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Non-Financial Liabilities and Effective Corporate Restructuring

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Bo Becker
Stockholm School of Economics, CEPR and ECGI

Jens Josephson
Stockholm University and Research Institute of Industrial Economics

Hongyi Xu
Stockholm School of Economics

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Abstract

Non-financial obligations created by long-term contracts such as leases are often large, exceeding financial debts in around a third of US firms. Their treatment in insolvency varies: Chapter 11 allows firms to freely reject or assume contracts, but many other restructuring regimes do not allow rejection. We model regimes with and without the rejection option. This option prevents excessive liquidation of insolvent firms and increases firms' debt capacity. Using novel measures of executory contracts by industry, and two difference-in-difference settings, we confirm that leverage and loan flow increase when the rejection option is available.

Keywords: Restructuring, Capital structure, Executory contracts, Insolvency, Bankruptcy

JEL Classifications:

Bo Becker*
Cevian Capital Professor of Finance
Stockholm School of Economics
Sveavägen 65
113 83 Stockholm, Sweden
phone: +46 873 691 11
e-mail: bo.becker@hhs.se

Jens Josephson
Professor of Financial Economics
Stockholm University
Albanovägen 18, A2530
SE-106 91 Stockholm, Swden
e-mail: jens.josephson@sbs.su.se

Hongyi Xu
Researcher
Stockholm School of Economics
PO Box 6501
Stockholm, 11383, Sweden
e-mail: hongyi.xu@hhs.se

*Corresponding Author

Non-Financial Liabilities and Effective Corporate Restructuring*

Bo Becker† Jens Josephson‡ Hongyi Xu§

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Abstract

Non-financial obligations created by long-term contracts such as leases are often large, exceeding financial debts in around a third of US firms. Their treatment in insolvency varies: Chapter 11 allows firms to freely reject or assume contracts, but many other restructuring regimes do not allow rejection. We model regimes with and without the rejection option. This option prevents excessive liquidation of insolvent firms and increases firms' debt capacity. Using novel measures of executory contracts by industry, and two difference-in-difference settings, we confirm that leverage and loan flow increase when the rejection option is available.

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†Stockholm School of Economics, CEPR, & ECGI. Email: bo.becker@hhs.se

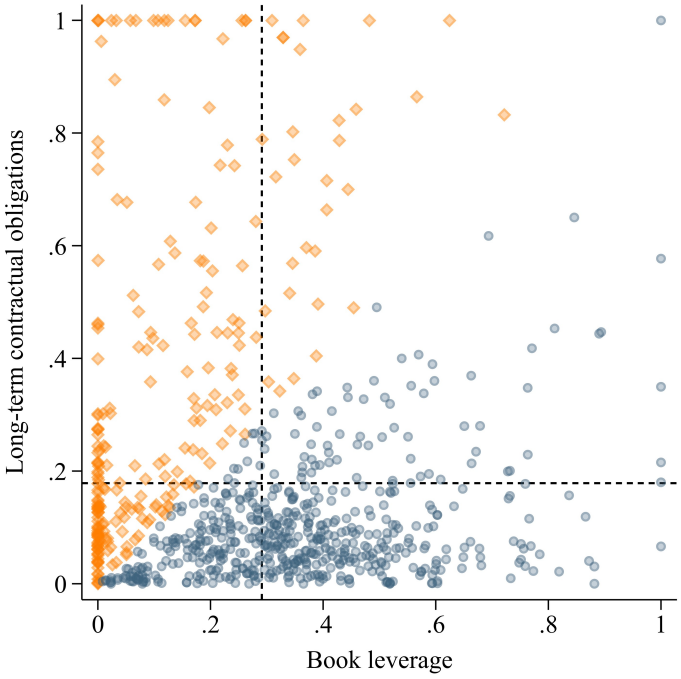
‡Stockholm University & IFN.

§Stockholm School of Economics.

1. Introduction

Non-financial obligations are created by, for example, leases, rental agreements, long-term purchasing contracts, and intellectual property (IP) sharing agreements. Figure 1 illustrates this for a cross-section of large public companies in the U.S. in 2018. The mean value of non-financial obligations in this sample is 17.9% of book assets, and mean book leverage is 29.1%. For 30% firms in this sample, the value of non-financial obligations exceed financial debts.

Figure 1: **Financial and non-financial obligations of U.S. firms**



This figure plots the vaklue of executory contracts divided by book assets (winsorized at one) against book leverage (winsorized at one). The sample is U.S. firms with market capitalization exceeding $1 billion in 2018. Dotted lines indicate mean values for the x and y variables. Orange diamonds denote firms where non-financial obligations exceed leverage, and blue circles those where debt is larger. The measurement of non-financial obligations is described in the data section.

Because non-financial obligations are comparable to financial debts in magnitude,

they often pose an important challenge for insolvent firms. However, the system for managing insolvency and distress in many countries has no tools for changing these obligations.[1] We model the implications of different systems for handling non-financial obligations in insolvency, on insolvency outcomes and on credit markets. Our starting point is that non-financial obligations can impede the continued operation of a business, or, in other words, make it non-viable, just like financial debts. Outside of a formal process it may be difficult or impossible to renegotiate contracts due to both hold-up and free-riding problems. Therefore, just as with debts, handling large non-financial claims in distress may require a formal procedure.[2] Non-financial claims are often large in U.S. bankruptcy cases: in Ayotte's (2015) sample of large Chapter 11 cases, lease obligations (a subset of long term obligations) constitute 23 percent of liabilities and, at the 90th percentile, as much as 70 percent of liabilities.

In Chapter 11 of the U.S. Bankruptcy Code, a few categories of claims – notably financial claims and collective bargaining agreements – are subject to special rules, but for other contracts, a key mechanism for managing obligations is the rejection of executory contracts. An executory contract is one where both parties have remaining obligations (i.e., one-off transactions do not create executory contracts). Examples of executory contracts are office leases, where the landlord will supply an office and the tenant lease payments, long-term vendor contracts (Moon and Phillips 2020), and licensing agreements. Under Section 365 of Chapter 11, executory contracts can be *rejected* (abandoned), *assumed* (retained), or *assigned* (transferred to a third party). The rejection option gives firms considerable ability to reduce their future obligations. Examples of bankruptcy cases where this was important include Kmart and Hertz. For Kmart, the number of leases was large and the company sold rejection rights to a third party in order to reach decisions quickly (Gilson and Abbott 2009). Hertz, which at the time of its Chapter 11 process leased almost half a million vehicles under a "master

[1] Note that outside of the U.S., restructuring is typically separate from bankruptcy. When we refer to 'insolvency law', we think primarily of any processes that do not liquidate: e.g, U.S. Chapter 11 bankruptcy, the UK Scheme of Arrangement, or the various national processes covered by the EU insolvency directives. Our sample period ends in 2023. Under a recent EU directive, some European countries introduced rejection options recently.

[2] Thinking of non-financial and financial contracts in similar terms is a natural implication of the Jensen and Meckling (1976) nexus-of-contracts view of the firm. See, e.g., Casey (2020) and Antill and Grenadier (2019).

lease agreement", rejected some leases and retained others, adopting the fleet to lower rental car demand post-Covid. These two cases highlight the important option values embedded in the right to reject a range of contracts.[3]

Outside of the U.S., it has remained rare for restructuring law to explicitly involve operational claims the way Chapter 11 does, and especially rare to give unconstrained rights to the debtor company to reject contracts as in the U.S.[4] We develop a model of an insolvent firm with financial and operational obligations, and study how capital structure and insolvency choices depend on whether debtors may reject executory contracts. We characterize equilibria under a restructuring process which allows adjusting both types of obligations (Chapter 11) and one limited to financial claims (most other processes).[5]

When both operational and financial claims are addressed simultaneously, it becomes more likely that firm liabilities can be sufficiently reduced for the businesses to survive. In the model, the option to reject executory contracts strengthens the bankrupt firm's bargaining power vis-à-vis the contract counterparties. This allows the firm to renegotiate its contract terms and reduce the operating liabilities, alongside financial debts. Putting all liabilities on the table raises the likelihood of successful restructuring.

Our model connects the option to reject contracts to *ex post* restructuring outcomes as well as *ex ante* capital structure. In testing the empirical relevance of this model, we focus on the prediction that executory contracts that cannot be rejected should discourage financial leverage. We test this by sorting industries based on the amount of executory contracts that are typical for U.S. firms in the industry. For this we used detailed data on leases and rents reported under U.S. GAAP rules, and we also

[3]Aircraft leases have a different position from typical executory contracts. Under Section 1110 of the bankruptcy code, a debtor has 60 days to cure such leases, i.e., the automatic stay ends at that point. See Benmelech and Bergman (2011) for a discussion of airline insolvency.

[4]For example, in an overview of thirty jurisdictions in Chuah and Vaccari, eds (2023), only the U.S. provides a broad and unconditional right to reject, with some rejection options in Australia, Greece and Italy (the Italian law is short of U.S. in that contracts can be assumed but not assigned to a third party). In other countries, rejection is allowed if it does not cause harm to counterparties, or only when the debtor is liquidated, or not at all. We discuss the international legal differences below.

[5]We ignore other differences between systems, such as the treatment of secured debt (Vig 2013), the ability to cram down a plan of reorganization (Richter and Thery 2020), and the status of various types of collateral (Davydenko and Franks 2008). In principle, various features interact.

collect data on purchase obligations from 10-K filings, following Moon and Phillips (2020). The overall value of contractual obligations is high: across firms the median is almost 20% of book assets. This firm-level evidence agrees with Ayotte's (2015) findings that executory contracts are large in many Chapter 11 cases. There is significant variation across industries in the extent of executory contracts - for example, retail and hospitality tend to have important non-financial obligations such as leases, airlines have few leases but significant long-term purchasing contracts, and mining, oil and gas as well as finance tend to have limited obligations. For cross-jurisdiction tests, we assume that this U.S. ordering is relevant to each industry's contractual obligations everywhere.

We test whether the option to reject encourages leverage by comparing industries with high and low executory contract use in three separate settings. First, we compare the U.S. (where rejection is relatively easy) to everywhere else (where it is impossible, cumbersome, or limited).[6] Second, we compare Israeli firms before to after a new law, introduced in 2019, which allowed rejection of contracts.[7] In both cases, controlling for time and firm fixed (and implicitly, country) effects, we find large and statistically significant positive effects on leverage. In cross-country tests, we estimate that a change in the ratio of executory contracts from the 25th to the 75th percentile corresponds to an increase of debt outstanding of 3-5% more debt, relative to a country without the rejection option. The Israeli before- and after tests produce similar magnitude estimates. Third, we also test the model's predictions in lending data from Dealscan, i.e., in loan flow data. High executory contract industries are associated with higher credit volumes in the U.S., consistent with an effect of operational restructuring rules on the debt capacity (higher) and capital structure choices (more debt) of firms.[8]

Our evidence, taken together, suggests that executory contracts matter for financial leverage – the financial debt capacity of firms in industries that rely on executory contracts is significantly affected by a rejection option. This evidence is consistent

[6]A non-U.S. company may file for Chapter 11 in the U.S. provided it "reside or [have] a domicile, a place of business, or property in the United States." However, this is expensive, and the number of such filings is very small compared to filings by U.S. companies (59 foreign enterprise filings compared to more than 60,000 filings by U.S. enterprises over the period 2012-2022).

[7]The reform also made significant changes to consumer bankruptcy (Ofir et al. (2025)).

[8]The number of loans issued in Israel is too small for applying the loan flow methodology to Israeli data.

with our model, which highlights how rejection can avoid liquidation and improve debt capacity. Additionally, the Israeli example suggests that reform in the U.S. direction is possible in other countries, and can be effective outside of the particular institutional setting of Chapter 11.

The rest of this paper is structured as follows. In Section 2, we discuss related literature. In Section 3, we introduce the theoretical framework and present our theoretical results. In Section 4, we describe the empirical method and present our empirical results, and in Section 5, we conclude. A list of variables, the equilibrium outcomes, and derivations of theoretical results can be found in the Appendix, together with an overview of the legal treatment of executory contracts internationally, and a description of the data collection procedure for the text analysis.

2. Related literature

The system for handling insolvent and distressed firms is critical to a range of economic and financial outcomes.[9] A key requirement for a successful system is avoiding liquidation of viable firms, and this sometimes necessitates restructuring of liabilities, including non-financial obligations such as those stemming from executory contracts. Eisfeldt and Rampini (2009) argue that financially constrained firms lease capital, whereas unconstrained firms own their capital. This underlines the importance of handling leases in insolvency.

Many contracts are long-term (e.g. Giglio et al. 2014), and will be executory for a large part of their life (i.e., both parties have important remaining obligations). The treatment of executory contracts in U.S. bankruptcy is controlled by Section 365 of the bankruptcy code.[10] Each executory contract is either rejected or assumed – assumed contracts become an obligation of the debtor, while rejected contracts become general unsecured claims (i.e. a relatively junior claim) of the debtor (assumption requires

[9] For example, the use of secured and asset-based debt (Vig 2013 and Lian and Ma 2020), bank lending to 'zombie' firms (Becker and Ivashina 2022 and Jorda et al. 2022), high yield bond markets (Becker and Josephson 2016), and the efficiency of business liquidation decisions (Bris et al. 2006).

[10] Ayotte (2015) examines important reforms of this section in 2005, including a reduction in the time available to make assumption-rejection decisions.

curing any defaults).[11] Fried (1996) points out that the ability to reject contracts without fully compensating the injured party may be *too strong*, to the point where socially valuable contracts may be rejected (*e.g.*, if a lot of the value has been delivered whereas more of the payments remain). This does not occur in our model, since the executory contract is renegotiated rather than rejected in equilibrium.

Dealing with executory contracts are important to U.S. bankruptcy, according to several papers. Using hand-collected data on firms that filed for Chapter 11 during the period 1991 to 2004, Lemmon, Ma and Tashjian (2009) show that the leases are rejected extensively in Chapter 11 and that the disposition of lease commitments rivals asset sales as a means of asset reduction in bankruptcy. For airlines, Benmelech and Bergman (2008) show that renegotiation of lease commitments is key Chapter 11 processes. Ayotte (2015) shows that disposing of lease obligations is often important in a hand-collected sample of large Chapter 11 cases. The median sample firm has leases worth 10% of assets, the average 18% and the maximum 73% of assets. On average, 50% of leases are assumed, 17% assigned, and 33% rejected. Ma and Tashjian (2015) establish that the value of operating leases raise the likelihood that a firm will file for Chapter 11 (rather than restructure out of court), underlining the usefulness of Section 365.

Outside of the U.S., rejection of executory contracts is more difficult. Dávalos (2017) compares the US, German, and Spanish systems and finds that the Spanish system give less incentives to reject value-creating contracts because claims from rejected executory contracts are very senior (treated as administrative expenses). Israel is an important example (Hahn and Kimhi 2021). A new Company Law, in effect since 2019, codified a flexible treatment of executory contracts of restructuring firms. The law gives a debtor 90 days from the start of proceedings to file a motion to reject a contract, and rejection is allowed with very few conditions. Counterparties of rejected contracts have an unsecured claim on the estate. In other words, this is now very similar to the

[11] Countryman (1972) and Countryman (1973) discuss the evolution of the treatment of executory contracts under U.S. bankruptcy code (before the modern Chapter 11). Countryman (1972) defines an executory contract as follows: "...within the meaning of the Bankruptcy Act an executory contract is one under which the obligations of both the bankrupt and the other party to the contract are so far unperformed that the failure of either to complete performance would constitute a material breach excusing the performance of the other" which agrees with current rules.

U.S. situation. Based on Chuah and Vaccari, eds (2023), we classify thirty countries in terms of treatment of executory contracts, and conclude that three other countries (Australia, Greece and Italy), at least on paper, appear to offer insolvent firms options – we estimate results with these countries grouped together with the U.S. Ayotte and Yun (2007) point out that the optimal bankruptcy law depends on the capabilities of the legal system. Our assessment is that the option to reject executory contracts is relatively straightforward, and could be implemented in most OECD countries, and this is the assumption behind our cross-sectional tests. However, this conjecture is difficult to verify. It is possible that a reform such as that undertaken in Israel has prerequisites in terms of judge skill sets and legal environment, in order to be effective.

3. Theoretical analysis

3.1 Framework

We develop a three-period model of a firm with financial and non-financial obligations that may enter distress and restructure. A list of variables can be found in Appendix A.

In period 1, two or more competing suppliers each offer the firm a quantity $\beta > 0$ of an input. The suppliers are identical with a production cost of $c > 0$ per unit of the input, and an opportunity cost of $k < c$ per unit. The opportunity cost represents what each supplier gives up in order to supply the input. It can be thought of as the market value in some secondary use.

In period 2, the firm signs an executory contract with one of the suppliers offering the lowest unit price, p.[12] In the same period, the firm invests in a project with stochastic payoffs. The investment is partly financed with debt and partly with equity, both determined endogenously within the model. We assume a competitive capital market made up of a continuum of identical risk-neutral creditors and a risk-free rate normalized to zero.

[12]As described in the introduction, an executory contract is one where both parties have remaining obligations. Such contracts may be optimal when spot markets are insufficient, for example reflecting asymmetric information before the contract is signed (Fudenberg et al. 1990), if the parties feature bounded rationality (Bolton and Faure-Grimaud 2010) or to reduce renegotiation costs (Klein et al. 1978 and Halonen-Akatwijuka and Hart 2020).

In between periods 2 and 3, everyone observes the realization s of a random variable $S \sim Uni\,[0,1]$. The realization is a perfectly revealing signal of the project's revenues, which amount to $\alpha s + \beta q$. This formula consists of two terms: αs corresponds to the (stochastic) revenues without the input, where $\alpha > 0$ measures the quantity of an internal factor of production and s its productivity per unit; βq corresponds to the (deterministic) revenues generated by the input, where β is the quantity of the input and $q > k$ measures its productivity per unit.

In period 3, the contracted payments of the input, βp, and of *gross debt*, D, are due. We use the term gross debt to denote the face value of debt plus the corresponding interest rate. If the firm is solvent, in the sense that revenues are enough to cover expenses, profits are taxed at a rate $t \in (0,1)$ and the game ends. If, on the other hand, the firm is insolvent, it will enter bankruptcy and either be liquidated or restructured by a bankruptcy court, maximizing the realization of firm value. We assume executory claims have priority over revenues in bankruptcy, but that the corresponding unsecured claims are paid zero in case of rejection. We also assume there is a cost $C > 0$ of bankruptcy and that a liquidation implies a net cash flow of $L - C > 0$ to creditors.

In summary, the set of players of the game consists of suppliers, the firm, and the bankruptcy court. Suppliers select the input price to offer, the firm selects a supplier and gross debt as a function of price, and the bankruptcy court decides for which realizations to liquidate or restructure the firm, given price and gross debt. Suppliers maximize expected profits, the firm maximizes the expected firm value, and the bankruptcy court the realization of the firm value.

We will study two institutional settings.

F. In the *Financial restructuring* setting, a financial restructuring is available as an alternative to a liquidation. This means that the debts of an insolvent firm can be written down and corresponds fairly well to typical European Union restructuring procedures.

O. In the *Operational and financial restructuring* setting, an operational and financial restructuring is available as an alternative to a liquidation. We model operational restructuring through the right to reject executory claims. This corresponds most clearly to Chapter 11 of the U.S. Bankruptcy Code.

In our model, the tax rate t is what gives the firm incentive to increase leverage and the bankruptcy cost C is what gives the firm incentives to restrict leverage. In order to guarantee interior solutions, we will assume that the bankruptcy cost is neither too large nor too small compared to the tax rate:

$$C < t(\alpha + \beta(q - p) - L), \tag{A1}$$

$$\beta(q - k) \leq C, \tag{A2}$$

$$4\alpha\beta t\,(c - k) \leq C^2. \tag{A3}$$

Assumption A1 guarantees a range of signals such that the bankruptcy court prefers to perform a financial restructuring rather than to liquidate the insolvent firm in the first setting. Assumption A2 implies that there is a range of signals such that the firm will be liquidated. Assumption A3 implies that there are prices such that the supplier makes non-negative profits in both settings.

We continue by deriving the equilibrium outcomes in each of the two institutional settings and thereafter compare these outcomes. Our equilibrium concept is subgame-perfect equilibrium and we solve the game using backward induction (see Appendix C. for formal derivations of the equilibria). The equilibrium outcomes in each setting are denoted by superscript $i \in \{F, O\}$.

3.2 Financial restructuring

We start by deriving the equilibrium in the institutional setting where the insolvent firm is restricted to either a financial restructuring or a liquidation. A financial restructuring is carried out through a write-down of debt while equity is eliminated. In our model, the write-down is achieved by the bankrupt court, but alternatively this could be performed *out of court* by a bond trustee who coordinates and bargains on creditors' behalf.[13]

[13] An example of this is Norway, where a bond trustee typically has contractual rights to make payment changes on behalf of investors. This type of contract is not possible in the U.S., but out-of-court solutions may be found in other ways (see Bolton and Scharfstein 1996).

Liquidation threshold

Solvency, meaning the ability to repay debts, is a key attribute of a firm in the model, and it depends on the realization s of S. The firm is solvent if and only if

$$\alpha s + \beta (q - p) - D \geq 0, \tag{1}$$

i.e. for s above s_I, defined as:

$$s_I := (D + \beta (p - q)) / \alpha. \tag{2}$$

For realizations of S below this level, the firm value equals the value of debt. The value of debt is greater with ongoing operations than in a liquidation provided:

$$\alpha s + \beta (q - p) - C \geq L - C. \tag{3}$$

The bankruptcy court will thus write down debt for s below s_I and above:

$$s_L^F := (L + \beta (p - q)) / \alpha. \tag{4}$$

and liquidate the firm for s below the latter threshold. Assumption A1 implies that the equilibrium liquidation threshold is strictly below the insolvency threshold. Hence, there will be a range of signals that result in financial restructuring. Moreover, we show below that in equilibrium both thresholds belong to the open unit interval.

Gross debt

The firm chooses the level of gross debt that maximizes the firm value, subject to the insolvency and liquidation thresholds s_I and s_L^F, respectively. The expected values of equity and debt in period 2 given gross debt D and price p can be expressed as follows:

$$e^F = (1 - t) \int_{s_I}^{1} (\alpha s + \beta (q - p) - D) \, ds, \tag{5}$$

$$d^F = (L - C) \int_{0}^{s_L^F} ds + \int_{s_L^F}^{s_I} (\alpha s + \beta (q - p) - C) \, ds + D \int_{s_I}^{1} ds. \tag{6}$$

The value of equity equals the expected value of after-tax profits. The value of debt is the sum of three terms. The first term represents the value if the firm is liquidated, the second term the expected revenue net of the payments to the supplier and the bankruptcy court if debts are restructured, and the third term the full repayment of gross debt when the firm is solvent. We will henceforward refer to the expected value of debt in period 2 as *net debt* to distinguish it from gross debt.

Differentiating the concave firm value, $f = d + e$, with respect to gross debt, D, gives the interior first-order condition:

$$t\left(\alpha - D + \beta\left(q - p\right)\right)/\alpha - C/\alpha = 0, \tag{7}$$

implying an optimal gross debt of:

$$D^F = \alpha + \beta\left(q - p\right) - C/t, \tag{8}$$

and an insolvency threshold of:

$$s_I^F = 1 - \frac{C}{t\alpha}. \tag{9}$$

Input price

In equilibrium, the suppliers will set prices so that they break even subject to the liquidation threshold. The equilibrium price in the setting F can be found by solving the following equation:

$$p - \left(p - k\right)\frac{L + \beta\left(p - q\right)}{\alpha} - c = 0. \tag{10}$$

The equation has potentially two solutions under our assumptions, but only the minimum solution can be sustained in equilibrium, since otherwise a minor price cut would constitute a profitable deviation.[14]

$$p^F = k + \frac{1}{2\beta}\left(\alpha + \beta\left(q - k\right) - L - \sqrt{\left(\alpha + \beta\left(q - k\right) - L\right)^2 - 4\alpha\beta\left(c - k\right)}\right). \tag{11}$$

[14]Lemma 1 in the Appendix shows that the term under the square root in (11) is positive by Assumption A3.

In Appendix C, we demonstrate formally that there is an equilibrium with the outcomes derived above. We summarize the equilibrium values of all variables in Appendix B.

Proposition 1 *With financial restructuring, there is a subgame-perfect equilibrium with the outcomes:*

$$\{p^F, D^F = \alpha + \beta\left(q - p^F\right) - C/t, s_L^F = \left(L + \beta\left(p^F - q\right)\right)/\alpha\}.$$

3.3 Operational and financial and restructuring

In the second setting, the bankruptcy court may write down debt as well as reject the executory contract and liquidate the firm. The option to reject the executory contract increases the firm's bargaining power relative the supplier. More precisely, we imagine that it enables the bankruptcy court to make a take-it-or-leave-it offer of a new and lower unit price of the input to the supplier, which the latter will accept provided it is at least as good as the outside option. This bargaining interpretation is in line with e.g. Casey (2020), who argues that the fundamental attribute of Chapter 11 is to create a bargaining framework for renegotiation.[15]

Liquidation threshold

Just like in the setting above, the firm is solvent if and only if $s \geq s_I$ (where the treshold depends on D and p). For realizations of S below this threshold, the bankruptcy court will use the rejection option to renegotiate the firm's contract with the supplier, lowering the unit price for the input from p to k.

The bankruptcy court prefers to continue the operations of the firm with the

[15]There are several reasons why a renegotiation of the executory contract may not be possible in a setting without the option to reject executory contracts. Given the assumption that the executory claimant has priority over financial claimants in bankruptcy, it has no incentive to renegotiate as long as debt write-downs prevent a liquidation. If revenues are so low that the firm would be liquidated without a renegotiation, funds may not be sufficient to pay the supplier what it could earn elsewhere. Finally, although we describe the executory claimant as a single entity, an alternative interpretation is that there are many small executory claimants that may have difficulty coordinating a renegotiation.

renegotiated contract rather than to liquidate the firm if and only if:

$$\alpha s + \beta (q - k) - C \geq L - C. \tag{12}$$

This gives a liquidation threshold below that under financial restructuring:

$$s_L^O := (L + \beta (k - q)) / \alpha. \tag{13}$$

Assumption A1 implies that in equilibrium, the liquidation threshold is below the insolvency threshold. Moreover, from the assumptions $L > C$ and A2 follow that the liquidation threshold is greater than zero.

Gross debt

The firm chooses the level of gross debt that maximizes the firm value, subject to the insolvency and liquidation thresholds s_I and s_L^O, respectively. In period 2, the values of equity and net debt given D and p equal:

$$e^O = (1 - t) \int_{s_I}^{1} (\alpha s + \beta (q - p) - D)\, ds, \tag{14}$$

$$d^O = (L - C) \int_{0}^{s_L^O} ds + \int_{s_L^O}^{s_I} (\alpha s + \beta (q - k) - C)\, ds + D \int_{s_I}^{1} ds. \tag{15}$$

The formulas for equity and net debt are similar to the setting with financial restructuring, but there are two differences. The liquidation threshold is lower and the payoff to creditors when the firm is restructured equals the expected revenue net of the renegotiated payment to the supplier (from βp to βk) and the payment to the bankruptcy court.

The firm value in the same period, $f = d + e$, is a concave function of gross debt, D. Differentiating the firm value with respect to this variable gives the interior first-order condition:

$$(\beta (p - q) + \beta (q - k)) / \alpha + t (\alpha - D - \beta (p - q)) / \alpha - C/\alpha = 0, \tag{16}$$

implying an optimal gross debt of:

$$D^O = \alpha + \beta(q-p) - C/t + \beta(p-k)/t, \tag{17}$$

and the insolvency threshold:

$$s_I^O = 1 - \frac{C}{\alpha t} + \frac{\beta(p-k)}{\alpha t}. \tag{18}$$

Since the input price must be greater than k, the firm borrows more and is more likely to become insolvent under operational restructuring.

Input price

In equilibrium, suppliers will set prices so that they break even subject to the insolvency threshold. The equilibrium price can be found by solving the following equation:

$$p - (p-k)\frac{\alpha t + \beta(p-k) - C}{\alpha t} - c = 0. \tag{19}$$

Just like in the previous setting, the equation has potentially two solutions under our assumptions, but only the minimum one can be sustained in equilibrium, since otherwise a minor price cut would be a profitable deviation.

$$p^O = k + \frac{1}{2\beta}\left(C - \sqrt{C^2 - 4t\alpha\beta(c-k)}\right). \tag{20}$$

We show in Appendix C that the input price with operational restructuring is greater than the one with merely financial restructuring and demonstrate formally that there is an equilibrium with the outcomes derived above. The equilibrium outcomes of all other variables are summarized in Appendix B.

Proposition 2 *With financial and operational restructuring, there is a subgame-perfect equilibrium with the outcomes:*

$$\{p^O, D^O = \alpha + \beta\left(q - p^O\right) - C/t + \beta\left(p^O - k\right)/t, s_L^O = \left(L + \beta(k-q)\right)/\alpha\}.$$

3.4 Comparing the institutional settings

We conclude the theoretical analysis by comparing the equilibrium outcomes in the two different institutional settings. Our first result compares the liquidation and insolvency thresholds with financial and operational restructuring. By substituting for the equilibrium prices in the thresholds for insolvency and liquidation, we immediately obtain the following inequalities.

Proposition 3 *In both settings, the insolvency and liquidation thresholds belong to the open unit interval. They can be ordered as follows:*

$$s_I^O > s_I^F > s_L^F > s_L^O.$$

The leftmost inequality is due to a higher level of gross debt and a higher input price with operational restructuring.[16] The intuition for the difference in gross debt is that the trade-off between the marginal tax benefit from borrowing more and the incremental cost in terms of a higher likelihood of bankruptcy differs in the two settings. With operational restructuring, the expected cost is lower since the executory contract can be renegotiated. The input price is higher with operational restructuring since it is less likely that the supplier is paid in full.

The intermediate inequality is an immediate consequence of Assumption A1. The intuition for the rightmost inequality is that the option to renegotiate the input price makes liquidation unattractive for a wider range of signals with operational restructuring.

Our second result compares leverage in the two institutional settings. It states that leverage with operational restructuring is higher and increases faster in the quantity of the input when the tax rate is not unreasonably high. Figure 2 illustrates this result for a set of parameters such that all assumptions of the model hold.

Proposition 4 *If $t \leq 1/2$, the following holds for leverage in the two settings:*

i. $d^F/e^F < d^O/e^O$,

ii. $\frac{\partial(d^F/e^F)}{\partial\beta} < \frac{\partial(d^O/e^O)}{\partial\beta}$.

[16] For formal proofs of these properties see Lemmas 2 and 3 in Appendix C.

To understand the first part of this result, it is helpful to analyze the differences in equity and net debt between the two settings. Since shareholders are the residual claimants of any cash flow above the insolvency threshold, and since insolvency is more likely with operational restructuring, by Proposition 3, the value of equity in period two is lower in that setting. Moreover, net debt is higher with operational restructuring because the firm borrows more in period 2 and creditors are paid more for intermediate realizations of the signal when they can renegotiate the input price.

The second part follows from two separate results. First, equity is decreasing in the quantity of the input with operational restructuring, but unaffected with financial restructuring. Second, the option to renegotiate the executory contract is more valuable to creditors the larger the executory contract.

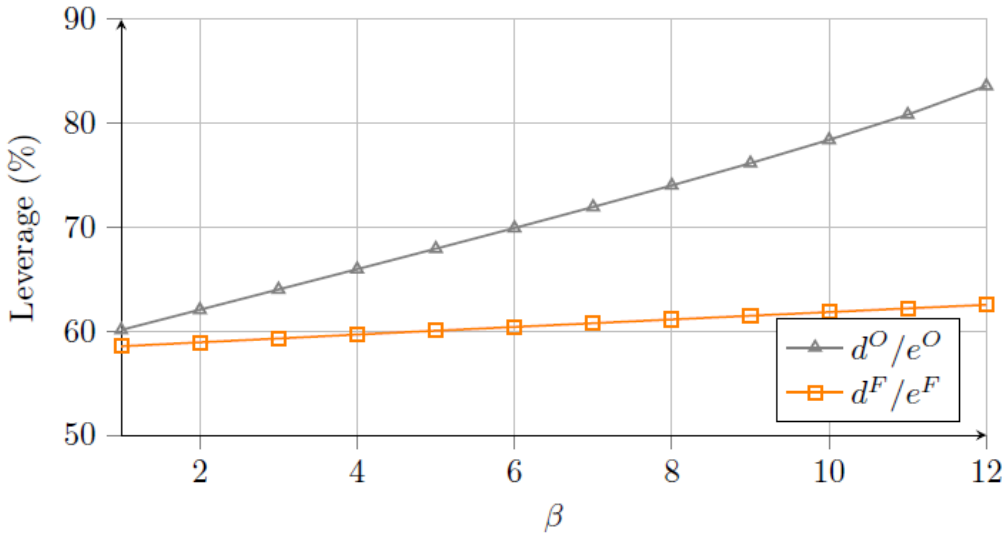
The condition that the tax rate be below 50% is sufficent but not necessary and it can be explained as follows. The firm borrows more with operational restructuring than with financial restructuring, but it has a higher probability of incurring the bankruptcy cost. The first effect, which increases net debt, dominates for sufficiently low tax rate.

Finally, we will consider the difference in total surplus between the two institutional settings, $W^O - W^F$. We will assume that a liquidation entails a negative externality given by Z. This could, for example, represent losses of firm-specific physical and human capital (Graham et al. (2023)) or negative effects of liquidation on other firms (Bernstein et al. (2019)). The setting with operational restructuring entails a lower probability of liquidation but a higher probability of insolvency, resulting in the following expression:

$$\begin{aligned} W^O - W^F &= \int_{s_L^O}^{s_L^F} (\alpha s + \beta (q-k) - L + Z)\, ds - C \int_{s_I^F}^{s_I^O} ds \\ &= \frac{\beta \left(p^F - k\right)}{\alpha} \left(\frac{\beta \left(p^F - k\right)}{2} + Z \right) - \frac{\beta \left(p^O - k\right) C}{\alpha t} \end{aligned}$$

Operational restructuring thus improves welfare if the welfare gains (private gains as well as externalities) from a lower probability of liquidation are large compared to the higher likelihood of a costly insolvency.

Figure 2: **Leverage as a function of** β



This figure depicts net debt as a function of β. The other parameters are as follows: $\alpha = 30$, $k = 0.3$, $q = 0.5$, $c = 0.35$, $t = 0.2$, $C = 4$, $L = 5$. Hence, all the assumptions of the model hold.

4. Empirical evidence

Our model captures the idea that executory contracts can be important to the viability of an insolvent firm. The model is relevant when executory contracts are important. Ayotte (2015) documents that this is true in Chapter 11 cases, i.e., among distressed US firms. We provide suggestive data from a large set of publicly traded firms.

The key prediction of our model is that, in industries with significant amounts of executory contracts, financial leverage should be low in a system without operational restructuring and higher in a system that allows operational restructuring (Proposition 4). We examine this empirically in an international cross-section of capital structure data. We use two empirical approaches. First, we consider Chapter 11 more capable of operating restructuring than other systems, and run cross-country capital structure regressions. Second, the 2019 new Company Law in Israel clearly established that contracts could be rejected without reason in restructuring procedures – we consider this an increase in the ability to restructure operating claims, and use this for

difference-in-difference tests (assuming the change is more important to industries with wider reliance on executory contracts).[17]

The rest of this section presents data sources and empirical tests.

4.1 Data

We employ three data sets to investigate the impact of operational restructuring rules in insolvency on credit markets. First, we use Compustat-CapitalIQ to understand how the intensity of executory contract use varies across industries, and to measure the capital structure of firms in various countries. Second, we use Refinitiv LoanConnector Dealscan to collect data on syndicated loan flows. Third, we use text analysis to extract information about Long-term Purchase Agreements from 10-K filings.

Firm level capital structure data come from Compustat-CapitalIQ; we also use this data set to construct industry-level measures of the typical extent of executory contracts by industry. There are two firm samples: one for the U.S. (Compustat), and one for the rest of the world (CapitalIQ). Accounting variables in these data sets are reported in local currency, and we use average annual exchange rates from the European Central Bank (ECB) Statistical Warehouse to translate all amounts into U.S. dollars. We use Bureau of Labor Statistics price level data to translate data for earlier years into 2023 dollars.

We use two main sources of data on executory contracts. We employ U.S. firm level data to calculate how important executory contracts typically are for firms in an industry, and assume that the relative importance of executory contracts in a U.S. industry is informative about the same industry for all the countries in our sample. Using industry-level variation reduces noise in measurement, and allows us to use detailed accounting data available for U.S. firms for tests on global samples, and, most importantly, means that we can test our theory outside of the U.S., where lease reporting is more limited. We collect data on financial and operating leases as well as rental payments from CapitalIQ. We add up lease commitments for the current year and the next four years, and multiply the current year's rent by three to approximate

[17]The data section below discusses the treatment of executory contracts in countries other than the U.S. and Israel.

typical contractual commitments (our results are qualitatively unchanged if we use two, four, or five instead).[18] For the firm level data used in Figure 1, we apply the same variables, from Compustat.

The second component of executory contract use is based on text parsing of 10-K filings at SEC, following Moon and Phillips (2020). Since an SEC ruling in 2003, firms are required to include tables with purchase obligations in their 10-Ks, together with leases (which we ignore, taking their value from balance sheets). The detailed process for extracting the purchase obligation data is described in the Appendix.

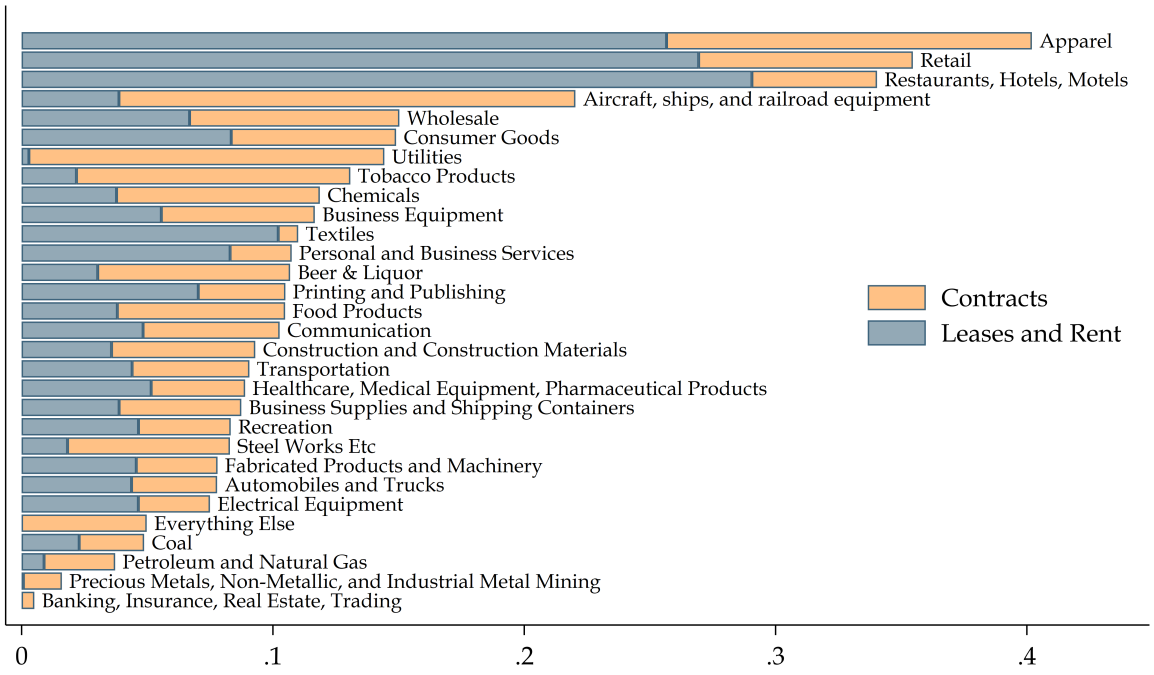
Our main measure of executory contract intensity in each industry is the median across all firms in the industry of the sum of the executory contract liabilities (i.e., rent time three, leases and purchase obligations), normalized by assets. We use a single year (2018) to calculate industry averages. The coverage of firms and industries is better for more recent years, and we want to use data before the Covid-19 pandemic (which may have impacted leases and rents in unusual ways). The industry-level variables appear very stable over time (we have similar results using 2014 or 2016 data for leases and rents, and 2017 data for long-term contracts). For firm level data (Figure 1) we cap the ratio of executory contracts to assets at one.

Average executory contracts for Fama-French 30 industries are reported in Table 1. The values are also plotted in Figure 3. In all our tests, we exclude Utilities (industry 20) as their capital structure is often regulated (results are similar if we include this). We also drop banks, based on sic codes between 6000 and 6199 (this is part of Banking, Insurance, Real Estate, Trading, industry number 29). Results are similar with alternative definitions using 12 or 44 industries instead of 30. The industries with the highest amount of obligations under executory contracts are Retail (27), Apparel (7) and Aircraft, ships and railroad equipment (16). Retail has a lot of rent and lease payments, Aircraft has large amounts of long-term purchase agreements, and apparel has both. U.S. Chapter 11 procedures where rejections play a large role in the industries include Kmart (industry 27), Payless ShoeSource (also 27). After these industries, Restaurants, Hotels and Motels (28), Communication (21); and Tobacco

[18]The variables names in Compustat are cld (for years 2-5), mrc (years 1-5) and xrent. We do not use the variable fatl which measures the asset value of leased property. We rely on data from 2018 and earlier when calculating leases (see below); after this date, capitalization rules changed (see Ma (2020)).

products have relatively high values through different combinations of rent, leases, and long-term agreements. In contrast, industries Textiles (10); Precious Metals and Mining (17) and Petroleum and Natural Gas (19) have low use of executory contracts (i.e. low values for all components). Our assumption is that industries vary systematically in the amount of executory contracts they tend to have, and that U.S. firms are representative (detailed data is available for U.S. firms). This appears reasonable given the nature of industries at the top and bottom of Table 1. In the firm panel sample used in regressions, the 25th and 75th percentiles of executory contracts normalized by assets are 0.050 and 0.099, and the interquartile range is 0.05.

Figure 3: **Executory contract use by industry**



This figure plots the value of two components of executory contracts, as a fraction of book assets, for 30 Fama-French industries.

To test the impact of executory contract rules, we employ data on global firm capital structures using a global sample from Compustat-CapitalIQ. We use accounting data (e.g., leverage, profitability, revenues) as well as information about industry, country

Table 1: **Value of executory contracts by industry**

Fama-French 30 Industry	**Executory contracts over assets**	**Purchase obligations share of exec. contracts**
Apparel	0.402	36%
Retail	0.355	24%
Restaurants, Hotels, Motels	0.340	15%
Aircraft, ships, and railroad eq.	0.220	82%
Wholesale	0.150	56%
Consumer Goods	0.149	44%
Utilities (*excluded from tests*)	0.144	98%
Tobacco Products	0.131	83%
Chemicals	0.119	68%
Business Equipment	0.117	52%
Textiles	0.110	7%
Personal and Business Services	0.107	23%
Beer	0.107	72%
Printing and Publishing	0.105	33%
Food Products	0.105	64%
Communication	0.103	53%
Construction and Construction Materials	0.093	62%
Transportation	0.091	51%
Healthcare, Medical Equipment, Pharma.	0.089	42%
Business Supplies and Shipping Containers	0.087	56%
Recreation	0.083	44%
Steel Works Etc	0.083	78%
Fabricated Products and Machinery	0.078	41%
Automobiles and Trucks	0.078	44%
Electrical Equipment	0.075	38%
Everything Else	0.050	100%
Coal	0.049	53%
Petroleum and Natural Gas	0.037	76%
Precious Metals and Mining	0.016	96%
Finance and Real Estate (*excluded from tests*)	0.005	100%

and year. The global database contains less detail than for U.S. firms (e.g., regarding lease obligations), so we rely on industry-level variation calculated from U.S. data. We define leverage as the ratio of the sum of short-term debt and long-term debt to assets

(we drop observations where this is outside the [0,1] range, and debt-to-EBITDA as the ratio of the long- and short-term debt to EBITDA (we drop observations where this is outside the [0,15] range). Summary statistics for leverage and debt-to-EBITDA for 2022 is presented in Table 2.

Table 2: **Summary Statistics dependent variables**

	10th Perc.	Mean	90th Perc.	Std. Dev.	Obs
Leverage					
Israel	0.01	0.273	0.603	0.232	550
U.S.	0.01	0.287	0.616	0.237	4,187
Rest of World	0.00	0.207	0.467	0.184	26,989
Debt/EBITDA					
Israel	0.29	4.068	8.980	3.484	334
U.S.	0.27	3.294	7.385	2.947	2,068
Rest of World	0.08	2.883	7.299	3.091	19,753

Summary statistics for various subsamples. Data are for the last year of the firm sample (2022) and excludes utrilities and banks.

In order to capture a flow measure of credit supply, we collect Dealscan data on syndicated loans. We start from all term loans made between 2010 and 2023. Revolving credit facilities are excluded since amounts mean something different in that loan category. We focus on new origination (however, changing the methodology to include changes in loan amounts that follow amendments does not impact our findings). Finally, we exclude subordinated loans, a small minority (including subordinated loans does not change our results). This leaves 492,973 loans. We aggregate amounts by Fama-French industry, year, and country. There are 10,033 cells with non-zero volumes out of a potential total of around 70 thousand (14 years, 30 industries, 169 countries); and after including fixed effects, we have 8,318 observations (singleton cells are dropped). For robustness tests, we focus on OECD countries only, which produces a sample of 4,768 observations out of a potential total of around 12 thousand.[19]

[19]We have also tried including all the cells without loans, by considering the log of a constant (e.g., one) plus the number or value of loans. Results are very similar.

We examine both total amounts of term loans and the number of loans made, and calculate several control variables as straight averages of loans in a cell - the fraction loans with a sponsor, the fraction of loans with working capital as the stated purpose, and the fraction of loans with deal purpose ("Merger", "Takeover", "Acquisition" or "Leveraged Buyout").

International variation in the treatment of Executory Contracts

The U.S. Chapter 11 treatment of executory contracts is unique. In an overview of the treatment of executory contracts in distress, Chuah and Vaccari, eds (2023) collects detailed country-level assessments of the status of this for thirty different countries. Based on Chuah and Vaccari, eds (2023), we provide a simplified classification of the treatment of executory contracts in insolvency procedures as follows. We consider a regime comparable to the U.S. system if (a) there is an in-court procedure for insolvent or distressed firms which does not automatically liquidate; (b) in this procedure, debtors (or their representatives) can reject or assume executory contracts freely (e.g., without fairness tests and not subject to counterparty approval); (c) *Ipso Facto* contract terms are not enforced (these terms can give counterparties the right to walk away from executory contracts); and (d) counterparties do not have rights to withhold performance on executory contracts with insolvent firms. When rules have changed, we focus on 2021 (i.e., we include data on recent reforms even if these are not relevant for the whole sample). This incorporates some recent reforms, and may therefore slightly overstate the rejection options available during our sample period. When rules differ for different types of executory contracts, we focus on leases.

Table 6 in the Appendix presents our assessment for the thirty countries covered by Chuah and Vaccari, eds (2023). According to our classification, apart from the U.S., only Australia, Greece and Italy feature a right to reject and assume contracts. We cannot verify that this corresponds to actual practice (e.g., whether there are any examples of restructuring procedures for large firm where important contracts were rejected), and in some cases we have not managed to identify how long these rules have been in place practices are (the Italian rejection option was introduced in 2012). We have re-estimated tests (cf. Table 3) where we group the three additional countries

together with the U.S. (and exclude all firms from countries not covered by Table 6). Results are similar in magnitude and statistical significance but all the identification comes from the U.S.. Because we cannot verify the practical relevance of the rejection option in Australia, Italy and Greece, we only report results with firms from these three countries in the untreated group.

4.2 Empirical tests - Cross-country variation in leverage

In this section, we report tests of the impact of restructuring law on corporate capital structures using the developed and extensive U.S. Chapter 11 machinery for handling non-financial obligations. In particular, we compare leverage in industries where executory contracts tend to create extensive obligations, under the hypothesis that this reduces debt capacity by a little in the U.S. system but by a lot in jurisdictions offering less room for rejection. We consider all other countries the benchmark against which we compare U.S. firms. It is not entirely accurate that no other countries allow restructuring of executory contracts (see next section for an example), but it is generally true. When rejection is possible, it is typically restricted (Dávalos 2017). Our empirical hypothesis is therefore that firms in industries with high executory contracts, leverage should be higher in the U.S. than elsewhere. We have a treatment which happens in just a single year, so standard two way fixed effects (TWFE) regressions should work well (Roth et al. 2023). The regression equation is: In this section, we report tests of the impact of restructuring law on corporate capital structures using the developed and extensive U.S. Chapter 11 machinery for handling non-financial obligations. In particular, we compare leverage in industries where executory contracts tend to create extensive obligations, under the hypothesis that this reduces debt capacity by a little in the U.S. system but by a lot in jurisdictions offering less room for rejection. We consider all other countries the benchmark against which we compare U.S. firms. It is not entirely accurate that no other countries allow restructuring of executory contracts (see next section for an example), but it is generally true. When rejection is possible, it is typically restricted (Dávalos 2017). Our empirical hypothesis is therefore that firms in industries with high executory contracts, leverage should be higher in the U.S. than elsewhere. We use standard two way fixed effects (TWFE)

regressions (Roth et al. 2023). The regression equation is:

$$d_{it} = \theta X_{it} + \gamma E_j I_c^{treated} + \lambda G_{j\times t} + \eta H_{c\times t} + \epsilon_{it} \tag{21}$$

where d is either book leverage or debt over EBITDA, i is firm and t year, $j(i)$ the industry of firm i, $c(i)$ the country of firm i, X vector of firm controls, E executory contract intensity of industry j, $I_c^{treated}$ US, and where G and H are industry-year, and country-year dummies (i.e., we saturate for the dimensions $j \times t$ and $c \times t$, and identify off the $j \times c$ dimension). We cluster standard errors both by firm and industry-year.

Table 3: **Leverage of U.S. firms compared to those in other countries**

	All Countries		OECD	
	(1)	(2)	(3)	(4)
	Leverage	Debt/EBITDA	Leverage	Debt/EBITDA
Dependent var. mean	0.229	2.836	0.233	2.836
Executory contr. / Assets	**0.150*****	**2.813*****	**0.142*****	**3.112*****
	(0.038)	(0.505)	(0.056)	(0.533)
Observations	655,854	537,497	340,805	277,107

Regressions of book leverage or debt on control variables (dependent variable indicated at the top of each column). Each column refers to one regression. Observations are firm-years. Executory contracts refers to the interaction of an indicator for U.S. firms and the industry measure of executory contracts. All regressions include controls and fixed effects. Standard errors clustered by firm and by industry-year are reported in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3 reports results for leverage regressions comparing U.S. firms to those in other countries, either the full sample or the sub-sample of firms in OECD countries, using the executory contracts measures normalized by assets and revenue, respectively. All coefficients are positive and significant, suggesting that U.S. firms in industries which tend to use executory contracts more have higher leverage (compared to industries with less such use, and compared to other countries). The coefficients suggest small but potentially important effects; for example, the first coefficient (0.150) implies

that a change in the ratio of executory contracts to assets from the 25th to the 75th percentile (around 0.05) corresponds to an increase of leverage in the U.S. of 0.008 (vs. average leverage is 0.23), or around 3% more debt. The Debt-to-EBITDA coefficient in the second column (2.813) implies that moving from the the 25th to the 75th percentile corresponds to an increase of 0.14, or about a 5% increase in the amount of debt.

These results suggest that operational obligations incurred through executory contracts reduce debt capacity outside the U.S., as predicted by our model. A potential concern with these results is that the U.S. context might differ in how debt and executory contracts are related due to reasons separate from insolvency law. In the next section, we examine a reform in Israel which allows us to test our hypothesis within a fixed jurisdiction.

4.3 Empirical Tests - leverage changes after Israel's Company Law reform in 2019

Until recently, the treatment of executory contracts during legal restructuring in Israel offered limited options. Prior to 2013, rejection was difficult. A 2013 legal case appeared possible under limited conditions, but courts did not generally allow it (Tadmor-Levy 2020). A new Company Law, in effect since 2019, codified very flexible treatment of executory contracts of restructuring firms. Now, a debtor has 90 days from the start of proceedings to file a motion to reject a contract, and rejection is allowed with few conditions (Hahn and Kimhi 2021). Counterparties of rejected contracts have an unsecured claim on the estate. The World Bank describes the reform as follows: "Israel made resolving insolvency easier through an amendment to its company law allowing the assumption or rejection of executory contracts, granting maximum priority to postcommencement credit, extending the maximum period of moratorium during restructuring proceedings and allowing the sale of secured assets when necessary to ensure a successful restructuring".[20] In effect, the right to reject executory contracts appears similar to the U.S.

In our empirical tests, we focus on the increased ability to deal with executory

[20]From https://archive.doingbusiness.org/en/reforms/overview/economy/israel, accessed June 2022.

contracts starting with the reform to the Company Law, in effect from 2019. We predict that financial leverage will increase following the reform for firms which operate in industries where executory contracts are important. By exploiting the different role of executory contracts across industries, and testing whether leverage increased *more* after the reform in those industries where executory contracts are important (than in industries where they are not), we can include time and industry fixed effects. Therefore, results are independent of aggregate time trends as well as of any industry-specific (but time-independent) determinants of leverage. In essence, the tests have a similar difference-in-difference interpretation as the cross-country but compare Israeli firms before and after the reform instead of U.S. firms to non-U.S. firms. The regression equation is:

$$d_{it} = \theta X_{it} + \gamma E_j I_{ct}^{treated} + \mu F_i + \lambda G_{j\times t} + \eta H_{c\times t} + \epsilon_{it} \tag{22}$$

where d is book leverage or debt-to-EBITDA, i is firm and t year, $c(i)$ represents the country of firm i, X vector of firm controls, E executory contract intensity of industry j, $j(i)$ industry, $I_{ct}^{treated}$ indicates observations in Israel in 2019 and later, and where F, G, H are firm, industry-year, and country-year dummies (i.e., we saturate for the dimensions $j \times t$ and $c \times t$, and identify off the $j \times t \times c$ dimension). We cluster standard errors both by firm and industry-year. Comparing to the cross-sectional tests above, we can include firm fixed effects (they raise R-squared above 90% in all regressions, but their inclusion makes little difference to the coefficient estimates of interest).

Results of the two regressions are reported in Table 4. Coefficients are larger than the magnitude to the U.S. tests in Table 3 for leverage, and smaller for debt-to-EBITDA. The coefficients are highly statistically significant. The coefficients imply that high executory contract industries have leverage that is higher by 3 percent of assets after the reform of insolvency law to permit executory contract rejection, in line with the cross-country results reported above.

These difference-in-difference estimates compare the period 2000-2018 to the period 2019-2021. One potential identification challenge is that they require parallel trends – otherwise the estimates may reflect long-term, slow-moving trends, rather than a change around the time of the new law. We estimate year-by-year coefficients

Table 4: **Leverage of Israeli firms around the 2019 Company Law Reform**

	(1)	(2)
	Leverage	Debt/EBITDA
Executory contracts / Assets	**0.573*****	**2.288*****
	(0.122)	(0.488)
Observations	606,173	542,197

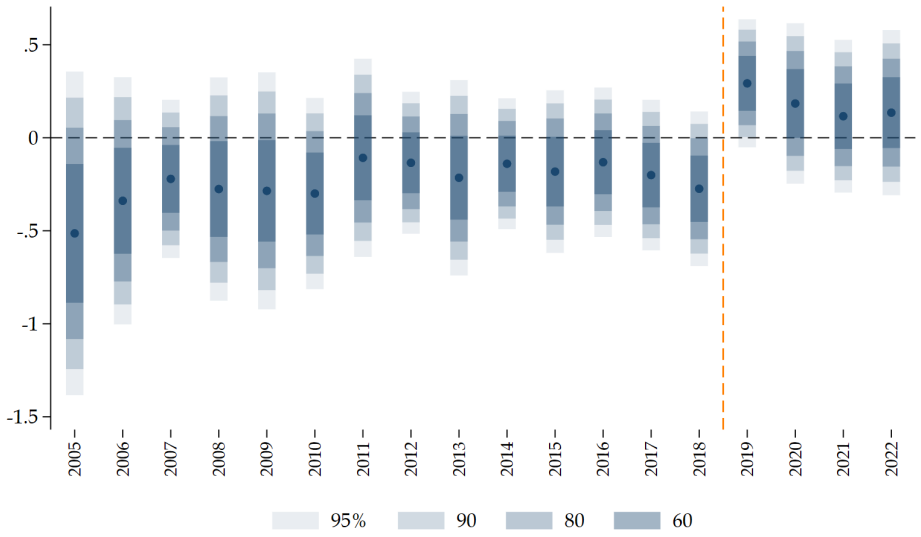
Regressions of book leverage or debt on control variables (dependent variable indicated at the top of each column). Each coefficient refers to one regression. Observations are firm-years. Executory Contracts refers to the interaction of an indicator for Israeli firms after 2019 and the industry measure of executory contracts. All regressions include controls and fixed effects. Standard errors clustered by firm and by industry-year are reported in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

to assess this concern. Figure 4 plots year-by-year coefficients on the executory contract variables from 2005 onwards. The average for the 2000-2018 corresponds to the pre-period in Table 4, and 2019-2021 to the post-period (the reported coefficient corresponds approximately to the difference between these two averages). Starting from a negative point estimate (Israeli firms in industries with lots of executory contracts have lower leverage), there is a jump in 2019, which continues in 2020-2021. The post-reform period is characterized by a reverse or at least disappearing difference in leverage between high and low executory contract industries in Israel.

The Israeli figure shows two things. First, there is no trend before 2019 and an increase in leverage manifests rapidly following the reform. Second, 2020 and 2021 (perhaps affected by Covid) are not driving the difference between before and after (using only 2019 and 2022 gives similar results). Taken together, the regressions and the diagram suggest that the Israeli Company Law reform allows the same interpretation as the U.S. tests: an option to reject executory contracts, by making operational restructuring more effective, allows higher leverage. Presumably it also allows more successful restructurings and better access to credit for a few industries.

Figure 4: **Leverage effect of executory contract claims for Israeli firms**



This figure plots year-by-year coefficients of leverage on executory contracts by industry, normalized by assets, with controls as in Table 2 and errors clustered by firm and by industry-year. Confidence intervals are indicated. The key reform was implemented in 2019.

4.4 Empirical Tests - Cross-country variation in lending volumes

Our final tests consider the flow of loans reported in the Dealscan data base. Although Dealscan contains a large number of loans, there is not enough data to use Dealscan flow data for the Israeli 2019 reform – for example, there are only thirteen term loans in 2018 and eighteen in 2019, and most industry-years have no loans. Therefore, we focus on the difference-in-difference comparison of high and low executory contract industries and the U.S. vs. everywhere else.

We aggregate lending by year and industry and country, and test whether the U.S. sees larger flows in the industries that have high use of executory contracts. Loan value (dollars) and number are summed by country-industry-year. The regression equations for aggregate data by industry-country-year are:

$$d_{jct} = \theta X_{jct} + \gamma E_j I_c^{treated} + \lambda G_{j\times t} + \eta H_{c\times t} + \epsilon_{ict} \tag{23}$$

Table 5: **Lending volume by country and industry**

	(1)	(2)
	Loan value	Loan number
Dependent variable mean	7.845	2.858
Executory contracts / Assets	**4.155*****	**1.398***
	(0.387)	(0.743)
Observations	8,308	8,318

Regressions of total term loan origination, measured by total value and number of loans (both in logs). The sample covers 2010-2023H2. Observations are industry-year-country. Each column refers to one regression. Executory Contracts refers to the interaction of an indicator for U.S. firms and the industry measure of executory contracts. All regressions include controls as well as fixed effects. Standard errors clustered by country and industry are reported in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

where d is the value or number of loans, j is industry, t year, and c country. X is a vector of control variables (the share of loans with sponsor, share used for working capital purposes, and share for transactions purposes), E executory contract intensity of industry j, j industry, $I_c^{treated}$ indicates observations for U.S. firms, and where G and H are industry-year, and country-year dummies (i.e., we saturate for the dimensions $j \times t$ and $c \times t$, and identify off the $j \times c$ dimension). Each observation represents between one and 2,966 loans (49 on average). We cluster standard errors by country and industry.[21]

Results are reported in Table 5, where each coefficient represents one regression. The coefficients are positive and highly statistically significantly different from zero. The magnitudes implied are large. For example, the first coefficient implies a 20% higher lending volume in a U.S. industry as we go from the industry with the 25$^{\text{th}}$ to the industry with the 75$^{\text{th}}$ percentile of executory contract use, compared to the same

[21] In our data, there are over 100 countries but many have very few observations and there may be heteroskedasticity across clusters. There are 30 industries. To address potential econometric issues with clustering, we implemented wild bootstrap (of)Cameron et al. (2008)) for either clustering dimension; the statistical significance remains high.

industry outside the U.S. We conclude that evidence from the flow of leveraged loans agrees with capital structure evidence on the U.S. credit markets being relatively more generous with credit to industries with high use of executory contracts. We interpret this as meaning that executory contracts reduce debt capacity *less* in the U.S. than elsewhere (possibly not at all). The treatment of executory contracts in insolvency is not the only possible explanation for this pattern, but it is perhaps the only one that fits both the cross-country and time-series capital structure evidence and flow evidence from Dealscan. [22]

5. Conclusions

The system for managing insolvent firms is important to economic performance (Gilson 2012), even beyond affected firms themselves (Bernstein et al. 2019). A particular challenge is posed by the restructuring of insolvent but viable firms (Gertner and Scharfstein 1991), and many countries struggle to approach the successful U.S. system (Djankov et al. 2008, Vig 2013, and Becker and Josephson 2016). We propose that the handling of non-financial obligations – in particular those created by executory contracts such as leases and long-term supply contracts – is a key design variable in insolvency law.

We develop a model where we can allow or disallow operational restructuring through the rejection of executory contracts. The ability to restructure non-financial obligation – what is achieved through rejection of contracts in Chapter 11 – allows more firms to restructure (instead of liquidate) and increases ex-ante financial debt capacity. Since executory contracts are large (we estimate that their value often exceeds 30 percent of assets) and important in many U.S. Chapter 11 cases (Ayotte 2015), we expect this to matter practically to corporate restructuring and credit markets.

We test the model's predictions in international data of leverage and lending. We employ two separate difference-in-difference approaches, relying on the difference of U.S. with the rest of the world, and on the changes to rejection rights embedded in the 2019 reform to Israel's Company Law. We find consistent evidence suggesting that

[22] In an earlier version of this paper, we included tests of loan pricing, but given that these are theoretically ambiguous, we decided to not report such tests.

restructuring non-financial obligations increases debt capacity of firms. We would expect liquidation to be rarer (difficult to test holding everything else equal), increased investment in affected firms and industries (not tested here, but likely testable), and development of debt markets (suggested by our findings). We believe that non-financial restructuring could be a suitable target for policy efforts in jurisdictions that wish to avoid the liquidation of viable firms. Recent reforms in Europe have been uneven in this regard - for example, the Italian reform from 2012 allows rejection but not assignment; the French Sauvegarde law from 2021 requires that rejection not be ”excessively detrimental” to the counterparty; whereas recent Dutch and Swedish rules appear more flexible.

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Appendix

A. List of variables in the theoretical model

d	net debt
e	expected value of equity in period 2
D	gross debt
C	cost of bankruptcy/restructuring
α	quantity of the stand-alone technology
β	quantity of the input
k	the supplier's opportunity cost of the input
q	productivity of the input
p	unit price of the input
s	signal realization
s_L	liquidation threshold
s_I	insolvency threshold
t	tax rate
F	financial restructuring possible
O	operational and financial restructuring possible
W	total surplus
Z	negative externality from liquidation

B. Equilibrium outcomes

Prices:

$$\begin{aligned} p^F &= k + \frac{1}{2\beta}\left(\alpha + \beta\left(q-k\right) - L - \sqrt{\left(\alpha+\beta\left(q-k\right)-L\right)^2 - 4\alpha\beta\left(c-k\right)}\right), \\ p^O &= k + \frac{1}{2\beta}\left(C - \sqrt{C^2 - 4t\alpha\beta\left(c-k\right)}\right). \end{aligned}$$

Liquidation thresholds:

$$\begin{aligned} s_L^F &= \left(L + \beta\left(p^F - q\right)\right)/\alpha, \\ s_L^O &= \left(L + \beta\left(k - q\right)\right)/\alpha. \end{aligned}$$

Insolvency thresholds:

$$\begin{aligned} s_I^F &= 1 - \frac{C}{t\alpha}, \\ s_I^O &= 1 - \frac{C}{\alpha t} + \frac{\beta\left(p^O - k\right)}{\alpha t}. \end{aligned}$$

Equity:

$$\begin{aligned} e^F &= \left(1-t\right)\int_{s_I^F}^1 \left(\alpha s + \beta\left(q - p^F\right) - D^F\right) ds \\ &= \frac{1-t}{2\alpha}\left[\left(\alpha s + \beta\left(q-p^F\right) - D^F\right)^2\right]_{s_I^F}^1 \\ &= \frac{1-t}{2\alpha t^2}C^2, \end{aligned}$$

$$\begin{aligned} e^O &= \left(1-t\right)\int_{s_I^O}^1 \left(\alpha s + \beta\left(q - p^O\right) - D^O\right) ds \\ &= \frac{1-t}{2\alpha}\left[\left(\alpha s + \beta\left(q-p^O\right) - D^O\right)^2\right]_{s_I^O}^1 \\ &= \frac{1-t}{2\alpha t^2}\left(C - \beta\left(p^O - k\right)\right)^2. \end{aligned}$$

Net debt:

$$\begin{aligned}
d^F &= (L-C)\int_0^{s_L^F} ds + \int_{s_L^F}^{s_I^F} \left(\alpha s + \beta\left(q-p^F\right) - C\right) ds + D^F \int_{s_I^F}^1 ds \\
&= (L-C)\, s_L^F + \frac{1}{2\alpha}\left[\left(\alpha s + \beta\left(q-p^F\right) - C\right)^2\right]_{s_L^F}^{s_I^F} + D^F\left(1-s_I^F\right) \\
&= (L-C)\,\frac{L+C-2\beta\left(q-p^F\right)}{2\alpha} + \frac{\left(D^F-C\right)^2}{2\alpha} + D^F\frac{C}{t\alpha} \\
&= \frac{1}{2\alpha}\left(L^2 - C^2 - 2\left(L-C\right)\beta\left(q-p^F\right) + \left(D^F\right)^2 - 2D^F C + C^2 + 2D^F\frac{C}{t}\right) \\
&= \frac{1}{2\alpha}\left(L^2 - 2\left(L-C\right)\beta\left(q-p^F\right) + \left(\alpha+\beta\left(q-p^F\right) - C/t\right)\left(\alpha+\beta\left(q-p^F\right) + C/t - 2C\right)\right) \\
&= \frac{1}{2\alpha}\left(\left(L-\beta\left(q-p^F\right)\right)^2 - C^2/t^2 + 2tC^2/t^2\right) - C + \frac{\alpha+2\beta\left(q-p^F\right)}{2} \\
&= \frac{\left(L+\beta\left(p^F-q\right)\right)^2}{2\alpha} - C - \frac{C^2\left(1-2t\right)}{2\alpha t^2} + \frac{\alpha+2\beta\left(q-p^F\right)}{2},
\end{aligned}$$

$$\begin{aligned}
d^O &= (L-C)\int_0^{s_L^O} ds + \int_{s_L^O}^{s_I^O} \left(\alpha s + \beta\left(q-k\right) - C\right) ds + D^O \int_{s_I^O}^1 ds \\
&= L\frac{L-2\beta\left(q-k\right)}{2\alpha} + \frac{1}{2\alpha}\left(\left(\alpha s_I^O\right)^2 + 2\alpha s_I^O\beta\left(q-k\right) + \beta^2\left(q-k\right)^2\right) + D^O\left(1-s_I^O\right) - Cs_I^O \\
&= \frac{L^2 - 2L\beta\left(q-k\right) + \beta^2\left(q-k\right)^2}{2\alpha} + s_I^O\frac{\alpha^2 s_I^O + 2\alpha\beta\left(q-k\right) - 2\alpha D - 2\alpha C}{2\alpha} + D^O \\
&= \frac{\left(L-\beta\left(q-k\right)\right)^2}{2\alpha} + D^O \\
&\quad + s_I^O\frac{\alpha t + \beta\left(p^O-k\right) - C + 2\beta t\left(q-k\right) - 2\alpha t - 2\beta t\left(q-p^O\right) + 2C - 2\beta\left(p^O-k\right) - 2Ct}{2t} \\
&= \frac{\left(L-\beta\left(q-k\right)\right)^2}{2\alpha} + \left(1-2t\right)s_I^O\frac{-\alpha t - \beta\left(p^O-k\right) + C}{2t} - t\alpha s_I^O + D^O \\
&= \frac{\left(L-\beta\left(q-k\right)\right)^2}{2\alpha} + \left(1-2t\right)\frac{\left(\alpha t + \beta\left(p^O-k\right) - C\right)\left(-\alpha t - \beta\left(p^O-k\right) + C\right)}{2\alpha t^2} - t\alpha s_I^O + D^O \\
&= \frac{\left(L-\beta\left(q-k\right)\right)^2}{2\alpha} - \left(1-2t\right)\frac{\left(\alpha t + \beta\left(p^O-k\right) - C\right)^2}{2\alpha t^2} \\
&\quad + \frac{\alpha t - \alpha t^2 + \beta\left(q-k\right) - t\beta\left(q-k\right) - C + tC + \beta\left(p^O-q\right) - t\beta\left(p^O-q\right) - t\beta\left(p^O-q\right)}{t} \\
&= \frac{\left(L-\beta\left(q-k\right)\right)^2}{2\alpha} - \left(1-2t\right)\frac{\left(\alpha t + \beta\left(p^O-k\right) - C\right)^2}{2\alpha t^2} + \frac{\left(1-t\right)\left(\alpha t + \beta\left(p^O-k\right) - C\right)}{t} \\
&\quad + \beta\left(q-p^O\right).
\end{aligned}$$

C. Proofs

Lemma 1 *Under the assumptions of the model, p^F and p^O are both real valued and greater than k.*

Proof. The statements for p^O follow trivially from Equation (20) and Assumption A3. We will show that the same statements also hold for p^F. First, consider the expression under the square root in (11) and note that Assumption A3 implies that:

$$(\alpha+\beta(q-k)-L)^2-4\alpha\beta(c-k)\geq(\alpha+\beta(q-k)-L)^2-C^2/t.$$

Second, since the tax rate is smaller than one, it follows that:

$$(\alpha+\beta(q-k)-L)^2-C^2/t>(\alpha+\beta(q-k)-L)^2-C^2/t^2.$$

Rewriting the rightmost expression gives:

$$(\alpha+\beta(q-k)-L-C/t)(\alpha+\beta(q-k)-L+C/t).$$

Since p^F must be greater than k (in fact it must be greater than c) or else the supplier would make negative profits, the final expression is greater than:

$$\left(\alpha+\beta\left(q-p^F\right)-L-C/t\right)\left(\alpha+\beta\left(q-p^F\right)-L+C/t\right),$$

which is positive by Assumption A1. ■

Proof of Proposition 1. We will demonstrate that the following is a subgame-perfect equilibrium strategy profile in setting F: $\left(p^F, D^F(p), s_L^F(p,D)\right)$, where p^F is defined above in (11) and real by Lemma 1,

$$D^F(p)=\alpha+\beta(q-p)-C/t$$

and

$$s_L^F(p,D)=\max\left\{\min\left\{\frac{L+\beta(p-q)}{\alpha},\frac{D+\beta(p-q)}{\alpha}\right\},0\right\}.$$

We solve the game using backward induction. In period 3, the bankruptcy court decides for what values of s to liquidate and restructure debt. From Section 3.2 follows that it prefers a liquidation for signals below $\frac{L+\beta(p-q)}{\alpha}$ (below one by Assumption A1) and a restructuring for signals above this threshold but below the insolvency threshold, which equals $\frac{D+\beta(p-q)}{\alpha}$ if this is smaller than one and one otherwise. This holds as long as the second threshold is

strictly above the first, which is equivalent to $D > L$. However, the firm can only be liquidated if it is insolvent. Hence, if instead $0 \leq D \leq L$, the liquidation threshold coincides with the insolvency threshold, which equals the maximum of $\frac{D+\beta(p-q)}{\alpha}$ and zero. This is captured by the function $s_L^F(p, D)$.

We continue with the firm's strategy in period 2. It follows from the first-order condition (7) in the text that $D^F(p)$ maximizes firm value in period 2 if $s_L^F\left(p, D^F(p)\right) < s_I^F\left(p, D^F(p)\right)$. Suppose there is a different optimal debt function $D^*(p)$ and a price p such that $s_L^F(p, D^*(p)) = s_I^F(p, D^*(p))$, which occurs if and only if $D^*(p) \leq L$. Differentiating the firm value with respect to D under the assumption that the last inequality is strict gives:

$$t(\alpha - D + \beta(q-p))/\alpha + (L - C - D)/\alpha.$$

Substituting $D < L$ results in an expression greater than:

$$t(\alpha - L + \beta(q-k) - C/t)/\alpha,$$

which is positive by Assumption A1 and Lemma 1. This rules out the existence of $D^*(p) < L$. An optimal gross debt $D^*(p) = L$ can similarly be ruled out by continuity of the firm value in D at this point.

Finally, we show that there is no profitable deviation for any of the suppliers from p^F in period 1. Note that $p^F < \hat{p}$ since $D^F\left(p^F\right) > L$ by Assumption A1. By offering a higher input price, the supplier would loose the contract with certainty. Hence, this would not be profitable deviation. By offering a lower price (which must be greater than c to avoid a loss), the firm would win the contract with certainty. That would increase gross debt in period 2 and result in a weakly lower liquidation threshold in period 3, but the insolvency threshold would be unaffected. Hence, the liquidation threshold would still be lower than the insolvency threshold. The supplier's expected profits would therefore be given by:

$$p - (p-k)\frac{L + \beta(p-q)}{\alpha} - c.$$

Differentiating this expression with respect to p gives:

$$1 - \frac{L + \beta(2p - q - k)}{\alpha},$$

which, by Lemma 1, is positive for p^F and lower prices since:

$$1-\frac{L+\beta\left(2p^F-q-k\right)}{\alpha}=\frac{\sqrt{\left(\alpha+\beta\left(q-k\right)-L\right)^2-4\alpha\beta\left(c-k\right)}}{\alpha}.$$

Hence, this is not a profitable deviation.

Figure 2 illustrates a set of parameters such that all the assumptions of the proposition are satisfied. ■

Proof of Proposition 2. We proceed in a similar fashion to the proof of Proposition 1 to show that the following is a subgame-perfect equilibrium in setting O: $\left(p^O, D^O\left(p\right), s_L^O\left(p,D\right)\right)$, where p^O is defined in (20) (and real by Lemma 1),

$$D^O\left(p\right)=\alpha+\beta\left(q-p\right)+min\{\beta\left(p-k\right)/t-C/t,0\},$$

and

$$s_L^O\left(p,D\right)=\max\left\{\min\left\{\frac{L+\beta\left(k-q\right)}{\alpha},\frac{D+\beta\left(p-q\right)}{\alpha}\right\},0\right\}.$$

In period 3, the threshold that maximizes firm value is $\frac{L+\beta(k-q)}{\alpha}$ (positive by Assumption A2 and smaller than one by Assumption A1) if this is smaller than $\frac{D+\beta(p-q)}{\alpha}$. Since the firm can only be be liquidated if it is insolvent, it follows that if instead the first threshold is greater, then the optimal threshold is the maximum of $\frac{D+\beta(p-q)}{\alpha}$ and zero. This is captured by the function $s_L^O\left(p,D\right)$.

We continue with the firm's strategy in period 2. It follows from the first-order condition (16) in the text that $D^O\left(p\right)$ maximizes firm value in period 2 if $s_L^O\left(p,D^O\left(p\right)\right)<s_I^O\left(p,D^O\left(p\right)\right)$ and $s_I^O\left(p,D^O\left(p\right)\right)<0$. The term $min\{\beta\left(p-k\right)/t-C/t,0\}$ deals with the corner solution and makes sure the insolvency treshold is not above one. Suppose there is a different optimal debt function $D^*\left(p\right)$ and a price p such that $s_L^O\left(p,D^*\left(p\right)\right)=s_I^O\left(p,D^*\left(p\right)\right)$, which occurs if and only if $D^*\left(p\right)\leq L+\beta\left(k-p\right)$. Differentiating the firm value with respect to D under the assumption that the last inequality is strict gives:

$$t\left(\alpha-D+\beta\left(q-p\right)\right)/\alpha+\left(L-C-D\right)/\alpha.$$

Substituting $D<L+\beta\left(k-p\right)$ results in an expression greater than:

$$t\left(\alpha-L+\beta\left(q-k\right)+\beta\left(p-k\right)/t-C/t\right)/\alpha,$$

which is positive by Assumption A1 and Lemma 1. This rules out the existence of $D^*(p) < L + \beta(k-p)$. An optimal gross debt $D^*(p) = L + \beta(k-p)$ can similarly be ruled out by continuity of the firm value in D at this point.

Finally, we demonstrate that there is no profitable deviation from p^O for any of the suppliers in period 1. By offering a higher input price, the firm would lose the contract with certainty. By offering a lower price (greater than k), the firm would win the contract with certainty. That would decrease gross debt and the insolvency threshold in period 2. However, the supplier's expected profits are given by:

$$p - (p-k)\frac{\alpha + \beta(p-k)/t - C/t}{\alpha} - c.$$

Differentiating this expression with respect to p gives:

$$1 - \frac{\alpha + 2\beta(p-k)/t - C/t}{\alpha},$$

which, by Lemma 1, is nonnegative for p^O and lower prices:

$$1 - \frac{\alpha + 2\beta\left(p^O - k\right)/t - C/t}{\alpha} = \frac{\sqrt{C^2 - 4\alpha\beta t(c-k)}}{\alpha t}.$$

Hence, this is not a profitable deviation.

Figure 2 illustrates a set of parameters such that all the assumptions of the proposition are satisfied. ■

Proof of Proposition 3. The equilibrium values of the thresholds are listed in Appendix B. We start by demonstrating that $s_L^O > 0$ and $s_I^O < 1$. The first of these two inequalities follows by Assumption A2, which implies: $(L + \beta(k-q))/\alpha > (L-C)/\alpha$. The second follows since:

$$1 - (C - \beta(p^O - k))/\alpha t = 1 - \left(C + \sqrt{C^2 - 4t\alpha\beta(c-k)}\right)/2\alpha t < 1.$$

We proceed with the inequalities of the proposition. $s_L^O < s_L^F$ follows since $p^F > k$ by Lemma 1. $s_L^F < s_I^F$ follows by Assumption A1 since:

$$s_I^F - s_L^F = (\alpha + \beta(q - p^F) - C/t - L)/\alpha.$$

Finally, $s_I^F < s_I^O$ follows since $p^O > k$ by Lemma 1. ■

Lemma 2 *The input price is higher with operational than financial restructuring:*

$$p^O > p^F.$$

Proof. To demonstrate the statement, define the generic threshold $\bar{s} \in (0,1)$. Note that the two thresholds, s_I^O and s_L^F, used in the break-even conditions (10) and (19) above, both belong to the open unit interval and $s_I^O > s_L^F$ by Proposition 3.

Solving the break-even equality with generic threshold for p:

$$p - (p-k)\,\bar{s} - c = 0,$$

gives the solution:

$$p^* = \frac{c - k\bar{s}}{1-\bar{s}}.$$

The partial of the latter with respect to $\bar{s}$ equals:

$$\frac{\partial p^*}{\partial \bar{s}} = \frac{-k\,(1-\bar{s}) + (c - k\bar{s})}{(1-\bar{s})^2} = \frac{c-k}{(1-\bar{s})^2} > 0.$$

Hence, a higher threshold implies a higher price. ■

Lemma 3 *The following holds for gross debt in the two settings:*

i. $D^F < D^O$,

ii. $\frac{\partial D^F}{\partial \beta} < \frac{\partial D^O}{\partial \beta}$.

Proof.

Part i): Comparing the equilibrium values of gross debt gives:

$$\begin{aligned} D^O &= \alpha + \beta\left(q - p^O\right) - C/t + \beta\left(p^O - k\right)/t \\ &> \alpha + \beta\left(q - p^O\right) - C/t + \beta\left(p^O - k\right) \\ &> \alpha + \beta\left(q - p^F\right) - C/t = D^F \end{aligned}$$

Both inequalities rely on $p^O > k$, which follows by Lemma 1, and the first one also that the tax rate is below 1.

Part ii): We simplify by defining $Q := (\alpha + \beta(q-k) - L)$.

$$\begin{aligned}
\partial \frac{D^O - D^F}{\partial \beta} &= \frac{\partial \beta\left(p^F - k\right)}{\partial \beta} + \frac{\partial \beta\left(p^O - k\right)}{\partial \beta}(1-t)/t \\
&= (q-k)\frac{\sqrt{Q^2 - 4\alpha\beta(c-k)} - Q}{2\sqrt{Q^2 - 4\alpha\beta(c-k)}} + \frac{2\alpha(c-k)}{2\sqrt{Q^2 - 4\alpha\beta(c-k)}} + \frac{(1-t)\alpha(c-k)}{\sqrt{C^2 - 4t\alpha\beta(c-k)}} \\
&= \frac{\left(p^F - k\right)\left(\alpha - L + \beta\left(q - p^F\right) - \beta(q-k)\right)}{\sqrt{Q^2 - 4\alpha\beta(c-k)}} + \frac{\left(p^F - k\right)(1-t)\left(\alpha - L + \beta\left(q - p^F\right)\right)}{\sqrt{C^2 - 4t\alpha\beta(c-k)}}
\end{aligned}$$

In the third row, we use a reshuffling of the break-even condition for setting F (10):

$$\alpha(c-k) = \left(\alpha - L + \beta\left(q - p^F\right)\right)\left(p^F - k\right).$$

The two terms of the last expression are positive by Lemma 1 and Assumptions A1 and A2. ■

Proof of Proposition 4. The statements immediately follow from Lemmas 4 and 5. ■

Lemma 4 *The following holds for equity in the two settings:*

i. $e^O < e^F$,

ii. $\frac{\partial e^O}{\partial \beta} < \frac{\partial e^F}{\partial \beta} = 0$.

Proof.

Part i): Substituting for the equilibrium price p^O in e^O and thereafter computing the ratio of e^O to e^F gives:

$$\begin{aligned}
e^O/e^F &= \frac{\left(C + \sqrt{C^2 - 4\alpha\beta t(c-k)}\right)^2/4}{C^2} \\
&= \left(1 + \sqrt{1 - 4\alpha\beta t(c-k)/C^2}\right)^2/4 < 1,
\end{aligned}$$

where the inequality on the final row follows by Assumption A3.

Part ii): Substituting for the equilibrium price p^O in e^O and differentiating gives:

$$\frac{\partial e^O}{\partial \beta} = -\frac{1-t}{2t}\frac{(c-k)\left(C + \sqrt{C^2 - 4\alpha\beta t(c-k)}\right)}{\sqrt{C^2 - 4\alpha\beta t(c-k)}} < 0.$$

From the expression for e^F immediately follows that it is independent of β. ■

Lemma 5 *If $t \leq 1/2$, the following holds for net debt in the two settings:*

i. $d^F < d^O$,

ii. $\frac{\partial d^F}{\partial \beta} < \frac{\partial d^O}{\partial \beta}$.

Proof.

Part i): The difference in net debt, $d^O - d^F$, equals:

$$
\begin{aligned}
&\int_{s_L^O}^{s_L^F} (\alpha s + \beta (q-k) - L)\, ds + \beta \left(p^F - k\right) \int_{s_L^F}^{s_I^F} ds \\
&+ \int_{s_I^F}^{s_I^O} \left(\alpha s + \beta (q-k) - C - D^F\right) ds + \left(D^O - D^F\right) \int_{s_I^O}^{1} ds \\
&= \left(\alpha s_L^F + \beta (q-k) - L\right)^2 / 2\alpha + \beta \left(p^F - k\right) \left(s_I^F - s_L^F\right) + \left(\alpha s_I^O + \beta (q-k) - C - D^F\right)^2 / 2\alpha \\
&- \left(\alpha s_I^F + \beta (q-k) - C - D^F\right)^2 / 2\alpha + \left(\beta \left(p^F - p^O\right) + \beta \left(p^O - k\right)/t\right) \left(1 - s_I^O\right) \\
&= \left(D^F + \beta \left(p^F - k\right) - L\right)^2 / 2\alpha + \beta \left(p^F - k\right) \left(\alpha - C/t - L - \beta \left(p^F - q\right)\right) / \alpha \\
&+ \left(\beta \left(p^F - k\right) - C + \beta \left(p^O - k\right)/t\right)^2 / 2\alpha - \left(\beta \left(p^F - k\right) - C\right)^2 / 2\alpha \\
&+ \left(\beta \left(p^F - p^O\right) + \beta \left(p^O - k\right)/t\right) \left(C - \beta \left(p^O - k\right)\right) / \alpha t \\
&= (\alpha + \beta (q-k) - C/t - L)^2 / 2\alpha + \beta \left(p^F - k\right) \left(\alpha - C/t - L - \beta \left(p^F - q\right)\right) / \alpha \\
&+ \left(\beta \left(p^O - k\right)\right)^2 / 2\alpha t^2 + 2t \left(\beta \left(p^F - k\right) - C\right) \beta \left(p^O - k\right) / 2\alpha t^2 \\
&+ \left(2t\beta \left(p^F - k + k - p^O\right) + 2\beta \left(p^O - k\right)\right) \left(C - \beta \left(p^O - k\right)\right) / 2\alpha t^2 \\
&= (\alpha + \beta (q-k) - C/t - L)^2 / 2\alpha + \beta \left(p^F - k\right) \left(\alpha - C/t - L - \beta \left(p^F - q\right)\right) / \alpha \\
&+ \beta \left(p^O - k\right) (1 - 2t) \left(2C - \beta \left(p^O - k\right)\right) / 2\alpha t^2 + \beta \left(p^F - k\right) C / \alpha t
\end{aligned}
$$

It follows from Lemma 1 and Assumption A1 that the first two and the last term of the last expression are positive. The third term is nonnegative for $t \leq 1/2$ by Lemma 1 and the following equality:

$$2C - \beta \left(p^O - k\right) = \left(3C + \sqrt{C^2 - 4t\alpha\beta (c-k)}\right) / 2.$$

Part ii): We start by deriving the partials of the contracted obligations and once again simplify using $Q = (\alpha + \beta (q-k) - L)$:

$$\begin{aligned}
\frac{\partial \beta p^O}{\partial \beta} &= k + \frac{t\alpha\left(c-k\right)}{\sqrt{C^2 - 4t\alpha\beta\left(c-k\right)}}, \\
\frac{\partial \beta p^F}{\partial \beta} &= k + \frac{q-k}{2}\left(1 - \frac{Q}{\sqrt{Q^2 - 4\alpha\beta\left(c-k\right)}}\right) + \frac{\alpha\left(c-k\right)}{\sqrt{Q^2 - 4\alpha\beta\left(c-k\right)}}.
\end{aligned}$$

Second, we compute the differential of d^O with respect to β:

$$\begin{aligned}
\frac{\partial d^O}{\partial \beta} &= \left(q-k\right)\frac{Q}{\alpha} + \frac{\alpha t\left(c-k\right)}{\sqrt{C^2 - 4t\alpha\beta\left(c-k\right)}}\frac{\left(1-2t\right)\left(C - \beta\left(p^O - k\right)\right)}{\alpha t^2} \\
&= \left(q-k\right)\frac{Q}{\alpha} + \frac{1-2t}{2t}\left(c-k\right)\left(1 + \frac{C}{\sqrt{C^2 - 4t\alpha\beta\left(c-k\right)}}\right).
\end{aligned}$$

It follows that the derivative is positive for $t \leq 1/2$.

Third, we compute the differential of d^F with respect to β:

$$\begin{aligned}
\frac{\partial d^F}{\partial \beta} &= \left(q - \frac{\partial \beta p^F}{\partial \beta}\right)\left(1 - s_L^F\right) \\
&= \left(\frac{q-k}{2}\left(1 + \frac{Q}{\sqrt{Q^2 - 4\alpha\beta\left(c-k\right)}}\right) - \frac{\alpha\left(c-k\right)}{\sqrt{Q^2 - 4\alpha\beta\left(c-k\right)}}\right)\left(1 - s_L^F\right) \\
&= \left(\frac{q-k}{2}\left(1 + \frac{Q}{\sqrt{Q^2 - 4\alpha\beta\left(c-k\right)}}\right) - \frac{\alpha\left(c-k\right)}{\sqrt{Q^2 - 4\alpha\beta\left(c-k\right)}}\right)\frac{Q - \beta\left(p^F - k\right)}{\alpha}.
\end{aligned}$$

Finally, straightforward calculations reveal that $\frac{\partial d^O}{\partial \beta} - \frac{\partial d^F}{\partial \beta}$ equals:

$$
\begin{aligned}
& (q-k)\frac{Q}{\alpha} + \frac{1-2t}{2t}(c-k)\left(1+\frac{C}{\sqrt{C^2-4t\alpha\beta(c-k)}}\right) \\
& -\left(\frac{q-k}{2}\left(\frac{Q+\sqrt{Q^2-4\alpha\beta(c-k)}}{\sqrt{Q^2-4\alpha\beta(c-k)}}\right) - \frac{\alpha(c-k)}{\sqrt{Q^2-4\alpha\beta(c-k)}}\right)\frac{Q-\beta\left(p^F-k\right)}{\alpha} \\
= \; & \frac{1-2t}{2t}(c-k)\left(1+\frac{C}{\sqrt{C^2-4t\alpha\beta(c-k)}}\right) + \frac{(c-k)\left(Q-\beta\left(p^F-k\right)\right)}{\sqrt{Q^2-4\alpha\beta(c-k)}} \\
& +\frac{q-k}{2}\left(\frac{2Q}{\alpha} - \frac{Q-\beta\left(p^F-k\right)}{\alpha}\left(\frac{Q+\sqrt{Q^2-4\alpha\beta(c-k)}}{\sqrt{Q^2-4\alpha\beta(c-k)}}\right)\right) \\
= \; & \frac{1-2t}{2t}(c-k)\left(1+\frac{C}{\sqrt{C^2-4t\alpha\beta(c-k)}}\right) + \frac{(c-k)\left(Q-\beta\left(p^F-k\right)\right)}{\sqrt{Q^2-4\alpha\beta(c-k)}} \\
& +\frac{q-k}{2}\frac{4Q\sqrt{Q^2-4\alpha\beta(c-k)} - \left(Q+\sqrt{Q^2-4\alpha\beta(c-k)}\right)^2}{2\alpha\sqrt{Q^2-4\alpha\beta(c-k)}} \\
= \; & (c-k)\left(\frac{1-2t}{2t}\frac{C+\sqrt{C^2-4t\alpha\beta(c-k)}}{\sqrt{C^2-4t\alpha\beta(c-k)}} + \frac{Q+\sqrt{Q^2-4\alpha\beta(c-k)}}{2\sqrt{Q^2-4\alpha\beta(c-k)}}\right) \\
& +(q-k)\frac{4Q\sqrt{Q^2-4\alpha\beta(c-k)} - \left(Q+\sqrt{Q^2-4\alpha\beta(c-k)}\right)^2}{4\alpha\sqrt{Q^2-4\alpha\beta(c-k)}} \\
= \; & (c-k)\left(\frac{1-2t}{2t}\frac{C+\sqrt{C^2-4t\alpha\beta(c-k)}}{\sqrt{C^2-4t\alpha\beta(c-k)}} + \frac{Q+\sqrt{Q^2-4\alpha\beta(c-k)}}{2\sqrt{Q^2-4\alpha\beta(c-k)}}\right) \\
& +(q-k)\frac{4Q\sqrt{Q^2-4\alpha\beta(c-k)} - 2Q^2 + 4\alpha\beta(c-k) - 2Q\sqrt{Q^2-4\alpha\beta(c-k)}}{4\alpha\sqrt{Q^2-4\alpha\beta(c-k)}} \\
= \; & (c-k)\left(\frac{1-2t}{2t}\frac{C+\sqrt{C^2-4t\alpha\beta(c-k)}}{\sqrt{C^2-4t\alpha\beta(c-k)}} + \frac{Q+\sqrt{Q^2-4\alpha\beta(c-k)}}{2\sqrt{Q^2-4\alpha\beta(c-k)}}\right) \\
& +(q-k)\frac{2Q\sqrt{Q^2-4\alpha\beta(c-k)} - 2\left(Q^2-4\alpha\beta(c-k)\right) - 4\alpha\beta(c-k)}{4\alpha\sqrt{Q^2-4\alpha\beta(c-k)}} \\
= \; & (c-k)\left(\frac{1-2t}{t}\frac{C+\sqrt{C^2-4t\alpha\beta(c-k)}}{2\sqrt{C^2-4t\alpha\beta(c-k)}} + \frac{\left(Q+\sqrt{Q^2-4\alpha\beta(c-k)}\right)/2 - \beta(q-k)}{\sqrt{Q^2-4\alpha\beta(c-k)}}\right) \\
& +(q-k)\frac{Q-\sqrt{Q^2-4\alpha\beta(c-k)}}{2\alpha}
\end{aligned}
$$

The first term inside the large parentheses of the last expression is trivially nonnegative

whenever $t \leq 1/2$. The second term is positive by Assumptions A1 and A2:

$$\begin{aligned} 0 < \alpha + \beta\left(q - p^F\right) - L - C/t &= \left(Q + \sqrt{Q^2 - 4\alpha\beta\left(c-k\right)}\right)/2 - C/t \\ &< \left(Q + \sqrt{Q^2 - 4\alpha\beta\left(c-k\right)}\right)/2 - \beta\left(q-k\right). \end{aligned}$$

The term on the last line equals $(q-k)\beta(p^O-k)/\alpha$, which is positive by Lemma 1. ■

E. Treatment of Executory Contracts in insolvency - overview

Table 6 summarizes the treatment of executory contracts in the law of several countries, based on Chuah and Vaccari, eds (2023). When laws differ across types of executory contracts, we have preferred the rules for property leases. **Restructuring** refers to whether there is an in-court legal procedure that does not automatically liquidate (e.g., Chapter 11 in the U.S., and Sauvegarde in France). **Unilateral rejection** refers to whether that procedure allows unilateral, unconstrained assumption and rejection decisions. We ignore whether assignment is possible (due to lack of detailed information about this). **Ipso Facto** refers to whether some contracts clauses which refer to insolvency are enforced (such contracts mean that executory contracts are not controlled by insolvent firms). **Withhold performance** refers to whether counterparties can withhold performance on executory contracts to restructuring firms. The **Executory Contracts** score is set to zero for countries if any of these variables take on the values No, No, Yes and Yes, respectively. Cells are left empty when information is missing.

Table 6: **Executory Contract Treatment (2022)**

Country	Restructuring	Unilateral rejection	Ipso Facto	Withhold performance	Executory Contracts
United States	Yes	Yes	No		1
Australia	Yes	Yes	No		1
Bangladesh	No	Yes			0
UK	Yes	No	Yes		0
India	Yes	No			0
New Zealand	Yes	No	No		0
Singapore	Yes	No		Yes	0
Denmark	Yes	No		Yes	0
Finland	Yes	No	No		0
Lithuania	Yes	Yes	Yes	Yes	0
Albania	Yes	Yes			0
Argentina	Yes	No			0
Austria	Yes	Yes	Yes		0
China	Yes	Yes		Yes	0
Croatia	Yes	Yes	Yes		0
France	Yes	No	No		0
Germany	Yes	No	No		0
Greece	Yes	Yes	No		1
Italy	Yes	Yes	No		1
Japan	Yes	Yes	No		0
Netherlands	Yes	Yes	Yes	Yes	0
Panama	Yes	No			0
Russia	Yes	No			0
Slovenia	Yes	No			0
South Korea	Yes	Yes	Yes		0
Spain	Yes	No	No		0
Turkey	Yes	Yes			0
Canada	Yes	Yes	Yes		0
South Africa	No				0
UAE	No		No		0

F. Data collection procedures for Purchase Obligations from 10-K filings

Following the instructions in Moon and Phillips (2020), we collect purchase obligations data for firms filing 10-Ks in 2018 and 2019. We download the 10-K filings, including 10-K, 10-K405, 10KSB and 10KSB40, from the Notre Dame Software Repository for Accounting and Finance (SRAF) (McDonald 2024). According to the Disclosure in Management's Discussion and Analysis About Off-Balance Sheet Arrangements and Aggregate Contractual Obligations issued in 2003, firms, excluding small businesses, are required to comprehensively explain their off-balance sheet arrangements in a distinct subsection of the "Management's Discussion and Analysis" ("MD&A") section in filings. The amendment also mandates these firms to summarize specific known contractual obligations in a table format. "Purchase obligations" is explicitly listed as one of the five categories of contractual obligations that must be included in the disclosure table.[23]

While most firms disclose their purchase obligations in the required tabular format in Item 7, "MD&A", as shown in Figure 5 and 6, some firms don't. A thorough review of the 10-K filings reveals that some firms disclose purchase obligations in text rather than the mandated table format, while others report this information in Item 8, "Financial Statements and Supplementary Data", instead of Item 7. For the first case, we manually extract the text containing the purchase obligations information and convert it into the table format. In the second scenario, we incorporate the purchase obligations data from Item 8 into the main dataset, ensuring it is added only if it does not replicate information already extracted from Item 7.

To extract all purchase obligations related information from firms' 10-Ks, we first parse the filing document and extract the Item 7 and 8 sections. Then we use the search keywords to identify the table(s) or paragraph(s) that contain the information of interest. The search keywords in Moon and Phillips (2020) are combinations of "purchase" and one of the following words: "obligation", "commitment", "agreement",

[23]According to Securities and Exchange Commission (2003), the disclosure table must include five mandatory categories of contractual obligations: long-term obligations, capital lease obligations, operating lease obligations, purchase obligations, and other long-term liabilities reported on the registrant's balance sheet in accordance with GAAP.

Figure 5: **Disclosure for Purchase Obligations by eBay Inc. FY-2018**

Commitments and Contingencies

We have certain fixed contractual obligations and commitments that include future estimated payments for general operating purposes. Changes in our business needs, contractual cancellation provisions, fluctuating interest rates, and other factors may result in actual payments differing from the estimates. We cannot provide certainty regarding the timing and amounts of these payments. The following table summarizes our fixed contractual obligations and commitments (in millions):

Payments Due During the Year Ending December 31,	Debt	Leases	Purchase Obligations	Total
2019	$ 1,841	$ 136	$ 209	$ 2,186
2020	1,259	104	147	1,510
2021	983	91	128	1,202
2022	1,935	76	116	2,127
2023	1,284	51	38	1,373
Thereafter	5,220	119	—	5,339
	$ 12,522	$ 577	$ 638	$ 13,737

The significant assumptions used in our determination of amounts presented in the above table are as follows:

- Debt amounts include the principal and interest amounts of the respective debt instruments. For additional details related to our debt, please see “Note 10 – Debt” to the consolidated financial statements included in this report. This table does not reflect any amounts payable under our $2 billion revolving credit facility or $1.5 billion commercial paper program, for which no borrowings were outstanding as of December 31, 2018.
- Lease amounts include minimum rental payments under our non-cancelable operating leases for office space, data centers, as well as fulfillment centers and other corporate assets that we utilize under lease arrangements. The amounts presented are consistent with contractual terms and are not expected to differ significantly from actual results under our existing leases, unless a substantial change in our headcount needs requires us to expand our occupied space or exit an office facility early.
- Purchase obligation amounts include minimum purchase commitments for advertising, capital expenditures (computer equipment, software applications, engineering development services, construction contracts) and other goods and services entered into in the ordinary course of business.

Figure 6: **Disclosure for Purchase Obligations by Apple Inc. FY-2018**

Contractual Obligations

The following table presents certain payments due by the Company as of September 29, 2018, and excludes amounts already recorded on the Consolidated Balance Sheet, except for term debt and the deemed repatriation tax payable (in millions):

	Payments Due in 2019	Payments Due in 2020–2021	Payments Due in 2022–2023	Payments Due After 2023	Total
Term debt	$ 8,797	$ 18,933	$ 17,978	$ 58,485	$ 104,193
Operating leases	1,298	2,507	1,838	3,984	9,627
Manufacturing purchase obligations (1)	41,548	2,469	1,183	–	45,200
Other purchase obligations	3,784	2,482	681	66	7,013
Deemed repatriation tax payable	–	5,366	5,942	22,281	33,589
Total	$ 55,427	$ 31,757	$ 27,622	$ 84,816	$ 199,622

“order” and “contract”. We combine these search keywords into a regular expression and use it to parse and extract the relevant row(s)/column(s) in the identified table(s) and/or the relevant sentences in the identified paragraph(s). For each filing, we clean and compile all extracted values into one dataset, recording (1) the specific name of each value in the “Purchase Obligation” category, (2) the corresponding period for the reported purchase obligation, and (3) the corresponding raw value extracted from the filing. Then, we determine the reporting unit for each extracted value from the subsection where the table or paragraph is located. The reporting unit is then

appended back to the main dataset and we use it to normalize all values to dollar amounts.

After gathering and cleaning all purchase obligations data, we apply two additional filters. First, we filter out identified purchase obligation items for financial instruments, assets or liabilities.[24] Second, we retain only the values for all future purchase obligations and those due within the next year or the next 12 months. While some firms specify their purchase obligations for each upcoming year (e.g., Figure 5), others aggregate their future obligations over multiple years (e.g., Figure 6). Finally, when multiple items extracted from the same table or paragraph of a filing are under the "Purchase Obligations" category, we aggregate these individual items to derive a comprehensive measure of the firm's total purchase obligations due within a specified time frame.

[24]We exclude the extracted items with "equity", "share", "stock", "loan", "bond", "capacity", "asset" or "liabilities" in their identified names.

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