Caballero *et al.*, 2008; Albuquerque and Iyer, 2024). Moreover, inefficient debt resolutions tend to make recessions deeper and longer in advanced economies, due to the presence of zombies (Jordà *et al.*, 2022).

Thus, it is of primarily importance to assess whether, and to which extent, efficient law enforcement may facilitate the exit of zombie firms. This is the focus of the paper. We show two sets of empirical tests. First, using a large sample of enterprises in the European Union (EU-27),[1] we show that in countries characterized by higher inefficiency of resolving insolvencies, measured by trial length, zombie firms are less likely to default in the short run (that is one year ahead the entrance into the zombie status). In that, our results confirm findings in related cross-country studies (for instance, Becker and Ivashina, 2022; Albuquerque and Iyer, 2024; Altman *et al.*, 2024), although we use a different sample and empirical methodology. Second, to estimate the causal impact of judicial efficiency, we rely on a quasi-natural experiment that generates variation in judicial efficiency orthogonal to the status of the economy, a feature that is hard to observe in a cross-country setting. Specifically, in this exercise, we take advantage of a

[1] We use a large sample of about 60 mil. observations in the period 2007-2018; see Section 2 for details.

reform that generates variation in judicial efficiency for a group of Italian courts from 2013 and replicate the cross-country analysis for the subsample of firms affected by the reform.[2] Our findings confirm the presence of a causal link between judicial efficiency and the default of zombie firms.

For our first empirical tests, we assemble a large sample of companies that are actively operating in the EU-27, as well as companies in financial distress and those in default status. Our sample comprises companies of all sizes, including micro firms (that is, enterprises with less than 10 employees and at most 2 million euros of total assets), which are usually disregarded in similar empirical analyses.[3] We argue that analyzing insolvency including micro enterprises is important, for at least two reasons. First, micro firms are relevant from an economic and a social point of view. Indeed, they account for about 86% of companies in the EU-27 (and for about 48.4% of total employment), with a large representation in all European countries and industries.[4] Second, micro firms are, on average, younger and more financially fragile, that is they are more leveraged and less profitable than larger enterprises. As a consequence, they are unconditionally more likely to become zombies and, possibly, default.

One key issue in studies on zombie firms is how to pinpoint these unviable firms in the data. In our favorite specification, we follow the strategy in Bonfim *et al.* (2023) and define as zombie a firm that has negative end-of-the year book equity. We prefer this definition for two reasons. First, negative end-of-the year equity identifies firms that entered in distress because of a large equity shortfall (Carletti *et al.*, 2020). Second, from a purely legal perspective, negative book equity represents an insolvent status in most European jurisdictions, as it represents the premise to file for bankruptcy or to enforce bankruptcy by creditors, unless the firm replenish its capital. Negative end-of-the year equity is not a rare event: the share of companies with negative equity in our

[2]Notice that we are not the first to exploit such reform. In particular, Pezone (2023) has studied the effects of the reform by analyzing its employment effects.

[3]Few works pursue a similar direction in their analysis focusing on small firms (Sakai *et al.*, 2010; Kim *et al.*, 2015), but with country-specific samples (Korea and Japan, respectively).

[4]The reader may refer to Fatica *et al.* (2022) for a comprehensive descriptive analysis of micro firms in the EU-27.

EU-27 sample is, on average, around 20%, with most of them being small and micro firms.[5]

With our definition of zombie firms at hand, we then study their default probability. In detail, we start from the default model developed by Beaver *et al.* (2019), and investigate the determinants of corporate default disentangling the impacts of firm-level variables - such as profitability, book leverage, earning before taxes and interest (over total liabilities), company size (as measured by the log of total assets) - as well as aggregate factors, including notably the sector bankruptcy rate (i.e., the proportion of firms filing for bankruptcy in each sector-country year). We then augment the model with the indicator for zombie firms. The results highlight that, keeping the characteristics at the firm and sector level constant, the status of zombie is an important determinant of corporate default especially for micro and small companies.[6] Next, we assess the role played by country-level institutional quality in driving the observed default dynamics of zombies. In particular, we exploit cross-sectional heterogeneity across the EU-27 member states according to their judicial efficiency. An extensive literature has documented the importance of creditors' rights and enforcement procedures (Porta *et al.*, 1998; Davydenko and Franks, 2008; Djankov *et al.*, 2008), and few works relate these institutional factors specifically to bankruptcy (Claessens and Klapper, 2005; Davydenko and Franks, 2008). We focus on an important dimension of national bankruptcy frameworks, that is the length of insolvency proceedings, which captures the time for creditors to recover their credit through reorganization, liquidation or debt enforcement (foreclosure or receivership) proceedings. We find that that zombies are more likely to default in countries that display more efficient systems, measured by the time taken to resolve insolvencies. Conversely, distressed firms in less efficient jurisdictions are more likely to survive in the short run. Results

[5]The literature has provided alternative identifications of zombie firms, mostly based on balance sheet information for private companies. In line with related papers (the reader may refer to Alvarez *et al.* (2023) for a recent taxanomy of zombie firms), we also employ an alternative definition of zombies using the Interest Coverage Ratio; results are presented in the robustness check section of the paper.

[6]This result is in line with Orlando and Rodano (2020) who analyze a large sample of Italian companies and find that undercapitalization is a good predictor of corporate insolvency and firm dissolution.

are robust to the inclusion of different sets of fixed effects (country-year, industry and size-category), additional firm-level controls, and to the use of an alternative definition of zombie. We also find that our baseline results are mostly driven by micro and small firms.

In the second part of the paper, to establish causality in the link between judicial inefficiency and the default of zombie firms, we rely on the Italian court reform that took effect in 2013. The reform aimed to gain efficient scale of Lower Courts by forcing the merge of 26 local courts with 23 preexisting adjacent courts. The reform was put forward by the non-political government appointed in 2011 in the wake of the sovereign debt crisis and was largely unexpected and not driven by local economic conditions. The merge between courts with different preexisting levels of efficiency, as measured by trial length, created an exogenous variation in the judicial efficiency faced by firms operating in the local areas affected by the merge. We exploit the cross-sectional and time variation induced by the reform using an instrumental variable approach similar to Pezone (2023). Two-stage least squares (2SLS) estimates for the subsample of Italian firms confirm that zombie firms operating in geographies with more efficient judicial systems are more likely to default. The 2SLS estimates are larger in magnitude, suggesting that OLS estimates are downward biased. Consistently with the above findings, these sets of results are robust to a battery of fixed effects, additional firm-level controls, and an alternative definition of zombie firms.

Our paper contributes to the literature on the role of judicial efficiency for economic outcomes. Focusing on private companies, Li and Ponticelli (2021) find that the introduction of specialized courts in China expedited insolvency resolutions, and favored a reallocation of employment out of zombie firms. Reduced court congestion further improves other outcomes, as evidenced by fewer small firm liquidations and improved resolution times for larger firms in less busy courts (Iverson, 2018). Efficient judicial systems also affect companies' financial conditions. For instance, they lower credit costs, increase credit availability, and reduce non-performing loans, particularly for

high-risk firms (Rodano, 2021). Furthermore, evidence from Spain shows that inefficiencies in the court system drive firms towards informal mechanisms such as private negotiations, delaying court filings until financial distress becomes severe (Mruk *et al.*, 2019). These inefficiencies increase the cost of financial intermediation and ultimately act as a drag on economic performance (Laeven and Majnoni, 2003; Srhoj *et al.*, 2023).

There is also direct evidence that the design of insolvency regimes is an essential element to resolve financial distress and improve aggregate productivity. Strong insolvency frameworks, characterized by low restructuring costs and streamlined procedures, are associated with higher productivity, better resource allocation and higher employment (Davydenko and Franks, 2008; McGowan *et al.*, 2017; Carreira *et al.*, 2021; Pezone, 2023). In the same spirit, our paper supports the idea of a cleansing effect of judicial efficiency in limiting the persistence of zombie firms in the economy. By reducing the time for liquidating ailing firms, a well-functioning insolvency framework may ultimately enable an efficient reallocation of resources towards viable companies and new entrants, allowing them to grow bigger and gain market shares.

The rest of the paper is organized as follows. Section 2 describes our data and summary statistics. Section 3 presents our empirical results based on the EU-27 sample. Section 4 presents results from the Italian reform. Section 5 shows robustness checks to empirical analyses and Section 6 concludes.

2 Data and empirical strategy

We draw firm-level data from the Orbis database provided by Moody's Bureau Van Dijk. Specifically, we assemble a large sample of non-financial companies located in EU-27 for which information on the status of activity is reported.[7] We initially select all companies for which key balance sheet items (total assets, total liabilities, profits

[7] In Orbis, the variable "status" broadly takes the following values: Active, Dissolved, In liquidation, Inactive, Bankruptcy, plus some rare hybrid cases like Active (default of payments), Active (dormant), Unknown.

before taxes and financial expenses, financial expenses) are not missing. Then, following Kalemli-Özcan *et al.* (2024), for each company we retain unconsolidated accounts (U1 or U2), or consolidated accounts (C1) when unconsolidated accounts are not available.[8] The final sample comprises about 58 million observations over the period 2007-2018. The panel is reasonably balanced, with the cross-sectional coverage becoming more stable as from 2011.[9] In addition, in the cross-country analysis, we complement our firm-level data with information on the institutional framework for resolving financial distress and dealing with corporate insolvency drawn from the World Bank - Doing Business Project (for details see Djankov *et al.*, 2008). In the tests where we exploit the Italian reform, we rely on data on each local courts' efficiency, with data sourced from Italian Minister of Justice.

2.1 Empirical model

Corporate default has been extensively studied in the literature. The seminal contribution of Altman (1968) has been adapted to different contexts (Claessens *et al.*, 2003; Altman *et al.*, 2017), and further extended in more recent papers (see, e.g., Chava and Jarrow, 2004; Bonfim, 2009; Bauer and Agarwal, 2014).

To predict firm default we adopt the predictive model proposed by Beaver *et al.* (2019), augmented with relevant variables for zombie firms and judicial efficiency, as follows:

$$y_{i,t+1} = \beta_1 NROAI_{i,t} + \beta_2 ROA_{i,t} + \beta_3 LTA_{i,t} + \beta_4 FTL_{i,t} + \beta_5 SIZE_{i,t} + \beta_6 Bankrate_{s,c,t} + \beta_7 Zombie_{i,t} + \beta_8 JI_{c,t} + \beta_9 Zombie_{i,t} \cdot JI_{c,t} + \gamma_c + \gamma_t + \epsilon_{i,t}, \quad (1)$$

[8] Some firms have duplicate reports within a year. In those cases, we keep only the records that closer to the latest accounting record in each given year.

[9] Key variables derived from income statements and balance sheets have been winsorized at the 5%-95% level to account for outliers.

where the subscript i refers to the firm and t to time. Our dependent variable, $y_{i,t+1}$, is a dichotomous indicator that takes the value of one for a bankrupt firm in year $t+1$, and 0 otherwise. We consider a firm as bankrupt, or in default, when its status is recorded as "Dissolved" or "In liquidation" or "Inactive" or "Bankruptcy" or "Insolvency proceedings" in Orbis.

We include a set of time-varying firm characteristics associated to the probability of default. $NROAI_{i,t}$ is a dummy variable equal to one if the return on assets ($ROA_{i,t}$) is negative, 0 otherwise. $ROA_{i,t}$ is the net income over total assets. $LTA_{i,t}$ is the ratio of total liabilities over total assets. $ETL_{i,t}$ is the ratio of financial expenses to total liabilities. $SIZE_{i,t}$ is the natural logarithm of the firm's total assets. In the spirit of previous works that show the importance of industry characteristics on bankruptcy (see, e.g., Zingales, 1998), we also include the variable $Bankrate_{s,c,t}$, which measures the bankruptcy rate of sector s in country c at time t. This variable captures bankruptcy waves related to industry-specific shocks or local market conditions.

Theoretical arguments and results from the empirical literature suggest that non-profitable firms usually display a higher probability of default. Hence, we expect a positive coefficient for $NROAI_{i,t}$ and negative coefficients for both $ROA_{i,t}$ and $ETL_{i,t}$. Moreover, the probability of default is expected to increase with leverage ($LTA_{i,t}$) and with bankruptcy waves that occur at country-sector-year level ($Bankrate_{c,s,t}$), while it is likely to be smaller for larger firms ($SIZE_{i,t}$).

To answer our research question, we supplement the baseline specification in Beaver *et al.* (2019) with a measure of zombie firms and their interaction with judicial efficiency. Specifically, $Zombie_{i,t}$ takes unit value if a firm has negative end-of-the fiscal year book equity. This definition, adopted in previous works (see, e.g., Carletti *et al.*, 2020; Bonfim *et al.*, 2023), pinpoints firms in distress that are legally insolvent. In line with other recent contributions (for instance Adalet McGowan *et al.*, 2018; Acharya *et al.*, 2024), we also employ an alternative strategy to identify zombie firms using the Interest Coverage (IC) ratio. In this case, we define as zombie firms those with an IC

ratio lower than one for three consecutive years.[10] $JI_{c,t}$ measures the judicial inefficiency in each country-year and is proxied by the time of insolvency proceedings, that is the length for creditors to recover their credit through reorganization, liquidation or debt enforcement (foreclosure or receivership) proceedings (in years). The coefficient of interest β_9, that is attached to the interaction between $Zombie_{i,t}$ and $JI_{c,t}$, measures how the propensity of a zombie firm (relative to a non-zombie firm) to default in $t+1$ depends on the efficiency of the judicial system of the country where it is domiciled.

The model includes country fixed effects (γ_c), and year fixed effects (γ_t), which account for country time-invariant differences, and for time effects common to all companies in our sample, respectively. By including these fixed effects, the model allows us to quantify the impact of country and time default patterns, as well as firm specific characteristics. To account for potential correlation in the error terms, we cluster standard errors at the country-year level. Estimates presented in the next sections are obtained running a linear probability model.[11]

To gauge potential differences in the determinants of default across firms' size classes, we split the sample of firms in three groups according to their dimension: micro, small, and medium plus large firms. We attribute firms to the different size categories by using the official classification adopted by the European Commission and sum-up medium and large firms due to the limited number of large firms in our sample.[12] Hence, we estimate the model in Equation (1) on the aggregate sample, and also on the subsamples of differently-sized companies.

[10] Main results are replicated using this alternative definition and are presented in Table A6 in the Appendix.

[11] This strategy has been preferred to non-linear probability models, such as logit, due to the presence of many fixed effects, and the large number of observations. Our estimates are qualitatively confirmed when using a logistic function. Baseline results using logit estimates are available upon request.

[12] The classification is available at $https://ec.europa.eu/growth/smes/sme-definition_en$ and is based on average values of total assets, turnover and employees of each firm observed in the period of analysis.

2.2 Judicial inefficiency and identification strategy

While the role of judicial inefficiency may be an important predictor of firms' default in a cross-country setting, the specification in model (1) does not necessarily provide evidence of a causal effect. To establish a causal relationship between judicial inefficiency and firm default, we exploit a judicial reform implemented in Italy in 2013. The reform entailed a reorganization of the court districts.[13] The Italian civil courts system was traditionally structured around 165 courts, with varying district size, and significant heterogeneity in trial length. In 2011, with the worsening of the sovereign debt crisis, measures to rationalize the organization of the Italian legal system were approved, including the suppression of twenty-six courts. The reorganization became effective since September 2013. Some pre-existing courts were forced to merge with others, those merged with less (more) efficient courts, after the reform, witnessed an decrease (increase) in efficiency. By following Pezone (2023), our identification strategy exploits these changes using variation in the trial length of affected districts. In the literature (Visaria, 2009; Chemin, 2012; Aiyar *et al.*, 2015), trial length is considered as a reliable proxy of the quality of judicial enforcement. The variable is calculated using pending, incoming and resolved cases and is defined as follows:[14]

$$Length = \frac{Pending_{t-1} + Pending_t}{Incoming_t + Resolved_t}$$

Starting from the measure of trial length, we then compute the variable Δ_{2012} which is the pre-reform difference between the estimated length trials if courts were already merged and the actual length of trials in 2012.

$$\Delta_{m,j,2012} = Log(\overline{Length_{j,2012}}) - Log(Length_{m,j,2012})$$

[13] Reforms in reorganization, liquidation and insolvency regimes in specific countries have been used to identify causal mechanisms also in Bose *et al.* (2021); Jose and Borad (2021); Srhoj *et al.* (2023).

[14] See Palumbo *et al.* (2013); Pezone (2023) for a discussion and validation of this measure.

For a firm located in district m, this measure reflects the predicted change of trial length and captures the hetereogenous effect of the reform. The value is positive for pre-reform more efficient districts merged with less efficient ones; in this case, these were penalized by the reorganization. On the contrary, its value is negative for districts with longer trial length that merged with more efficient ones. We then adopt a two-stage least-squares using $\Delta_{m,j,2012} \times Post_{2013}$ as instrument to predict the $Length_{i,m,j,t}$ of firms i, located in pre-reform district m that become part of district j after the reform. Importantly, the reorganization of districts was not driven by the economic environment or other institutional characteristics, which allows us to use it as an exogenous instrument.

2.3 The EU-27 sample and the Italian sample

In the first set of analysis, we examine how national bankruptcy regimes affect the probability of zombie firms becoming insolvent. Table 1 presents the sample summary statistics for the full sample. In column 1 we display summary statistics for the full sample of firms, while in column 2 we consider only active firms (at time t+1), and firms in default (at time t+1) in column 3. The share of zombie firms is 17% among active firms, but it is twice as large among firms in default. This pattern is confirmed when considering the alternative definition for zombies based on the IC ratio. Looking at the other characteristics, we can notice that, on average, the group of firms in default shows a larger incidence of companies with negative end-of-the-year profits and negative ROA. This is in line with the average low level of earnings before taxes and interests over total liabilities, which is well below the values of active firms. As expected, the ratio of liabilities over TA is larger for firms in default, which are characterized by higher levels of indebtedness. The average value of *Bankrate* is significantly larger in the subgroup of firms in default. This suggests that there is an unconditional correlation between bankruptcy waves at the country-sector-year level and the default of individual firms. Default is also more likely among smaller firms: with 92% of de-

faulted enterprises classified as micro. Micro firms represent 86% of the total number of enterprises in our sample, small firms make up 11%, and medium-large firms represent approximately 4%. We draw our cross-country variable for judicial inefficiency from the World Bank. We consider a measure of the speed of resolving insolvency (in years). In our sample of EU-27 countries, the average number of years to resolve insolvency is 2.11 (with a standard deviation of 1.23) and the value is similar in the two sub-groups of firms. Hence, even within the EU-27, our measure for judicial inefficiency varies considerably across countries and over time.

In the second set of the analyses, we focus on the Italian subsample of firms and exploit the reorganization of the Italian court districts as a quasi-natural experiment. By creating exogenous changes to the judicial efficiency within courts, the reform allows us to establish a causal relationship between the judicial insolvency regime and the default of zombie firms. Table 2 displays the summary statistics for the Italian subsample. Italian firms represent around 16% of the European sample during the period we consider around the reform (2009-2016). In column 1 we display summary statistics for the full sample of Italian firms. Compared to the EU sample, Italian firms are less profitable, hold less cash, and have a smaller IC ratio. Conversely, other financial variables such as liabilities over TA, financial expenses as well as the distribution across size classes do not display substantial differences. In column 2 we consider only active firms at time t+1, and in column 3 firms in default in t+1. Around 10% of active firms are zombies, while the share is three times as large among firms in default. Similarly to the European sample, the subsample of defaulted Italian firms display, more frequently, a negative ROA, larger liabilities over TA and smaller size. These patterns corroborate the view that there are recurring differences among defaulted and active firms. Here, the judicial inefficiency measure, $JI(length_{j,t})$, is defined at the district (and year) level. We use data from the Italian Ministry of Justice that reports the district-level average length of civil proceeding to build our measure of judicial inefficiency. Although not directly comparable with the World Bank index, we find

that the average length of resolving insolvency is similar: its average value is larger than one year, and it is approximately the same for active firms and firms in default.

3 Empirical results: EU 27

Table 3 reports estimates of the corporate default model for the full EU sample. In model 1 we include firm-specific variables, as well as year and country fixed effects. The coefficient of *NROAI* is positive and statistically significant indicating that negative profitability is an important determinant of future default. Consistently, also *ROA* has a negative coefficient. The coefficients for *LTA* and *FTL* are both positive and statistically significant, suggesting that firms that are more leveraged and incur higher financial expenses are more likely to default. As expected, firm size is negatively correlated with the default probability: larger firms are less likely to go bankrupt. The coefficient of *Bankrate* – the bankruptcy defined at the sector-country-time level – is equal to 0.99 and highly statistically significant throughout the different model specifications. Quantitatively, a 10 p.p. increase in the sector default rate leads to a 9 p.p. increase in the likelihood that a firm in the same sector-country-time will file for bankruptcy in the subsequent year. The magnitude of the effect is fairly stable and robust to the inclusion of different sets of fixed effects that capture variation over time, as well as country and time differences. This indicates that industry distress and solvency conditions in each country are crucial to identify the determinants of firms' default. Moreover, the results are suggestive of a high risk that bankruptcy waves are triggered once insolvency starts to become material in a given sector.

Model 2 includes the variable *Zombie* using the financial distress definition. The coefficient estimate on this variable is positive and highly statistically significant. Quantitatively, companies that experience financial distress (i.e. negative equity) are by about 2 p.p. more likely to go bankrupt in the subsequent year, *ceteris paribus*. Hence, everything else equal, negative equity represents an important source of vulnerability,

as it substantially increases the one-year ahead probability of default.

Next, in model 3 we formally examine how national bankruptcy regimes affect the probability of firms becoming insolvent. We include the variable *JI(resolving insolvency)*, which measures the length of insolvency proceedings, defined as the time for creditors to recover their credit through reorganization, liquidation or debt enforcement (foreclosure or receivership) proceedings. As such, the variable is a reliable proxy of the inefficiency level of the judicial system of a country in managing corporate bankruptcy. The positive coefficient suggests that the length in resolving insolvencies has a positive and statistically significant impact on the likelihood of going bankrupt. We also include the interaction term between *Zombie* and *JI(resolving insolvency)*. Our coefficient of interest is negative and statistically significant, indicating that in countries with more inefficient judicial systems zombie firms are less likely to go bankrupt. Results are confirmed also in model 4 where we saturate the specification with country $\times$ year fixed effects. Quantitatively, zombie firms display a larger conditional probability of default one year ahead of about 5 p.p, while the marginal impact of resolving insolvency is about -0.014 for countries where resolving insolvency takes one year, keeping other variables constant. In words, reducing the time needed for resolving insolvency from three to one year increases the probability of default of a zombie firm by about 3 p.p. Overall, this evidence suggests that national bankruptcy regimes determine how orderly ailing firms can exit the market or how speedily and efficiently those that are still viable can be restructured.

4 Empirical Results: Italy

In this section we provide evidence of causal effects of judicial efficiency. We focus on Italy, one of the EU-27 countries included in our initial sample, with the aim to exploit the 2013 judicial reform of court districts implemented there.

4.1 OLS

Before getting to the 2SLS analysis, we validate the Italian subsample by replicating the OLS model for these firms. The only difference with respect to version of the model illustrated in Section 2.1 is the structure of the fixed effects, which needs to account for within-country variability in localized confounding factors. Hence, we include year and municipality fixed effects and, alternatively, municipality and region-year fixed effects. There are 20 regions and 7351 municipalities of different size. By including municipality and region-year fixed effects we control for differences across areas to capture geographic patterns in the firms' default dynamics (in the same spirit we have included country-year fixed effects in the cross-country analysis). Standard errors are clustered at the court district-year levels, consistent with the granularity of the measure for judicial efficiency used in this specification. Results are displayed in Table A2 in the Appendix. Column 1 shows that the coefficients on the firm-level covariates are very similar to the estimates in Table 3. The variable $Bankrate_{s,IT,t}$ measures the sectoral bankruptcy rates in Italy over time. The coefficient is again positive and highly statistically significant. The point estimate of 0.62 suggests that a 10 p.p. increase in the sector default rate leads to a 6 p.p. increase in the likelihood that a firm in the same sector will file for bankruptcy in the subsequent year. In column 2 we include the indicator variable for zombies, with an estimated coefficient that is also positive and statistically significant. As specified above, the variable judicial inefficiency is the average length of civil proceedings retrieved from the Italian Ministry of Justice. The measure, defined at the district level, varies over time with higher values indicating more inefficient judicial districts. Column 3 includes $JI(length_{j,t})$ and its interaction with the variable for zombie firms. We find that the coefficient of judicial inefficiency is positive while the interaction term is negative. Both are statistically significant at the highest level. This suggests that zombie firms are less likely to file for bankruptcy in the following year in those districts that have longer trial lengths. The result is confirmed also in column 4, where we control for region-year fixed effects capturing

time-varying differences due to business cycle across the Italian regions. Similarly to the cross-country analysis, this finding confirms that judicial inefficiency negatively affects the probability of orderly exit from the market of zombie firms, although still not addressing endogeneity concerns.

4.2 IV strategy

The previous evidence, both using the cross-country and the entire Italian samples, show that legal inefficiencies negatively interact with the zombie status of firms in determining their default rates. However, the relationship identified via OLS may be the result of a spurious correlation: arguably, judicial systems are slower in those countries (or districts) where there are more firms in distress. Having more firms filing for bankruptcy increases workload of courts, which, in turn, lengthens judicial proceedings and delays insolvency resolutions. To address this issue we need an instrumental variable that influences judicial inefficiency but is not directly affecting the dependent variable (once all the explanatory variables included in the analysis are adequately considered). As outlined in Section 2.2, the reform of the 2013 Italian judicial system provides exogenous variation in the average length of civil proceeding in districts affected by the reorganization of courts. Thus, we perform a 2SLS estimation where we use $\Delta_{m,j,2012} \times Post_{2013}$ as an instrument for the judicial inefficiency ($JI(length)_{j,t}$). Specifically, here we consider the judicial inefficiency defined as the $JI_{i,m,j,t}$ of firms i, located in pre-reform district m that become part of district j after the reform, restricting our sample to those firms located in the districts affected by the restructuring. The variation in the first stage analysis is defined by the following regression model:

$$JI(length)_{i,m,j,t} = \lambda_1 \Delta_{m,j,2012} \times Post_{2013} + \eta_{MU} + \gamma_{r,t} + \epsilon_{i,t}, \tag{2}$$

where the dependent variable ($JI(length)$) and the main independent variable (Δ)

have been described in Section 2.2, η_{MU} are municipality fixed effects (η_{MU}) and ($\gamma_{r,t}$) are region-year fixed effects. In the second stage analysis, the fitted values from the first-stage are used as main regressors in the default model, as follows:

$$y_{i,t+1} = \beta_1 NROAI_{i,t} + \beta_2 ROA_{i,t} + \beta_3 LTA_{i,t} + \beta_4 FTL_{i,t} + \beta_5 SIZE_{i,t} + \beta_6 Bankrate_{s,IT,t} + \beta_7 Zombie_{i,t} + \beta_8 \widehat{JI_{i,m,j,t}} + \beta_9 \widehat{Zombie_{i,t} \times JI_{i,m,j,t}} + \eta_{MU} + \gamma_t + \epsilon_{i,t}, \quad (3)$$

where all other firm-level and sector-level variables are defined as before. While equations 2 and 3 include municipality and region-year fixed effects, in most saturated models we include municipality-year fixed effects that, among all other factors, also naturally absorb the variation in local judicial efficiency.

From a theoretical standpoint, the key properties for instruments to be valid require that they are strongly correlated with the endogenous variable, that is judicial inefficiency (and its interaction with zombie) in our case, but they do not exert a direct impact on firm bankruptcy. The fact that reorganization of districts was not driven by local economic conditions or other institutional characteristics supports our choice for the reform as providing an exogenous instrument. Consistent with that, we do not find evidence of a differential effect of the instrumental variable on pre-reform changes in default rates of affected firms with respect to 2013, as displayed in Figure 1. On the contrary, we find a positive reduced form impact in the years following the reform, that confirms the impact of the increase in efficiency on default rates.

4.3 2SLS results

In Table 4 we report the estimate of the impact of the instrumental variable on judicial efficiency. This provides a test for the strength of the first stage regression. Column 1 includes year and municipality fixed effects, while in column 2 we include munic-

ipality and region-year fixed effects. Results show a positive impact of the theoretical change in efficiency before the reform ($\Delta_{m,j,2012}$) interacted with the post variable ($Post_{2013}$) on the length of the trials, suggesting that courts that merged with less efficient peers experienced increased inefficiency after the reform. The very low p-values indicate that the instrument is sufficiently strong.

Table 5, columns 3 and 4, show the estimates of the second stage regressions. Results from this analysis confirm the findings from the OLS regressions discussed above. Zombie firms display a larger probability of default one-year ahead, but this impact is lower for firms operating in areas characterized by more inefficient courts. Notice that here the sample analysis comprises those firms located in districts affected by the court restructuring following the reform, for a total of around 890,000 observations. In columns 1 and 2 of Table 5 we provide OLS estimates using the same sample and specification to allow a more direct comparison with the 2SLS estimates. Specifications in columns 1 and 3 include municipality and region-year fixed effects, while in columns 2 and 4 we include municipality-year fixed effects.

The OLS results in the analyzed subsample are consistent with the findings in Table A2, where we include all Italian companies. This confirms that this subsample of firms is homogenous to the entire Italian sample. Importantly, 2SLS estimates provide the tests for our main hypothesis on the impact of judicial efficiency of zombie firms. With reference to the most saturated model in column 4, we find that zombie firms display a larger conditional probability of default one year ahead of about 8 p.p; the marginal impact of resolving insolvency is about -4 p.p., that is one year difference in the length of resolving insolvencies halves the one-year ahead probability of default of zombie firms. In comparing OLS with 2SLS results, we find that the interaction coefficient in column 2 is about half with respect to the coefficient in column 4, suggesting that results under the first strategy are downward biased. Overall, these results confirm that judicial efficiency may be a large and significant driver of default of zombie firms in the short run.

5 Additional results and robustness tests

Motivated by the evidence that the share of zombie firms is very different across firms of different sizes, with a significantly larger incidence among micro firms, we replicate the analyses in column 4 of Table 3, and in column 4 of Table 5, for the sub-samples of micro, small and medium-large. The results, displayed in Table A3 and Table A7, consistently show that the impact of judicial efficiency on the one-year ahead default probability of zombie firms is mostly driven by the most financially vulnerable firms, that is micro firms and, to a lesser extent, by small firms.

Moreover, in this section, we provide some robustness checks to our main findings. First, we replicate the analyses in Table 3 and in Table 5 using an alternative definition of zombie firms based on the Interest Coverage (IC) ratio. A zombie is here defined as a firm with a IC ratio lower than 1 for three consecutive years. The drawback from this strategy is that we lose observations for starting years of the sample and for companies with limited time coverage. Despite the reduction in sample size, the estimation results from the cross-country sample (Table A5) and from the Italian sample of firms affected by the reform (Table A6) confirm our baseline findings.

Finally, we re-estimate the baseline default models adding other potential determinants of default, that is a measure of firm liquidity (*Cash over TA*), defined as cash and cash equivalent over total assets, and firm age (*Age*). Firms benefit from holding cash (Opler *et al.*, 1999), which in turn affects growth opportunities, asset liquidation, and financial distress, especially among smaller firms (Martínez-Sola *et al.*, 2018). Also, early empirical studies have highlighted the crucial role of firm age in firm dynamics and performance (Haltiwanger *et al.*, 2013). Additionally, we include industry and size-category fixed effects in all specifications. Results from the cross-country sample, as well as from the Italian subsample are displayed in Table A7 and in Table A8, respectively. We find that the cash ratio does not play a significant role in explaining the probability of default. By contrast, *Age* is negative and statistically significant, as

expected. Importantly, our main coefficients of interest are substantially unchanged after the inclusion of the additional observables and fixed effects.

6 Conclusions

In this paper, we study the determinants of corporate default using a large sample of companies from the EU-27 during the period 2007–2018, with a focus on zombie firms and judicial efficiency in resolving insolvencies.

Our findings indicate that the conditional default probability of zombie firms is, on average, higher than that of other firms, but its magnitude significantly depends on the jurisdiction in which the firms operate. Specifically, the probability is higher in countries that exhibit relatively faster processes for resolving insolvencies. This empirical regularity is primarily driven by micro-sized companies.

The paper addresses the common identification limitations of related cross-country analyses by leveraging a judicial reform that took place in Italy in 2013. Results from the subsample of Italian firms affected by the reform support the hypothesis that efficient insolvency resolution can ultimately facilitate the orderly liquidation of non-viable firms in the short term.

An implication of our results is that institutional reforms aimed at enhancing judicial efficiency can play a crucial role in reallocating resources from ailing firms to more productive ones, thereby maximizing potential productivity growth resulting from the exit of zombie firms. This cleansing effect of efficient judicial systems may imply larger number of defaults in the short-run, while resulting in a long-run decrease in default rates, and a reduction in the number of zombie firms in the economy.

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A Tables

Table 1: **Summary statistics: EU-27 sample (2007-2018).**

	Entire sample	$Fail_{i,t+1} = 0$	$Fail_{i,t+1} = 1$
Zombie (distress)	0.18	0.17	0.34
Zombie (IC ratio)	0.25	0.24	0.38
NROAI	0.34	0.34	0.53
ROA	0.01	0.01	-0.08
LTA	0.78	0.77	1.04
FTL	0.02	0.02	0.02
SIZE	12.23	12.26	11.45
Number of employees	20.17	20.55	9.64
Bankrate	0.04	0.04	0.08
IC ratio	25.41	26.06	8.66
Age	18.26	18.34	16.37
Cash over TA	0.20	0.20	0.21
JI(resolving insolvency$_{c,t}$)	2.11	2.11	2.06
Micro	0.86	0.86	0.92
Small	0.11	0.11	0.06
Medium	0.03	0.03	0.01
Large	0.01	0.01	0.00
Observations	47,778,099	45,788,932	1,989,167

Note: Detailed variable definitions can be found in Table A1 in the Appendix.

Table 2: **Summary statistics: Italian sample (2009-2016).**

	Entire sample	$Fail_{i,t+1} = 0$	$Fail_{i,t+1} = 1$
Zombie (distress)	0.13	0.10	0.31
Zombie (IC ratio)	0.30	0.29	0.46
NROAI	0.42	0.39	0.64
ROA	-0.03	-0.01	-0.12
LTA	0.80	0.76	1.01
FTL	0.02	0.02	0.02
SIZE	12.77	12.94	11.81
Number of employees	17.02	17.70	10.02
Bankrate	0.05	0.05	0.05
IC ratio	23.98	26.70	2.99
Age	18.21	18.60	15.44
Cash over TA	0.13	0.13	0.16
JI(length$_{j,t}$)	1.11	1.10	1.12
Micro	0.83	0.82	0.92
Small	0.14	0.15	0.07
Medium	0.02	0.02	0.01
Large	0.00	0.00	0.00
Observations	7,506,737	6,491,444	339,311

Note: Detailed variable definitions can be found in Table A1 in the Appendix.

Table 3: **Determinants of default rates: Evidence from EU-27.**
The table reports estimation results of the default model in equation 1. $Fail_{i,t+1}$ is a dummy variable equal to one if firm i files for bankruptcy in year $t+1$, and zero otherwise. $Zombie(distress)$ is a dummy variable equal to one if firm i reports negative values of shareholder funds in year t, and zero otherwise. $JI(resolving\ insolvency_{c,t})$ is the average time of insolvency proceedings in country c at time t. Detailed variable definitions can be found in Table A1 in the Appendix. Models 1-3 include country and year fixed effects, model 4 includes country $\times$ year fixed effects. Standard errors are clustered at the country-year levels. ***, **, and * indicate that the parameter estimate is significantly different from zero at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)
Dep. Var.		$Fail_{i,t+1}$		
NROAI	0.0181***	0.0155***	0.0152***	0.0152***
	(0.0017)	(0.0015)	(0.0015)	(0.0015)
ROA	-0.0151***	-0.0157***	-0.0174***	-0.0183***
	(0.0036)	(0.0034)	(0.0032)	(0.0030)
LTA	0.0159***	0.0076***	0.0089***	0.0079***
	(0.0019)	(0.0013)	(0.0013)	(0.0012)
FTL	0.0997***	0.0977***	0.0872***	0.0870***
	(0.0105)	(0.0105)	(0.0106)	(0.0105)
SIZE	-0.0075***	-0.0073***	-0.0072***	-0.0071***
	(0.0007)	(0.0007)	(0.0007)	(0.0007)
Bankrate	0.9949***	0.9947***	0.9995***	1.1338***
	(0.0725)	(0.0725)	(0.0728)	(0.0582)
Zombie (distress)		0.0188***	0.0485***	0.0493***
		(0.0025)	(0.0076)	(0.0077)
JI(resolving insolvency$_{c,t}$)			0.0027*	
			(0.0016)	
Zombie (distress) $\times$ JI(resolving insolvency$_{c,t}$)			-0.0137***	-0.0139***
			(0.0027)	(0.0028)
Observations	47,823,040	47,823,040	47,778,099	47,778,095
R-squared	0.0493	0.0499	0.0506	0.0549
Year FE	Yes	Yes	Yes	No
Country FE	Yes	Yes	Yes	No
Country-Year FE	No	No	No	Yes

Table 4: **Evidence from Italian reform - First stage.**
The table reports estimation results of the first stage of the 2SLS in equation 2. Model 1 includes year and municipality fixed effects, model 2 includes municipality and region $\times$ year fixed effects. Standard errors are clustered at the court district-year levels. ***, **, and * indicate that the parameter estimate is significantly different from zero at the 1%, 5%, and 10% level, respectively.

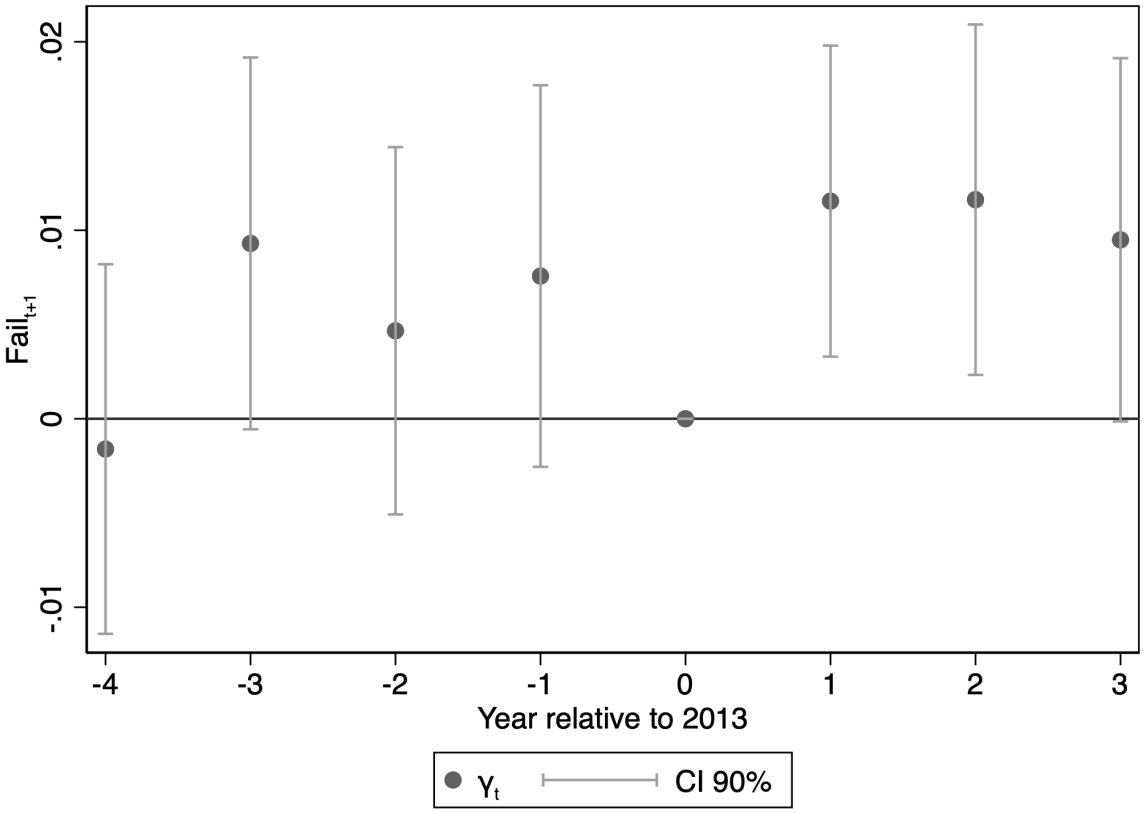
	$\text{Length}_{i,m,j,t}$	
$\Delta_{m,j,2012} \times Post_{2013}$	0.3658***	0.5669***
	(0.0791)	(0.1248)
Observations	929,414	929,414
R-squared	0.8129	0.8737
Year FE	Yes	No
Municipality FE	Yes	Yes
Region-Year FE	No	Yes

Table 5: **Determinants of default rates: Evidence from the Italian reform.**
The table reports OLS estimation results of the default model in equation 1 (models 1-2) and the second stage of the 2SLS in equation 3 (models 3-4). $Fail_{i,t+1}$ is a dummy variable equal to one if firm i files for bankruptcy in year $t+1$, and zero otherwise. $Zombie(distress)$ is a dummy variable equal to one if firm i reports negative values of shareholder funds in year t, and zero otherwise. $JI(length_{j,t})$ is the average length of civil proceedings in district j at time t. Detailed variable definitions can be found in Table A1 in the Appendix. Models 1 and 3 include Region-year and municipality fixed effects, models 2 and 4 include municipality-year fixed effects. Standard errors are clustered at the court district-year levels. ***, **, and * indicate that the parameter estimate is significantly different from zero at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)
Dep. Var.	$Fail_{i,t+1}$			
	OLS		2SLS	
NROAI	0.0093***	0.0093***	0.0092***	0.0092***
	(0.0008)	(0.0008)	(0.0008)	(0.0008)
ROA	-0.0711***	-0.0717***	-0.0706***	-0.0712***
	(0.0042)	(0.0042)	(0.0043)	(0.0043)
LTA	0.0279***	0.0276***	0.0278***	0.0276***
	(0.0014)	(0.0014)	(0.0014)	(0.0014)
FTL	0.1835***	0.1821***	0.1898***	0.1879***
	(0.0178)	(0.0179)	(0.0187)	(0.0188)
SIZE	-0.0082***	-0.0082***	-0.0082***	-0.0082***
	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Bankrate	0.5337***	0.5294***	0.5475***	0.5510***
	(0.0996)	(0.1010)	(0.1027)	(0.1035)
Zombie (distress)	0.0799***	0.0801***	0.0917***	0.0935***
	(0.0043)	(0.0043)	(0.0219)	(0.0226)
JI(length$_{j,t}$)	0.0003		0.0059	
	(0.0012)		(0.0049)	
Zombie (distress) $\times$ JI(length$_{j,t}$)	-0.0281***	-0.0280***	-0.0393**	-0.0407**
	(0.0033)	(0.0033)	(0.0197)	(0.0203)
Observations	890,266	886,522	843,287	839,626
R-squared	0.0496	0.0541	0.0276	0.0963
Municipality-FE	Yes	No	Yes	No
Region-Year FE	Yes	No	Yes	No
Municipality-Year FE	No	Yes	No	Yes

B Figures

Figure 1: **Exogeneity of the instrument**



Note: The graph shows the yearly coefficients relative to the baseline year (2013).

Supplementary Appendix

Table A1: **Variable definitions.**

Variable	Definition	Source
NROAI	Dummy variable equal to one if firm i's return on assets in year t is negative, and zero otherwise	Orbis
ROA	Return on assets for firm i in year t	
LTA	Ratio of total liabilities to total assets for firm i in year t	
FTL	Ratio of financial expenses to total liabilities for firm i in year t	
SIZE	Natural logarithm of the book value of assets of firm i in year t	
Bankrate	Proportion of firms filing for bankruptcy in NACE industry s, country c and in year t	
Zombie (distress)	Dummy variable equal to one if firm i reports negative values of shareholder funds in year t, and zero otherwise	
Zombie (IC ratio)	Dummy variable equal to one if firm i reports an interest coverage ratio lower than one for three consecutive years, and zero otherwise	
JI(resolving insolvency$_{c,t}$)	Time of insolvency proceedings, that is the length for creditors to recover their credit through reorganization, liquidation or debt enforcement (foreclosure or receivership) proceedings. It is measured in years	World Bank
JI(length$_{j,t}$)	Average length of civil proceeding at district level. It is measured in years	Italian Ministry of Justice
Age	Difference between the current period and the founding year of the firm	Orbis
Cash over TA	Ratio of cash and cash equivalent to total assets for firm i in year t	

Note: This data appendix describes the primary variables of interest.

Table A2: **Italian analysis: determinants of default rates (OLS).**
The table reports estimation results of the default model for the Italian sample. $Fail_{i,t+1}$ is a dummy variable equal to one if firm i files for bankruptcy in year $t+1$, and zero otherwise. $Zombie(distress)$ is a dummy variable equal to one if firm i reports negative values of shareholder funds in year t, and zero otherwise. $JI(length_{j,t})$ is the length of civil proceedings in district j at time t. Detailed variable definitions can be found in Table A1 in the Appendix. Models 1-3 include municipality and year fixed effects, model 4 includes municipality $\times$ year fixed effects. Standard errors are clustered at the court district-year levels. ***, **, and * indicate that the parameter estimate is significantly different from zero at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)
Dep. Var.		$Fail_{i,t+1}$		
NROAI	0.0175***	0.0134***	0.0134***	0.0134***
	(0.0004)	(0.0003)	(0.0003)	(0.0003)
ROA	-0.0822***	-0.0720***	-0.0721***	-0.0720***
	(0.0015)	(0.0014)	(0.0014)	(0.0014)
LTA	0.0449***	0.0270***	0.0269***	0.0269***
	(0.0005)	(0.0004)	(0.0004)	(0.0004)
FTL	0.1218***	0.1181***	0.1147***	0.1149***
	(0.0062)	(0.0063)	(0.0062)	(0.0062)
SIZE	-0.0132***	-0.0125***	-0.0125***	-0.0125***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Bankrate	0.6177***	0.6207***	0.6200***	0.6193***
	(0.0209)	(0.0209)	(0.0211)	(0.0212)
Zombie (distress)		0.0456***	0.0624***	0.0624***
		(0.0006)	(0.0017)	(0.0017)
JI(length$_{j,t}$)			0.0017***	0.0013***
			(0.0005)	(0.0004)
Zombie (distress) $\times$ JI(length$_{j,t}$)			-0.0148***	-0.0148***
			(0.0014)	(0.0014)
Observations	6,780,249	6,780,249	6,720,500	6,720,500
R-squared	0.0431	0.0454	0.0455	0.0456
Year FE	Yes	Yes	Yes	No
Municipality FE	Yes	Yes	Yes	Yes
Region-Year	No	No	No	Yes

Table A3: **EU-27 analysis: heterogeneity by firm size.**
The table reports estimation results of the default model in equation 1. $Fail_{i,t+1}$ is a dummy variable equal to one if firm i files for bankruptcy in year $t+1$, and zero otherwise. $Zombie(distress)$ is a dummy variable equal to one if firm i reports negative values of shareholder funds in year t, and zero otherwise. $JI(resolving\ insolvency_{c,t})$ is the average time of insolvency proceedings in country c at time t. Detailed variable definitions can be found in Table A1 in the Appendix. In models 1, 2 and 3 the sample includes observations for micro, small and medium-large firms, respectively. Size categories are defined according to the definition by the European Commission. All models include country $\times$ year fixed effects. Standard errors are clustered at the country-year levels. ***, **, and * indicate that the parameter estimate is significantly different from zero at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)
Dep. Var.		$Fail_{i,t+1}$	
	Micro	**Small**	**Medium-Large**
NROAI	0.0152***	0.0134***	0.0101***
	(0.0016)	(0.0014)	(0.0009)
ROA	-0.0174***	-0.0392***	-0.0281***
	(0.0028)	(0.0039)	(0.0033)
LTA	0.0068***	0.0262***	0.0160***
	(0.0012)	(0.0023)	(0.0024)
FTL	0.0775***	0.1245***	0.0869***
	(0.0102)	(0.0181)	(0.0137)
SIZE	-0.0078***	-0.0024*	-0.0032**
	(0.0008)	(0.0013)	(0.0013)
Bankrate	1.1509***	0.7462***	0.5690***
	(0.0577)	(0.0587)	(0.0662)
Zombie (distress)	0.0486***	0.0422***	0.0264***
	(0.0075)	(0.0101)	(0.0069)
Zombie (distress) $\times$ JI(resolving insolvency$_{c,t}$)	-0.0135***	-0.0064*	-0.0025
	(0.0028)	(0.0033)	(0.0030)
Observations	41,199,804	5,036,105	1,542,186
R-squared	0.0573	0.0310	0.0237
Country-Year FE	Yes	Yes	Yes

Table A4: **Italian analysis - heterogeneity by firm size.**
The table reports the second stage of 2SLS estimation results of the default model for the Italian sample. $Fail_{i,t+1}$ is a dummy variable equal to one if firm i files for bankruptcy in year $t+1$, and zero otherwise. $Zombie(distress)$ is a dummy variable equal to one if firm i reports negative values of shareholder funds in year t, and zero otherwise. $JI(length_{j,t})$ is the average length of civil proceedings in district j at time t. Detailed variable definitions can be found in Table A1 in the Appendix. In models 1, 2 and 3 the sample includes observations for micro, small and medium-large firms, respectively. Size categories are defined according to the definition by the European Commission. All models include municipality $\times$ year fixed effects. Standard errors are clustered at the court district-year levels. ***, **, and * indicate that the parameter estimate is significantly different from zero at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)
Dep. Var.		$Fail_{i,t+1}$	
	Micro	**Small**	**Medium-Large**
NROAI	0.0159***	0.0053***	0.0085***
	(0.0008)	(0.0014)	(0.0030)
ROA	-0.0693***	-0.1123***	-0.0582**
	(0.0039)	(0.0105)	(0.0242)
LTA	0.0275***	0.0308***	0.0180***
	(0.0014)	(0.0027)	(0.0066)
FTL	0.1028***	0.2634***	0.1839***
	(0.0175)	(0.0358)	(0.0518)
SIZE	-0.0151***	-0.0042***	-0.0053*
	(0.0005)	(0.0012)	(0.0031)
Bankrate	0.7135***	0.2034**	0.2585*
	(0.0464)	(0.0793)	(0.1383)
Zombie (distress)	0.0742***	0.1315	-0.2521
	(0.0168)	(0.0991)	(0.4861)
Zombie (distress) $\times$ JI(length$_{j,t}$)	-0.0274*	-0.0657	0.3246
	(0.0151)	(0.0986)	(0.4964)
Observations	689,907	125,501	22,613
R-squared	0.0443	0.0392	0.0111
Municipality-Year FE	Yes	Yes	Yes

Table A5: **EU-27 analysis - Robustness: alternative definition of zombie.**
The table reports estimation results of the default model in equation 1. $Fail_{i,t+1}$ is a dummy variable equal to one if firm i files for bankruptcy in year $t+1$, and zero otherwise. $Zombie(IC\,ratio)$ is a dummy variable equal to one if firm i reports an interest coverage ratio lower than one for three consecutive years. $JI(resolving\ insolvency_{c,t})$ is the average time of insolvency proceedings in country c at time t. Detailed variable definitions can be found in Table A1 in the Appendix. Models 1-3 include country and year fixed effects, model 4 includes country $\times$ year fixed effects. Standard errors are clustered at the country-year levels. ***, **, and * indicate that the parameter estimate is significantly different from zero at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)
Dep. Var.		$Fail_{i,t+1}$		
NROAI	0.0162***	0.0144***	0.0143***	0.0144***
	(0.0017)	(0.0015)	(0.0015)	(0.0016)
ROA	-0.0363***	-0.0357***	-0.0363***	-0.0369***
	(0.0047)	(0.0047)	(0.0046)	(0.0046)
LTA	0.0194***	0.0183***	0.0184***	0.0182***
	(0.0025)	(0.0024)	(0.0024)	(0.0024)
FLT	0.1459***	0.1326***	0.1311***	0.1351***
	(0.0139)	(0.0126)	(0.0125)	(0.0119)
SIZE	-0.0065***	-0.0067***	-0.0067***	-0.0065***
	(0.0008)	(0.0008)	(0.0008)	(0.0008)
Bankrate	0.8344***	0.8346***	0.8355***	0.9629***
	(0.0690)	(0.0690)	(0.0692)	(0.0584)
Zombie (IC ratio)		0.0052***	0.0141***	0.0141***
		(0.0007)	(0.0033)	(0.0034)
JI(resolving insolvency$_{c,t}$)			0.0006	
			(0.0010)	
Zombie (IC ratio) $\times$ JI(resolving insolvency$_{c,t}$)			-0.0047***	-0.0047***
			(0.0015)	(0.0016)
Observations	23,602,843	23,602,843	23,600,977	23,600,975
R-squared	0.0350	0.0351	0.0352	0.0378
Year FE	Yes	Yes	Yes	No
Country FE	Yes	Yes	Yes	No
Country-Year FE	No	No	No	Yes

Table A6: **Italian analysis - Robustness: alternative definition of zombie.**
The table reports estimation results of the default model for the Italian sample. $Fail_{i,t+1}$ is a dummy variable equal to one if firm i files for bankruptcy in year $t+1$, and zero otherwise. $Zombie(IC\,ratio)$ is a dummy variable equal to one if firm i reports an interest coverage ratio lower than one for three consecutive years. $JI(length_{j,t})$ is the average length of civil proceedings in district j at time t. Detailed variable definitions can be found in Table A1 in the Appendix. Models 1-3 include country and year fixed effects, model 4 includes country $\times$ year fixed effects. Standard errors are clustered at the court district-year levels. ***, **, and * indicate that the parameter estimate is significantly different from zero at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)
Dep. Var.		$Fail_{i,t+1}$		
	OLS		2SLS	
NROAI	0.0127***	0.0127***	0.0126***	0.0126***
	(0.0010)	(0.0010)	(0.0010)	(0.0010)
ROA	-0.1289***	-0.1297***	-0.1298***	-0.1305***
	(0.0058)	(0.0058)	(0.0059)	(0.0060)
LTA	0.0447***	0.0445***	0.0443***	0.0441***
	(0.0016)	(0.0016)	(0.0017)	(0.0017)
FTL	0.1462***	0.1458***	0.1434***	0.1427***
	(0.0198)	(0.0198)	(0.0207)	(0.0207)
SIZE	-0.0126***	-0.0126***	-0.0127***	-0.0127***
	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Bankrate	0.3485***	0.3441***	0.3570***	0.3528***
	(0.0544)	(0.0540)	(0.0570)	(0.0564)
Zombie (IC ratio)	0.0097***	0.0098***	0.0217***	0.0227***
	(0.0015)	(0.0015)	(0.0081)	(0.0083)
JI(length$_{j,t}$)	0.0016		0.0147***	
	(0.0012)		(0.0054)	
Zombie (IC ratio) $\times$ JI(length$_{j,t}$)	-0.0037***	-0.0039***	-0.0152**	-0.0162**
	(0.0012)	(0.0012)	(0.0076)	(0.0079)
Observations	469,548	467,229	444,579	442,307
R-squared	0.0514	0.0570	0.0472	0.0474
Region-Year	Yes	No	Yes	No
Municipality FE	Yes	No	Yes	No
Municipality-Year FE	No	Yes	No	Yes

Table A7: **EU-27 analysis - Robustness: additional controls.**
The table reports estimation results of the default model in equation 1. $Fail_{i,t+1}$ is a dummy variable equal to one if firm i files for bankruptcy in year $t+1$, and zero otherwise. $Zombie(distress)$ is a dummy variable equal to one if firm i reports negative values of shareholder funds in year t, and zero otherwise. $JI(resolving\ insolvency_{c,t})$ is the average time of insolvency proceedings in country c at time t. Additional determinants included are Age, the difference between year t and the incorporation year for firm i in year t, and $Cash\ over\ TA$, the ratio of cash and cash equivalent to total assets for firm i in year t. Detailed variable definitions can be found in Table A1 in the Appendix. Models 1-3 include country and year fixed effects, model 4 includes country $\times$ year fixed effects. Standard errors are clustered at the country-year levels. ***, **, and * indicate that the parameter estimate is significantly different from zero at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)
Dep. Var.		$Fail_{i,t+1}$		
NROAI	0.0163***	0.0139***	0.0137***	0.0137***
	(0.0012)	(0.0011)	(0.0011)	(0.0011)
ROA	-0.0148***	-0.0152***	-0.0167***	-0.0174***
	(0.0032)	(0.0030)	(0.0028)	(0.0027)
LTA	0.0125***	0.0045***	0.0057***	0.0055***
	(0.0016)	(0.0011)	(0.0010)	(0.0010)
FLT	0.1009***	0.0991***	0.0907***	0.0896***
	(0.0102)	(0.0103)	(0.0105)	(0.0103)
SIZE	-0.0057***	-0.0056***	-0.0055***	-0.0055***
	(0.0008)	(0.0008)	(0.0008)	(0.0008)
Bankrate	0.5738***	0.5732***	0.5688***	0.6392***
	(0.0617)	(0.0619)	(0.0622)	(0.0319)
Age	-0.0005***	-0.0005***	-0.0004***	-0.0004***
	(0.0001)	(0.0000)	(0.0000)	(0.0000)
Cash over TA	0.0008	0.0002	0.0003	-0.0002
	(0.0024)	(0.0024)	(0.0024)	(0.0024)
Zombie (distress)		0.0178***	0.0430***	0.0432***
		(0.0020)	(0.0059)	(0.0059)
JI(resolving insolvency$_{c,t}$)			0.0035***	
			(0.0009)	
Zombie (distress) $\times$ JI(resolving insolvency$_{c,t}$)			-0.0117***	-0.0117***
			(0.0023)	(0.0023)
Observations	36,150,676	36,150,676	36,140,138	36,140,134
R-squared	0.0238	0.0243	0.0250	0.0272
Year FE	Yes	Yes	Yes	No
Country FE	Yes	Yes	Yes	No
Industry FE	Yes	Yes	Yes	Yes
Size Cat. FE	Yes	Yes	Yes	Yes
Country-Year FE	No	No	No	Yes

Table A8: **Italian analysis - Robustness: additional controls.**
The table reports estimation results of the default model in equation 1. $Fail_{i,t+1}$ is a dummy variable equal to one if firm i files for bankruptcy in year $t+1$, and zero otherwise. $Zombie(distress)$ is a dummy variable equal to one if firm i reports negative values of shareholder funds in year t, and zero otherwise. $JI(length_{j,t})$ is the average length of civil proceedings in district j at time t Additional determinants included are Age, the difference between year t and the incorporation year for firm i in year t, and $Cash\ over\ TA$, the ratio of cash and cash equivalent to total assets for firm i in year t. Detailed variable definitions can be found in Table A1 in the Appendix. Models 1-3 include country and year fixed effects, model 4 includes country $\times$ year fixed effects. Standard errors are clustered at the court district-year levels. ***, **, and * indicate that the parameter estimate is significantly different from zero at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)
Dep. Var.		$Fail_{i,t+1}$		
	OLS		2SLS	
NROAI	0.0093***	0.0093***	0.0092***	0.0092***
	(0.0008)	(0.0008)	(0.0008)	(0.0008)
ROA	-0.0711***	-0.0717***	-0.0706***	-0.0712***
	(0.0042)	(0.0042)	(0.0043)	(0.0043)
LTA	0.0279***	0.0276***	0.0278***	0.0276***
	(0.0014)	(0.0014)	(0.0014)	(0.0014)
FTL	0.1835***	0.1821***	0.1898***	0.1879***
	(0.0178)	(0.0179)	(0.0187)	(0.0188)
SIZE	-0.0082***	-0.0082***	-0.0082***	-0.0082***
	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Bankrate	0.5337***	0.5294***	0.5475***	0.5510***
	(0.0996)	(0.1010)	(0.1027)	(0.1035)
Age	-0.0004***	-0.0004***	-0.0004***	-0.0004***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Cash over TA	0.0026	0.0024	0.0026	0.0024
	(0.0020)	(0.0020)	(0.0020)	(0.0020)
Zombie (distress)	0.0799***	0.0801***	0.0917***	0.0935***
	(0.0043)	(0.0043)	(0.0219)	(0.0226)
JI(length$_{c,t}$)	0.0003		0.0059	
	(0.0012)		(0.0049)	
Zombie (distress) $\times$ JI(length$_{c,t}$)	-0.0281***	-0.0280***	-0.0393**	-0.0407**
	(0.0033)	(0.0033)	(0.0197)	(0.0203)
Observations	630,383	627,568	597,143	594,403
R-squared	0.0356	0.0419	0.0284	0.0286
Industry FE	Yes	Yes	Yes	Yes
Region-Year	Yes	No	Yes	No
Municipality FE	Yes	No	Yes	No
Size Cat. FE	Yes	Yes	Yes	Yes
Municipality-Year FE	No	Yes	No	Yes