Insolvency Regimes and Firms' Default Risk Under Economic Uncertainty and Shocks *

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Abstract

One of the arguments often advanced for implementing a stronger insolvency and bankruptcy framework is that it enhances credit discipline among firms. Using a large cross-country firm-level dataset, we empirically test whether a stronger insolvency regime reduces firms' likelihood of defaulting on their debt. In particular, we examine whether it reduces default risk during increased economic uncertainty and various external shocks. Our results confirm that a stronger insolvency regime moderates the adverse effects of economic shocks on firms' default risk. The effects are more pronounced for firms in the top half of the size distribution. We also explore channels through which improved creditor rights influence firms' default risk, including dependence on external finance, corporate leverage, and managerial ethics. Our main results are robust to an alternative measure of default risk, inclusion of currency and sovereign debt crisis episodes, and alternative estimations.

Keywords: Insolvency; Bankruptcy; Default risk; Economic policy uncertainty; Sovereign debt crisis; Currency crisis

JEL Codes: G30; G32; G33

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1. Introduction

Institutional measures that protect the interest of various stakeholders in a financial contract are often considered as means to reduce financing frictions and, consequently, improve contracting outcomes of various parties. There are two broad views on how creditor rights impact firms' risk-taking, investment, and financing. One view holds that enhanced creditor rights would improve their debt financing capacity by increasing the availability of private credit by the financial system (Djankov, McLiesh, & Shleifer, 2007). The second view holds that stronger creditor rights would deter firms from undertaking riskier investments (Acharya, Amihud, & Litov, 2011) and lower their leverage (Cho, El Ghoul, Guedhami, & Suh, 2014). Claessens and Klapper (2005) argue that *ex-ante* incentive effects of stronger creditor rights and insolvency systems encourage less risky behavior by firms, thereby reducing their chances of financial distress. In this study, we build on the latter view by empirically examining whether enhanced creditor rights reduce firms' ex-ante risk of debt default during episodes of policy uncertainty and economic shocks.

We examine the role of creditor rights in influencing firm behavior across advanced and emerging economies by using their disclosed financial information. First, we consider how institutional changes in the insolvency framework, which improve creditor rights, affect firms' behavior in terms of their risk of defaulting on their debt obligations. Second, we consider whether an improvement in the insolvency regime moderates the effect of economic shocks on their risk of debt distress. Our emphasis on firms' response to economic shocks as an outcome of creditor rights differs from existing literature that considers the impact of creditor rights on risky investments (Acharya et al., 2011; Seifert & Gonenc, 2012); on firms' capital structure decisions (Cho et al., 2014; Gilson, 1997); and on private credit across countries (Djankov et al., 2007). We also complement Bergoeing, Kehoe, Kehoe, and Soto (2002) who find a positive effect of bankruptcy reforms on the recovery from a debt crisis.

We examine the above questions by considering the association between the strength of insolvency regimes, economic shocks, and firms' likelihood of financial distress. Our results point to a negative association between the strength of the insolvency framework, a measure

of creditor rights, and firms' risk of debt default. This finding is consistent with prior studies that show an inverse relationship between creditor rights and firms' risk-taking (Acharya et al., 2011; Cho et al., 2014). We also find that stronger insolvency regimes moderate the adverse effects of heightened economic policy uncertainty and economic shocks on firms' risk of default. This finding suggests that when the insolvency regime is stronger, borrowers are less likely to take on additional risk during adverse economic shocks. One possible channel is the impairment in borrowers' collateral during economic downturns, which can raise the agency costs of financing (Gertler & Bernanke, 1989) and, consequently, increase the likelihood of liquidation under stronger creditor rights. This can discourage managers acting on behalf of the shareholders from taking on risks that can increase the possibility of a debt default (Adler, 1991).[1]

The analysis of the impact of the insolvency framework on firms' risk-taking employs the Altman Z-score developed by Altman (1968), a measure of firms' default risk which has found wide acceptance in the finance literature (for instance, see Almeida, Hankins, and Williams (2017) and Eisdorfer (2008)). Our baseline results also hold for an alternative measure of default risk, the market signal probability of default (MSPD) developed by Standard and Poor's, which employs a structural distance-to-default approach that builds on the corporate debt pricing model of Merton (1974). The S&P measure captures the default probability of the risky debt of firms and provides a market implied estimate of firm risk compared to those that rely on financial performance.

As discussed by Arltová, Smrčka, Louda, and Mateos-Planas (2016) and Valiante (2016), there is considerable heterogeneity in the insolvency regimes across countries. In order to have a comparable measure of the efficacy of insolvency regimes, we employ a harmonized cross-country index obtained from the World Bank's *Doing Business* database (World Bank, 2019). The *Resolving Insolvency* index builds on earlier work on creditor rights by La Porta, Lopez-de Silanes, Shleifer, and Vishny (1998) and Djankov et al. (2007).[2]

We employ the economic policy uncertainty (EPU) index, a country-specific measure of

[1] Adler (1991) argues that while managers of an insolvent firm may take on *greater* investment risk prior to final bankruptcy resolution, *ex ante* they would reduce their risk in order to avoid bankruptcy (see also Acharya et al. (2011)).

[2] See subsection 3.2 for details of this measure.

uncertain government policies developed by Baker, Bloom, and Davis (2016), to understand the effect of the insolvency regime on firms' risk-taking during adverse economic events. Episodes of higher economic policy uncertainty can lead to a delay in private sector investments and affect firms' financing decisions (Gulen & Ion, 2016; Lee, Lee, & Xiao, 2020). In addition to EPU, we employ other measures of country-specific economic shocks, such as currency crises and sovereign debt crises episodes compiled by Reinhart and Reinhart (2015) to validate our results. The results for the crisis episodes are in line with the main findings on the moderating effect of a stronger insolvency regimes on firm's default risk during policy uncertainty.

Further, we find that both the average effect of a better insolvency regime, as well as its moderating effect during economic shocks is higher for larger firms. This may be explained by the propensity of professional managers of larger firms, who enjoy more control rights given the diffused shareholder ownership structure that exists in such firms, to maintain their reputational capital. A stronger insolvency regime can discourage managers from taking risky decisions as they stand to lose the private benefits associated with their control rights in the event of insolvency during a downturn (Eckbo & Thorburn, 2003). In smaller firms, the decisions of the managers and shareholders might be closely aligned, and hence, these firms may not pass up riskier investment activities when creditor rights are stronger. Our key findings hold for a subsample that excludes the United States and Japan.

In order to account for the possibility that the observed relationship between the insolvency score and firms' risk of debt distress could be non-linear in nature, we perform an additional robustness using a semiparametric panel data model (Baltagi & Li, 2002). We find that the benefits of stronger creditor rights impact firm behavior asymmetrically, with a significantly positive impact between the 10^{th} and the 70^{th} unit of the insolvency index and a diminishing positive impact at higher levels of insolvency scores. The non-linear relationship is also observed to be steeper at higher levels of economic policy uncertainty. The results of this estimation are consistent with the key findings of the parametric model, and provide additional insights into how the effectiveness of regulatory interventions to enforce creditors rights could vary across different levels of insolvency scores.

We also consider the potential channels through which improved creditor rights influence

firms' default risk. Using a measure of external financial dependence developed by Rajan and Zingales (1998), we find a larger moderating effect of a better insolvency regime on firms' risk of defaulting on debt obligations during economic shocks for industrial sectors with higher external finance dependence. This suggests that the strength of the insolvency framework plays a larger role for firms with higher reliance on the financial system than their internal cash flows. We find that better insolvency regimes lower firms' likelihood of default through a reduction in leverage, an indicator of their risk-taking behavior (Acharya et al., 2011).

While our primary emphasis is on how creditor rights alter firm behavior, it is possible that the results are influenced by their efforts to reduce agency costs in financial contracting. One such signaling mechanism is the ethical behavior of corporate managers, which can help to mitigate the agency costs arising out of asymmetric information (Huang, Louwers, Moffitt, & Zhang, 2008; Husted, 2007; Van Oosterhout, Heugens, & Kaptein, 2006). As expected, we find that both a stronger insolvency framework and a measure of firms' ethics have a negative association with their default risk. However, the interaction of the two suggests that a stronger insolvency framework can result in lower risk-taking even when corporate governance is relatively weak, particularly during periods of greater economic uncertainty.

This study contributes to the literature on the role of regulatory institutions in improving financial contracting outcomes in several ways. To our knowledge, this is the first study that considers the role of the insolvency regime in mitigating the risk of default during economic shocks in a cross-country setting. We extend the existing literature on creditor rights and firm behavior by examining the ex-ante behavior of firms during economic shocks for a large sample of firms across countries with varying creditor rights. Consequently, we are able to integrate the recent literature on firm behavior under economic policy uncertainty (Bloom, 2009; Drobetz, El Ghoul, Guedhami, & Janzen, 2018) and on firms' risk-taking as a result of changes in creditor rights (Acharya et al., 2011; Eckbo & Thorburn, 2003; Gilson, 1997).

Second, we directly examine firms' default risk rather than investment and capital structure decisions that influence firm risk. Our findings on default risk corroborate earlier studies on the relationship between creditor rights and firm behavior (Cho et al., 2014; Seifert & Gonenc, 2012). Third, we employ a cross-country harmonized distance-to-frontier measure of creditor

rights that is based on the time, cost, and outcome of insolvency proceedings, which determine the recovery rates in bankruptcy (World Bank, 2019). The advantage of this measure is that it provides a comparable index of the efficacy of the insolvency regimes across countries. Overall, our findings contribute to the literature on firm behavior in response to changes in regulations that improve creditor rights.

The next section discusses the literature on creditor rights, firm risk-taking, and economic policy uncertainty. The subsequent section discusses the empirical methodology and data used for this study. Our main results and robustness to alternative specifications and subsamples are discussed next. The last section concludes with relevance for policies on creditor rights.

2. Related Literature

Our study is closely related to the literature on the role of creditor rights in financial contracting, capital market development, and risk-taking by firms. It also relates to the literature on the role of economic policy uncertainty and economic shocks in financial outcomes, cost of capital, investment, and employment. In this section, we bring together the arguments put forth by the literature on the role of firm behavior as a response to changes in creditor rights and economic policy uncertainty.

2.1. Creditor rights and firm behavior

The literature on the impact of creditor rights on firms can be classified into two strands, the supply-side arguments and the demand-side arguments. Under the first strand, several studies have examined the effect of improved creditor rights on credit availability and financing terms for firms. The seminal study of La Porta, Lopez-de Silanes, Shleifer, and Vishny (1997) shows that the quality of law enforcement is an important consideration in the development of capital markets. The authors show that the development of both equity and debt markets of civil law countries lag behind those of common law countries. Using a large cross-country database, Djankov et al. (2007) find that credit to the private sector goes up in countries with stronger legal systems that protect the rights of the creditors. The authors rely on an index that measures

the power of creditors against defaulting borrowers in different jurisdictions. Their findings corroborate the role of creditor rights in optimal financial contracting (Hart & Moore, 1998).

Rodano, Serrano-Velarde, and Tarantino (2016) find that reforms in Italy, which strengthened creditor rights during liquidation, led to a significant reduction in the cost of bank financing and an increase in firm investment. Stef and Dimelis (2020) examine the role of creditor protection in enhancing foreign banks' presence across countries with different types of bankruptcy regimes. The authors find that the effect of creditor rights on foreign bank expansion is stronger in countries with bankruptcy regimes that encourage the survival of firms compared to regimes that promote liquidation. The above studies on credit availability and financing terms support the argument that stronger creditor rights are positively associated with credit supply due to an improvement in the enforcement of financial contracts.

Studies relating to the demand-side view examine the investment and financing choices of firms due to changes in creditor rights. Gilson (1997) finds evidence that bankruptcy costs can induce managers to maintain a capital structure with lower leverage to avoid the possibility of financial distress. In a cross-country study, Acharya et al. (2011) find that stronger creditor rights in bankruptcy reduce corporate risk-taking and leverage. The authors show that firms reduce risk through diversification of value-reducing acquisitions. Chava and Roberts (2008) find that firms in the US reduce their capital investment in response to a threat by creditors to accelerate loan repayments. According to the authors, contingent control rights of the creditors, facilitated by the enforcement of debt covenants, mitigate distortions in firms' investment decisions that arise from asymmetric information. Seifert and Gonenc (2012) report that firms based in countries with stronger creditor rights reduce their R&D intensity, with a larger negative effect for firms that are closer to financial distress. The authors argue that the finding can be explained by the actions of managers to reduce cash-flow risk when faced with the prospect of bankruptcy in countries with stronger creditor rights.

Other studies argue for the role of managerial conservatism in firms' investment choices to maintain their reputational capital. In Sweden, Eckbo and Thorburn (2003) show that the private benefits of control encourages managers to make conservative investment decisions in the presence of a stringent bankruptcy process that can force them out of their jobs. Zwiebel

(1995) argues that managers refrain from riskier investments due to fear of reputational loss. According to the authors, managers would prefer to undertake projects that meet industry standards instead of riskier or complicated projects that can jeopardize their career. Hirshleifer and Thakor (1992) argue that managers choose conservative investment projects to preserve their reputation, thereby aligning their behavior with the interests of bondholders rather than shareholders. This can reduce the agency cost of debt and, consequently, facilitates higher issuance of debt.

Dewaelheyns and Van Hulle (2008) show that the likelihood of distress among Belgian small and medium-sized firms reduced significantly after the introduction of insolvency reforms in 1997. The reforms included a formal reorganization procedure, creation of an early warning system for financial distress, and measures to reduce spillover effects on suppliers due to the bankruptcy of clients. Bergoeing, Loayza, and Repetto (2004) argue that weaker bankruptcy regimes distort the reallocation of resources across economic units and result in slower growth. In a study on insolvency regimes in OECD countries, Adalet McGowan, Andrews, and Millot (2018) show that weaker insolvency regimes encourage inefficient allocation of industry capital in failing firms that would otherwise be liquidated or restructured in a competitive market. Bergoeing et al. (2002) find that bankruptcy reforms helped in a faster recovery in Chile compared to Mexico after a crisis in the early 1980s. These reforms included allowing private trustees to facilitate a faster resolution of bankruptcy and limiting government subsidies that could delay eventual bankruptcy.

The extant literature on creditor rights reviewed above attests to their potential impact on financial contracting and firm behavior through two main channels. First, the strength of creditor rights during bankruptcy can influence the terms under which the creditors provide financing to firms. Second, stronger creditor rights can influence the actions of managers in taking appropriate investment and financing decisions to mitigate the risk of debt distress and thereby avoid bankruptcy. Our study on firms' ex-ante risk-taking behavior is closer to the latter set of studies that have examined changes in firm investment, risk diversification, and financing outcomes in response to stronger creditor rights.

2.2. *Economic uncertainty and firm outcomes*

Our study relates to the recent empirical literature on economic policy uncertainty and its implications for real-sector outcomes, equity market responses, and bank credit supply. Several empirical studies have explored the links between policy uncertainty, corporate finance, and real-sector outcomes (Baker et al., 2016; Baum, Caglayan, & Talavera, 2010; Baum, Stephan, & Talavera, 2009; Drobetz et al., 2018; Gulen & Ion, 2016; Lee et al., 2020). We complement this literature by examining the role of creditor rights in moderating the relationship between policy uncertainty and firms' risk-taking behavior.

Using a theoretical framework, Bloom (2009) argues that higher uncertainty shocks may result in temporary delays in investment and employment generation by firms, and a fall in productivity growth. Higher economic policy uncertainty has been shown to be associated with adverse macroeconomic performance in the form of lower output, investment, and employment (Baker et al., 2016). Baum et al. (2010) show that market uncertainty has a negative effect on investment decisions of firms in the United States. In a cross-country setting, Drobetz et al. (2018) find that higher economic policy uncertainty distorts the relationship between the cost of capital and firms' capital investment. The authors show that the presence of higher economic policy uncertainty dissuades firms from taking up capital investment projects despite a lower cost of capital.

Gulen and Ion (2016) show that higher policy uncertainty is related to lower firm-level capital investments in the United States, with a stronger effect observed for firms with relatively higher irreversible investments and for firms in industries that rely more on government spending. Baum et al. (2009) find that firms in the United States reduce their short-term leverage as a consequence of an increase in macroeconomic and idiosyncratic uncertainty. Using a sample of Chinese listed firms, Lee et al. (2020) document that corporate finance decisions are negatively associated with economic policy uncertainty. The authors show that the effect is more prominent for debt financing than for equity financing. Our emphasis on creditor rights is in line with the authors' finding that debt financing is more affected during periods of economic policy uncertainty.

Our study also complements recent research that has examined the effect of economic policy uncertainty on credit availability, financial stability, and sovereign creditworthiness. Bordo, Duca, and Koch (2016) find that economic policy uncertainty negatively affected aggregate bank credit growth in the United States during the 2007-13 period. They also find that the effect of policy uncertainty was more pronounced for larger, less well-capitalized, and less liquid banks. The authors posit that weaker credit supply through the bank lending channel resulted in lower economic growth. In a cross-country setting, Phan, Iyke, Sharma, and Affandi (2020) show that economic policy uncertainty has a negative effect on financial stability, with the impact varying by financial system competition, bank regulatory capital, and size of the banking sector. Chi and Li (2017) find evidence that economic uncertainty resulted in higher non-performing loans in China. Berger, Guedhami, Kim, and Li (2018) report that higher economic policy uncertainty is associated with greater liquidity hoarding by banks. Boumparis, Milas, and Panagiotidis (2017) find that lower rated countries in Europe experience a larger negative impact on their creditworthiness during heightened economic policy uncertainty compared to higher rated countries.

Among studies that explore the effect of EPU on equity market outcomes, Brogaard and Detzel (2015) find that equity portfolios with higher sensitivity to economic policy uncertainty under-perform those with lower sensitivity. The authors show that an increase in economic policy uncertainty is associated with a contemporaneous decrease in market returns and an increase in future three-month excess returns. Using equity market data from the United States, Nagar, Schoenfeld, and Wellman (2019) show that firms face higher information asymmetries in the form of higher bid-ask spreads and decreased stock price reactions to earnings surprises during heightened economic policy uncertainty. In a general equilibrium setting, Pastor and Veronesi (2012) predict a larger fall in stock prices, on an average, during greater uncertainty about government policies.

The above studies suggest that firm behavior could be substantially impacted during periods of aggregate uncertainty and also by institutional factors at the country-level. While the extant literature has examined firm behavior in response to either stronger creditor rights or changes in economic policy uncertainty separately, we integrate these two strands of the literature by

empirically examining the relationship between creditor rights and firms' risk-taking in the context of economic policy uncertainty. Our study contributes to the literature by bringing out the impact of insolvency regimes on firm behavior during both normal and volatile periods.

3. Methodology and Data

3.1. Empirical methodology

Drawing on literature that suggests that improved creditor rights may reduce the risk of debt default by increasing credit discipline among firms, we model the effect of creditor rights on firms' default risk using the following estimation equation:

$$\begin{aligned} DefaultRiskScore_{it} = \alpha_0 + \alpha_1 Insol\_score_{jt-1} + \sum_k \alpha_{2,k} X_{i,kt-1} \\ + \sum_l \alpha_{3,l} Y_{j,lt-1} + \mu_i + \tau_t + \epsilon_{it} \end{aligned} \tag{1}$$

where $DefaultRiskScore_{it}$ is the default risk score, proxied by *Z-score*, of the firm i in year t. Higher the default risk score, the lower the chances of a default. $Insol\_score_{jt-1}$ is a score that captures the relative strength of the insolvency standards for the country j for the year $t-1$. X is a set of firm-specific control variables that affect the default risk of the firm. Specifically, we control for the asset size, future and present growth opportunities through the market to book ratio and sales growth, respectively, availability of tangible collateral, and operational cash flows of the firm.

Y is a set of country-specific variables that may affect the default risk of firms. μ_i captures the firm-specific time-invariant factors and subsumes any other higher order time-invariant effects, such as industry and country fixed effects. τ_t captures any year-specific exogenous shocks that affect all the firms. In alternative specifications, we control for $Industry \times Year$ fixed effects to account for any change in industry-level time-variant fluctuations that could affect the default risk of firms in a specific industry (Gormley & Matsa, 2014). All standard errors are clustered at the firm-level and control for heteroskedasticity.

Next, we examine whether the impact of economic policy uncertainty on firms' risk-taking

behavior varies with the strength of creditor rights. The following empirical specification is employed to test the moderating role of the insolvency framework during episodes of policy uncertainty shocks.

$$DefaultRiskScore_{it} = \beta_0 + \beta_1 Insol\_score_{jt-1} + \beta_2 Shock_{jt-1} \times Insol\_score_{jt-1} + \beta_3 Shock_{jt-1} + \sum_s \beta_{4,s} X_{i,st-1} + \sum_l \beta_{5,l} Y_{j,lt-1} + \mu_i + \tau_t + \epsilon_{it} \quad (2)$$

The dependent variable is the $DefaultRiskScore$. The primary $Shock$ variable is based on the economic policy uncertainty (EPU) index of Baker et al. (2016). In alternative specifications, we employ two other economic shock proxies, currency crisis ($Curr\_crisis$) and sovereign debt crisis ($Debt\_crisis$), to capture the effect of creditor rights on firms' default risk in the presence of economic shocks. The detailed definition of the three $Shock$ variables is provided in Table 1. The key explanatory variable is the interaction term $Insol\_score \times Shock$. As we hypothesize that better creditor rights would reduce the effect of shocks on firms' default risk, β_2 is expected to be positive and significant.

All other variables are similar to those shown in Equation 1. In alternative estimations, we interact firm size with $Shock \times Insol\_score$ to examine its effect on the moderating effects of the insolvency score during economic shocks. As the variation of the triple interaction term is at the firm-level, we control for country-year fixed effects in these estimations. The country-year dummies capture the effects of any unobserved yearly variation at the country level (Gormley & Matsa, 2014).

3.2. Data

The sample for the estimation of Equation 1 covers firm-level data from 60 countries over a 15 year period spanning 2003 to 2017 (see Table A1). The sample includes all advanced and developing countries for which data on insolvency scores, country-level macroeconomic variables, and firm-level variables are available. The time period of the sample is determined by the availability of the information on creditor rights. We obtain the data on firm-level financial information across countries from the Worldscope database of Thomson Reuters. In our analysis,

we consider only non-financial manufacturing firms (SIC 2 digit 20-39).[3] Detailed definitions of the firm-level variables are shown in Table 1.

The primary dependent variable *Z-score* is computed using disclosed firm financial information (Altman, 1968) (see Table 1 for the detailed definition). This measure of firm default risk has been used in several earlier studies in finance (Almeida et al., 2017; Asness, Frazzini, & Pedersen, 2019; Eisdorfer, 2008). As the *Z-score* is based primarily on accounting information, it offers wider coverage as compared to other measures of financial distress. We also employ an alternative measure of default risk, the market signal probability of default ($MSPD$) developed by Standard & Poor's, which is based on the structural model of Merton (1974).[4] The Merton distance-to-default methodology has been used in several studies to forecast the default probability of risky debt (Bharath & Shumway, 2008; Vassalou & Xing, 2004). The $MSPD$ measure ranges from 0 to 100. We transform this variable to $MSPD\_inv$, calculated as 100 - $MSPD$, in order to be in the same direction as the *Z-score*. More details on this measure are provided in subsection 4.3.

The key explanatory variable that captures the strength of creditor rights, $Insol\_score$, is obtained from the $Doing\ Business$ database of the World Bank. The $Insol\_score$ is a distance-to-frontier measure ranging from 0 to 100 based on the time, cost, and outcome of the insolvency proceedings that determine the recovery rate in bankruptcy, as well as the strength of the legal framework for liquidation and reorganization (World Bank, 2019). This measure, available since 2003, is based on annual surveys of local insolvency practitioners and information on laws, regulations, and insolvency systems across countries.

The measures of economic shocks are obtained from various publicly available sources. Our main measure, the economic policy uncertainty (EPU) index, is obtained from the database maintained by Baker et al. (2016). The text-based EPU index relies on the frequency of certain keywords that appear in articles in leading newspapers. The availability of the EPU index reduces the estimation sample to 38 countries in the specification with policy uncertainty (see Equation 2). This measure of policy-related economic uncertainty has been used in many

[3]The default risk measure used in our study was developed for a set of manufacturing firms by Altman (1968).

[4]Similar to Moody's KMV which has a proprietary mapping of the evaluated probability of default (PD) with historical default rates (Crosbie & Bohn, 2003), S&P also map their model based distance-to-default measure with the observed default rates for the universe of S&P rated firms.

recent studies (Bordo et al., 2016; Drobetz et al., 2018; Nagar et al., 2019). The information on country-level currency crisis and sovereign debt crisis episodes is obtained from the Global Crises Data that is based on Reinhart and Rogoff (2009) and Reinhart and Reinhart (2015). The crises data is maintained by the Behavioral Finance and Financial Stability (BFFS) project of Harvard Business School.[5]

In order to control for the heterogeneity in economic and financial development across countries, we employ a set of country-level control variables. The ability of firms to undertake risky activities can be influenced by the level of overall economic development, the availability of credit, and the depth of the financial sector (Acharya et al., 2011; Altman, Brady, Resti, & Sironi, 2005). The country-level variables, obtained from the World Development Indicators of the World Bank, include GDP growth, the logarithm of per capita GDP, and the ratio of private credit to GDP (an indicator of the level of financial development). In addition to country and time fixed effects used in the baseline regressions, in some specifications we control for possible unobserved country-specific time-varying heterogeneity such as structural and regulatory changes by employing country-year fixed effects. In alternative estimations, we employ $Firm\_ethics$, an indicator of the ethical practices in firms, obtained from the Global Competitiveness Report database of the World Economic Forum.[6] The analysis with firm ethics allows us to consider the potential substitutability between creditor rights and managerial ethics in influencing firms' default risk.

All firm-specific variables are winsorized at the 1^{st} and 99^{th} percentiles. The final estimation sample based on the data availability of the baseline specification shown in Equation 1 has 103,576 firm-year observations for 13,019 unique firms across 60 countries. The summary statistics of the variables employed in the study is shown in Table 2. The average firm has a *Z-score* of about 3.2 and $MSPD\_inv$ of 97.3%, indicating a relatively low likelihood of a default during the estimation period.

The average size of the representative firm in our sample is $282 million. Such a firm has a

[5]We do not include banking crises episodes in this study since such events can be potentially endogenous to the likelihood of debt default by firms, which can, in turn, increase the non-performing loans of the banking system.

[6]This factor is a part of the Private Institutions subgroup of the Institutions pillar of the *Global Competitiveness Report*.

mean sales growth of 6.3% and a market-to-book (M/B) ratio of 2.3, suggesting future growth opportunities. The average firm has positive operational cash flows and has about 31% of its assets as fixed assets. The firms experienced a currency crisis during 14% of the estimation period. Table 3 shows the industry-level observations and the corresponding mean and standard deviation of the *Z-score*. There is significant variation in the default risk scores within and across industry subgroups. The lowest mean *Z-score* is for the textile mill products and the highest mean *Z-score* is for the tobacco products industry group.

4. Results

4.1. Creditor rights and likelihood of debt distress

The findings of the estimation model shown in Equation 1 are presented in Table 4. The results of the estimation in column (1) suggest that higher the quality of the insolvency process in a country, lower the default risk (higher value of *Z-score*) of the firms in that country. In the baseline specifications, we control for fixed effects at the firm, year, and industry-year levels and cluster the standard errors at the firm level. In column (2), we additionally control for firm-specific factors that are known to affect the creditworthiness of the firms. The magnitude of the insolvency variable remains stable with the inclusion of these firm controls. In column (3), we control for country-specific factors. The results in column (3) suggest that a 10-unit increase in insolvency score (which is measured on a scale of 0-100) increases the *Z-score* score by 0.07 units. This represents a 2.2% increase compared to the mean *Z-score* of 3.19, suggesting that an improvement in the insolvency score has an economically significant effect in terms of reducing the risk of debt default by firms.

We further examine how this effect of the insolvency regime varies by the size of the firms in our sample. The findings in column (4) are in line with our expectation that stronger creditor rights dissuade larger firms from riskier investments and decisions that increase the chances of distress. We find that the negative association between stronger creditor rights and the likelihood of default is driven by the larger firms. The effects are higher by about 45% (0.010 vs. 0.007) as compared to the smaller firms in our sample (see column (4) in Table 4).

The coefficients of the control variables are as expected. These results suggest that smaller firms, firms with higher cash flows, and those with higher growth opportunities (higher *Market-to-Book* ratio) tend to have higher *Z-scores*, indicating a lower propensity to default. Firms with higher tangible capital have a lower *Z-score*, which may be explained by a greater reliance on debt financing secured by the firms' tangible assets. The coefficients of country-specific factors indicate that firms in countries with higher GDP growth, higher per capita income, and lower private credit to GDP (implying a lower debt overhang) tend to have a lower likelihood of default.

Our results are robust to the exclusion of the United States and Japan, both advanced economies that constitute about 35% of the observation in our sample (see columns (5) and (6)). These countries have been excluded in robustness tests in earlier studies on creditor rights to ensure that large advanced economies do not drive the main results (Cho et al., 2014).[7] The coefficient of $Insol\_score$ is significant and positive, albeit smaller in magnitude as compared to the full sample. However, in the restricted sample, we do not find any significant difference in the effect of the insolvency regime between the larger and the smaller firms.

Next, we estimate Equation 2 in which we test whether firms in countries with stronger insolvency framework would be able to perform better during heightened economic uncertainty. In order to capture large policy uncertainty shocks, we create EPU_shock, a dummy variable which takes the value 1 if the EPU index is one standard deviation above its average value and 0 otherwise. We interact this variable with the $Insol\_score$. The positive coefficient of the interaction term $Insol\_score \times EPU\_shock$, shown in Table 5 column (1), suggests that the likelihood of debt distress of firms is moderated during episodes of heightened economic policy uncertainty in countries with stronger creditor rights. A one standard deviation increase in the creditor rights score (equivalent to 27.9 unit increase) moderates the adverse effect of an EPU_shock on firm's default risk score by about 0.14, which is about 5.5% of the *Z-score* of the median firm in our sample. As expected, the negative and significant coefficient of the level effect of EPU_shock suggests that the default risk of firms is higher (lower *Z-score*) during episodes of heightened economic policy uncertainty.

[7] Our main results hold in terms of sign and significance even if we exclude China, the largest developing country, along with the United States and Japan.

The finding that better insolvency regimes moderate the adverse effects of higher economic policy uncertainty on firms' default risk is corroborated for an alternative measure of heightened economic uncertainty (EPU_shock_alt) that takes the value 1 for the top quartile of the EPU distribution (see column (2) of Table 5). The moderating effect of creditor rights is consistent for the restricted sample that excludes the United States and Japan, with the magnitude of the moderating effect being slightly higher for EPU_shock and similar for EPU_shock_alt compared to the full sample (see columns (3) and (4)).

4.2. Size-effects in firms' response to creditor rights

Beck, Demirgüç-Kunt, and Maksimovic (2006) suggest that weak creditor rights can incentivize firms that are dependent on external financing to increase their size. Larger firms may benefit from internalization of the allocation of capital, particularly when there is ineffective monitoring by intermediaries or as a consequence of weak legal systems for enforcement of creditor rights. In this section, we attempt to understand whether the moderating effect of insolvency regimes on default risk during heightened economic uncertainty is driven by larger or smaller firms.

We classify the firms into two groups using a dummy variable that takes the value 1 if the asset size is larger than the mean asset size for the sample and 0 otherwise. The result with country-level controls is reported in column (1) of Table 6. In column (2), we include country-year dummies that capture any country-specific time-varying effects. In the latter specification, country-specific level terms, such as $Insol\_score$ and EPU_shock, are subsumed by the country-year dummies and, consequently, only interaction terms that vary at the firm-level survive in the regression analysis.

The coefficient of the triple interaction term $Insol\_score \times EPU\_shock \times Large\_size$ is positive and significant, as shown in Table 6, suggesting that the moderating effects discussed in the earlier subsection are driven by larger firms. This finding is consistent with the argument of Eckbo and Thorburn (2003) that stronger creditor rights can dissuade managers from taking riskier decisions as they may lose the private benefits associated with higher control rights, a facet of large-sized firms with diffused ownership (Demsetz & Lehn, 1985). The findings are

consistent for the restricted sample of observations that excludes the firms from the US and Japan (see columns (3) and (4)).

4.3. Alternative measure of default risk

Our primary measure of default risk, *Z-score*, offers computational ease but suffers from some limitations as it is predominantly a book-value measure and does not take into account other factors that could affect the creditworthiness of the firm. In order to address this concern, we test the robustness of our main results with an alternative proxy for default risk, the market signal probability of default ($MSPD$). This measure is computed by Standard & Poor's using a proprietary structural model of default risk that is based on the corporate debt pricing model of Merton (1974) (see also Bharath and Shumway (2008)). The S&P methodology employs an iterative process, similar to that used by Vassalou and Xing (2004), to calculate the market value and volatility of assets. The model generates the distance-to-default and the commensurate probability of default.[8] As discussed in subsection 3.2, the $MSPD$ is transformed into $MSPD\_inv$ to be in the same direction as the *Z-score*. The higher the $MSPD\_inv$ measure, the lower would be the chances of default. One limitation of the $MSPD\_inv$ data is that it is available only since 2013 and for a relatively small subsample of 6,432 observations for 1,617 unique firms.

We re-estimate Equation 2 with $MSPD\_inv$ as the dependent variable. The results of the estimation shown in columns (1) and (2) of Table 7 are consistent with the findings shown in Table 5 for EPU_shock and EPU_shock_alt. The coefficient of the interaction terms that captures the role of better creditor rights during periods of shock is positive and significant. A one standard deviation increase in the insolvency framework of the country reduces the probability of default by 0.45 percentage points. Our findings remain robust for the subsample excluding the United States and Japan, as reported in columns (3) and (4).

[8]Detailed technical notes on Standard & Poor's probability of default (PD) methodology can be accessed from: https://www.spglobal.com/marketintelligence/en/documents/pd-model-market-signal-an-enhanced-structural-probability-of-default-model.pdf.

4.4. *Alternative measure of economic shocks*

In order to test whether our results for firms' default risk during economic policy shocks is robust to alternative measure of country-specific shocks, we employ two measures, namely, the presence of currency crisis in a country and the presence of sovereign debt crisis in a country. The results of the estimation in Table 8 suggest that the moderating effects found for periods of higher economic policy uncertainty is prevalent during periods of currency crisis (see coefficient of the interaction term $Insol\_score \times Curr\_crisis$ in column (1) for the full sample and column (3) for the subsample excluding the United States and Japan). A similar result is observed when firms are faced with sovereign debt crisis. The coefficient of the interaction term $Insol\_score \times Debt\_crisis$ in columns (2) and (4) is positive and significant. A comparison of the coefficients of the interaction terms above suggests that the effect of creditor rights is higher during sovereign debt crisis as compared to currency crisis.

4.5. *Continuous measure of economic policy uncertainty*

Next, in order to address the concerns regarding the choice and construction of the binary EPU_shock variable, we re-estimate Equation 2 with the continuous measure of economic policy uncertainty EPU of Baker et al. (2016). The results of the re-estimation shown in Table 9 column (1) for the full sample and in column (3) for the subsample excluding the United States and Japan capture the effect of stronger creditor rights during higher policy uncertainty. Similarly, in columns (2) and (4), we estimate the large-size effect described in the earlier sections. The results are consistent with our findings for the discrete measure of economic uncertainty shocks reported in Table 5 and Table 6.

4.6. *Role of alternative institutional factors*

Although our focus is on whether a stronger insolvency regime influences firms' behavior in response to changes in creditor rights, the prevailing ethical practices of managers in a country may help to reduce agency costs in debt contracts. Hence, we employ $Firm\_ethics$, a measure of ethical practices of firms provided by the Global Competitiveness Index of the World Eco-

nomic Forum. We re-estimate the model shown in Equation 1 by interacting the $Insol\_score$ with the $Firm\_ethics$ measure described above. The results of the estimation are reported in Table 10 column (1) for the full sample and column (3) for the subsample that excludes the United States and Japan. The level terms of both $Firm\_ethics$ and $Insol\_score$ are positive and significant, suggesting that both these institutional variables lower the default risk of firms. The findings on the effect of $Firm\_ethics$ is consistent with the arguments advanced by earlier studies that ethical practices in firms reduce the information asymmetry in financial contracting (Huang et al., 2008; Husted, 2007; Van Oosterhout et al., 2006). However, the interaction between creditor rights and firm ethics is negative and significant, suggesting that the strength of the insolvency regime and firm ethics may act as substitutes in influencing firm behavior.

Additionally, we estimate the incremental effects of $Firm\_ethics$ during episodes of higher economic policy uncertainty. The results in columns (2) and (4) of Table 10 show that the coefficient of the interaction term $Firm\_ethics \times EPU\_shock$ is positive and significant, suggesting that ethical practices in firms have a positive effect on firm default risk during periods of economic policy shocks. This finding is consistent with the effects observed for $Insol\_score \times EPU\_shock$. However, the coefficients of the triple interaction $Insol\_score \times Firm\_ethics \times EPU\_shock$ suggest that $Insol\_score$ and $Firm\_ethics$ may act as substitutes in moderating the adverse effects of economic policy shocks.

4.7. Channels of firm responses to improved creditor rights

While we find evidence substantiating our hypothesis that creditor rights moderate the adverse effects of economic shocks on firms' default risk, it is important to explore the potential channels through which creditor rights can affect the risk of debt default during heightened policy uncertainty. First, we examine the role of dependence of firms on external finance. The measure of external financial dependence (EFD) is based on the seminal work of Rajan and Zingales (1998). The variable that is computed at the firm-level captures the amount of the capital expenditure that is not financed by internally generated cash flows. We aggregate this measure at the industry-level by taking the median value of EFD for each of the 2-digit SIC industry sectors. We classify the industries in our sample into two groups based on their dependency on

external finance.

We re-estimate Equation 2 for the two groups of firms belonging to industries with low (below median) and high (above median) values of EFD. The results of the estimations shown in columns (1) and (2) of Table 11 for high and low EFD, respectively, suggest that the moderating effect of $Insol\_score$ is more pronounced in the case of firms belonging to industries with relatively high dependence on external finance. This finding suggests that the importance of creditor rights is likely to be germane for firms that rely on external sources of financing as compared to those that rely mostly on internal sources. This is consistent with a larger role of creditor rights in reducing financing frictions when a firm has higher reliance on external debt financing. A similar result is observed for the restricted subsample that excludes the United States and Japan, shown in columns (3) and (4) for high and low EFD, respectively.

Next, we examine the role of leverage, identified as one of the primary causes of financial distress (Andrade & Kaplan, 1998), and cash holdings in the response of firms to an improved insolvency framework. Strong creditor rights have been associated with lower leverage in several studies (Acharya et al., 2011; Cho et al., 2014). In a similar vein, better creditor rights are linked to lower cash holdings given the precautionary motive of riskier firms (Huang, Elkinawy, & Jain, 2013). Financially constrained firms with high hedging needs have a strong propensity to save cash out of a firm's cash flows (Acharya, Almeida, & Campello, 2007).

We employ a two-stage least squares (2SLS) estimation to understand the channels through which improved creditor rights influence firms' risk-taking. In the first stage, we regress contemporaneous values of leverage and cash holdings on the $Insol\_score$ and $Insol\_score \times EPU\_shock$. In the second stage, we regress *Z-score* on leverage and cash. Since *Z-score* includes market value leverage, we estimate the second stage equation for a variant of *Z-score* that excludes this component (see MacKie-Mason (1990)). The first stage results shown in Table 12 column (1) suggest that firms on average reduce their cash holdings during an economic shock in order to wade over the crisis. However, we do not find the interaction term to be significant, suggesting that a stronger insolvency framework does not play an important role in moderating the adverse effects of economic policy uncertainty on cash holdings.

The results reported in column (2) suggest that firms' leverage increases (lower value of

$Mkt\_leverage\_inv$) during economic policy shocks. The interaction term $Insol\_score \times EPU\_shock$ is positive and significant, supporting the argument that a stronger insolvency regime induces firms to reduce their leverage during economic uncertainty shocks. The second-stage results for the *MacKie-Mason Z-score* in column (3) suggest that the moderating effect of $Insol\_score$ during EPU_shock acts through the leverage channel.

4.8. Robustness with nonparametric methods

It is possible that the relationship between the insolvency framework and firms' risk-taking is non-linear in nature, with the benefits accruing differentially at various levels of the insolvency score. In order to account for potential non-linearities in the relationship, we employ a semiparametric estimator suitable for panel data developed by Baltagi and Li (2002). The methodology allows a flexible functional form for the relationship between the dependent variable and the key explanatory variable.[9] Such semiparametric approaches have been used in the corporate finance literature (for instance, Florackis, Kostakis, & Ozkan, 2009; Gorton & Schmid, 2000; Hamadi & Heinen, 2015)

First, the nonparametric estimation of the relationship between the insolvency score ($Insol\_score$) and firm debt distress (*Z-score*) is conducted with the same set of control variables as in our baseline specification (see Equation 1). The predicted values of the estimation are shown in Figure 1. The figure suggests that the effect of an enhanced insolvency regime is asymmetric in nature, rising steeply from around the 10^{th} to the 70^{th} unit of the insolvency index (on a 0-100 scale), and then plateaus for higher insolvency scores. The effect is also not observed for the small number of countries with insolvency scores below the 10^{th} unit.

The broadly positive, albeit non-linear, relationship between creditor rights and the predicted default risk scores supports the baseline results from the earlier parametric analysis as per the specification in Equation 1. The observed non-linearity suggests that firms domiciled in countries with relatively weak insolvency frameworks are more affected by changes to creditor rights as compared to those in countries with relatively stronger insolvency regimes. However, for countries with extremely weak insolvency regimes, marginal changes to creditor rights may

[9]The analysis is conducted using the semiparametric Stata routine for panel data developed by Libois and Verardi (2013).

not be sufficient to reduce firms' default risk. Such countries may need to undertake significant reforms to observe a marked improvement in firms' risk-taking behavior.

Second, we consider possible changes to the non-linear relationship between firms' risk of debt distress and insolvency regimes under economic policy uncertainty. We compare the results from the nonparametric estimation of the relationship between the $Insol\_score$ and *Z-score* for firms operating under high economic policy uncertainty and those under low uncertainty. The definition of 'high EPU' in this analysis is the same as the EPU_shock variable defined earlier, with the remaining periods classified as 'low EPU'.

Similar to the overall sample, the observed positive non-linear relationship between firms' *Z-score* and the insolvency index for both groups (high and low EPU) is consistent with the baseline results for Equation 1, as shown in Figure 2. Further, in line with the results of the parametric analysis as per the specification in Equation 2, we find that it is steeper for the subsample of firms operating in countries facing high economic policy uncertainty as compared to firms in other countries (see Figure 2). This further supports our hypothesis that better insolvency frameworks moderate the effect of policy uncertainty on firm's risk-taking behavior.

The nonparametric analysis provides additional insights into the effect on firms' default risk at various levels of the insolvency index. While the overall results corroborate the linear relationship detailed in earlier sections, the analysis incorporating potential non-linearities captures the relevance of insolvency regimes for firms located in countries with relatively weak creditor rights. These results also underscore the importance of improving regulatory capacity, particularly in countries that have poor creditor protection and are more prone to economic shocks.

4.9. Revised measure of insolvency

One possible concern regarding the measure employed to capture the strength of the insolvency regime is a change in methodology undertaken by the World Bank's $Doing\ Business$ report in 2015. This change in methodology incorporates some subjective components such as the efficacy of the legal system in the country, in addition to the time, cost, and outcome of insolvency proceedings that determine the recovery rates in bankruptcy used in the earlier methodology.

In order to address this concern, we extend the insolvency score from 2015 onward with the distance-to-frontier methodology employed until 2014. The new measure $Insol\_score\_ext$ is calculated by normalizing the recovery rate in the year t with the maximum recovery rate across the full sample of countries for all years such that the index ranges from 0 to 100. The new measure that captures the distance to frontier is employed in the estimations shown in Table 13. We re-estimate Equation 2 for both *Z-score* as well as $MSPD\_inv$. The results for the interaction term $Insol\_score\_ext \times EPU\_shock$ in column (1) for full sample and column (3) for the subsample excluding the United States and Japan are very similar in sign and magnitude as that in Table 5. Similarly, the interaction terms in columns (2) and (4) for $MSPD\_inv$ are similar to those in Table 7.

4.10. Extended sample with service sector firms

We have included manufacturing firms in the analysis so far in order to have a relatively homogeneous sample of firms. The default risk score that is used in our analysis was developed by Altman (1968) for manufacturing firms. However, this measure has also been used for services firms in recent studies (see, for instance, Eisdorfer (2008) and Acharya, Bharath, and Srinivasan (2007)). In this section, we conduct robustness of our main results for an extended sample of firms that also includes service sector firms. In addition to manufacturing firms with 2-digit SIC codes 20 to 39, we include all firms except for those in the financial services and real estate (SIC codes 60-67), utility and public transportation (SIC codes 40-49), and public service establishments (SIC codes 90-99). The results of the estimations shown in Table 14 are consistent with the findings observed for manufacturing firms.

5. Conclusion

In this study, we examine whether stronger creditor rights reduce firms' risk of default during episodes of heightened economic policy uncertainty using a large cross-country firm-level dataset. Consistent with earlier studies that argue for an inverse relationship between creditor rights and firms' risk-taking, we find a negative association between the strength of the insol-

vency framework and firms' risk of debt distress. Further, we find that stronger creditor rights moderate the adverse effects of economic shocks and crises on firms' likelihood of default. A nonparametric estimation of the relationship between creditor rights and firms' risk-taking behavior under high and low economic policy uncertainty corroborates our baseline findings. Overall, the results suggest that a stronger insolvency framework improves the stability of the corporate sector and its ability to withstand government policy uncertainty and various economic shocks, such as currency and sovereign debt crisis episodes.

Our findings suggest that the presence of stronger creditor rights may improve the outcomes of both the contracting parties by dissuading managers and entrepreneurs from undertaking riskier profitable investments. While the passing up of riskier and value-increasing investments may not be in the best interest of the shareholders, in some instances, this can potentially reduce agency costs and improve contracting outcomes. The conservative risk choices of managers could also be an outcome of a fear of loss of reputational capital if strong creditor rights result in a greater likelihood of a management change in the event of a debt default.

The observed moderating effect of stronger creditor rights during economic policy uncertainty implies that the utility of having a sound insolvency regime extends beyond normal economic conditions. Not only do creditor rights improve contracting outcomes, but they also reduce the risk of debt distress of the corporate sector during a crisis event. In such instances, firms are likely to actively manage business risks in anticipation of a crisis so as to avoid entering bankruptcy. The findings of our study are particularly relevant for countries that are prone to adverse economic shocks.

In addition to influencing risk-taking behavior of firms, inadequacies in the insolvency regime can impose a substantial burden on the broader economy. The divergence of insolvency frameworks from best practices can increase costs for investors and discourage domestic and cross-border investment (Bricongne, Demertzis, Pontuch, & Turrini, 2016). Inadequate bankruptcy regimes that facilitate survival of less productive firms may have contributed to the productivity slowdown in OECD countries (Adalet McGowan et al., 2018). Hence, it is imperative for policymakers in countries that are lagging in creditor rights to implement reforms that can improve the effectiveness of their insolvency framework.

Institutional reforms to strengthen creditor rights would reduce the incentive of firms to take on excessive risk, especially in environments characterized by weak insolvency regimes. Bricongne et al. (2016) identify several institutional reforms such as improving the ability of debtors and creditors to initiate insolvency proceedings based on clearly defined criteria, increasing the capacity of the judicial system, and ensuring resolution of viable firms and early liquidation of non-viable firms. Other reforms include enhancing the skills of insolvency resolution professionals, improving accuracy and timely availability of data on debtors' financial condition, and facilitating secondary markets for non-performing loans.

While we emphasize the importance of improving the efficiency of the insolvency framework, this may have to be complemented by a broader set of policies. For instance, strengthening the rule of law and improving product market regulations can complement insolvency reforms (Adalet McGowan et al., 2018). Safeguarding the financial system with additional capital buffers and reserves, improving corporate governance norms, and proactive government policies can also help firms deal with adverse shocks and reduce the risk of financial distress.

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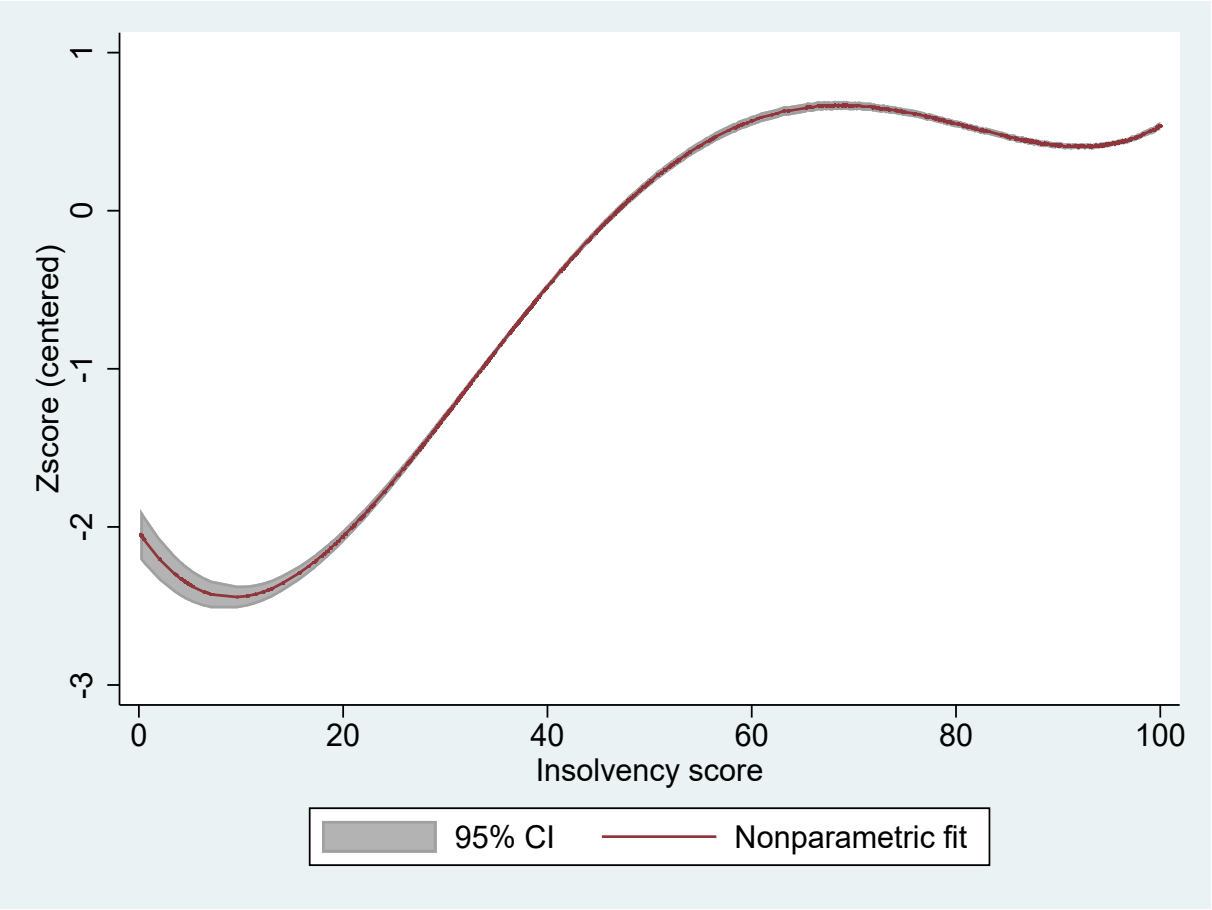
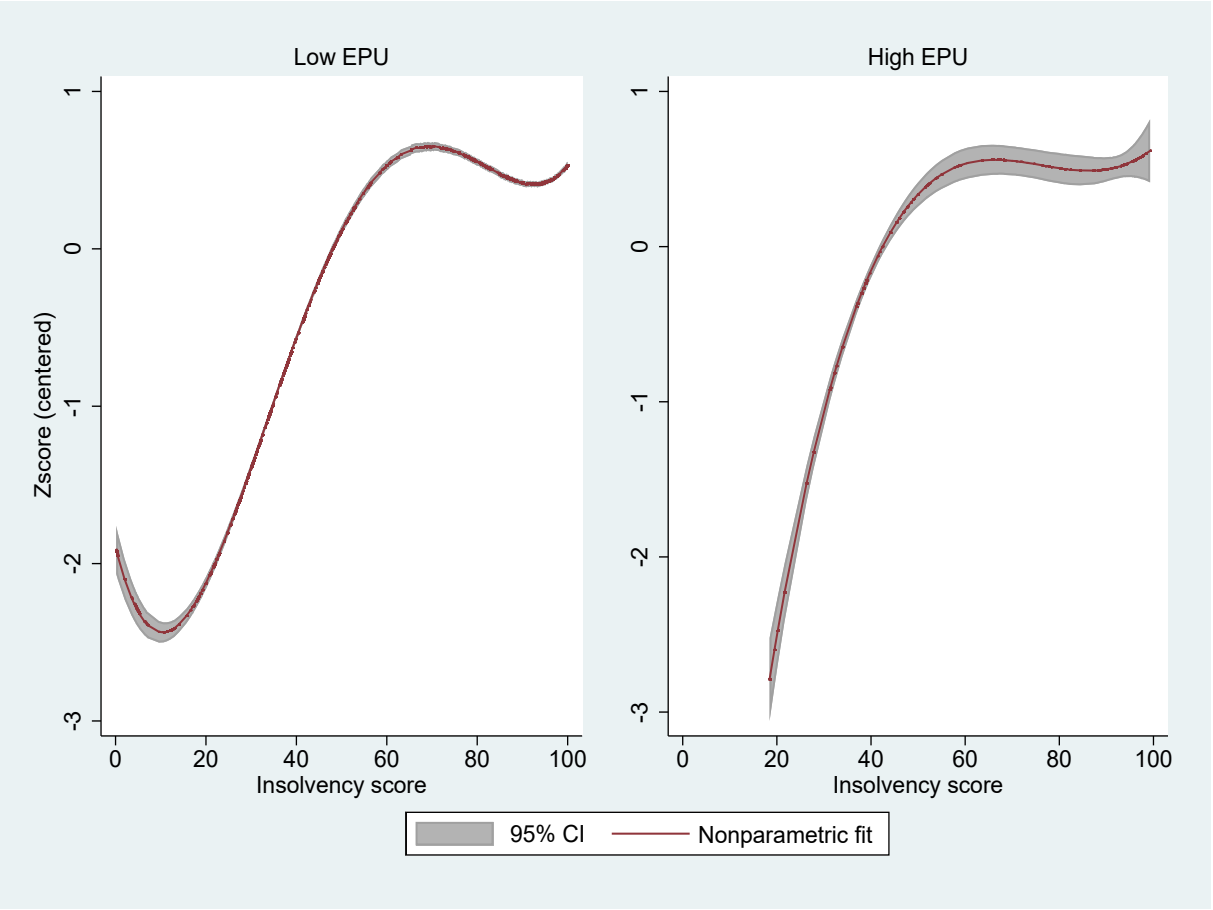
Figure 1: Nonparametric estimation results: Full sample



The figure shows the result of the nonparametric estimation of the relationship between Insolvency score ($Insol\_score$) and default risk score (*Z-score*), with the same set of control variables as in our baseline specification. The analysis is conducted using the partially linear fixed-effects estimator for panel data developed by Baltagi and Li (2002). The predicted *Z-score* (Y-axis) based on the non-linear model is centered around zero. Insolvency score (X-axis) ranges from 0 to 100.

Figure 2: Nonparametric estimation results: By low and high EPU



The figure shows the results of the nonparametric estimation of the relationship between Insolvency score ($Insol\_score$) and default risk score (*Z-score*), with the same set of control variables as in our baseline specification for two subsamples. The right panel corresponds to firm-year observations for values of EPU larger than one standard deviation above the mean (EPU_shock = 1) and the left panel corresponds to observations for which EPU_shock = 0. The analysis is conducted using the partially linear fixed-effects estimator for panel data developed by Baltagi and Li (2002). The predicted *Z-score* (Y-axis) based on the non-linear model is centered around zero. Insolvency score (X-axis) ranges from 0 to 100.

Table 1: Variable description & data source

Variable	Definition and construction	Data source
Z-score	Computed based on the Altman model of default risk (Altman, 1968). The measure is computed as 1.2 × Working capital to assets + 1.4 × Retained earnings to total assets + 3.3 × EBITDA to total assets + 0.6 × Market value of equity divided by book value of liabilities + 0.999 × Sales to assets	Worldscope
$Insol\_score$	An index that provides a score based on the time, cost and outcome of the insolvency proceedings of domestic entities in a country.	Doing Business World Bank
$Firm\_ethics$	An index that captures the level of corporate ethics in interactions with politicians, bureaucrats, and other firms	Global Competitiveness Index of the World Economic Forum
$MSPD\_inv$	Market signal probability of default (ranging between 0 and 100) is a measure of default risk computed using structural models. The measure is transformed as 100 - Probabilty of default. Higher the $MSPD\_inv$, lower the likelihood of default.	S&P Capital IQ
EPU	An index that provides a measure of country-specific economic policy uncertainty.	Economic Policy uncertainty Index of Baker, Bloom and Davis (2016)
EPU_shock	A dummy variable that takes the value of 1 if the EPU is higher than one standard deviation above the mean EPU and 0 otherwise	Authors' calculations
$Curr\_crisis$	A country-specific dummy variable that takes the value 1 for all the years in which there was a currency crisis in a country and 0 otherwise.	Behavioral Finance and Financial Stability data from Harvard Business School
$Debt\_crisis$	A country-specific dummy variable that takes the value 1 for all the years in which there was a sovereign debt crisis in a country and 0 otherwise.	Behavioral Finance and Financial Stability data from Harvard Business School
$Sales\_gro$ (%)	Growth in sales in a year	Worldscope
Log_Asset	Natural logarithm of inflation adjusted total assets in USD (*WC07230*) of the firm	Worldscope
$Mkt\_leverage\_inv$	Ratio of market value of equity to total liabilities (*WC07210/(WC07230- WC07220)*)	Worldscope
Op_CF_Asset	Operational cash flow divided by the total assets at the end of the year of a firm (*WC04201/WC02999*)	Worldscope
M/B	Ratio of market value of the equity to book value of equity (*WC07210/WC07220*)	Worldscope

Continued on next page

Table 1 – *Continued from previous page*

Variables	Definition and Construction	Data Source
$Tangibility$ (%)	Fixed assets to total assets of a firm (*WC02501/WC02999*).	Worldscope
GDP_growth (%)	GDP growth of the country where the firm is headquartered.	World Bank WDI
$Pvtcredit\_GDP$ (%)	Ratio of private credit to the GDP of the country where the firm is headquartered.	World Bank WDI
Log_GDPPC	Log of the annual GDP per capita of a country where the firm is headquartered.	World Bank WDI

Table 2: Summary statistics

P(x) refers to the xth percentile of the distribution. The definition of the variables is given in Table 1.

Variable	Obs.	Mean	Std. Dev.	Median	Min.	Max.	P10	P90
Firm-specific								
Z-score	103,576	3.19	3.32	2.53	-5.77	20.43	0.09	8.89
Log_asset	103,576	12.55	1.87	12.44	8.38	17.53	9.60	15.94
$Sales\_gro$	103,576	6.26	25.09	5.42	-85.47	102.78	-31.26	45.63
Op_CF_Asset	103,576	0.06	0.10	0.07	-0.41	0.28	-0.09	0.19
M/B	103,576	2.31	2.90	1.41	0.18	19.94	0.34	7.15
$Tangibility$	103,576	0.31	0.18	0.29	0.01	0.77	0.05	0.64
$Mkt\_leverage\_inv$	103,576	3.05	4.96	1.36	0.06	32.20	0.18	11.98
$Cash\_asset$	103,159	0.14	0.13	0.10	0.00	0.68	0.01	0.41
$MSPD\_inv$	7,544	97.33	3.56	98.49	36.02	100.00	90.55	99.92
Country-specific								
$Insol\_score$	103,576	69.15	27.92	82.55	0.14	100.00	27.36	99.83
$Pvtcredit\_GDP$	103,576	181.51	88.41	159.74	4.91	363.25	52.20	350.08
Log_GDPPC	103,576	9.75	1.21	10.46	6.10	11.69	7.32	10.93
GDP_growth	103,576	3.57	3.73	2.76	-17.00	25.56	-2.25	10.04
$Curr\_crisis$	99,784	0.14	0.35	0.00	0.00	1.00	0.00	1.00
$Debt\_crisis$	98,047	0.00	0.06	0.00	0.00	1.00	0.00	0.00
EPU	88,577	123.11	50.64	119.53	27.00	364.83	65.82	209.98
EPU_shock	88,577	0.12	0.32	0.00	0.00	1.00	0.00	1.00
EPU_shock_alt	88,577	0.24	0.43	0.00	0.00	1.00	0.00	1.00
$Firm\_ethics$	79,499	4.93	0.87	5.02	2.74	6.78	3.61	6.21

Table 3: Industry-specific Altman Z-score

The mean and standard deviation of the *Z-score* by SIC 2-digit industry codes for the manufacturing sector are shown in the table. The number of firm-year observations by industry group is also shown.

SIC code	Industry	Mean	Std. Dev.	Obs.
20	Food & Kindred Products	3.28	2.90	10,571
21	Tobacco Products	5.68	4.90	229
22	Textile Mill Products	2.33	2.39	3,191
23	Apparel & Other Textile Products	3.33	3.01	2,294
24	Lumber & Wood Products	2.62	2.53	1,565
25	Furniture & Fixtures	2.87	2.43	1,077
26	Paper & Allied Products	2.48	2.23	3,315
27	Printing & Publishing	2.73	2.60	3,028
28	Chemical & Allied Products	3.54	4.04	16,278
29	Petroleum & Coal Products	3.14	2.19	1,318
30	Rubber & Miscellaneous Plastics Products	3.03	2.95	2,942
31	Leather & Leather Products	4.42	4.00	560
32	Stone, Clay, & Glass Products	2.76	2.86	4,701
33	Primary Metal Industries	2.70	2.50	6,909
34	Fabricated Metal Products	2.95	2.34	4,458
35	Industrial Machinery & Equipment	3.17	2.94	11,967
36	Electronic & Other Electric Equipment	3.36	3.81	14,069
37	Transportation Equipment	2.69	2.52	6,239
38	Instruments & Related Products	4.15	4.78	6,859
39	Miscellaneous Manufacturing Industries	3.52	3.12	2,006
	Overall	3.19	3.32	103,576

Table 4: Insolvency framework and firms' default risk

The dependent variable in the estimations is the *Z-score* of the firm in year t. A higher value of *Z-score* indicates a lower likelihood of default. $Large\_size$ is a dummy variable that takes the value 1 for firms with assets more than the median asset size in the sample and 0 otherwise. Robust standard errors, clustered at firm level are presented in the parenthesis. '***', '**' and '*' indicate significance at the 1%, 5% and 10% respectively. The definition of each of the variables is given in Table 1.

	All countries				Excluding US & Japan	
Dep_var : *Z-score*	(1)	(2)	(3)	(4)	(5)	(6)
$Insol\_score_{t-1}$	0.016***	0.016***	0.007***	0.007***	0.005**	0.006**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$Large\_size$				-0.654***		-0.629***
				(0.119)		(0.133)
$Insol\_score_{t-1} \times Large\_size$				0.003*		0.002
				(0.002)		(0.002)
Log_asset_{t-1}		-0.429***	-0.611***		-0.713***	
		(0.038)	(0.044)		(0.048)	
$Sales\_gro_{t-1}$		0.000	0.001**	0.000	0.002***	0.001
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
$Op.CF\_Asset_{t-1}$		6.933***	6.991***	6.880***	7.198***	7.123***
		(0.276)	(0.277)	(0.277)	(0.323)	(0.324)
M/B_{t-1}		0.128***	0.115***	0.133***	0.110***	0.133***
		(0.009)	(0.009)	(0.009)	(0.010)	(0.010)
$Tangibility_{t-1}$		-2.449***	-2.410***	-2.367***	-2.381***	-2.376***
		(0.183)	(0.181)	(0.183)	(0.203)	(0.205)
$Pvtcredit\_GDP_{t-1}$			-0.003***	-0.003***	-0.002*	-0.003***
			(0.001)	(0.001)	(0.001)	(0.001)
GDP_growth_{t-1}			0.022***	0.023***	0.018***	0.018***
			(0.004)	(0.004)	(0.005)	(0.005)
Log_GDPPC_{t-1}			0.951***	0.636***	0.995***	0.614***
			(0.076)	(0.069)	(0.092)	(0.085)
$Constant$	2.074***	7.481***	1.552**	-2.764***	2.642***	-2.312***
	(0.165)	(0.496)	(0.663)	(0.688)	(0.771)	(0.795)
Firm-year obs.	103,576	103,576	103,576	103,576	66,981	66,981
No. of firms	13,019	13,019	13,019	13,019	8,956	8956
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
$Adj.\_R^2$	0.642	0.669	0.672	0.669	0.679	0.675

Table 5: Economic shocks and firms' default risk

The dependent variable in the estimations is the *Z-score* of the firm in year t. A higher value of *Z-score* indicates a lower likelihood of default. Robust standard errors, clustered at firm level are presented in the parenthesis. '***', '**' and '*' indicate significance at the 1%, 5% and 10% respectively. The definition of each of the variables is given in Table 1.

	All countries		Excluding US & Japan	
Dep_var : *Z-score*	(1)	(2)	(3)	(4)
$Insol\_score_{t-1}$	0.008**	0.008***	0.004	0.004
	(0.003)	(0.003)	(0.003)	(0.003)
EPU_shock_{t-1}	-0.157**		-0.225***	
	(0.071)		(0.074)	
$Insol\_score_{t-1} \times EPU\_shock_{t-1}$	0.005***		0.007***	
	(0.001)		(0.001)	
$EPU\_shock\_alt_{t-1}$		-0.390***		-0.435***
		(0.060)		(0.066)
$Insol\_score_{t-1} \times EPU\_shock\_alt_{t-1}$		0.005***		0.005***
		(0.001)		(0.001)
Log_asset_{t-1}	-0.651***	-0.651***	-0.791***	-0.791***
	(0.050)	(0.050)	(0.056)	(0.056)
$Sales\_gro_{t-1}$	0.001**	0.001**	0.002***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)
$Op.CF\_Asset_{t-1}$	7.031***	7.024***	7.327***	7.340***
	(0.315)	(0.315)	(0.393)	(0.392)
M/B_{t-1}	0.111***	0.111***	0.102***	0.103***
	(0.009)	(0.009)	(0.010)	(0.010)
$Tangibility_{t-1}$	-2.325***	-2.317***	-2.279***	-2.250***
	(0.210)	(0.210)	(0.244)	(0.245)
$Pvtcredit\_GDP_{t-1}$	-0.004***	-0.004***	-0.003***	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
GDP_growth_{t-1}	0.023***	0.018***	0.012**	0.009
	(0.005)	(0.005)	(0.006)	(0.006)
Log_GDPPC_{t-1}	1.016***	1.067***	1.106***	1.102***
	(0.081)	(0.082)	(0.099)	(0.102)
$Constant$	1.491**	0.923	2.819***	2.885***
	(0.708)	(0.713)	(0.840)	(0.858)
Firm-year obs.	88,554	88,554	51,947	51,947
No. of firms	11,210	11,210	7,146	7,146
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry-year fixed effects	Yes	Yes	Yes	Yes
Adj_R^2	0.672	0.672	0.681	0.681

Table 6: Size-effects in firms' response to creditor rights

The dependent variable in the estimations is the *Z-score* of the firm in year t. A higher value of *Z-score* indicates a lower likelihood of default. $Large\_size$ is a dummy variable that takes the value 1 for firms with assets more than the median asset size in the sample and 0 otherwise. Robust standard errors, clustered at firm level are presented in the parenthesis. '***', '**' and '*' indicate significance at the 1%, 5% and 10% respectively. The definition of each of the variables is given in Table 1.

	All countries		Excluding US & Japan	
Dep_var : *Z-score*	(1)	(2)	(3)	(4)
$Insol\_score_{t-1}$	0.005		0.004	
	(0.003)		(0.004)	
EPU_shock_{t-1}	0.253**		0.218*	
	(0.120)		(0.123)	
$Insol\_score_{t-1} \times EPU\_shock_{t-1}$	0.000		0.002	
	(0.002)		(0.002)	
$Large\_size$	-0.720***	-0.829***	-0.675***	-0.774***
	(0.137)	(0.139)	(0.155)	(0.159)
$Insol\_score_{t-1} \times Large\_size$	0.004**	0.005***	0.002	0.004
	(0.002)	(0.002)	(0.003)	(0.003)
$EPU\_shock_{t-1} \times Large\_size$	-0.714***	-0.686***	-0.796***	-0.725***
	(0.149)	(0.170)	(0.153)	(0.172)
$Insol\_score_{t-1} \times EPU\_shock_{t-1} \times Large\_size$	0.008***	0.008***	0.010***	0.009***
	(0.002)	(0.003)	(0.003)	(0.003)
$Sales\_gro_{t-1}$	0.000	0.001	0.001*	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)
$Op.CF\_Asset_{t-1}$	6.864***	6.787***	7.161***	7.074***
	(0.315)	(0.315)	(0.396)	(0.390)
M/B_{t-1}	0.129***	0.128***	0.128***	0.125***
	(0.009)	(0.010)	(0.010)	(0.011)
$Tangibility_{t-1}$	-2.261***	-2.415***	-2.257***	-2.406***
	(0.212)	(0.215)	(0.247)	(0.251)
$Pvtcredit\_GDP_{t-1}$	-0.004***		-0.004***	
	(0.001)		(0.001)	
GDP_growth_{t-1}	0.024***		0.012**	
	(0.005)		(0.006)	
Log_GDPPC_{t-1}	0.716***		0.730***	
	(0.073)		(0.091)	
$Constant$	-3.395***	3.731***	-3.164***	46.896***
	(0.749)	(0.761)	(0.883)	(11.046)
Firm-year obs.	88,554	88,545	51,947	51,938
No. of firms	11,210	11,210	7,146	7,146
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry-year fixed effects	Yes	Yes	Yes	Yes
Country-year fixed effects	No	Yes	No	Yes
$Adj.\_R^2$	0.669	0.678	0.677	0.686

Table 7: Alternative measure of default risk

The dependent variable in the estimations is the $MSPD\_inv$ of the firm in year t. A high value of $MSPD\_inv$, which ranges from 0 to 100, indicates a lower probability of default. Robust standard errors, clustered at firm level are presented in the parenthesis. '***', '**' and '*' indicate significance at the 1%, 5% and 10% respectively. The definition of each of the variables is given in Table 1.

	All countries		Excluding US & Japan	
$Dep\_var: MSPD\_inv$	(1)	(2)	(3)	(4)
$Insol\_score_{t-1}$	0.007	0.019	-0.015	0.008
	(0.027)	(0.026)	(0.031)	(0.029)
EPU_shock_{t-1}	-1.520***		-1.746***	
	(0.379)		(0.446)	
$Insol\_score_{t-1} \times EPU\_shock_{t-1}$	0.016***		0.016***	
	(0.005)		(0.006)	
$EPU\_shock\_alt_{t-1}$		-1.635***		-1.818***
		(0.388)		(0.486)
$Insol\_score_{t-1} \times EPU\_shock\_alt_{t-1}$		0.016***		0.015**
		(0.005)		(0.006)
Log_asset_{t-1}	-0.284	-0.267	-0.338	-0.332
	(0.235)	(0.236)	(0.325)	(0.324)
$Sales\_gro_{t-1}$	-0.001	-0.001	0.000	0.000
	(0.002)	(0.002)	(0.002)	(0.002)
$Op.CF\_Asset_{t-1}$	1.086	1.052	0.977	0.979
	(0.973)	(0.971)	(1.635)	(1.632)
M/B_{t-1}	-0.047**	-0.044**	-0.060**	-0.061**
	(0.020)	(0.020)	(0.025)	(0.025)
$Tangibility_{t-1}$	-0.765	-0.788	-0.63	-0.69
	(0.886)	(0.887)	(1.144)	(1.144)
$Pvtcredit\_GDP_{t-1}$	0.016***	0.016***	0.012***	0.013***
	(0.003)	(0.003)	(0.005)	(0.005)
GDP_growth_{t-1}	-0.001	-0.007	0.026	0.026
	(0.034)	(0.036)	(0.042)	(0.044)
Log_GDPPC_{t-1}	0.727*	0.740*	1.664**	1.732**
	(0.436)	(0.444)	(0.768)	(0.752)
$Constant$	90.580***	89.498***	85.293***	83.471***
	(2.882)	(2.922)	(5.604)	(5.437)
Firm-year obs.	6,432	6,432	3,837	3,837
No. of firms	1,617	1,617	974	974
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry-year fixed effects	Yes	Yes	Yes	Yes
Adj_R^2	0.669	0.67	0.651	0.653

Table 8: Alternative measure of economic shocks - Currency and debt crisis

The dependent variable in the estimations is the *Z-score* of the firm in year t. A higher value of *Z-score* indicates a lower likelihood of default. $Curr\_crisis$ and $Debt\_crisis$ are dummy variables that captures the presence of a currency and sovereign debt default in a country. Robust standard errors, clustered at firm level are presented in the parenthesis. '***', '**' and '*' indicate significance at the 1%, 5% and 10% respectively. The definition of each of the variables is given in Table 1.

	All countries		Excluding US & Japan	
Dep_Var : *Z-score*	(1)	(2)	(3)	(4)
$Insol\_score_{t-1}$	0.007***	0.006**	0.006**	0.004*
	(0.002)	(0.002)	(0.002)	(0.002)
$Curr\_crisis_{t-1}$	-0.481***		-0.442***	
	(0.067)		(0.077)	
$Insol\_score_{t-1} \times Curr\_crisis_{t-1}$	0.006***		0.003*	
	(0.001)		(0.001)	
$Debt\_crisis_{t-1}$		-0.500*		-0.588*
		(0.299)		(0.308)
$Insol\_score_{t-1} \times Debt\_crisis_{t-1}$		0.023**		0.024**
		(0.010)		(0.011)
Log_asset_{t-1}	-0.600***	-0.610***	-0.714***	-0.720***
	(0.045)	(0.046)	(0.049)	(0.050)
$Sales\_gro_{t-1}$	0.001*	0.001**	0.002***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)
$Op.CF\_Asset_{t-1}$	7.050***	6.950***	7.291***	7.120***
	(0.284)	(0.286)	(0.335)	(0.339)
M/B_{t-1}	0.114***	0.114***	0.108***	0.110***
	(0.009)	(0.009)	(0.010)	(0.010)
$Tangibility_{t-1}$	-2.402***	-2.390***	-2.387***	-2.370***
	(0.189)	(0.191)	(0.214)	(0.217)
$Pvtcredit\_GDP_{t-1}$	-0.003***	-0.003***	-0.001	-0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
GDP_growth_{t-1}	0.020***	0.028***	0.018***	0.023***
	(0.004)	(0.004)	(0.005)	(0.005)
Log_GDPPC_{t-1}	1.014***	0.967***	1.069***	1.051***
	(0.080)	(0.079)	(0.095)	(0.097)
$Constant$	0.911	1.560**	2.005**	2.412***
	(0.693)	(0.673)	(0.780)	(0.780)
Firm-year obs.	99,778	98,041	63,180	61,433
No. of firms	12,522	12,345	8,459	8,282
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry-year fixed effects	Yes	Yes	Yes	Yes
Adj_R^2	0.677	0.677	0.688	0.688

Table 9: Continuous measure of uncertainty

The dependent variable in columns (1), (2) and (4) is *Z-score*, and in column (3) is $MSPD\_inv$. A higher value of *Z-score* indicates a lower likelihood of default. $Large\_size$ is a dummy variable that takes the value 1 for firms with assets more than the median asset size in the sample and 0 otherwise. Robust standard errors, clustered at firm level are presented in the parenthesis. '***', '**' and '*' indicate significance at the 1%, 5% and 10% respectively. The definition of each of the variables is given in Table 1.

	All countries		Excluding US & Japan	
	(1)	(2)	(3)	(4)
$Insol\_score_{t-1}$	-0.001	-0.001	-0.005	-0.003
	(0.003)	(0.004)	(0.004)	(0.004)
EPU_{t-1}	-0.429***	-0.226**	-0.490***	-0.266**
	(0.052)	(0.101)	(0.061)	(0.111)
$Insol\_score_{t-1} \times EPU_{t-1}$	0.007***	0.005***	0.007***	0.004**
	(0.001)	(0.002)	(0.001)	(0.002)
$Large\_size$		-0.379*		-0.318
		(0.194)		(0.219)
$Insol\_score_{t-1} \times Large\_size$		0.000		-0.003
		(0.003)		(0.004)
$EPU_{t-1} \times Large\_size$		-0.345***		-0.385***
		(0.121)		(0.134)
$Insol\_score_{t-1} \times EPU_{t-1} \times Large\_size$		0.004**		0.005**
		(0.002)		(0.002)
Log_asset_{t-1}	-0.647***		-0.788***	
	(0.050)		(0.056)	
$Sales\_gro_{t-1}$	0.001**	0.001	0.002***	0.001**
	(0.001)	(0.001)	(0.001)	(0.001)
$Op.CF\_Asset_{t-1}$	7.030***	6.868***	7.346***	7.186***
	(0.314)	(0.315)	(0.392)	(0.395)
M/B_{t-1}	0.111***	0.129***	0.103***	0.129***
	(0.009)	(0.009)	(0.010)	(0.010)
$Tangibility_{t-1}$	-2.343***	-2.273***	-2.260***	-2.228***
	(0.210)	(0.213)	(0.244)	(0.247)
$Pvtcredit\_GDP_{t-1}$	-0.003***	-0.003***	-0.002**	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
GDP_growth_{t-1}	0.017***	0.019***	0.009	0.009
	(0.005)	(0.005)	(0.006)	(0.006)
Log_GDPPC_{t-1}	1.131***	0.830***	1.208***	0.831***
	(0.082)	(0.074)	(0.101)	(0.093)
$Constant$	0.68	-4.359***	2.367***	-3.799***
	(0.713)	(0.786)	(0.846)	(0.926)
Firm-year obs.	88,554	88,554	51,947	51,947
No. of firms	11,210	11,210	7,146	7,146
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry-year fixed effects	Yes	Yes	Yes	Yes
Adj_R^2	0.672	0.669	0.682	0.677

Table 10: Interaction of insolvency framework and governance

The dependent variable in the estimations is the *Z-score* of the firm in year t. A higher value of *Z-score* indicates a lower likelihood of default. $Firm\_ethics$ is a country-level index that measures the ethical practices of firms based in a country in dealing with various stakeholders. Robust standard errors, clustered at firm level are presented in the parenthesis. '***', '**' and '*' indicate significance at the 1%, 5% and 10% respectively. The definition of each of the variables is given in Table 1.

	All countries		Excluding US & Japan	
Dep_var : *Z-score*	(1)	(2)	(3)	(4)
$Firm\_ethics_{t-1}$	0.308***	0.100	0.383***	0.159
	(0.095)	(0.131)	(0.104)	(0.150)
$Insol\_score_{t-1}$	0.031***	0.016*	0.033***	0.012
	(0.006)	(0.009)	(0.009)	(0.013)
$Insol\_score_{t-1} \times Firm\_ethics_{t-1}$	-0.006***	-0.003	-0.006***	-0.002
	(0.001)	(0.002)	(0.002)	(0.003)
EPU_shock_{t-1}		-2.086***		-2.197***
		(0.484)		(0.504)
$Firm\_ethics_{t-1} \times EPU\_shock_{t-1}$		0.449***		0.458***
		(0.116)		(0.120)
$Insol\_score_{t-1} \times EPU\_shock_{t-1}$		0.027***		0.030***
		(0.007)		(0.007)
$Insol\_score_{t-1} \times Firm\_ethics_{t-1} \times EPU\_shock_{t-1}$		-0.005***		-0.005***
		(0.002)		(0.002)
Log_asset_{t-1}	-0.708***	-0.734***	-0.804***	-0.859***
	(0.054)	(0.060)	(0.059)	(0.069)
$Sales\_gro_{t-1}$	0.001*	0.001	0.002***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)
$Op\_CF\_Asset_{t-1}$	5.859***	5.915***	6.048***	6.219***
	(0.308)	(0.355)	(0.367)	(0.455)
M/B_{t-1}	0.091***	0.088***	0.090***	0.084***
	(0.010)	(0.010)	(0.011)	(0.012)
$Tangibility_{t-1}$	-2.559***	-2.576***	-2.587***	-2.648***
	(0.207)	(0.242)	(0.233)	(0.285)
$Pvtcredit\_GDP_{t-1}$	-0.001	-0.002**	0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
GDP_growth_{t-1}	0.012***	0.008	0.010**	0.001
	(0.004)	(0.005)	(0.005)	(0.006)
Log_GDPPC_{t-1}	0.575***	0.651***	0.582***	0.664***
	(0.092)	(0.104)	(0.106)	(0.122)
$Constant$	5.327***	6.033***	6.225***	7.458***
	(0.843)	(0.960)	(0.953)	(1.114)
Firm-year obs.	79,152	67,197	53,232	41,278
No. of firms	11,865	10,160	8,371	6,670
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry-year fixed effects	Yes	Yes	Yes	Yes
Adj._R^2	0.711	0.711	0.714	0.715

Table 11: External finance dependence

The dependent variable in the estimations is the *Z-score* of the firm in year t. A higher value of *Z-score* indicates a lower likelihood of default. The estimation sample is divided into two sub groups, High Dep. (Low Dep.) based on above median (below median) external finance dependence of the firm's industry. Robust standard errors, clustered at firm level are presented in the parenthesis. '***', '**' and '*' indicate significance at the 1%, 5% and 10% respectively. The definition of each of the variables is given in Table 1.

	All countries		Excluding US & Japan	
	High Dep.	Low Dep.	High Dep.	Low Dep.
Dep_var : *Z-score*	(1)	(2)	(3)	(4)
$Insol\_score_{t-1}$	0.013**	0.003	0.009	0.001
	(0.005)	(0.004)	(0.006)	(0.004)
EPU_shock_{t-1}	-0.207*	-0.117	-0.309***	-0.153
	(0.107)	(0.096)	(0.111)	(0.100)
$Insol\_score_{t-1} \times EPU\_shock_{t-1}$	0.006***	0.004**	0.009***	0.005***
	(0.002)	(0.002)	(0.002)	(0.002)
Log_asset_{t-1}	-0.731***	-0.562***	-0.887***	-0.678***
	(0.073)	(0.066)	(0.077)	(0.079)
$Sales\_gro_{t-1}$	0.002**	0.001	0.003***	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
$Op\_CF\_Asset_{t-1}$	7.102***	6.966***	7.596***	7.057***
	(0.470)	(0.413)	(0.581)	(0.524)
M/B_{t-1}	0.099***	0.123***	0.085***	0.121***
	(0.013)	(0.013)	(0.015)	(0.015)
$Tangibility_{t-1}$	-2.233***	-2.400***	-2.070***	-2.483***
	(0.312)	(0.273)	(0.352)	(0.329)
$Pvtcredit\_GDP_{t-1}$	-0.004***	-0.004***	-0.003**	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
GDP_growth_{t-1}	0.033***	0.014**	0.015	0.009
	(0.008)	(0.006)	(0.009)	(0.007)
Log_GDPPC_{t-1}	1.176***	0.822***	1.281***	0.911***
	(0.119)	(0.107)	(0.146)	(0.131)
$Constant$	0.647	2.533***	2.438**	3.222***
	(1.007)	(0.976)	(1.219)	(1.125)
Firm-year obs.	42,159	46,395	25,548	26,399
No. of firms	5,445	5,765	3,542	3,604
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry-year fixed effects	Yes	Yes	Yes	Yes
$Adj.\_R^2$	0.657	0.69	0.673	0.693

Table 12: Impacts on market leverage and cash flows under improved creditor rights

The dependent variable in the first-stage estimations shown in column (1) is the $Cash\_asset$ and in column (2) is the $Mkt\_leverage\_inv$. The dependent variable in the second-stage regression in column (3) is the *Z-score* without the market value leverage component (MacKie-Mason, 1990). A higher value of *Z-score* indicates a lower likelihood of default. Robust standard errors, clustered at firm level are presented in the parenthesis. '***', '**' and '*' indicate significance at the 1%, 5% and 10% respectively. The definition of each of the variables is given in Table 1.

	Stage 1		Stage 2
	Cash_asset	*Mkt_leverage_inv*	*MacKie-Mason Z-score*
	(1)	(2)	(3)
$Insol\_score_{t-1}$	0.011	0.030***	
	(0.009)	(0.004)	
$Insol\_score_{t-1} \times EPU_{t-1}$	0.006	0.006***	
	(0.004)	(0.001)	
EPU_{t-1}	-0.664***	-0.358***	-0.017
	(0.217)	(0.089)	(0.080)
$Mkt\_leverage\_inv_t$			0.270**
			(0.132)
$Cash\_asset_t$			-0.186
			(0.241)
Log_asset_{t-1}	-1.916***	-1.186***	0.035
	(0.074)	(0.030)	(0.327)
$Sales\_gro_{t-1}$	-0.011***	-0.003***	0.001
	(0.001)	(0.000)	(0.002)
$Op\_CF\_Asset_{t-1}$	6.525***	5.612***	3.471***
	(0.446)	(0.182)	(0.956)
M/B_{t-1}	0.052***	0.215***	-0.054***
	(0.013)	(0.005)	(0.018)
$Tangibility_{t-1}$	-21.046***	-2.396***	-3.98
	(0.386)	(0.158)	(4.798)
$Pvtcredit\_GDP_{t-1}$	0.018***	-0.001	0.003
	(0.001)	(0.001)	(0.004)
GDP_growth_{t-1}	-0.056***	-0.036***	0.001
	(0.012)	(0.005)	(0.010)
Log_GDPPC_{t-1}	0.871***	1.287***	-0.232**
	(0.119)	(0.049)	(0.094)
Firm-year obs.	88,174	88,174	88,168
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes

Table 13: Extended measure of Insolvency

The dependent variable in the estimations is the *Z-score* of the firm in year t. A higher value of *Z-score* indicates a lower likelihood of default. $Insol\_score\_ext$ is an extended measure of insolvency score described in the text. Robust standard errors, clustered at firm level are presented in the parenthesis. '***', '**' and '*' indicate significance at the 1%, 5% and 10% respectively. The definition of each of the variables is given in Table 1.

	All countries		Excluding US & Japan	
Dep_var	*Z-score*	$MSPD\_inv$	*Z-score*	$MSPD\_inv$
	(1)	(2)	(3)	(4)
$Insol\_score\_ext_{t-1}$	0.002	-0.024	-0.004	-0.028
	(0.003)	(0.018)	(0.003)	(0.022)
EPU_shock_{t-1}	-0.141**	-1.521***	-0.203***	-1.775***
	(0.071)	(0.380)	(0.074)	(0.459)
$Insol\_score\_ext_{t-1} \times EPU\_shock_{t-1}$	0.005***	0.015***	0.007***	0.016***
	(0.001)	(0.005)	(0.001)	(0.006)
Log_asset_{t-1}	-0.651***	-0.281	-0.792***	-0.337
	(0.050)	(0.235)	(0.056)	(0.325)
$Sales\_gro_{t-1}$	0.001**	-0.001	0.002***	0.000
	(0.001)	(0.002)	(0.001)	(0.002)
$Op\_CF\_Asset_{t-1}$	7.029***	1.084	7.330***	0.997
	(0.315)	(0.973)	(0.392)	(1.634)
M/B_{t-1}	0.111***	-0.046**	0.103***	-0.059**
	(0.009)	(0.020)	(0.010)	(0.025)
$Tangibility_{t-1}$	-2.326***	-0.777	-2.280***	-0.655
	(0.210)	(0.886)	(0.244)	(1.146)
$Pvtcredit\_GDP_{t-1}$	-0.004***	0.016***	-0.003***	0.013***
	(0.001)	(0.003)	(0.001)	(0.005)
GDP_growth_{t-1}	0.023***	0.004	0.013**	0.03
	(0.005)	(0.034)	(0.006)	(0.042)
Log_GDPPC_{t-1}	1.024***	0.802*	1.098***	1.514**
	(0.081)	(0.434)	(0.100)	(0.754)
$Constant$	1.876***	91.938***	3.369***	87.284***
	(0.705)	(2.653)	(0.843)	(5.868)
Firm-year obs.	88,554	6,432	51,947	3,837
No. of firms	11,210	1,617	7,146	974
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry-year fixed effects	Yes	Yes	Yes	Yes
$Adj.\_R^2$	0.672	0.670	0.681	0.651

Table 14: Extended sample with service-sector firms

The dependent variable in the estimations is the *Z-score* of the firm in year t. A higher value of *Z-score* indicates a lower likelihood of default. Robust standard errors, clustered at firm level are presented in the parenthesis. '***', '**' and '*' indicate significance at the 1%, 5% and 10% respectively. The definition of each of the variables is given in Table 1.

	All countries			Excluding US & Japan		
Dep_var : *Z-score*	(1)	(2)	(3)	(4)	(5)	(6)
$Insol\_score_{t-1}$	0.005**	0.003	0.003	0.004**	0.001	0.001
	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)
EPU_{t-1}		-0.051			-0.108*	
		(0.061)			(0.065)	
$Insol\_score_{t-1} \times EPU_{t-1}$		0.003**			0.005***	
		(0.001)			(0.001)	
$EPU\_shock\_alt_{t-1}$			-0.277***			-0.309***
			(0.052)			(0.056)
$Insol\_score_{t-1} \times EPU\_shock\_alt_{t-1}$			0.004***			0.004***
			(0.001)			(0.001)
Log_asset_{t-1}	-0.608***	-0.626***	-0.626***	-0.713***	-0.766***	-0.766***
	(0.035)	(0.038)	(0.038)	(0.041)	(0.047)	(0.047)
$Sales\_gro_{t-1}$	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
$Op\_CF\_Asset_{t-1}$	6.674***	6.747***	6.743***	6.837***	7.016***	7.022***
	(0.207)	(0.232)	(0.232)	(0.244)	(0.290)	(0.290)
M/B_{t-1}	0.100***	0.096***	0.096***	0.107***	0.102***	0.102***
	(0.006)	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)
$Tangibility_{t-1}$	-2.095***	-1.982***	-1.981***	-2.027***	-1.869***	-1.852***
	(0.150)	(0.176)	(0.176)	(0.169)	(0.208)	(0.208)
$Pvtcredit\_GDP_{t-1}$	-0.002***	-0.003***	-0.003***	-0.001**	-0.003***	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
GDP_growth_{t-1}	0.022***	0.022***	0.018***	0.014***	0.008*	0.005
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
Log_GDPPC_{t-1}	1.015***	1.059***	1.100***	1.095***	1.169***	1.177***
	(0.066)	(0.070)	(0.070)	(0.080)	(0.087)	(0.088)
$Constant$	0.544	0.561	0.116	1.318**	1.534**	1.504**
	(0.563)	(0.614)	(0.615)	(0.662)	(0.742)	(0.749)
Firm-year obs.	183,266	158,031	158,031	115,609	90,364	90,364
No. of firms	24,725	21,499	21,499	16,569	13,342	13,342
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
$Adj.\_R^2$	0.663	0.664	0.664	0.655	0.655	0.655

A. Appendix

Table A1: Country statistics

The number of firm-year observations for each country are shown in the table.

Country name	Obs.	Country name	Obs.
Argentina	349	Lithuania	74
Australia	1,701	Luxembourg	96
Austria	457	Latvia	90
Belgium	487	Morocco	222
Brazil	1,064	Mexico	525
Canada	1,032	Mauritius	26
Switzerland	1,381	Malaysia	4,527
Chile	651	Nigeria	209
China	15,971	Netherlands	461
Cote d'Ivoire	82	Norway	317
Colombia	153	New Zealand	123
Czech Republic	37	Peru	421
Germany	3,027	Philippines	411
Denmark	615	Poland	1,219
Egypt, Arab Rep.	570	Portugal	184
Spain	705	Russia	659
Estonia	35	Singapore	1,963
Finland	850	Serbia	226
France	2,898	Slovak Republic	38
United Kingdom	3,361	Slovenia	105
Ghana	53	Sweden	1,416
Greece	1,089	Thailand	1,579
Hong Kong SAR, China	3,092	Tunisia	142
Indonesia	1,272	Turkey	1,816
India	5,925	United States	15,520
Ireland	306	Venezuela	66
Iceland	49	South Africa	840
Italy	1,339	Zambia	29
Japan	21,021	Zimbabwe	15
Kenya	92	**Total**	**103,576**
Sri Lanka	593		