Corporate Insolvency Rules and Zombie Lending

By Bo Becker and Victoria Ivashina[1]

Abstract

Bank lending to less productive firms at subsidized rates has long been recognized as an important mechanism that can help banks in the short run, but deepens and prolongs economic crises. Explanations of such "zombie lending" are underpinned by misaligned bank incentives. We propose an additional driver of zombie lending: the inefficient resolution of insolvency. We provide supporting evidence consistent with insolvency playing a critical role. Using substantial variation in the efficiency of resolution systems across Europe, we show that better insolvency systems are associated with more cyclical use, and high development of private debt markets which rely heavily on the private resolution of insolvency. We also find that, at the firm level, cheaper credit is more common in bad times when insolvency works worse. Critically, insolvency-driven zombie lending cannot be moderated through bank targeted policies, thus, making insolvency reform a key complement to bank capital requirements and supervision.

1 Introduction

Zombie credit—that is, lending to otherwise insolvent firms—has been shown to slow economic growth through the misallocation of credit and the suppression of normal competitive forces. (For example, Hoshi and Kashyap (2004), Peek and Rosengren (2005), Caballero, Hoshi, and Kashyap (2008), Banerjee and Hofman (2018), McGowan, Andrews, Millot (2018), Blattner, Farhino and Rebello (2019), Acharya, Eisert, Hirsch (2019), and Andrews and Petroulakis (2019).) The prevailing view of what drives zombie lending, is rooted in the Japanese experience, and it tends to put banks and government assistance administered through banks at the heart of the problem. This paper postulates that another important determinant of zombie credit is insolvency resolution rules. We argue that a substantial cost of restructuring insolvent firms will narrow borrowers' and banks' choices, and foster superficial or insufficient remedies, including—in extreme cases—sham loan restructurings.

To be clear, we do not dispute the relevance of perverse bank incentives for zombie lending. Our claim is that this is only half of the problem, and consequently, any

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policy efforts that target banks are only half of the solution. A typical mechanism envisioned behind zombie lending is that a bank wants to avoid recognizing the deteriorated condition of the borrower due to a risk-shifting motive as in Jensen and Meckling (1976). Caballero, Hoshi, and Kashyap (2008) stress the importance of regulatory capital constraints: banks try to avoid recognition of non-performing loans in order to maintain regulatory capital requirements, and by extending loans they can avoid borrower later payments and defaults (which trigger increased capital requirements). Through zombie lending, banks stay afloat in the hope of a macroeconomic recovery or a public bailout.[2] The central implication is that—for capital constrained banks—this leads to misallocation of credit away from firms with better investment opportunities. Since this view of zombie lending abstracts from insolvency resolution, inefficiencies are seen as driven by bank incentives alone. A standard policy implication, therefore, is ex-post realignment of incentives through the removal of troubled assets from insolvent banks' balance sheets, or ex-ante policies aimed at reducing risk-shifting motives.

The mechanism we propose interacts with how borrower insolvency is resolved: if insolvency if very costly, restructuring is less attractive for lenders, and hence zombie lending becomes more prevalent. It is well known that there is significant and persistent cross-country heterogeneity in the efficiency insolvency procedures. Djankov, Hart, McLeish and Shleifer (2008) use survey methodology to construct a measure of efficiency for debt enforcement that is comparable across a wide set of countries and shows that these measures are strongly correlated with economic growth, and debt market development. Davydenko and Franks (2008) use micro data on corporate defaults in France, Germany and the U.K. to highlight that differences in creditors' rights across these countries impact banks' lending and restructuring practices that try to mitigated the costs of insolvency proceedings. Focusing on productivity growth, Adalet McGowan and Andrews (2018) discusses policies relevant for firm exit and identify gaps in terms of OECD countries and time series coverage of key insolvency indicators.

More recently, a widespread economic shutdown related to the 2020 pandemic raised world-wide alarms regarding the potential amplification of economic distress due to unsuitability of many insolvency regimes to handle restructuring in a timely and effective manner, and on a high scale. (For example, see Greenwood, Iverson and Thesmar (2020), Group of Thirty (2020), Becker and Oehmke (2021), and Ellias, Iverson and Roe (2020)).

Because efficiency losses resulting from lack of proper and timely restructuring procedures, and consequent misallocation of credit, this may deepen a crisis and delay recovery. Minimizing zombie lending though implementation of improved restructuring systems—and not solely through bank-targeted actions—is key to economic crisis management. This intuition can be illustrated in the framework of Diamond and Rajan (2011), which focuses on bank holdings of illiquid assets. In their model, a negative shock leads to a fire sale of illiquid assets. We can reinterpret their model with the cost of insolvency resolution

[2] Zombie lending could also be encouraged by the government as a form of financial repression, but such centrally-driven zombie lending has different policy implications.

taking the place of the fire sale discount of illiquid assets. In our setting, a negative shock leads to borrower insolvency and losses associated with restructuring. An important difference is that in the Diamond and Rajan (2011) model, the illiquid assets are not directly affected by the shock. So, ultimately, the inefficiency results from banks' forced sales. This leads to the policy recommendation that to unfreeze the credit market, ex-post, the authorities should seek to move—in one way or another—illiquid assets away from the balance sheets of banks. Regulations that reduce banks' risk exposure ex-ante can help reduce the likelihood of incentive problems ex-post. This framework delivers the standard policy implications for bank-driven zombie lending. With illiquid assets, however, no inefficiency is realized if assets are held until maturity. This is exactly why moving them away from the bank balance sheet realigns the incentives for efficient credit allocation, and forgoes the losses if assets are held to maturity. With insolvent assets that are facing additional losses due to inefficient restructuring procedures, mere movement of assets cannot resolve the problem, and could even turn the government into the zombie lender. Thus, if zombie lending is caused in part by deficiencies in restructuring systems, it cannot be effectively moderated by ex-ante or ex-post policy action targeting banks alone.

We should clarify that the insolvency regime is relevant for firms that are still operationally viable, but have experienced a negative shock and, as a result, carry a capital structure that is no longer suitable. Underlying the zombie lending problem is capital misallocation. Some of the zombie firms might not be operationally viable, especially in a competitive setting. Evidently, this problem cannot be addressed through financial restructuring, and as such is outside of the scope of the question that we tackle in this study. However, cases where a firm becomes obsolete as a result of a broader economic shock, are likely to be few which, ultimately, is what makes the zombie lending phenomenon so hard to detect in a timely manner.

To illustrate the significance of insolvency frameworks for zombie lending we use World Bank cross-country data that rates several aspects of insolvency procedures. (This study uses a range of variables and data sources; we elaborate on these in the next section.) First, we look at bankruptcies. Our point is that better insolvency procedures make restructurings more likely. Simply put, if bankruptcy proceedings are dysfunctional, empirically we will see no bankruptcies (and, therefore, under our hypothesis, more zombie lending.) The data show that—as one would expect—lower economic growth is associated with an increase in bankruptcies on average. However, this pattern differs by country. In countries with better insolvency proceedings, higher recovery rates, and shorter resolutions time, years with negative GDP growth show more bankruptcies. This pattern is absent in countries with poor systems. In other words, formal restructuring is more likely to fulfil its important cyclical role when it works better.

Additional aggregate supporting evidence emerges from looking at the development of the private markets in several countries. Note that feasibility of restructuring and its direct and implicit costs might affect banks differently from other types of creditors. Ultimately, however, it should affect all types of debt investors. This is a distinct

feature of our hypothesis as compared to bank-centred explanations of zombie lending. Outside of bank-originated credit, there are two other significant sources of debt that we can consider: bond market and (non-bank) private debt. However, the restructuring of bond debt is generally very hard due to coordination reasons (e.g., Bolton and Scharfstein (1996)) and institutional constraints (e.g., Chernenko and Sunderam (2012)).

The private debt segment has mostly developed following the GFC.[3] However, it has been growing at a fast pace. According to Preqin, in 2020, global private debt funds had assets under management estimated at $848 billion, projected to grow at 11.4% annually for the next five years. Like banks, private debt funds are highly sophisticated and "active" lenders. In line with this observation, their debt products tend to be highly customized.[4] Moreover, private debt creditors not only have the necessary expertise but also have low coordination costs and institutional flexibility to restructure debt of a struggling borrower. Indeed, they depend on the ability to restructure, as they target higher returns than banks and finance riskier debt.[5] If there is an event of default (either a missed payment or covenants violation), there has to be a way to move forward in a timely and effective way. However, in the absence of effective insolvency procedures, such private resolutions of distress do not tend to emerge even if creditors themselves are flexible in their mandate and do not face high coordination costs.

Our hypothesis, therefore, is that the development of private debt investments is dependent on the strength of the insolvency framework. This is exactly what we find: private debt markets are larger in country-years with better insolvency systems. Note that most of the private debt investment is done by large, global funds. So, one way to think about it is that we are measuring Blackstone's or CVC's or Ardian's desire to pursue private debt transactions in different jurisdictions. This finding also brings new evidence to support the connection between country-wide insolvency resolution rules and growth of debt markets. Among other papers, this literature includes Djankov, Hart, McLeish and Shleifer (2008), Becker and Josephson (2016), and Ponticelli and Alencar (2016)).

Finally, we present a set of results that uses firm level information to measure zombie lending. We use the empirical literature that follows Caballero Hoshi and Kashyap (2008) and focuses on credit "unusual cheapness". To capture this empirically, we construct a dummy variable indicating if the current interest rate on loans is below the rate on new loans issued over the preceding four quarters and rated "AA" in the benchmark market. For European loans we use benchmark loans issued in the EU and U.K. markets excluding Greece, Ireland, Italy, Portugal, and Spain. Our sample covers 2004-2020, that high rating cut-off and exclusion of some of the countries from the benchmark assures that we are identifying "cheap" credit.

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[3] As an example, the Blackstone Group, the largest private equity group in the world, acquired GSO, which became its credit arm in early 2008. Specialized debt asset managers such as Owl Rock Capital, which of the leader in the segment where not started until several years later.

[4] See for example Ivashina, Dione and Boyar (2017).

[5] Private debt segment is relevant to our study for several reasons, But, as compared to banks, private debt lenders are much more constraint from "pretend" restructurings, as most of these are finite life closed-end funds similar to private equity funds.

To do so we rely on the data that contains accurate new loans and loan amendments. The analysis is done by controlling for borrower size and leverage and loan characteristics. We include industry and year fixed effects and control for economic growth bank-sector capitalization. As before, we are interested in the rise in zombie lending during economic downturns. We find that, in years with negative GDP growth, “cheap” credit is less likely to take place in countries with stronger insolvency frameworks. The results for recovery rates and time to resolution are consistent with our hypothesis and economically meaningful, but not statistically significant at conventional levels.[6]

The question of zombie lending and credit misallocation is especially timely given the rapid growth of debt markets, which reflect increases in corporate loan securitization as well as high-yield markets more broadly. Specifically, corporate leverage has increased in Europe and other developed markets. (See, for example, Lane (2020)). At the same time, the banking sectors has re-emerged from the aftermath of the GFC and Sovereign debt crisis with stronger financial positions. The traditional, bank-centred narrative, therefore, would suggest that the overall risk of zombie lending is low. This, however, puts us in danger of missing pressures for the lending emerging from the lack of effective solvency resolution.

2 Data

We constrain our analysis to the country members of the European Union as of the end of 2003, U.K. and U.S. We use multiple data sources.

Our central explanatory variables measure effectiveness of the restructuring framework at the country level. For this we rely on the World Bank annual “Doing Business” report which compares business regulation in a wide range of countries. We specifically focus on the measures concerning resolution of business insolvency. The methodology used for this section was developed based on the study by Djankov, Hart, McLiesh, and Shleifer (2008).[7] Generally it is very hard to compare actual outcomes of resolutions across-countries as there is a non-trivial selection into which companies pursue a formal restructuring. (Our study highlights one such source of selection.) The World Bank approach constructs a simple standard scenario of a company in financial distress and then surveys experts to understand the likely outcomes of a hypothetical resolution in different countries.

In what follows we will report four main variables:[8]

- Recovery Rate Score is based on the expected creditor’s net recovery rate for a standardized scenario, which takes into account resolution costs and time

[6] Andrews and Petroulakis (2019) use a set of alternative measures of ease of financial restructuring and find some evidence for “barriers to restructuring” to contribute to zombie lending problem in periods of slower economic growth. They do not find evidence on other measures of the strength of insolvency framework.

[7] For more information see https://www.doingbusiness.org/en/methodology/resolving-insolvency.

[8] Although the World Bank database provides alternative measures we found that several of them are highly correlated within our sample. The four variable that we choose reflect the four distinct aspects of insolvency reported in the World Bank data.

among other factors. The score ranges from 0 to 100, with 100 indicating highest efficiency.

- Strength of Insolvency Framework Score is based on whether the country adopted international practices in (i) commencement of insolvency proceedings, (ii) management of the debtor's assets, (iii) reorganization proceedings and (iv) creditor participation in insolvency proceedings.[9] Similarly, this score ranges from 0 to 100, with 100 indicating highest efficiency.

- Insolvency Restructuring Score (or Main Score) is the simple average of the two previous scores.

- Resolution Time is the expected number of years to resolution of insolvency of the standardized, in years. This is one of the separate components of the recovery score. This measure has the opposite sign to the other three, with the shortest duration time being a proxy for most effective resolution framework.

The availability of these measures dictates the period of our analysis which is 2004-2020.[10]

The World Bank data are not without caveats. It is a catch-all approach that is intended to be meaningful in all countries participating in the survey. As a result, it is stripped of much granularity. Although, as one can see in Chart 1, it still picks up substantial variation among the countries in our sample and over time. Another related issue with the World Bank data is that it paints a picture that is too positive in that—to create a representative business that would be meaningful in all countries—the survey focuses on a hypothetical firm with real estate assets and a single secured bank loan. There are no international operations, no complex balance sheets, no intangible assets. Realistically, if all these ingredients were included, the U.S. would look better than some of the other countries. While these are important considerations, as of today, we don't have many meaningful cross-country alternatives to measure insolvency system strength. For example, the OECD effort to construct an alternative metric and reflected in Andrews and Petroulakis (2019) has limited power when thinking about zombie lending.

Chart 1 plots Insolvency Restructuring Score for the countries in our sample. It is easy to see that there is substantial variation even within these relatively narrow samples. In 2020, Finland leads the group with the score of 92.69, followed by the U.S. with 90.48. Greece and Luxemburg, on the other hand, have the lowest scored with 53.13 and 45.48, respectively. There is also time-variation within country with Spain and France showing the largest improvement over the period of our sample. However, both of countries still have relative low score as compared to other countries even in 2020.

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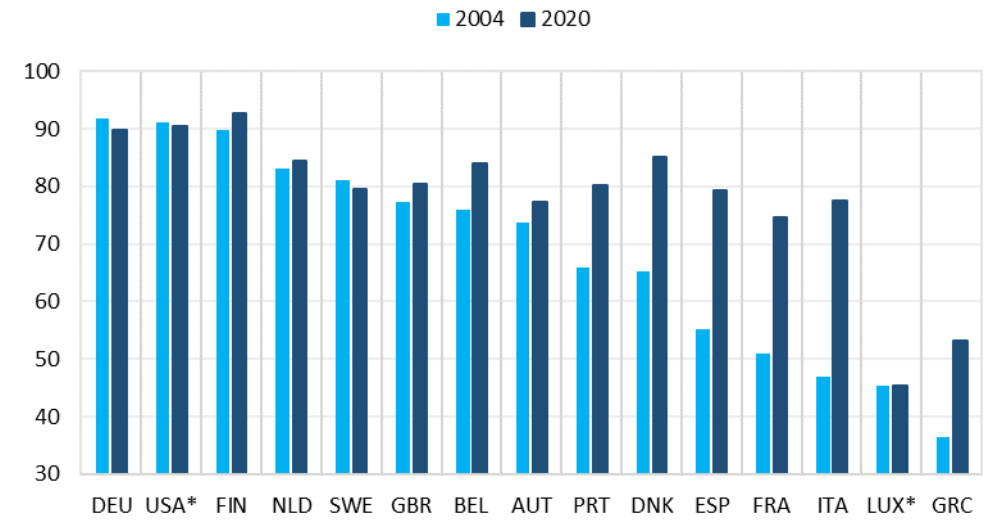
[9] The criteria reflected in this index were developed on the basis of the World Bank's Principles for Effective Insolvency and Creditor/Debtor Regimes (World Bank, 2011) and the United Nations Commission on International Trade Law's Legislative Guide on Insolvency Law (UNCITRAL, 2004).

[10] Reported results backfill for the U.S. some of the measure that are not available before 2014, but this is not essential to our conclusions.

Chart 1

Country-level variation in insolvency restructuring scores



Sources: World Bank.
Notes: (*) US and Luxemburg data starts in 2014.

Bankruptcy data has been collected from a range of reliable sources which are reported in the appendix. The major concern with the data collected from individual sources, however, is their comparability across countries. To account for this problem, we instead look at the growth rate in bankruptcies based on the preceding two-year average. Given that bankruptcy filings tend to be concentrated in time, looking at a two-year average allows us to moderate potential gaps.

We use DealScan and Refintiv data which primarily covers syndicated loan origination. These datasets are comparable, but Refintiv has some rating data and better coverage of loan amendments. Thus, we complement DealScan to include this additional information.

We matched loan level samples to CapitalIQ which we use as a source of quarterly financial information. We also use several aggregate variables. In particular, we use IMF data on bank capitalization at the country level as a control variable.

3 Supporting Evidence

To build supporting evidence for the importance of insolvency regimes for zombie lending, we start with the aggregate evidence. We first look at the intensity of use of the formal bankruptcy system as a proxy for effective restructurings (the opposite of zombie lending). If a company has difficulty servicing its debt as a result of an

economic shock, its capital structure should be restructured to reflect the new economic reality. In a country with strong insolvency procedures, entering a formal resolution process helps to solve this problem. Absence of bankruptcy filings would be indicative of less efficient resolutions.

In a large sample analysis, we have limited visibility into whether a private negotiation with creditors took place, and whether its outcome was efficient. So, we should consider whether it is plausible that efficient private resolutions are more likely when we see fewer formal bankruptcies. Of course, in an extreme, if the bankruptcy system is very weak, all resolutions will be private. But the question is not whether private resolutions go up, but whether they are efficient. This is why it is important to emphasize that formal insolvency rules set up a benchmark that guides out-of-court restructuring. For example, if filing for bankruptcy allows the firm to operate as a going concern, and achieve mediated restructuring in a relatively speedy manner, then any direct resolution with the creditors will have to be at least as effective (otherwise the firm would file for bankruptcy protection.)[11] In sum, what seems most plausible is that the correlation between efficiency of private resolutions (unobservable) and strength of formal bankruptcy procedures is actually positive.

Building on the insight above, we look at the use of the formal bankruptcy system in periods of economic stress. The regression results are reported in Table 1. The dependent variable is the number of bankruptcies in a given year, scaled by the average number of bankruptcies in the preceding two years. Columns (1) and (2) show the basic cyclicality of financial distress: lower GDP growth, and negative GDP growth are associated with spikes in bankruptcy rates. What interests us is cross-country variation in use of bankruptcy in moments of economic stress and its relation to the effectiveness of insolvency procedures. These results are reported in columns (3) to (6). The coefficients of interest are interaction terms between measures of effectiveness of the restructuring framework at the country level and the indicator for whether GDP growth was negative (“stress” year). Consistent with our hypothesis, we find that the better bankruptcy system leads to more bankruptcies (i.e., its higher use.) The results are consistent across all four measures starting with the general Insolvency Restructuring score.

[11] When multiple creditors are involved, it might be desirable to use bankruptcy proceedings to lock in a private resolution, since effective bankruptcy resolution does not require a universal creditor consent, and instead is based on supermajority voting thresholds. For example, in the U.S., distressed restructurings are typically achieved through pre-bankruptcy negotiation and creditor voting (in accordance with bankruptcy rules) and formally “ceiled” through a bankruptcy filing. Filing for bankruptcy with a pre-negotiated restructuring plan in turn allows for a quick resolution. Empirically, this means that filings for bankruptcy actually are positively correlated with effective private restructuring.

Table 1

Use of formal bankruptcy resolution and efficiency of insolvency rules

	(1)	(2)	(3)	(4)	(5)	(6)
GDP growth	-0.216*	--	--	--	--	--
	(0.123)					
I (Negative GDP growth)		0.937	-6.383*	-5.830*	-7.519*	5.965***
		(0.805)	(3.711)	(3.067)	(3.940)	(2.111)
Insolvency restructuring score	--	--	-0.0129	--	--	--
			(0.0248)			
Insolvency restructuring score *Stress year	--	--		--	--	--
			0.0874*			
			(0.0491)			
Recovery rate score	--	--	--	-0.0121	--	--
				(0.0205)		
Recovery rate score *Stress year	--	--	--	0.0796**	--	--
				(0.0397)		
Strength of insolvency framework	--	--	--	--	-0.0276	--
					(0.0237)	
Strength of insolvency framework*Stress year	--	--	--	--	0.114**	--
					(0.0520)	
Resolution time	--	--	--	--	--	-0.312
						(0.598)
Resolution time*Stress year	--	--	--	--	--	-3.533***
						(1.222)
Constant	-49.95***	-50.41***	-49.13***	-49.14***	-48.38***	-49.66***
	(0.353)	(0.348)	(1.919)	(1.682)	(1.767)	(0.933)
N	224	224	184	184	197	184
R^2	0.014	0.006	0.018	0.023	0.030	0.069

Notes: The estimates correspond with an OLS regression. The dependent variable is the growth rate in bankruptcies with respect to the preceding two-year average. The underlying data is an unbalance country*year panel. ***, **, * denote the 1%, 5% and 10% level of significance respectively.

Another take at the aggregate tie between the insolvency resolution framework and the prevalence of effective private insolvency resolution can be seen by looking at the volume of private debt transactions. (See Table 2.) As discussed in the introduction, non-bank direct lenders are highly sophisticated creditors that actively engage in the customization of credit solutions. They lend across the spectrum of firms, with a large emphasis on distressed and mid-cap firms (i.e., higher risk-higher expected return as compared to bank lending).[12] Some additional institutional aspects are important. Similar to private equity, private debt is typically funded through finite life closed end funds. Although assets can be held beyond fund life, it effectively requires a formal sale to the next fund. Thus, between higher risk, and finite horizons, private debt creditors are particularly dependent on effective insolvency systems. To reiterate, between expertise, flexible institutional mandates and low coordination costs (as this debt is not widely held), private debt creditors are also well positioned to put forward private resolutions of insolvency. Ultimately, however, because private resolution is shaped by the formal insolvency rule, our hypothesis is that we should see that private debt markets are less likely to develop in weaker insolvency regimes.

[12] For more information see 2020 American Finance Association Annual Meeting, Panel: “Shadow Banking: Understanding Private Debt”, https://www.youtube.com/watch?v=kef3uEnvGOQ.

The results in Table 2 support this view. The dependent variable is the number of private deals closed in the lead three-year window. Panel B include controls for country-wide bank capitalization. The results are striking. For example, as little as a 1-point difference in insolvency restructuring score leads to 7.4 to 9.9 private deals difference in the next three year. (We purposefully look at the number of deals and not the volume.) This is as compared to the median of 21 for the whole sample and average of 62 deals for European countries. U.S. is an outlier in this market with 1,418 deals on average over the sample. The potential impact of the resolution time is particularly damming, with one extra year to resolution leading to 136.7 or 170.2 difference in the number of deals over three years.

Table 2

Private debt investments and efficiency of insolvency rules

Panel A

	(1)	(2)	(3)	(4)
Insolvency restructuring score	7.447***	--	--	--
	(2.725)			
Recovery rate score	--	2.760	--	--
		(2.278)		
Strength of insolvency framework	--	--	12.60***	--
			(2.398)	
Resolution time	--	--	--	-136.7**
				(68.08)
GDP growth	5.481	3.898	9.883	4.080
	(13.44)	(13.65)	(13.39)	(13.55)
Constant	-410.9*	-60.30	-724.8***	357.3***
	(213.8)	(188.8)	(181.8)	(104.7)
N	176	176	188	176
R^2	0.042	0.009	0.131	0.023

Panel B

	(1)	(2)	(3)	(4)
Insolvency restructuring score	9.902***	--	--	--
	(3.485)			

Notes: The estimates correspond with an OLS regression. The dependent variable is the number of private deals closed in the lead three-year window. The underlying data is an unbalance country*year panel. ***, **, * denote the 1%, 5% and 10% level of significance respectively.

In Tables 3 and 4, we move the analysis to the firm level. This requires us to construct an indicator of whether the firm is “subsidized” by the creditors. Measuring “subsidized” credit, however, is challenging as banks can transfer resources to the borrowers in a variety of ways. For example, Caballero, Hoshi and Kashyap (2008) show that—in the context of the Japanese crisis— such assistance can include interest concessions, debt forgiveness, and a moratorium on loan amortizations

and/or interest payments. In their sample, they also observe equity injection by lenders, and debt-equity swaps. Post GFC changes had precluded European banks from this type of transaction, but there are several anecdotal examples indicating that equity transactions were common for European banks in the GFC context. The existing literature detects the subsidy by benchmarking the interest rate implied in the firms' interest expected to what would be conservatively the lower bound on market rate. For example, in European context, Acharya, Eisert and Hirsch (2019) and Acharya, Crosignani, Eisert and Eufinger (2020) look at the firms that have implied interest rates below the AAA-like firms.

We depart from this methodology in two ways. First, we look directly at interest rates of loans, rather than inferring from accounting statements. Caballero, Hoshi and Kashyap (2008) use implied interest rates (interest expenses divided by interest-bearing debt in the balance sheet) due to lack of detailed data on the terms of individual debts. Existing data sources for syndicate credit (which is the relevant credit market segment for firms with available financial data, that is, firms that tend to be the focus of firm-level zombie lending analysis) have a comprehensive cross-country coverage not only of new credit, but also of loan amendments.[13] Given that the existing narrative focuses on bank-driven zombie lending it makes sense to focus on the cost of bank loans, as opposed to aggregate interest expenses, which may include trade credit, market finance, non-bank loans and so on.

The second way in which our methodology differs from the previous literature is where to draw the line for what we could consider to be unusually "cheap", and therefore potentially subsidized credit. One approach is to define a potential zombie loan as any loan cheaper than the yield on AAA-rated bonds, in other words, the highest quality credit. This approach suffers from data availability issues: there are very few European bonds rated AAA. In the bank-centric European financial system, there may be a "missing mass" of high-quality credits: loans that would be rated "AAA" do not need to be rated since banks—unlike other large institutional investors—rely on proprietary credit risk assessment methodologies.[14] Instead, we focus on "AA", the next rating category, and loan ratings instead of bond ratings. There are enough observations of AA credit in our data to construct a reliable benchmark. That is, in a standard methodology to identify zombie lending, one would take yields for "AAA" rated bonds and then examine whether the average debt cost implied in firm's interest expense is above or below this threshold, regardless of whether the firm in question is rated. Similarly, using data from Refintiv, we take newly issued loans rated "AA" and construct a quarterly benchmark of all-fees-in interest rates. (Not relying on the pricing of corporate bonds, which have different seniority and tend to be much less standardized on maturity, should reduce noise in our zombie classification.) To identify zombie loans, we then benchmark current rate on all outstanding loans in a given quarter against this benchmark, regardless of

[13] We should note that zombie lending affects firms of all sizes, including small and medium enterprises. Loan syndication only applies to large loans. But while our data sources only allow us to look at zombie lending for firms that borrow in the syndicated loan market, it is unlikely to be a big departure from other empirical approaches as conditioning the sample to firms with extensive financial information already constraints the sample to the largest firms.

[14] Another contributing factor could be that corporate ratings tend to be capped at sovereign ratings. See Almeida, Cunha, Ferreira, and Restrepo (2017). Only a handful of sovereigns are highly rated in Europe.

whether loans in question are rated. If the interest rate on the loan is below the “AA” mark we code it as a zombie loan.

In addition, to construct benchmark the benchmark, we exclude debt issued by firms in Greece, Ireland, Italy, Portugal, and Spain from the benchmark. Our sample spans the Great Financial Crisis and its aftermath. Country risk might have influenced the rates for even better rated companies in those countries. The exclusion of issuers from the most affected economies leads to a more conservative approach (which is in line with the previous zombie literature) and assured that we are picking truly cheap credit when the firm is classified as a zombie. The benchmark for the U.S., market is computed separately from Europe.

The basic result is plotted in Chart 2, and corresponds to estimates in the first column of Table 3, Panel A. The explanatory variables of interest in Table 3 are a regression of Insolvency Restructure Score and Insolvency Restructuring Score*Stress Year. To generate Chart 2, we first omit these variables and instead plot residuals against Insolvency Restructure Score separately for years with negative GDP growth (“crisis”) and years without positive GDP growth (“no crisis”). (Confidence intervals do not account for clustering, but still help give some sense of precision.) The idea is the following: imagine that we would just plot the zombie dummy against the insolvency score separately for (i) crisis years (blue); (ii) non-crisis years (green), and then draw a linear fit through each of these samples. This is the intuition behind Chart 2, except that in our context there are a few controls. In particular, we ought to account for firm level and loan characteristics. So, instead of plotting raw data we plot residuals from regressing data on controls. To give a sense of residuals dispersion, the chart also plots underlying data grouped in buckets of five on the insolvency score. In sum, Chart 2 suggests that—in a crisis—weak insolvency regimes give cheap credit (which given the firm level controls are used as a zombie proxy).

Chart 2

Use of bankruptcy and strength of insolvency regime

World Bank Main Insolvency Score

(The score varies from 0 to 100.)

Notes: The figure shows the linear regression relationship between zombie lending and the Insolvency Restructuring Score (or Main Score) from the World Bank survey. The blue line refers to crisis years (negative GDP growth) and the green line refers to non-crisis years (positive GDP growth). Data points refer to averages by grouping observations with similar insolvency scores (only buckets with 100 or more borrower-year observations are plotted).

Table 3 reports results of the regressions. The dependent variable is a dummy equal to 100 if the active interest rate on the loan is below the rate on the new loans issued over the preceding four quarters and rated “AA” in the benchmark market, and zero otherwise. All regressions include 2-digit SIC industry controls and year fixed effects. In addition, we control for loan characteristics including loan amount maturity at origination or amendment and dummy for whether the loan is a revolving line.[15] We also control for lagged firm size and leverage. Standard errors are clustered at the country level. Panel A focuses on country-specific

significant at conventional levels, they are the predicted sign and economically meaningful.

Table 3

Zombie lending and efficiency of insolvency rules

Panel A: "Stress year" is a year of negative GDP growth in a given country

	(1)	(2)	(3)	(4)
Insolvency restructuring score	0.475**	--	--	--
	[0.164]			
Insolvency restructuring score *Stress year	-0.501**	--	--	--
	[0.174]			
Recovery rate score	--	0.034	--	--
		[0.112]		
Recovery rate score *Stress year	--	-0.029	--	--
		[0.148]		
Strength of insolvency framework	--	--	0.321***	--
			[0.070]	
Strength of insolvency framework*Stress year	--	--	-0.297***	--
			[0.067]	
Resolution time	--	--	--	-8.377**
				[3.870]
Resolution time*Stress year	--	--	--	4.940
				[4.506]
Log(Loan amount)	-1.101	-0.780	-0.320	-1.098
	[0.751]	[0.800]	[0.369]	[0.726]
Loan maturity	-0.016	-0.024	-0.005	-0.014
	[0.017]	[0.015]	[0.009]	[0.015]
I(Revolving line)	4.178***	4.448***	4.230***	4.123***
	[1.068]	[0.951]	[0.386]	[1.046]
Log (assets), t-1	4.149***	3.959***	3.426***	4.208***
	[1.239]	[1.295]	[0.484]	[1.242]
Book leverage, t-1	-13.209	-12.099	-12.705***	-12.501
	[7.808]	[8.093]	[2.150]	[8.163]
I (Negative GDP growth)	35.865**	-0.088	21.339***	-8.209
	[14.517]	[11.760]	[5.751]	[6.741]
Fixed effects: Year/Industry	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes
N	103,339	103,339	224,677	103,339
R^2	0.122	0.111	0.152	0.116

Panel B: "Stress years" are 2008-2013 and 2020

	(1)	(2)	(3)	(4)
Insolvency restructuring score	0.567***	--	--	--
	[0.178]			
Insolvency restructuring score *Stress year	-0.562***	--	--	--
	[0.186]			
Recovery rate score	--	0.044	--	--
		[0.158]		
Recovery rate score *Stress year	--	-0.036	--	--
		[0.185]		
Strength of insolvency framework	--	--	0.351***	--
			[0.090]	
Strength of insolvency framework*Stress year	--	--	-0.236**	--
			[0.090]	
Resolution time	--	--	--	-9.395**
				[4.350]
Resolution time*Stress year	--	--	--	7.582
				[5.311]
Log(Loan amount)	-1.117	-0.774	-0.280	-1.093
	[0.741]	[0.803]	[0.386]	[0.716]
Loan maturity	-0.018	-0.024	-0.003	-0.017
	[0.017]	[0.016]	[0.010]	[0.016]
I(Revolving line)	4.162***	4.460***	4.263***	4.111***
	[1.057]	[0.915]	[0.356]	[1.036]
Log (assets), t-1	4.102***	3.960***	3.402***	4.182***
	[1.245]	[1.291]	[0.494]	[1.233]
Book leverage, t-1	-13.494	-12.143	-12.699***	-12.621
	[7.698]	[8.072]	[2.154]	[8.143]
Fixed effects: Year/Industry	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes
N	103,339	103,339	224,677	103,339
R^2	0.124	0.110	0.153	0.117

Notes: The estimates correspond with an OLS regression (this allows inclusion of fixed effects). The dependent variable is a dummy equal to 100 if the current interest rate on the loan is below the rate of the new loans issued over the preceding four quarters and rated "AA" in the benchmark market. Loans to US companies are benchmarked against the rates in the US market, and loans to European companies and benchmarked against loans issued in the EU and U.K. market excluding Greece, Ireland, Italy, Portugal, and Spain. Standard errors are clustered at the country level. ***, **, * denote the 1%, 5% and 10% level of significance respectively.

Table 4 includes controls for country-level bank-sector capitalization. Low bank capitalization sharpens bank incentives to issue zombie loans. Controlling for bank capitalization partially helps to focus on incentives to pursue zombie lending that are grounded in lack of insolvency restructuring solutions. Although, the exact separation of these interlinked effects cannot be achieved without an instrumental approach.

We use country-average Tier 1 bank sector capitalization as reported in the Bank for International Settlements (BIS) database. The results in Table 4 indicate that zombie loans are less likely to take place in countries with higher bank capitalization. This is consistent with the standard prediction and result in the literature (e.g., Schivardi, Sette and Tabllini, 2021). Our focus continues to be on interaction terms between measures of insolvency framework strength and stress years. The results are robust to these additional controls: in a year with a negative GDP, a 10 point higher Insolvency Restructuring Score is associated with a 4.0 percentage point increase in the likelihood of there being a zombie loan (as compared to the unconditional mean of 12.3%.)

Table 4

Zombie lending and efficiency of insolvency rules, conditional on bank capitalization

Panel A: "Stress year" is a year of negative GDP growth in a given country

	(1)	(2)	(3)	(4)
Insolvency restructuring score	0.398***	--	--	--
	[0.123]			
Insolvency restructuring score *Stress year	-0.391**	--	--	--
	[0.164]			
Recovery rate score	--	0.180**	--	--
		[0.074]		
Recovery rate score *Stress year	--	-0.054	--	--
		[0.137]		
Strength of insolvency framework	--	--	0.167**	--
			[0.072]	
Strength of insolvency framework*Stress year	--	--	-0.203**	--
			[0.078]	
Resolution time	--	--	--	-10.038***
				[2.522]
Resolution time*Stress year	--	--	--	3.853
				[3.748]
Bank capitalization	-2.333***	-2.831***	-2.151***	-2.646***
	[0.373]	[0.370]	[0.308]	[0.357]
Fixed effects: Year/Industry	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes
Controls (Table 3)	Yes	Yes	Yes	Yes
N	87,483	87,483	159,889	87,483
R^2	0.145	0.142	0.151	0.147

Panel B: "Stress years" are 2008-2013 and 2020

	(1)	(2)	(3)	(4)
Insolvency restructuring score	0.490***	--	--	--
	[0.149]			
Insolvency restructuring score *Stress year	-0.431**	--	--	--
	[0.171]			
Recovery rate score	--	0.210*	--	--
		[0.101]		
Recovery rate score *Stress year	--	-0.080	--	--
		[0.131]		
Strength of insolvency framework	--	--	0.242**	--
			[0.083]	
Strength of insolvency framework*Stress year	--	--	-0.297***	--
			[0.081]	
Resolution time	--	--	--	-10.702***
				[2.617]
Resolution time*Stress year	--	--	--	4.166
				[3.486]
Bank capitalization	-2.181***	-2.796***	-2.099***	-2.595***
	[0.394]	[0.384]	[0.302]	[0.385]
Fixed effects: Year/Industry	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes
Controls (Table 3)	Yes	Yes	Yes	Yes
N	87,483	87,483	159,889	87,483
R^2	0.146	0.141	0.152	0.146

Notes: The estimates correspond with an OLS regression (this allows inclusion of fixed effects). The dependent variable is a dummy equal to 100 if the current interest rate on the loan is below the rate of the new loans issued over the preceding four quarters and rated "AA" in the benchmark market. Loans to US companies are benchmarked against the rates in the US market, and loans to European companies and benchmarked against loans issued in the EU and U.K. market excluding Greece, Ireland, Italy, Portugal, and Spain. Bank capitalization corresponds to country level bank capitalization from Bank for International Settlements. Standard errors are clustered at the country level. ***, **, * denote the 1%, 5% and 10% level of significance respectively.

4 Final Discussion

We propose that zombie lending – the practice of issuing bank loans at subsidized rates to otherwise insolvent borrowers – is affected not just by banks' incentive problems and the conventional understanding, but also by the financial outcomes for

lenders in insolvency processes. Insolvency processes vary significantly in quality and efficiency across countries. We argue that poor insolvency outcomes encourage zombie lending, as a way of avoiding triggering procedures. Banks incentive still matter, but policy actions that solely seek to ex-ante better align or ex-post realign banks' incentives cannot singlehandedly resolve zombie problem.

Weak insolvency processes also create zombie lending incentives for all types of creditors and not just banks. This point is central to consider given insurance companies' role in the debt market, and pension funds active expansion into direct lending. It is also relevant for the leveraged loan market, which is originated by banks and largely funded by a wide range of institutional investors including mutual funds and structured products marketed to insurance companies, and pension funds. In sum, even if the problem would be solely constrained to banks, strong insolvency proceedings would be a necessary policy action to address zombie lending. But the problem percolates though a wide range of essential financial institutions and not just banks. (This also highlights a limitation of empirical research focused solely on bank credit.)

Overall, improvement in the insolvency regime is of macroeconomic importance, as zombie lending has been shown to stale economic growth through the misallocation of credit. There is also a practical policy matter: insolvency frameworks, which have deep historical and cultural roots, cannot be fixed overnight, and ex-post set of tools on this front is limited.

As a final matter, we want to raise the observation that reform of formal insolvency procedures is likely to be more effective if it can be broad-based and standardized across countries. A critical issue, beyond the scope of this paper, is the role of insolvency resol olendiivbe , m v cy

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producing activities of households for own use", and "U - Activities of extraterritorial organizations and bodies". For US we only use Chapter 7 and Chapter 11 bankruptcies.

Table A.1

Bankruptcy data sources by country

Country	Source	Website
Austria	Statistik Austria	https://www.statistik.at/web_en/statistics/in html
Belgium	Statbel	https://bestat.statbel.fgov.be/bestat/crossta html?view=f00cf502-ee2f-48a8-8b1a-0b323f02350b
Denmark	Statbank Denmark	https://www.statbank.dk/statbank5a/default ?w=1920
Finland	StatFin	https://pxnet2.stat.fi/PXWeb/pxweb/en/Stat
France	Banque de France	http://webstat.banque-france.fr/en/browseBox.do?node=5385030
Germany	Statistisches Bundesamt	https://www.destatis.de/EN/Service/_node.
Greece	Hellenic Statistical Authority	https://www.statistics.gr/en/statistics/-/publication/SJU21/2019
Italy	Camera di Commercio delle Marche	https://opendata.marche.camcom.it/datase ?url=https://opendata.marche.camcom.it/da rocedure-Concorsuali-Italia.json&r1=2&c1=
Luxembourg	Statistics Portal Grand Duchy of Luxembourg	https://statistiques.public.lu/stat/TableView bleView.aspx?ReportId=13303&IF_Langua eng&MainTheme=4&FldrName=1&RFPath 835%2c13847
Netherlands	CBS Open data StatLine	https://opendata.cbs.nl/portal.html?_la=en& talog=CBS&tableId=82522ENG&_theme=1
Portugal	Instituto Nacional de Estatistica	https://www.ine.pt/xportal/xmain?xpid=INE id=ine_indicadores&contecto=pi&indOcorr 0008466&selTab=tab0
Spain	Instituto Nacional de Estatistica	https://www.ine.es/jaxiT3/Tabla.htm?t=316
Sweden	SCB	http://www.statistikdatabasen.scb.se/pxwel ssd/START__NV__NV1401/KonkurserFore ?rxid=b076f788-b670-4e06-a5f3-c1431573
United Kingdom	CEIC	https://insights-ceicdata-com.prd1.ezproxy-prod.hbs.edu/login
United States	New Generation Research Bankruptcy Data	

References

Acharya, V.V., Crosignani, M., Eisert, T. and Eufinger, C. (2020), "Zombie Credit and (Dis-)Inflation: Evidence from Europe", National Bureau of Economic Research Working Paper 27158.

Acharya, V.V., Eisert, T. and Hirsch, C. (2019), “Whatever It Takes: The Real Effects of Unconventional Monetary Policy”, Review of Financial Studies, Vol. 32, No. 9, pp. 3366-3411.

Adalet McGowan, M. and Andrews D., 2018, “Insolvency Regimes and Productivity Growth: A Framework for Analysis,” OECD Economics Department Working Papers 1309.

Almeida, H., Cunha, I., Ferreira, M., and Restrepo, F. (2017), “The Real Effects of Credit Ratings: The Sovereign Ceiling Channel”, Journal of Finance, Vol. 72, No. 1, pp. 249-290.

Andrews, D. and Petrolakis, F. (2019), “Breaking the Shackles: Zombie Firms, Weak Banks and Depressed Restructuring in Erurope”, European Central Bank Working Paper 2240.

Banerjee, R. and Hofmann, B. (2018), “The Rise of Zombie Firms: Causes and Consequences”, BIS Quarterly Review, September, pp. 68-77.

Becker, B. and Josephson, J. (2016), “Insolvency Resolution and the Missing High-Yield Bond Markets”, Review of Financial Studies, Vol. 29, No. 10, pp. 2814-2849.

Becker, B. and Oehmke, M. (2021), “Preparing for Post-Pandemic Rise in Corporate Insolvencies”, European Systemic Risk Board, ASC Insight, No 2.

Blattner, L, Farinha, L. and Rebelo, F. (2019), “When Losses Turn into Loans: The Cost of Undercapitalized Banks”, European Central Bank – Lamfalussy Fellowship Programme, No. 2228.

Bolton, P. and Scharfstein, D. (1996), “Optimal Debt Structure and the Number of Creditors,” Journal of Political Economy, Vol. 104, No.1, pp. 1-25.

Caballero, R., Hoshi, T. and Kashyap, A.K. (2008), “Zombie Lending and Depressed Restructuring in Japan”, American Economic Review, Vol. 98, No. 5, pp. 1943-1997.

Chernenko, S. and Sunderam, A. (2012), “The Real Consequences of Market Segmentation,” Review of Financial Studies, Vol. 25, No. 7, pp. 2041-2070.

Davydenko, S.A. and Franks, J.R. (2008), “Do Bankruptcy Codes Matter? A Study of Defaults in France, Germany, and the U.K.”, Journal of Finance, Vol. 63, No. 2, pp. 565-608.

Diamond, D.W. and Rajan, R. G. (2011), “Fear of Fire Sales, Illiquidity Seeking, and Credit Freezes”, Quarterly Journal of Economics, Vol. 126, No. 2, pp. 557-591.

Djankov, S., Hart, O., McLiesh, C. and Shleifer, A. (2008), “Debt Enforcement around the World”, Journal of Political Economy, Vol. 116, No. 6, pp. 1105-1149.

Ellias, J., Iverson, B., and Roe M. (2020), “Estimating the Need for Additional Bankruptcy Judges in Light of the COVID-19 Pandemic,” Harvard Business Law Review, Vol. 11.

Greenwood, R., Iverson, B., and Thesmar, D. (2020), “Sizing up Corporate Restructuring in the COVID Crisis”, NBER Working paper 28104.

Group of Thirty, 2020, “Revitalizing and Restructuring Corporate Sector Post-Covid,” https://group30.org/publications/detail/4820.

Hoshi, T. and Kashyap, A. K. (2004), “Japan’s Financial Crisis and Economic Stagnation”, Journal of Economic Perspectives, Vol. 18, No, 1, pp. 3-26.

Ivashina, V., Dionne, J. and Boyar, J. (2017), “Blackstone’s GSO Capital: Crosstex Investment,” Harvard Business School Case 218-008.

Jensen, M. and Meckling, W. H. (1976), “Theory of the firm: Managerial behavior, agency costs and ownership structure”, Journal of Financial Economics, Vol. 3, No. 4, pp. 305-360.

Lane, P. R., “Monetary Policy in a Pandemic: Ensuring Favourable Financing Conditions,” Trinity College Dublin, 26 November 2020.

McGowan, M.A., Andrews, D. and Millot, V. (2018), “The walking dead? Zombie firms and productivity performance in OECD countries”, Economic Policy, Vol. 33, No. 96, pp. 687-736.

Peek, J. and Rosengren, E.S. (2005), “Unnatural Selection: Perverse Incentives and the Misallocation of Credit in Japan”, American Economic Review, Vol. 95, No. 4, pp. 1144-1166.

Ponticelli, J. and Alencar, L.S. (2016), “Court Enforcement, Bank Loans, and Firm Investment: Evidence from a Bankruptcy Reform in Brazil”, Quarterly Journal of Economics, Vol. 131, No. 3, pp. 1365-1413.

Schivardi, F., Sette, E. and Tabellini, G. (2021), “Credit Misallocation During the European Financial Crisis”, The Economic Journal.