The Economics of Legal Uncertainty*

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Abstract

In this paper, we study how legal uncertainty affects economic activity. We develop a parsimonious model with different types of legal uncertainty that reduce economic activity and that can be classified as idiosyncratic (i.e., diversifiable) or systematic (i.e., nondiversifiable). We test the model's predictions using micro-level data on bankruptcy judges and corporate loans from Korea. Exploiting differences in judges' debtor-friendliness combined with random judge assignment to restructuring cases and exogenous judge rotations in the judicial system, we compute time-varying court-level measures of debtor-friendliness and legal uncertainty. We first document that firms are more likely to file for restructuring in more debtor-friendly courts with lower legal uncertainty. We further show that legal uncertainty reduces the size of credit markets. The effects are driven by high-risk firms that are most sensitive to bankruptcy law. Examining interest rates, we find that credit supply is relatively more sensitive to systematic than to idiosyncratic sources of legal uncertainty relative to credit demand.

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1 Introduction

The fundamental link between the law and economic development has been recognized at least since the 19th century. Max Weber famously attributed the emergence of modern industrial capitalism to the rule of law and, in particular, to legal certainty (Trubek, 1972). Absent the rule of law, the rules governing civil and economic life are inherently unpredictable. For example, individuals face the risk of expropriation at the discretion of the ruling elites. While the rule of law significantly reduces legal uncertainty, legal uncertainty remains a feature of any legal system due to, for example, judicial discretion and changes in the law over time.[1] Despite the potentially important role of legal uncertainty in economic development, surprisingly few attempts have been made to characterize and quantify the link between legal uncertainty and economic activity. This paper takes a first step to address this gap in the literature.

We start our analysis by developing a theoretical framework to characterize the link between legal uncertainty and economic activity.[2] We study a supplier-producer relationship in which a legal dispute arises with some probability. The transfer between the two parties in the event of a legal dispute is uncertain due to legal uncertainty. We show that legal uncertainty reduces production in the economy and characterize three distinct sources of legal uncertainty. First, assignment uncertainty arises in the presence of random judge assignments to legal disputes. Second, decision uncertainty captures the fact that decisions of a given judge are not fully predictable. Third, parameter uncertainty captures uncertainty about legal parameters that systematically affect legal disputes in the economy such as uncertainty about future changes in the law. We show that assignment and decision uncertainty are idiosyncratic sources of legal uncertainty because they can be diversified by a supplier or producer with exposure to a large number of legal disputes. In contrast, parameter uncertainty cannot be diversified because it affects all legal disputes in a systematic manner. We further extend our model to show that learning about a legal regime reduces legal uncertainty. In this case, the possibility of a legal regime change introduces the risk of losing the information about the current legal regime, which in turn generates systematic legal uncertainty.

[1] The tension between legal certainty and judicial discretion is also at the core of modern legal philosophy (see, e.g., Dworkin, 1963; Hart, 2013).

[2] In line with the literature, and as discussed in further detail in Section 2, we refer to a single concept of uncertainty throughout the paper capturing aspects of both risk and uncertainty.

In the second part of our paper, we test the empirical predictions from our theoretical framework. We exploit a unique institutional setting in Korea and employ detailed micro-level data on the decisions of bankruptcy judges and corporate loans to overcome these empirical challenges. Specifically, we exploit variation in legal uncertainty generated by differences in bankruptcy judges' interpretation of the law, which we refer to as judge types. Intuitively, some judges are more debtor friendly than others. In the Korean court system, judges typically serve as a bankruptcy judge for a single term of two years, after which they are replaced by other judges. Thus, a judge's type is not known when the judge first joins a bankruptcy court. Motivated by a simple Bayesian learning model in which firms and banks learn about a judge's type from the judge's decisions in restructuring cases, we construct a time-varying measure of judges' types in terms of their debtor-friendliness. Because firms are strictly assigned to a specific bankruptcy court in Korea, different firms are exposed to different variation in judge types in the cross section and over time.

The institutional setting and our measures of judge types allow us to compute three time-varying court-level measures of legal uncertainty that correspond to idiosyncratic and systematic sources of legal uncertainty in our theoretical framework. First, differences in judge types in a given court combined with the random assignment of judges to cases generate assignment uncertainty, which we measure by the standard deviation of judge types in a given court and month. Assignment uncertainty is idiosyncratic and therefore diversifiable. Second, learning about current judges through their decisions reduces legal uncertainty by reducing uncertainty about current judge types. We measure this learning effect by the average number of decisions across judges that have been observed in a given court up to a given month. Third, replacing judges in a given court increases legal uncertainty, because agents are better informed about current judges' types. Thus, the completion of judges' term increases legal uncertainty, which we measure by the fraction of the current judges' term in a court that has passed up to a given month. The learning and judge-term effects are systematic and not diversifiable because they affect all cases systematically.[3]

In addition to providing novel measures of economic uncertainty based on legal uncertainty, the advantage of our measures of legal uncertainty is that they are not systematically related to

[3]Since most courts replace bankruptcy judges every two years, about half of all bankruptcy judges across the country are replaced in a given year. This further increases the systematic and nondiversifiable nature of legal uncertainty due to judge replacements.

economic conditions like many other measures of uncertainty (see, e.g., Bloom, 2014). Variation in our measures of legal uncertainty is driven by exogenous judge rotations within the Korean court system and the random assignment of cases to judges, both of which are unrelated to economic conditions.

We start our empirical analysis by establishing the validity and relevance of our measures of debtor-friendliness and legal uncertainty. If our measures capture decision-relevant information, they should predict restructuring filings across different courts. Specifically, because firms initiate restructuring filings in Korea, we would expect to see more restructuring filings at courts with more debtor-friendly judges and with lower legal uncertainty. In our strictest test, we focus on the subset of firms that can choose to file at one of two courts. The appeal of this test is that by examining filing decisions across two courts for the same firm, we can keep firm characteristics and economic conditions constant. We find that restructuring filings at a given court are higher when the court is more debtor friendly, when assignment uncertainty is lower, and when firms have more information about current judges. Together these findings suggest that our measures of debtor-friendliness and legal uncertainty capture information that affects economic decisions.

Next, we assess how legal uncertainty affects credit markets. Controlling for firm, bank, and time fixed effects, we find that loan volume at the firm-bank relationship level is higher when assignment uncertainty at a given court is lower, when more information is available about current judges, and when judge replacement occurs further in the future. This suggests that both idiosyncratic and systematic sources of legal uncertainty have a negative effect on credit. In addition, we find that loan volume is higher when the court is more debtor friendly. While the effect of the courts' debtor-friendliness on credit is theoretically ambiguous because more debtor-friendly judges increase the demand for credit but reduce the supply of credit, this finding suggests that the positive demand effect dominates in equilibrium. When we split firms into high, medium, and low default risk firms, we find that the sensitivity of credit to courts' debtor-friendliness and to all three sources of legal uncertainty is concentrated within high-risk firms. This strengthens the interpretation of our results as being driven by exposure to legal uncertainty in bankruptcy law. Finally, we confirm that our results continue to hold when we consider the intensive margin (existing lending relationships), the extensive margin (new lending relationships), and when we consider total credit at the firm level.

We further examine variation in interest rates and find that interest rates are lower when assignment uncertainty is higher. In contrast, less information about judges and the completion of judges' term are associated with higher interest rates. These results are in line with credit demand being relatively more sensitive to idiosyncratic sources of legal uncertainty and credit supply being relatively more sensitive to systematic sources of legal uncertainty. In addition, as predicted by the model, interest rates are higher when the court is more debtor friendly, because more debtor-friendly judges increase credit demand, but reduce credit supply. As in our previous tests, all of the results are driven by high-risk firms. Finally, we show that changes in credit levels and interest rates translate into changes in real investment. Specifically, investment is higher when assignment uncertainty is lower, when more information is available about current judges, and when judge replacement occurs further in the future.

We complement our empirical analysis with several robustness tests to strengthen the validity of our results. First, we show that the results are not sensitive to our assumptions about the strength of agents' prior regarding judge types. Second, we show that firms and banks do not use more precise estimates of judge types based on information that is not reflected in our modelling of judge types. Specifically, when we include fully-informed judge types based on all observations of a judge's decisions, we find that they have no independent explanatory power for credit volumes.[4] Third, we show that the results are not related to differences in bank quality across different courts by including bank-time fixed effects. Fourth, we show that the results are not driven by industry-specific shocks by including industry-time fixed effects. Fifth, we show that our measures are not correlated with economic conditions. Finally, while our measures of debtor-friendliness and assignment uncertainty fluctuate over time within a specific term, when we aggregate the measures across all judges' terms, they do not systematically vary over time within the term. This implies that these measures are not systematically related to changes in the quality of judges' decisions that may occur over time.

Our analysis has important economic and policy implications. Reform of the judicial or legal systems may be able to reduce legal uncertainty, for example, by limiting the frequency of judge ro-

[4]This also suggests that our results are not driven by systematic allocation of judges of different types to specific courts, since this would be observable to firms and banks.

tations, limiting judicial discretion, eliminating random judge assignment, increasing transparency, and using information technology to make legal outcomes more predictable. While stronger adherence to precedent may reduce legal uncertainty by making future decisions more predictable, it also means that some decisions systematically affect legal outcomes going forward, which generates systematic legal uncertainty. In addition, our results have implications for the diversification of legal uncertainty through intermediaries, such as banks, insurance companies, or investment funds specializing in distressed debt. Finally, our analysis has implications for the boundary of the firm, because firm boundaries may affect the diversification of legal disputes, for example, through mergers and acquisitions.[5]

Related Literature Despite its potential importance for economic outcomes, as highlighted for example by Max Weber, the economics literature has not paid much attention to the economic consequences of legal uncertainty. There is a significant literature on the economic consequences of other sources of uncertainty such as economic policy uncertainty (see, e.g., Bloom, 2014). Our contribution is to provide a novel measure of uncertainty—legal uncertainty—and to study its economic effects. Legal uncertainty is a potentially important source of uncertainty in the economy and generates many novel implications for the judicial system, the legal system, legislation, transparency, the boundaries of the firm, and intermediation (see Section 7).

Related to the notion of legal uncertainty is the notion of tax uncertainty that has been studied in a separate literature. For example, Lee and Xu (2019) use the methodology developed in Baker et al. (2016) to create an index of tax uncertainty and show that higher tax uncertainty leads to lower growth of establishments. Brok (2019) develops a country-level measure of tax uncertainty and finds that higher tax uncertainty leads to lower leverage. Jacob et al. (2021) consider a reform in the U.S. that increased tax uncertainty and show that firms subject to the reform delay large capital investments.

Our paper also contributes to the law and finance literature. Following the seminal work of La Porta et al. (1997, 1998), a number of studies document a positive relationship between creditor protection and the size of credit markets (see, e.g., Levine, 1998, 1999; Djankov et al., 2007; Qian

[5] It should be noted that policies that can reduce legal uncertainty may also have other consequences that need to be taken into account when designing policy.

and Strahan, 2007; Djankov et al., 2008; Haselmann et al., 2010; Campello and Larrain, 2016; Ponticelli and Alencar, 2016; Calomiris et al., 2017; Favara et al., 2021). In contrast, several recent studies suggest a negative relationship (Acharya and Subramanian, 2009; Acharya et al., 2011; Vig, 2013). Schoenherr and Starmans (2022) reconcile these opposing views by studying conditions under which firm borrowing and investment increase or decrease as creditor protection increases. While existing studies focus on the level of creditor protection, we show that uncertainty about the degree of creditor protection in bankruptcy proceedings independently reduces the size of credit markets.

A large theoretical literature in law assesses the role of legal uncertainty in the functioning of the legal system (see, e.g., Posner, 1973; D'Amato, 1983; Bebchuk, 1984; Craswell and Calfee, 1986; Kaplow, 1990; Bebchuk and Kaplow, 1992; Kaplow and Shavell, 1992; Kaplow, 1994; Harel and Segal, 1999; Guthrie, 2002; Brooks and Schwartz, 2005; Mullally, 2009; Geistfeld, 2010; Lang, 2017). In sharp contrast to the large theoretical literature, there are very few attempts to study legal uncertainty empirically. Notable exceptions include, for example, Lefstin (2006) who measures legal indeterminacy through the extent to which judges disagree in patent cases decided by panels of the U.S. Federal Circuit. Farnsworth et al. (2010) use surveys to measure the ambiguity generated by different legal interpretations of laws.[6] Our paper employs detailed micro-level data to provide a direct measure of legal uncertainty based on judge decisions and investigates the economic consequences of legal uncertainty.

Our analysis also contributes to the literature that takes advantage of the random assignment of judges or juries and variation in the interpretation of the law by different judges or juries (see, e.g., Anderson et al., 1999; Kling, 2006; Doyle, 2007; Anwar et al., 2012; Chang and Schoar, 2013; Galasso and Schankerman, 2014; Dobbie and Song, 2015; Bernstein et al., 2019a,b; Antill, 2022; Arnold et al., 2022). The main idea in this literature is that random judge assignment provides an instrument for the treatment of different types of judges ex post after a legal dispute is initiated. While our analysis also exploits the random assignment of judges, it takes an ex-ante perceptive. If judges differ in their decision making, random judge assignment generates legal uncertainty ex ante. We measure this assignment uncertainty and assess its ex-ante effect on credit markets.

[6]The World Bank's Doing Business Project, which compiles data on ten different areas of business law from one hundred seventy-five countries, includes indicators related to legal uncertainty (Davis and Kruse, 2007).

2 Theoretical Framework

In this section, we develop a stylized model in which the producer of a good or service requires an input from a supplier and in which the supplier-producer relationship is subject to legal uncertainty. For example, a firm requires capital from an investor and there is legal uncertainty in the event of bankruptcy or a firm requires human capital from a worker and there is legal uncertainty in the event of a breach of contract. Our goal is to formally characterize different types of legal uncertainty and to study their effect on the demand for and supply of the input, which jointly determine production.

Knight (1921) proposed the distinction between risk and uncertainty, where risk is described by a known probability distribution, whereas uncertainty captures agents' inability to forecast a precise probability distribution. Our model focuses on risk according to Knight's definition. Following the literature on uncertainty (see, e.g., Bloom, 2014), we refer to a single concept of uncertainty throughout the paper capturing aspects of both risk and uncertainty because agents will typically care about both dimensions in reality.

2.1 Model Setup

Consider a producer who owns a production technology requiring an input from a supplier. The supplier's cost of producing the input is $C > 0$. If the supplier provides the input and the producer produces the output, then the producer's revenue is equal to $R > C$. The endogenous price of the input is denoted by P. In particular, $R - C > 0$ is the surplus generated by production and the price P determines how this surplus is split between the supplier and the producer.

After the production of the output, there is a legal dispute between the producer and the supplier with probability π. For example, a firm may have a legal dispute with an employee. In the event of a legal dispute, the dispute is over the amount $D > 0$ of the producer's revenue R.[7] To simplify the exposition, we assume that $\pi = 1$ in this section and study the general case with $\pi \in [0, 1]$ in

[7] We assume that the producer loses a fraction of the amount D in a legal dispute. Our results would be qualitatively identical if we assumed that the supplier loses a fraction of the amount D. We could also consider a general transfer between the supplier and the producer that can be positive or negative and is uncertain. As will become clear in the analysis below, whether the producer or the supplier receives a transfer in the legal dispute on average does not matter because the price can adjust to changes in the average transfer.

Appendix A.2. The general insights regarding the effect of legal uncertainty on production extend to the general case with $\pi \in [0,1]$.

The split of the disputed amount D between the producer and the supplier is uncertain ex ante, capturing legal uncertainty. Legal uncertainty can arise, for example, due to future changes in the law or due to judicial discretion. Specifically, the share of the disputed amount D that is allocated to the producer—the producer's share—is given by the random variable $\Lambda \in [0,1]$. The supplier's share is therefore given by $1-\Lambda$. We assume that the random variable Λ follows a probability distribution that is described by a parameter vector $\theta \in \mathbb{R}^n$. For example, the parameter θ may capture how producer- or supplier-friendly the legal environment is. The parameter θ is unknown and agents in the economy have homogeneous beliefs regarding its probability distribution. For example, the uncertainty regarding the parameter θ may capture the limited knowledge of market participants regarding how producer- or supplier-friendly the legal environment is.

Taken together, the producer's final payoff is given by $R-D+\Lambda D-P = R-(1-\Lambda)D-P$. The supplier's final payoff is given by $P-C+(1-\Lambda)D$. The producer and the supplier are guided by mean-variance objectives over their final payoffs, where $\gamma > 0$ denotes their risk aversion. The reservation utility of both agents is normalized to zero.

2.2 Demand, Supply, and Production

To determine the demand for and the supply of the input, we need to determine the expectation and variance of the producer's and supplier's payoffs. Using the law of iterated expectations, the expectation of the producer's payoff is given by

$$\mathbb{E}[R-(1-\Lambda)D-P] = R-(1-\mathbb{E}\left[\mathbb{E}[\Lambda|\theta]\right])D-P.$$

Using the law of total variance, the variance of the producer's payoff is given by

$$\mathrm{Var}[R-(1-\Lambda)D-P] = D^2\,\mathrm{Var}[\Lambda] = D^2\left(\mathbb{E}\left[\mathrm{Var}[\Lambda|\theta]\right] + \mathrm{Var}\left[\mathbb{E}[\Lambda|\theta]\right]\right).$$

The producer's payoff is uncertain only due to legal uncertainty, captured by the uncertainty of the producer's share Λ. Hence, the variance of the producer's share, $\mathrm{Var}[\Lambda]$, is the measure of legal uncertainty in our model.[8] There are two sources of legal uncertainty. First, $\mathrm{Var}[\mathbb{E}[\Lambda|\theta]]$ captures the legal uncertainty that arises because the parameter θ is uncertain. We therefore refer to $\mathrm{Var}[\mathbb{E}[\Lambda|\theta]]$ as *parameter uncertainty*. Second, $\mathbb{E}[\mathrm{Var}[\Lambda|\theta]]$, captures *realization uncertainty* that arises even if the parameter θ was certain.

The producer is willing to buy the input at price P and produce the output if and only if

$$R-(1-\mathbb{E}[\mathbb{E}[\Lambda|\theta]])D-P-\frac{\gamma}{2}D^2(\mathbb{E}[\mathrm{Var}[\Lambda|\theta]]+\mathrm{Var}[\mathbb{E}[\Lambda|\theta]])\geq 0,$$

which can be written as

$$P\leq R-(1-\mathbb{E}[\mathbb{E}[\Lambda|\theta]])D-\frac{\gamma}{2}D^2(\mathbb{E}[\mathrm{Var}[\Lambda|\theta]]+\mathrm{Var}[\mathbb{E}[\Lambda|\theta]]). \tag{1}$$

The expectation and the variance of the supplier's payoff are given by

$$\mathbb{E}[P-C+(1-\Lambda)D]=P-C+(1-\mathbb{E}[\mathbb{E}[\Lambda|\theta]])D,$$

and

$$\mathrm{Var}[P-C+(1-\Lambda)D]=D^2\,\mathrm{Var}[\Lambda]=D^2(\mathbb{E}[\mathrm{Var}[\Lambda|\theta]]+\mathrm{Var}[\mathbb{E}[\Lambda|\theta]]),$$

respectively. In particular, the producer and the supplier are equally exposed to legal uncertainty. The supplier is willing to produce the input at cost C and sell it to the producer at price P if and only if

$$P-C+(1-\mathbb{E}[\mathbb{E}[\Lambda|\theta]])D-\frac{\gamma}{2}D^2(\mathbb{E}[\mathrm{Var}[\Lambda|\theta]]+\mathrm{Var}[\mathbb{E}[\Lambda|\theta]])\geq 0,$$

which can be written as

$$P\geq C-(1-\mathbb{E}[\mathbb{E}[\Lambda|\theta]])D+\frac{\gamma}{2}D^2(\mathbb{E}[\mathrm{Var}[\Lambda|\theta]]+\mathrm{Var}[\mathbb{E}[\Lambda|\theta]]). \tag{2}$$

[8] Note that the variance of the producer's share, Λ, and the variance of the supplier's share, $1-\Lambda$, are identical, that is, $\mathrm{Var}[\Lambda]=\mathrm{Var}[1-\Lambda]$.

Taken together, production of the input and the output requires that there exists a price P that satisfies both the demand constraint (1) and the supply constraint (2).

Proposition 1. *There exists an input price P at which the producer is willing to buy the input from the supplier and produce the output and the supplier is willing to produce the input and sell it to the producer if and only if*

$$R - C \geq \gamma D^2 \left(\mathbb{E}\left[\mathrm{Var}\left[\Lambda|\theta\right]\right] + \mathrm{Var}\left[\mathbb{E}\left[\Lambda|\theta\right]\right] \right).$$

Intuitively, production takes place if the surplus generated by production, $R - C$, exceeds the disutility that the producer and the supplier incur due to their exposure to legal uncertainty, $\gamma D^2 \left(\mathbb{E}\left[\mathrm{Var}\left[\Lambda|\theta\right]\right] + \mathrm{Var}\left[\mathbb{E}\left[\Lambda|\theta\right]\right] \right)$. Production is decreasing in the supplier's and the producer's risk aversion, γ, in the size of the legal dispute, D, and in the level of legal uncertainty, $\mathbb{E}\left[\mathrm{Var}\left[\Lambda|\theta\right]\right] + \mathrm{Var}\left[\mathbb{E}\left[\Lambda|\theta\right]\right]$.[9]

2.3 Extensions

In this section, we introduce several extensions to the baseline model to study diversification, learning, legal regime changes, and random judge assignment.

2.3.1 Diversification

In this section, we consider the role of diversification with respect to legal uncertainty. Specifically, we consider an economy with $N > 1$ suppliers and N producers. If each of the suppliers enters a relationship with a single producer and each supplier-producer relationship is as described in Section 2.1, then the results from Section 2.2 apply.

To study diversification across supplier-producer relationships, we consider the case in which each supplier supplies a fraction $\frac{1}{N}$ of the input to each of the N producers and receives the revenue $\frac{P}{N}$ from each producer, which implies a total revenue of P. We further assume that legal uncertainty

[9] Note that when the likelihood of a legal dispute is smaller than one, then legal uncertainty is weighted by this probability (see Appendix A.2).

is producer specific in the sense that the producer's share for producer $i \in N := \{1,\dots,N\}$ is described by the random variable Λ_i.[10] The supplier's share in the relationship with producer i is then given by $\frac{1-\Lambda_i}{N}$. Each random variable Λ_i, $i \in N$, is as described in Section 2.1. In particular, each random variable Λ_i, $i \in N$, has the same unknown parameter θ. In addition, we assume that the random variables Λ_i, $i \in N$, are independent and identically distributed conditionally on θ. We denote by Λ a random variable that has the same distribution as each Λ_i conditionally on θ.

Thus, the payoff of producer $i \in N$ is given by

$$R-(1-\Lambda_i)D-P,$$

and the payoff of a single supplier is given by

$$P-C+\sum_{i=1}^{N}\frac{1-\Lambda_i}{N}D.$$

The expectation and the variance of the producer's payoff are identical to Section 2.2. The expectation and the variance of the supplier's payoff are given by the following lemma.

Lemma 1. *The expectation of the supplier's payoff is given by*

$$\mathbb{E}\left[P-C+\sum_{i=1}^{N}\frac{1-\Lambda_i}{N}D\right]=P-C+\left(1-\mathbb{E}\left[\mathbb{E}[\Lambda|\theta]\right]\right)D.$$

The variance of the supplier's payoff is given by

$$\mathrm{Var}\left[P-C+\sum_{i=1}^{N}\frac{1-\Lambda_i}{N}D\right]=\frac{D^2}{N}\mathbb{E}\left[\mathrm{Var}\left[\Lambda|\theta\right]\right]+D^2\,\mathrm{Var}\left[\mathbb{E}\left[\Lambda|\theta\right]\right].$$

Lemma 1 shows that while realization uncertainty, $\mathbb{E}\left[\mathrm{Var}\left[\Lambda|\theta\right]\right]$, can be diversified, parameter

[10] As we will show, making legal uncertainty producer specific implies that suppliers can diversify legal uncertainty across their producer relationships. If legal uncertainty was supplier specific instead, producers would be able to diversify legal uncertainty across their supplier relationships.

uncertainty, $\mathrm{Var}[\mathbb{E}[\Lambda|\theta]]$, cannot be diversified. In particular, exposure to realization uncertainty is decreasing in the number of supplier-producer relationships N. Thus, parameter uncertainty is systematic legal uncertainty because it cannot be diversified, whereas realization uncertainty is idiosyncratic legal uncertainty because it can be diversified. There is systematic legal uncertainty because the parameter θ is unknown and because the parameter systematically affects the payoffs in all supplier-producer relationships.

Proposition 2. *Consider an economy with N diversified suppliers. There exists an input price P at which producers are willing to buy the input from the suppliers and produce the output and the suppliers are willing to produce the input and sell it to the producers if and only if*

$$R-C \geq \gamma D^2 \left(\frac{1}{2}\left(1+\frac{1}{N}\right)\mathbb{E}[\mathrm{Var}[\Lambda|\theta]]+\mathrm{Var}[\mathbb{E}[\Lambda|\theta]]\right).$$

Intuitively, because systematic legal uncertainty, $\mathrm{Var}[\mathbb{E}[\Lambda|\theta]]$, cannot be diversified, it affects both the supplier and the producer. In contrast, idiosyncratic legal uncertainty, $\mathbb{E}[\mathrm{Var}[\Lambda|\theta]]$, can be diversified and affects a diversified supplier less. Compared with Proposition 1, Proposition 2 shows that diversification increases production in the economy by lowering the overall exposure to legal uncertainty in the economy.

2.3.2 Learning about Legal Regime

The supplier and the producer may be able to collect information about the legal regime that allows them to better predict the outcomes of a legal dispute. For example, they may observe how laws are interpreted and enforced, which reduces their uncertainty about the legal regime. To illustrate the effect of learning, consider a signal S that agents observe and that is informative about the producer's share Λ, that is, $\mathrm{Var}[\mathbb{E}[\Lambda|S]] > 0$. Using the law of total variance, we get

$$\mathbb{E}[\mathrm{Var}[\Lambda|S]] = \mathrm{Var}[\Lambda] - \mathrm{Var}[\mathbb{E}[\Lambda|S]] < \mathrm{Var}[\Lambda].$$

That is, in expectation, legal uncertainty decreases as new information about the legal regime arrives. We formally introduce learning into the model in Section 5.1 to motivate measures of legal uncertainty we use in our empirical analysis.

2.3.3 Legal Regime Change

The legal and institutional environment may change over time. For example, the law itself can change, which can systematically change the way disputes between suppliers and producers are treated by the law. Alternatively, if judges are replaced within the legal system, the average producer-friendliness of judges in a given court may change over time.

To introduce the possibility of a future change in the legal regime, we assume that the producer's share is determined by the "future" legal regime with probability $q \in [0,1]$. In this case, the producer's share is given by the random variable Λ_f, which is described by a parameter $\theta_f \in \mathbb{R}^n$. With probability $1-q$ it is determined by the "current" legal regime. In this case, the producer's share is given by the random variable Λ_c, which is described by a parameter $\theta_c \in \mathbb{R}^n$. The parameters θ_c and θ_f are unknown and agents in the economy have homogeneous beliefs regarding their probability distributions. We denote by $\eta \in \{0,1\}$ the random variable that determines whether the current or future legal regime applies to the legal dispute, where $\eta = 1$ denotes the future legal regime. In particular, $\mathbb{P}(\eta = 1) = q$. We assume that the random variables η, Λ_c, and Λ_f are independent.

An increase in the parameter q increases the likelihood that the future legal regime determines the outcome of the legal dispute between the supplier and the producer. In particular, an increase in q can be interpreted as moving closer in time to a date at which the legal regime changes.

Taking into account a possible change in the legal regime, the producer's payoff is given by

$$R - \big(1 - \big(\eta\Lambda_f + (1-\eta)\Lambda_c\big)\big)\, D - P.$$

The supplier's payoff is given by

$$P - C + \big(1 - \big(\eta\Lambda_f + (1-\eta)\Lambda_c\big)\big)\, D.$$

Proposition 3. *There exists an input price P at which the producer is willing to buy the input from* *the supplier and produce the output and the supplier is willing to produce the input and sell it to the producer if and only if*

$$R - C \geq \gamma D^2 \left(q \operatorname{Var}[\Lambda_f] + (1-q) \operatorname{Var}[\Lambda_c] + q(1-q) \left(\mathbb{E}[\Lambda_c] - \mathbb{E}[\Lambda_f]\right)^2 \right).$$

Proposition 3 implies that putting more weight on the future legal regime has two effects. First, if the future legal regime has a higher level of legal uncertainty (i.e., $\operatorname{Var}[\Lambda_f] > \operatorname{Var}[\Lambda_c]$), then putting more weight on the future legal regime reduces production. For example, the legal uncertainty in the current legal regime may be lower because agents have more information about it. Second, a potential change in the legal regime introduces an additional source of uncertainty if the average producer's shares between the legal regimes differ (i.e., $\mathbb{E}[\Lambda_c] \neq \mathbb{E}[\Lambda_f]$). Putting more weight on the future legal regime can increase or decrease this uncertainty regarding the legal regime.[11] Note that the exposure to a change in the legal regime constitutes systematic legal uncertainty because it affects all legal cases in the economy and can therefore not be diversified.

2.3.4 Random Judge Assignment

An important feature of many legal systems is the random assignment of legal cases to judges. To introduce random judge assignment into our framework, we assume that the legal dispute between the producer and the supplier is assigned randomly to one of $J > 1$ judges. The producer's share when assigned to judge $j \in J := \{1, \ldots, J\}$ is described by the random variable $\lambda_j \in [0,1]$. We assume that the random variable λ_j follows a probability distribution with a single parameter $\theta_j \in \mathbb{R}$. The random variable $\xi \in J$ describes the random allocation to judges, where $\mathbb{P}(\xi = j) = \frac{1}{J}$. We thus get $\Lambda = \sum_{j \in J} \mathbb{1}_{\{\xi = j\}} \lambda_j$, where the parameter vector θ for the random variable Λ is given by $\theta = (\theta_j)_{j \in J} \in \mathbb{R}^J$. The parameter θ is unknown and agents have symmetric beliefs regarding its probability distribution, and we assume that the components θ_j are independent across j. We further assume that the random variables ξ and $(\lambda_j)_{j \in J}$ are independent conditionally on θ, and that ξ and θ are independent.

[11] Due to the binary nature of the uncertainty regarding the legal regime, this uncertainty is highest when $q = \frac{1}{2}$.

Lemma 2. *We have*

$$\mathrm{Var}\left[\mathbb{E}\left[\Lambda|\theta\right]\right] = \frac{1}{J^2}\sum_{j\in J}\mathrm{Var}\left[\mathbb{E}\left[\lambda_j|\theta_j\right]\right].$$

Lemma 2 determines the parameter uncertainty in the context of random judge assignment. Specifically, parameter uncertainty is simply given by the weighted sum of the parameter uncertainty associated with each individual judge j, $\mathrm{Var}\left[\mathbb{E}\left[\lambda_j|\theta_j\right]\right]$.

Lemma 3. *We have*

$$\mathbb{E}\left[\mathrm{Var}\left[\Lambda|\theta\right]\right] = \underbrace{\frac{1}{J}\sum_{j\in J}\left(\mathbb{E}\left[\lambda_j\right] - \frac{1}{J}\sum_{k\in J}\mathbb{E}\left[\lambda_k\right]\right)^2}_{\textit{Assignment uncertainty}} + \underbrace{\frac{1}{J}\sum_{j\in J}\mathrm{Var}\left[\lambda_j\right] - \frac{1}{J^2}\sum_{j\in J}\mathrm{Var}\left[\mathbb{E}\left[\lambda_j|\theta_j\right]\right]}_{\textit{Decision uncertainty}}.$$

In addition to the parameter uncertainty characterized in Lemma 2, Lemma 3 shows that there are two sources of realization uncertainty in the presence of random judge assignment: *assignment uncertainty* and *decision uncertainty*. Assignment uncertainty captures the idea that the random assignment of legal cases to judges creates uncertainty if there are different judge types, where a judge's type is captured by the judge's expected producer's share, $\mathbb{E}\left[\lambda_j\right]$. Decision uncertainty captures the idea that even if the allocation to a particular judge is known, then there is uncertainty about the judge's decision for idiosyncratic reasons. Intuitively, if a court has both supplier-friendly and producer-friendly judges, then the random assignment of legal cases to judges generates uncertainty. In addition, even after the assignment to a judge, the judge's decision making is not deterministic due to idiosyncratic factors that affect judge decision making (see, e.g., Chen et al., 2016).

Recall from Section 2.3.1 that $\mathbb{E}\left[\mathrm{Var}\left[\Lambda|\theta\right]\right]$ captures the diversifiable part of legal uncertainty. In the context of random judge assignment, this means that assignment and decision uncertainty can be diversified. In contrast, parameter uncertainty is systematic and cannot be diversified because it affects all legal cases. Intuitively, if there is uncertainty regarding whether judges systematically rule in favor of suppliers or producers, then this uncertainty cannot be diversified.

2.4 Empirical Implications

In this section, we summarize the key empirical implications of our model. The first basic insight of the model is that a higher level of legal uncertainty reduces production.

Implication 1. *A higher level of legal uncertainty reduces demand and supply and therefore reduces production.*

Our model further highlights that there are two types of legal uncertainty: idiosyncratic and systematic. In particular, as discussed in Section 2.3.4, if agents face uncertainty from random judge assignments, then assignment uncertainty and decision uncertainty are diversifiable because they are not correlated across different supplier-producer relationships. In contrast, parameter uncertainty is systematic and therefore not diversifiable.

Implication 2. *If the supplier (producer) is diversified, then supply (demand) depends less on idiosyncratic uncertainty relative to systematic legal uncertainty.*

In particular, an agent who is diversified is more exposed to systematic legal uncertainty whereas an undiversified agent is exposed equally to idiosyncratic and systematic legal uncertainty. As a result, an increase in idiosyncratic legal uncertainty has a larger effect on demand when producers are less diversified. Similarly, an increase in idiosyncratic legal uncertainty has a larger effect on supply when suppliers are less diversified.

Further, learning about the legal regime can reduce legal uncertainty.

Implication 3. *Learning about the legal regime can reduce legal uncertainty and therefore increase production.*

Finally, if we introduce the possibility of a change in the legal regime that systematically changes legal uncertainty, we get the following implication.

Implication 4. *If legal uncertainty under a new legal regime is sufficiently higher compared with the current legal regime, then an increase in the probability of a change in the legal regime reduces production.*

In many applications, the legal uncertainty associated with a future legal regime is significantly higher because agents have less information about it.

3 Institutional Background

In this section, we describe the basic features of the Korean bankruptcy code and bankruptcy court system and describe the judges' role in in-court restructuring cases proceedings.

3.1 Bankruptcy Courts in Korea

During our sample period, bankruptcy cases in Korea were handled by 14 District Courts. Nine of these District Courts handle only cases in the local court district, whereas the other five District Courts that are located in cities with a High Court have the authority to handle cases from several court districts in a region. Specifically, the District Court covering cases in the northern part of the country is located in Seoul, the District Court covering the western part of the country is located in Daejeon, the District Court covering the eastern part of the country is located in Daegu, the District Court covering the south-western part of the country is located in Gwangju, and the District Court covering the south-eastern part of the country is located in Busan. The nine District Courts handling only local cases are located in smaller cities within these five areas (Changwon, Cheongju, Chuncheon, Incheon, Jeju, Jeonju, Suwon, Uijeongbu, Ulsan). During our sample period, nine courts have a separate division for bankruptcy cases (Busan, Changwon, Daegu, Daejeon, Gwangju, Incheon, Seoul, Suwon, Uijeongbu), whereas four courts handle bankruptcy cases through their civil law division (Cheongju, Chuncheon, Jeonju, Ulsan), and one court through its criminal law division before establishing a separate bankruptcy division in February 2015 (Jeju). For ease of exposition, we refer to a court division handling bankruptcy cases simply as the bankruptcy division or the bankruptcy court.

Determination of Jurisdiction The jurisdiction of a bankruptcy court for a given firm is determined by geography. Specifically, the Debtor Rehabilitation and Bankruptcy Act, Article 3 (Jurisdiction), states that every bankruptcy case shall be placed under the exclusive jurisdiction of the principal District Court having jurisdiction over the location of the debtor's principal office or place of business. In addition, an application for a bankruptcy case may be filed with a District Court in the city with a High Court that has jurisdiction over the location of the debtor's principal office or place of business. That is, a firm may file either at the local District Court or at the District Court in the city with a High Court that has jurisdiction over the firm's geographic location. For firms located in cities with a High Court, this implies that they have only one option to file their case with the local District Court. In contrast, firms located elsewhere have two options: they may either file with their local District Court or with the District Court in the city with the High Court covering their region. This procedure effectively divides Korea into five court zones for the purpose of bankruptcy jurisdiction (see Figure 1). Table 1 provides an overview of these five court zones and the filing options for firms in different regions in Korea. Jurisdiction is strictly enforced, and in our data, we do not observe any change of address of firms in the twelve months before their filing.

Bankruptcy Judges In contrast to other countries like the U.S., Korea does not have a system of specialized bankruptcy judges. Instead, Korean judges are considered to be generalists, who rotate through different courts and different court divisions throughout their career. In particular, being appointed to a bankruptcy division of a court requires no prior exposure to bankruptcy law. In fact, most judges start their term in a bankruptcy division with no prior experience of bankruptcy-related cases.

For the vast majority of bankruptcy divisions, there is a two-year term for bankruptcy judges after which they are replaced by new judges. Given that the rotation happens in same month for all courts and the term of most bankruptcy judges is two years, on average about half of all bankruptcy judges are replaced in a given year. Thus, even for banks operating across different regions in Korea, judge rotation is a systematic event.

At a given bankruptcy court, bankruptcy cases are randomly assigned to individual judges. An exception is that cases in which a debtor is related to a previous case, for example a subsidiary of a firm already in the bankruptcy process or if the owner of the firm is involved in a personal bankruptcy case, the case is assigned to the judge already working on the related case. Furthermore, the Seoul Central District Court allocates cases with total assets of more than 10 billion Korean won (KRW)[12] to a presiding judge, who is a more senior and higher ranked judge.

[12] As a rule of thumb, 1 U.S. dollar is between 1,000 and 1,200 KRW.

3.2 Bankruptcy Law in Korea

The relevant bankruptcy code for our sample period is the Debtor Rehabilitation and Bankruptcy Act, which applied from April 1, 2006. The corporate restructuring procedure, which is referred to as "rehabilitation," resembles the U.S. Chapter 11 process in most of its key features. The similarity to U.S. Chapter 11 is due to the fact that the bankruptcy law was initiated under supervision of the IMF and World Bank during the Asian Financial Crisis with the stated objective to follow international best practice, which in practice meant close adherence to U.S. bankruptcy law. Thus, Korean bankruptcy law from April 2006 features a bargaining process similar to Chapter 11 in which a court-appointed custodian is in control of the firm and in charge of proposing a restructuring plan. Typically, the court appoints the incumbent manager as custodian, except for cases in which financial distress could be attributed to fraudulent activity on the part of incumbent management, creditors provided reasonable grounds for appointing a third-party custodian, or the court considered the appointment of a third-party custodian to be essential. In practice, incumbent management remains in control in most restructuring cases (Ko, 2007) and negotiates a restructuring plan with the firm's creditors under court supervision.

In-court Restructuring Proceedings The average restructuring case during our sample period takes 19 months to resolve with a median case duration of 10 months. The steps of the in-court proceedings are summarized in Figure 2. The in-court restructuring process starts with a debtor's filing for restructuring.[13] The filing is then randomly assigned to a judge, who reviews the application. The first step in the review is to determine whether the firm is under the jurisdiction of the bankruptcy court where it filed for restructuring. If the judge determines that the case was filed under the wrong jurisdiction, the filing is declined. Next, the judge determines whether the firm has a realistic chance to survive as a going concern and whether its continuation value exceeds its liquidation value. Because this decision has to be made within ten days of the filing date, the review mainly validates whether the estimates provided by the firm seem plausible. The judge may block the execution of collateral, the sale of assets, the issuance of debt, and the hiring of new workers during the review process. If the judge decides that the firm's continuation value exceeds

[13]While creditors also have the legal right to file for restructuring, this is not observed in practice.

its liquidation value, the case is accepted and restructuring proceedings commence. If the judge decides that the firm is not viable and that the liquidation value of the firm exceeds the continuation value, the case is dismissed and the judge may order the liquidation of the firm. Importantly, after the acceptance of a case, the judge has the authority to terminate the case and order liquidation of the firm at any stage of the process.

Once a case is accepted, the judge determines a date for the first assembly of interested parties and a time period during which stakeholders in the firm can report their claim to the court. The judge also appoints a custodian who is in control of the firm's operations during the restructuring process. The custodian of the firm is responsible to propose a first restructuring plan for the firm.

After the period to file claims with the court ends, the custodian reviews the validity of the claims and outside accountants are consulted to value the claims and to update the liquidation and continuation value of the firm. At this stage, the judge may terminate the case and potentially order liquidation of the firm if the outside accountants find that the liquidation value of the firm exceeds its continuation value. Otherwise, the first assembly of interested parties is held, which primarily serves an informative role to share the custodian's report with all parties and to outline the timeline of the restructuring procedure. From 2015, the assembly was abolished and all relevant information is shared with all parties by mail.

After the meeting, the court determines the deadline to submit a restructuring plan. From 2015 this deadline is already determined when the case is first accepted. The deadline may be extended by the judge. Once the custodian submitted the restructuring plan, it is reviewed in the second assembly of interested parties and the plan is voted on during the meeting. While the judge may take the vote into account, it is a non-binding vote. That is, it is at the judge's own discretion whether to approve or reject the restructuring plan. If the plan is rejected, the judge may order the liquidation of the firm instead. Alternatively, the judge may order the custodian to revise the plan, in which case another assembly of interested parties is held repeating the same process as described above until a decision is made to either accept and execute the plan or to reject the plan.

Once a restructuring plan has been approved, it is implemented under court supervision. During this process, the judge evaluates whether the firm is able to implement all aspects of the restructuring plan and whether the firm is in good standing. At any point in time, the judge may determine that the firm failed to fully implement the plan, in which case liquidation of the firm is mandatory. It is also at the judge's discretion to decide at which point the firm has successfully implemented its commitments under the approved plan and is therefore allowed to successfully graduate from the restructuring process. This is an important step for the firm as it no longer faces the threat of mandatory immediate liquidation in case the judge determines that the firm failed to fully implement the approved plan.

4 Data

In this section, we describe the data we use for our empirical analysis. The sample period runs from April 2006 to December 2015, except monthly loan data, which is only available from December 2009.

Court Data We obtain bankruptcy filing data from the Court of Korea registry.[14] The data provides information on the year and the type of the filing, the court at which the case was filed, the case number, and the name of the filing firm. Comprehensive data on the in-court process for each case is available from the Court of Korea.[15] The data contains the filing date and court, the type of the case, the case number, the name of the firm, the court division and rank of the judge whom the case is assigned to, the date when the case ended, and detailed information on every step of the process including the exact date for each step. This allows us to follow each step of a given case and to observe all decisions that are taken by the judge including the time when these decisions are made.

Table 2, Panel A, provides descriptive statistics on our legal data. Overall, we use data from 4,688 restructuring cases during our sample period. The average case length is 19.39 months, with a median of 10 months. During our sample period, judges make 23,900 decisions that we code as debtor friendly or creditor friendly (see Section 5.1). Our data comprises 327 judges who serve in a bankruptcy court for an average of 23.57 months. Together, this implies that judges make just over 3 decisions that we code as debtor friendly or creditor friendly per month on average.

[14] The data is available at `http://www.iros.go.kr/PMainJ.jsp`.
[15] The data is available at `https://www.scourt.go.kr/portal/information/events/search/search.jsp`.

Loan Data We combine data on loans from two different sources. First, we obtain monthly loan-level data from the Korea Information Service (KIS), which provides information on the borrower, lender, and loan amount. The data covers all firms in Korea. Each borrower and lender has a unique ID number, which gives the data a panel structure. To ensure anonymity, the borrower and lender names are omitted. In addition, the data has information on the city of a firm's principal location of operation and basic accounting information, such as total assets and sales.

Table 2, Panel B, provides descriptive statistics for the monthly loan data. There are 125,663 firms for which interest coverage ratios can be computed, which we require for most parts of our empirical analysis. The average loan size is 189 million KRW, and the average monthly firm-level loan volume is 1,326 million KRW.

Second, we use annual loan data from Moon and Schoenherr (2022), who extract loan and interest rate information from firms' annual reports. While the data has a lower frequency and is less comprehensive in terms of the coverage of firms compared with the monthly loan data from KIS, the advantage of the data is that is provides information on interest rates. In addition, the data includes a firm's business ID number, an official ID number assigned to all firms in Korea. The average interest rate during our sample period is 4.17 percent.

Accounting Data Because the accounting information in the monthly loan data is limited, we separately obtain detailed annual accounting data from KIS. The data contains information on all balance sheet and income statement items and two firm identifiers, an ID number that KIS uses internally to identify firms, and an official business ID number that is assigned to every firm in Korea.

Descriptive statistics for the accounting data are reported in Table 2, Panel C. Accounting data is available for 337,484 firms. The average firm has 30 employees, with a median of 9 employees. The average firm has total assets of 9,567 million KRW, sales of 9,678 million KRW, an investment-to-asset ratio of 2.19 percent, a return on assets of 4.16 percent, and a leverage ratio of 47.49 percent.

Local GDP Data We obtain data on real local GDP from Statistics Korea. To compute GDP growth for each court zone, we match province-level and county-level GDP data with the 14 District Court zones.[16] We compute real GDP per capita for each court zone by dividing real GDP by the population of the respective court zone, which is also available from Statistics Korea.

Data Merging The restructuring filings and the data on case details can be matched using information on the court where the case was filed and a unique case number. This allows us to assign a precise date of filing to each restructuring case. Information on judge ranks allows us to link judges to specific bankruptcy cases.

The monthly loan data contains information on the location of firms' headquarters, which allows us to assign firms to District Courts based on which court has jurisdiction over their location. Because the monthly loan data is anonymized, we match it to the more comprehensive financial data using balance sheet and income statement items that are available in both databases. Specifically, we use the variables time (year), total assets, and total cash and cash equivalents for matching. Because jointly these variables uniquely identify firms, we can match the data for all firms for which accounting data is available. Annual loan and interest rate data can be matched to the merged data using a unique business ID number that is assigned to all Korean firms and is available both in the annual accounting data and in the annual loan and interest rate data.

5 Empirical Strategy and Results

In this section, we describe how we compute the monthly court-level measures of debtor-friendliness and legal uncertainty we employ in our analysis, outline the identification strategy underlying our empirical analysis, and present the results.

[16]Since disaggregated county-level GDP data for Gyeonggi-do is not available from 2005 to 2009, we apply the county weights from 2010 to decompose local GDP into the three District Court zones of Incheon, Suwon, and Uijeongbu for the period from 2005 to 2009.

5.1 Measurement

We start by describing how we code decisions of judges that can be identified as debtor friendly or creditor friendly. We then describe how we use this data to generate monthly court-level measures of debtor-friendliness and legal uncertainty.

Judge Decisions We code the decisions of judges at critical stages of the restructuring process as debtor friendly or creditor friendly. During our sample period, judges make 23,900 relevant decisions that can be identified as debtor friendly or creditor friendly. Table 3 lists all decisions that we classify as debtor friendly or creditor friendly in the data.

The first decision for each restructuring case is whether the judge accepts the case or dismisses it and potentially orders the firm to be liquidated. Restructuring gives firms a chance to survive distress, preventing shareholders from being wiped out. In contrast, most creditors typically prefer liquidation at the time of filing (see, e.g., Bergström et al., 2002; Ayotte and Morrison, 2009; Vig, 2013). Moreover, had creditors preferred a restructuring, they could have agreed on restructuring with the firm outside of court. Liquidation allows creditors to recover at least a fraction of their claims without delay. Thus, we code the acceptance of a case as debtor friendly and its dismissal as creditor friendly.

During the restructuring proceedings, the judge may side with the firm by preventing creditors from seizing any of the firm's assets, by approving an extension of the period during which the debtor's management can propose a restructuring plan, or by approving the restructuring plan proposed by the debtor's management or modifications thereof. Hence, we code these decisions as debtor friendly. If the judge instead sides with creditors by allowing the seizure of assets, by not approving an extension of the period during which the debtor's management can propose a restructuring plan, or by rejecting the restructuring plan proposed by the debtor's management or modifications thereof, we code these decisions as creditor friendly.

Finally, the judge decides when a firm is allowed to graduate from the proceedings. This is important because if the firm fails to implement parts of the restructuring plan while in proceedings, liquidation is mandatory. In contrast, once a firm is allowed to graduate, the threat of automatic liquidation is removed. Thus, we code this decision as debtor friendly. In contrast, if a judge decides that a firm failed to graduate from the restructuring proceeding, the firm is liquidated. As discussed above, this decision is creditor friendly due to the liquidation bias of secured creditors.

In coding the decisions, we deliberately abstain from assigning weights to different decisions based on their potential importance. The reason is that we use the data to proxy for what agents in the economy learn about a judge's type in terms of her debtor-friendliness rather than how the decision affects a particular case. Intuitively, even if a specific decision is less crucial for the outcome of a case, it still allows the economic agents to learn about the judge's type (Chang and Schoar, 2013).

Our objective is to estimate judge types based on the information set and technology available to firms and their creditors because these estimates determine agents' expectations and decisions. We therefore treat all decisions in all cases the same, coding them as if they were determined only by the characteristics of the judge without accounting for other characteristics of a specific case. In principle, we could estimate a model to predict decisions based on firm characteristics, local characteristics, etc., to extract the marginal effect of judges' preferences and characteristics on decisions. However, for our sample period from 2006 to 2015, the challenge of obtaining the necessary data in a timely manner makes it unlikely that economic agents may have used this approach. In Section 6.1, we provide evidence in support of our assumption that firms and banks do not seems to use more sophisticated methods to predict judge types.

Judge Types and Learning To compute the monthly court-level measures of debtor-friendliness and legal uncertainty we use in our empirical analysis, we make use of two important features of Korea's legal and institutional environment. First, as discussed in Section 3, Korean judges are generalists and rotate through different courts and different court divisions during their careers. In particular, judges typically enter bankruptcy courts without prior experience of bankruptcy cases and are replaced by new judges at the end of their term of typically two years. This implies that judges' types in terms of their debtor-friendliness are initially unknown and debtors and creditors need to learn about them from judges' decisions over time. Second, at a given court, bankruptcy cases are randomly assigned to individual judges. This random assignment generates assignment uncertainty as discussed in Section 2.

To motivate our monthly court-level measures of debtor-friendliness and legal uncertainty, we extend our model of legal uncertainty with random judge assignment from Section 2.3.4 to allow agents in the economy to learn from judges' decisions. We refer to the supplier as the creditor and to the producer as the debtor. The goal is to use a simple model to derive intuitive and robust formulae that plausibly capture the learning of agents in the economy. To capture the binary nature of the decisions in restructuring cases in our data, we assume that the producer's share for judge $j \in J$, λ_j, follows a Bernoulli distribution. Specifically, a judge decides either in favor of the creditor or the debtor. The probability of the decision being debtor friendly is given by q_j. The probabilities q_j, $j \in J$, are unknown to the debtor and the creditor and they have homogeneous beliefs regarding their probability distributions.[17] In particular, we have $\mathbb{E}\left[\lambda_j\right] = \mathbb{E}\left[\mathbb{E}\left[\lambda_j | q_j\right]\right] = \mathbb{E}\left[q_j\right]$.

To allow for closed form solutions of the Bayesian updating formulae, we assume that agents' beliefs are such that the probability q_j is distributed according to a beta distribution with parameters α and β. Agents' prior is given by a beta distribution with parameters α_0 and β_0. Agents observe the decisions of a judge over time and update their beliefs using Bayes' rule. Denote by N_j the number of decisions of judge j that agents observe up to a given month. Let F_j denote the number of debtor-friendly decisions. Define $\bar{F}_j = \frac{F_j}{N_j}$. Then the posterior distribution of q_j for judge j is given by a beta distribution with parameters $\alpha_j = \alpha_0 + F_j$ and $\beta_j = \beta_0 + N_j - F_j$. In particular, we have

$$\mathbb{E}\left[q_j\right] = \frac{\alpha_j}{\alpha_j + \beta_j} = \frac{\alpha_0 + F_j}{\alpha_0 + \beta_0 + N_j} = \frac{\alpha_0 + \beta_0}{\alpha_0 + \beta_0 + N_j} \frac{\alpha_0}{\alpha_0 + \beta_0} + \frac{N_j}{\alpha_0 + \beta_0 + N_j} \bar{F}_j. \tag{3}$$

Using the data on judges' decisions, we compute $\mathbb{E}\left[q_j\right]$ for each judge j in each month, which we refer to as judges' types.[18] To compute these measures, we calibrate the parameters of the prior distribution, α_0 and β_0, to match the distribution of judge types in our sample based on all the decisions of a judge—the fully-informed judge types. The average fully-informed judge type is 0.643 and the variance of fully-informed judge types is 0.26. Calibrating α_0 and β_0 using the formulae for the mean and variance of a beta distribution implies $\alpha_0 + \beta_0 = 7.834$, which we use

[17] Using the notation from Section 2.3.4, we have $\theta_j = q_j$.

[18] Note that the Bayesian updating formula (3) is conceptually identical to the case of a normally distributed transfer in a legal dispute with an unknown mean. As such, our measures of judge types do not narrowly depend on our assumption of a beta distribution.

in our main analysis. Figure 3 shows the histogram and calibrated beta distribution for our sample. We discuss the robustness of our results with respect to the choice of α_0 and β_0 in Section 6.1.

The parameters of the prior distribution have an intuitive interpretation. Choosing α_0 and β_0 is equivalent to treating the strength of the prior with mean $\frac{\alpha_0}{\alpha_0+\beta_0}$ as if it is based on observing $\alpha_0+\beta_0$ observations. For example, if agents have prior beliefs given by $\alpha_0=\beta_0=5$ and observe five decisions of a judge, one of which is debtor friendly, then we get

$$\mathbb{E}\left[q_j\right]=\frac{10}{10+5}0.5+\frac{5}{10+5}0.2=0.4.$$

If the prior belief is instead given by $\alpha_0=\beta_0=10$, that is, the weight on the prior increases from ten to 20, then we get

$$\mathbb{E}\left[q_j\right]=\frac{20}{20+5}0.5+\frac{5}{20+5}0.2=0.44.$$

Intuitively, a higher weight on the prior reduces the speed at which agents in the economy update their beliefs based on information about judge decisions they observe.

As a next step, we use the monthly judge types $\mathbb{E}\left[q_j\right]$ to compute a court-level measure of debtor-friendliness. Specifically, the expectation of the debtor's share in a legal dispute in a court with judges $j \in J$ is given by

$$\mathbb{E}[\Lambda]=\frac{1}{J}\sum_{j\in J}\mathbb{E}\left[\lambda_j\right]=\frac{1}{J}\sum_{j\in J}\mathbb{E}\left[q_j\right]. \tag{4}$$

The variance of the debtor's share in a legal dispute, $\text{Var}[\Lambda]$, which is the measure of legal uncertainty in our model, can be decomposed into assignment uncertainty, which is given by

$$\frac{1}{J}\sum_{j\in J}\left(\mathbb{E}\left[\lambda_j\right]-\frac{1}{J}\sum_{k\in J}\mathbb{E}\left[\lambda_k\right]\right)^2=\frac{1}{J}\sum_{j\in J}\left(\mathbb{E}\left[q_j\right]-\frac{1}{J}\sum_{k\in J}\mathbb{E}\left[q_k\right]\right)^2, \tag{5}$$

and the sum of parameter uncertainty and decision uncertainty, which is given by

$$\frac{1}{J}\sum_{j\in J}\text{Var}\left[\lambda_j\right]=\frac{1}{J}\sum_{j\in J}\mathbb{E}\left[q_j\right]\left(1-\mathbb{E}\left[q_j\right]\right). \tag{6}$$

Even though our model suggests multiple direct measures of legal uncertainty, we focus on assignment uncertainty in our empirical analysis for two reasons. First, assignment uncertainty is less sensitive to potential firm-specific adjustments of the expected debtor's share based on unobservable firm-specific information.[19] Second, whereas the computation of the variance $\text{Var}\left[\lambda_j\right]$ depends to some extent on the distributional assumptions in our model, our measure of assignment uncertainty is more robust to our distributional assumptions.

In addition to our proxy for assignment uncertainty, which captures idiosyncratic legal uncertainty, we develop two proxies for systematic legal uncertainty. First, as discussed in Section 2, if agents learn about the current legal regime from judges' decisions, then legal uncertainty declines over time. The strength of this learning effect of the completion of the judges' term therefore depends on how much agents learn over time. To capture this effect, for each court, we compute the average number of decisions that judges have made up to a given month. Second, as the replacement of judges in a given court moves closer, legal uncertainty increases as agents put more weight on the future legal regime with new judges, which they have less information about. We capture this time-varying effect of parameter uncertainty at the court level by computing a variable that measures the fraction of judges' term in the court that is completed in a given month.[20]

5.2 Empirical Predictions

In this section, we summarize the empirical predictions regarding the monthly court-level measures of debtor-friendliness and legal uncertainty we employ in our empirical analysis.

First, the empirical prediction regarding the effect of courts' debtor-friendliness (given in equation (4)) on borrowing and investment is ambiguous. As shown in Section 2, demand depends positively on the expectation of the debtor's share in a legal dispute, but supply depends negatively

[19] Assume that firm i's conditional expected debtor's share for judge j is given by $\mathbb{E}_i[\lambda_j] = \mathbb{E}\left[q_j\right] + a_i$, where a_i is a firm-specific adjustment based on the firm's information set. Then the expectation of the debtor's share for firm i in a legal dispute in a court with judges $j \in J$ is given by $\frac{1}{J}\sum_{j\in J}\mathbb{E}\left[q_j\right] + a_i$. As a result, the term a_i is absorbed by firm fixed effects in our empirical specification. Importantly, assignment uncertainty is invariant to the firm-specific adjustment a_i. In contrast, due to its nonlinear nature, the firm-specific adjustments introduce a significant amount of noise in the remaining variance term in equation (6).

[20] Note that in our setting the measure based on the number of observed decisions in a given court is less systematic compared with the measure based on the fraction of judges' term that is completed. At a given point in time, there is more variation in the number of judge decisions across courts, whereas judge replacement cycles move together more closely across courts.

on the debtor's share. In our model, the demand and supply effects cancel out. In a more general model with downward-sloping aggregate demand or with additional frictions, either the demand or supply effect of $\mathbb{E}[\Lambda]$ may dominate (see, e.g., Schoenherr and Starmans, 2022). As a result, whether the demand or supply effect dominates in our setting is an empirical question.

Second, our model predicts that an increase in courts' assignment uncertainty (given in equation (5)) reduces borrowing and investment. As shown in Section 2, an increase in assignment uncertainty reduces both demand and supply, and should therefore have a negative effect on borrowing and investment. In addition, because assignment uncertainty is idiosyncratic legal uncertainty, a diversified creditor should be less exposed to assignment uncertainty and supply should therefore be relatively less responsive to an increase in assignment uncertainty compared with parameter uncertainty (i.e., systematic legal uncertainty). In contrast, an undiversified debtor is equally exposed to assignment uncertainty and parameter uncertainty.

Third, our model predicts that an increase in the average number of decisions that judges make in a given court reduces systematic legal uncertainty and therefore increases both the demand for and the supply of credit.

Fourth, our model predicts that an increase in the fraction of judges' term at a court on borrowing and investment is negative. As discussed in Section 2.3.3, moving closer in time to the date at which judges are replaced implies that debtors and creditors are relatively more exposed to the new legal regime that follows after the replacement of judges. Given that agents have better information about the current legal regime under the current judges at the court compared with the future legal regime, this first effect increases legal uncertainty.

5.3 Empirical Analysis

Next, we present our empirical analysis in which we employ the monthly court-level measures of debtor-friendliness, assignment uncertainty, which is an idiosyncratic source of legal uncertainty, and the completed fraction of judges' term, which captures exposure to systematic legal uncertainty, to assess the effect of legal uncertainty on credit markets.

5.3.1 Legal Uncertainty and Restructuring Filings

We start our analysis by providing direct evidence that courts' debtor-friendliness and legal uncertainty affect firm decision making. Specifically, we examine whether time-series variation in restructuring filings across different courts can be predicted by our measures of debtor-friendliness and legal uncertainty by estimating

$$F_{c,t} = \alpha_c + \alpha_t + \delta \cdot \mu_{c,t-1} + \theta_1 \cdot \sigma_{c,t-1} + \theta_2 \cdot N_{c,t-1} + \theta_3 \cdot \tau_{c,t-1} + \varepsilon_{c,t}, \tag{7}$$

where the variable $F_{c,t}$ is the number of restructuring filings in court c in month t, the variable $\mu_{c,t-1}$ is court c's debtor-friendliness at the end of month $t-1$, as defined in equation (4), the variable $\sigma_{c,t-1}$ is the level of assignment uncertainty at court c at the end of month $t-1$, defined as the square root of the variance in equation (5),[21] the variable $N_{c,t-1}$ is the average number of decision across current judges at court c at the end of month $t-1$ in units of 100 decisions (e.g., for ten decisions, the value of the variable is 0.1), and the variable $\tau_{c,t-1}$ is the completed fraction of judges' term at court c at the end of month $t-1$. For example, if judges' term at a given court is 24 months, the measure $\tau_{c,t-1}$ takes the value of 0.25 after 6 months. Court (α_c) and month (α_t) fixed effects ensure that we control for time-invariant court-specific differences in filing levels, and for time-series shocks by comparing filing rates across courts within the same month. In our strictest specifications, we replace time fixed effects with court zone-time fixed effects ($\alpha_{z,t}$), which implies that we compare filings in adjacent courts that belong to the same court zone as defined in Section 3.1. Finally, to account for court-specific trends that affect filing rates, but that are unobservable to us, we control for the number of judges appointed to the bankruptcy court division at the beginning of a term, which reflects the court's expected case load.

If our measures of debtor-friendliness and legal uncertainty capture relevant information, we should expect them to predict restructuring filings across courts over time. Specifically, firms should be more likely to file for restructuring, if a court is more debtor friendly and if legal uncertainty is lower. This predicts that δ is positive, and that θ_1 is negative. The prediction for θ_2 is positive. As firms obtain more information about current judges, legal uncertainty declines. The

[21] We use the standard deviation rather than the variance for ease of exposition because the standard deviation has the same unit as our measure of debtor-friendliness. All results are qualitatively identical if we use the variance instead.

prediction for θ_3 is negative for credit as approaching the end of judges' term increases the probability that decisions are handled by a new team of judges for which no information is available, which increases legal uncertainty. However, for restructuring filings, the prediction θ_3 is ambiguous because firms may have an incentive to accelerate filing decisions before the end of judges' term to get current judges to be in charge of some important early decision (e.g., the decision to accept the case). Intuitively, credit decisions do not immediately trigger a restructuring case and therefore differ from the decision regarding the restructuring filing.

The results from estimating equation (7) are reported in Table 4. In columns I and II, we find that the number of monthly restructuring filings is higher in more debtor-friendly courts. In contrast, assignment uncertainty is associated with fewer filings. While we find no significant effect for the average number of judge decisions, we observe a positive effect for the completion of the judges' term. Specifically, in the more stringent test with court zone fixed effects is column II, we find that a 10 percentage-point increase in courts' debtor-friendliness increases filings by 0.86 per month and completing half of the judges' term increases filings by 0.79, whereas a 10 percentage-point increase in assignment uncertainty reduces filings by 1.03 per month.

In the sharpest test, in column III, we restrict our sample to firms located in areas that allow them to choose between two courts when they file: the local District Court and the District Court in the city with the High Court that covers their region. The advantage of this design is that it keeps the firm and therefore geographic location and economic conditions constant, which eliminates concerns about differences in filing rates across courts being driven by differences in economic conditions. Consistent with the previous results, we find that the number of filings is higher when courts are more debtor friendly, whereas assignment uncertainty is associated with fewer filings. In addition, we find that the number of filings is higher when there is more information about current judges, whereas the completion of the judges' term does not affect filing rates.

Comparing the results in columns II and III reveals that filing rates are determined both by firms' choices of where to file and the decision to file in the first place. If differences in filing rates were solely driven by firms that can choose between two courts, the estimates in columns II and III should be similar in magnitude. Instead, the magnitudes are about twice as large when including firms that cannot choose between two courts in column II. This implies that courts' debtor-friendliness and assignment uncertainty not only affect where firms file, but also determine whether or not firms file for restructuring in the first place. While higher filing rates under more debtor-friendly bankruptcy regimes have been documented before (see, e.g., Franks and Torous, 1989; Schoenherr and Starmans, 2022), the results in Table 4 provide novel evidence that the decision to file for restructuring is also affected by legal uncertainty.

5.3.2 Legal Uncertainty and Credit Markets

Next, we assess how legal uncertainty affects credit markets by estimating

$$\log(L_{ij,t}) = \alpha_i + \alpha_j + \alpha_{z,t} + \delta \cdot \mu_{c,t-1} + \theta_1 \cdot \sigma_{c,t-1} + \theta_2 \cdot N_{c,t-1} + \theta_3 \cdot \tau_{c,t-1} + \varepsilon_{ij,t}, \qquad (8)$$

where $\log(L_{ij,t})$ is the log of total loan volume from bank j to firm i in month t. As discussed in Section 3, some firms can choose between two courts when filing for restructuring. The results from Section 5.3.1 suggest that firms choose the more debtor-friendly court. As a result, in a given month, we assign the debtor-friendliness and uncertainty measures from the more debtor-friendly court to firms that have a choice between courts. Firm (α_i) and bank (α_j) fixed effects ensure that we control for time-invariant firm- and bank-specific differences in lending volumes. Court zone-month fixed effects ($\alpha_{z,t}$) control for time trends specific to a court zone.

The results are reported in Table 5, column I, and suggest that assignment uncertainty has a negative effect on loan volume. Specifically, a 10 percentage-point increase in assignment uncertainty reduces loan volume for the average firm-bank relationship by 0.61 percent. Similarly, a lower level of information about current judges has a negative effect on loan volume. Specifically, observing 100 fewer observations per judge reduces loan volume by 1.41 percent. In addition, the completion of judges' term is associated with lower loan volume. Specifically, completing half of the judges' term (about one year on average) reduces loan volume by 0.17 percent for the average firm-bank relationship. Finally, we find that loan volumes are higher under more debtor-friendly courts. Specifically, a 10 percentage-point increase in debtor-friendliness is associated with an increase in loan volume by 0.87 percent for the average firm-bank relationship.

Firm Risk To sharpen the interpretation of the results, we estimate equation (8) separately for firms with different expected exposure to the bankruptcy courts.[22] Specifically, we use firms' interest coverage ratio as a measure of default risk and split firms into three groups: high-risk firms with an interest coverage ratio below two, medium-risk firm with an interest coverage ratio between two and five, and low-risk firms with an interest coverage ratio above five.[23] We find that the negative relationship between legal uncertainty and loan volumes is mostly driven by the riskiest firms (Table 5, column II). For these firms, a 10 percentage-point increase in assignment uncertainty reduces loan volume by 1.35 percent per firm-bank relationship. The effects are economically and statistically weaker for medium-risk (column III) and low-risk (column IV) firms. Similarly, more information about current judges increases loan volume by 3.41 per 100 decisions for high-risk firms, whereas the effect is only 1.08 and 0.70 percent for medium-risk and low-risk firms, respectively. Completing half of the judges' term reduces loan volume by 0.54 percent for the riskiest firms, whereas the effect is only 0.06 and 0.05 percent for medium-risk and low-risk firms, respectively. Finally, while a 10 percentage-point increase in courts' debtor-friendliness increases loan volume by 5.34 percent per firm-bank relationship for the riskiest firms, the effect is statistically insignificant for medium-risk and low-risk firms.

Firm-level Aggregation Equation (8) focuses on loan volumes for existing lending relationship. To complement this intensive margin with extensive margin evidence, we replace the dependent variable in equation (8) with the variable $E_{ij,t}$ that takes the value of -1 if an existing lending relationship is terminated in month t, 1 if a new lending relationship is started in month t, and 0 otherwise.

The results are reported in Table 6. In column I, we find that a 10 percentage-point increase in assignment uncertainty reduces the probability of a firm-bank relationship to exist in a given month by 0.07 percentage points. An additional 100 observations per judge increases the probability of a firm-bank relationship to exist by 0.04 percentage points. Completing half of the judges'

[22] This augmentation is consistent with our model extension in Appendix A.2 in which the probability of a legal dispute is smaller than one.

[23] An interest coverage ratio below two translates into a rating of B- or worse, and an interest coverage ratio above five translates into a rating of A- or better (see `https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ratings.htm`).

term reduces the probability of a lending relationship to exist by 0.14 percentage points. A 10 percentage-point increase in courts' debtor-friendliness increases the probability for a firm-bank relationship to exist in a given month by 0.48 percentage points.

In columns II to IV, we split firms into high-risk (column II), medium-risk (column III), and low-risk (column IV) firms. We find that the assignment risk, current judge information, and judge-term effects are strongest for high-risk firms, and overall economically and statistically weaker for the medium-risk and low-risk firms. These extensive margin results show the same qualitative effects as the intensive margin results in Table 5.

To jointly capture both the extensive and intensive margin, we aggregate total loan volume at the firm level and estimate

$$\log(L_{i,t}) = \alpha_i + \alpha_{z,t} + \delta \cdot \mu_{c,t-1} + \theta_1 \cdot \sigma_{c,t-1} + \theta_2 \cdot N_{c,t-1} + \theta_3 \cdot \tau_{c,t-1} + \varepsilon_{i,t}, \tag{9}$$

where $\log(L_{i,t})$ is the log of firm i's total loan volume in month t. All other variables are defined as before.

The results are reported in Table 7. In column I, we find that aggregate loan volume is 0.49 percent lower per 10 percentage-point increase in assignment uncertainty. An additional 100 observations per judge increase loan volume by 0.75 percent. Completing half of the judges' term reduces loan volume by 1.43 percent. For the average firm, a ten percentage-point increase in courts' debtor-friendliness leads to 2.02 percent higher loan volume. In columns II to IV, we split firms into high-risk (column II), medium-risk (column III), and low-risk (column IV) firms. Consistent with the previous results, we find that the adverse effects of legal uncertainty are concentrated in high-risk firms. For these firms, a 10 percentage-point increase in assignment uncertainty reduces loan volume by 1.91 percent, 100 additional observations per judge increase credit volume by 2.92 percent, and completing half of the judges' term reduces loan volume by 7.86 percent. In addition, a 10 percentage-point increase in courts' debtor-friendliness increases loan volume by 8.33 percent for high-risk firms.

Demand and Supply The results from estimating equations (8) and (9) capture both demand and supply responses to courts' legal uncertainty and debtor-friendliness. To assess the relative importance of demand and supply effects, we examine prices. Because interest rate data is only available at an annual frequency, we collapse the data at the annual level. Specifically, we estimate

$$R_{i,t} = \alpha_i + \alpha_j + \alpha_{z,t} + \delta \cdot \overline{\mu}_{c,t} + \theta_1 \cdot \overline{\sigma}_{c,t} + \theta_2 \cdot \overline{N}_{c,t} + \theta_3 \cdot \overline{\tau}_{c,t} + \varepsilon_{i,t}, \tag{10}$$

where $R_{i,t}$ is the average interest rate on loans to firm i in year t. All other variables are the annual averages of the monthly measures, the debtor-friendliness measure ($\overline{\mu}_{c,t}$), the monthly assignment uncertainty measure ($\overline{\sigma}_{c,t}$), the monthly number of judge decisions measure ($\overline{N}_{c,t}$), and the monthly measure of the completion of judges' term ($\overline{\tau}_{c,t}$).

The results are reported in Table 8. The first observation is that interest rates are higher when courts are more debtor friendly (column I), with the effect being driven by the riskiest firms (column II). This result further corroborates our theory, because for prices (i.e., interest rates) the prediction for δ is unambiguous. Specifically, a more debtor-friendly court increases the demand for but reduces the supply of credit, both of which predict an increase in prices, with a stronger effect for riskier firms. For high-risk firms, a 10 percentage-point increase in courts' debtor-friendliness implies an increase in interest rates by 12 basis points.

In addition, we find that higher assignment uncertainty is associated with lower interest rates for the average firm (column I) and for high-risk firms (column II). For high-risk firms, a 10 percentage-point increase in assignment uncertainty reduces interest rates by 3 basis points. The combination of lower quantity and lower prices is consistent with the negative relationship between assignment uncertainty and loan volume being mainly driven by lower demand for credit. In contrast, less information about judges and the completion of judges' term are associated with higher interest rates. Specifically, 100 fewer observations per judge lead to 27 basis points higher interest rates, and completing half of the judges' term implies an 8 basis points higher interest rate for high-risk firms. This suggests that systematic legal uncertainty, which is captured by the amount of information about current judges and the completion of the judges' term, is relatively more important for credit supply. This is consistent with our theory, which suggests that diversified banks are more sensitive to systematic sources of legal uncertainty, such as parameter uncertainty, rather than idiosyncratic sources of legal uncertainty, such as assignment uncertainty.

5.3.3 Legal Uncertainty and Firm Investment

Finally, we examine whether the effects of courts' debtor-friendliness and legal uncertainty translate into investment decisions by replacing the dependent variable in equation (10) with firm investment, $I_{i,t}$, defined as the change in fixed assets from year $t-1$ to year t scaled by total assets in year $t-1$.

The results are reported in Table 9. We find that greater assignment uncertainty reduces investment (column I) with the effect being driven by high-risk firms (column II). A 10 percentage-point increase in assignment uncertainty reduces investment by 0.07 percentage points for the average firm and by 0.15 percentage points for high-risk firms. In addition, an additional 100 observations about current judges increases investment by 0.94 percent for high-risk firms, and completing half of the judges' term reduces investment by 0.18 percentage points for the average firm and by 0.74 percentage points for high-risk firms. Further consistent with the results on loan volumes, for high-risk firms, we find that investment is 0.77 percentage points higher per 10 percentage-point increase in courts' debtor-friendliness. These results suggest that differences in courts' debtor-friendliness and legal uncertainty have real effects.

6 Alternative Interpretations and Robustness Tests

In this section, we discuss alternative interpretations of the empirical findings and present the results from additional empirical tests to strengthen the interpretation of the results. In discussing alternative interpretations, we differentiate between their relevance for courts' debtor-friendliness and for legal uncertainty.

6.1 Agents' Prior and Learning

To start with, we examine how sensitive the paper's results are to assumptions about the learning model and agents' prior.

Strength of Agents' Prior First, we assess how sensitive our results are with respect of our choice of the persistence of the prior. In the beta distribution, priors have a very intuitive property. Choosing the parameters α_0 and β_0 of the beta distribution that describes agents' prior about judge types in the economy is equivalent to treating the strength of the prior as if it is based on observing $\alpha_0 + \beta_0$ observations. That is, by choosing $\alpha_0 + \beta_0 = 7.834$ from our baseline calibration, we treat the strength of prior as if agents based their prior on 7.834 judge decisions.

To assess how sensitive our results are to the choice of $\alpha_0 + \beta_0$ and therefore the weight agents put on their prior, we alter the choice of $\alpha_0 + \beta_0$ in Table 10. In Panel A, we reduce the weight agents put on their prior by choosing $\alpha_0 + \beta_0 = 5$. In Panel B, we increase the weight agents put on their prior by choosing $\alpha_0 + \beta_0 = 10$. We find qualitatively identical results with similar magnitudes in both panels compared with the main results in Table 5. This suggests that the results are not sensitive to the strength of agents' prior.

Informed Priors and Alternative Learning Models In our analysis, we assume that firms and banks start with the same prior for all judges at the beginning of their term. However, it may be the case that judges types are predictable at least to some extent from judges' characteristics or expectations about economic conditions in ways that we are not able to observe.

To formally test whether firms and banks use more informed priors, we include the courts' debtor-friendliness ($\hat{\mu}_{c,t}$) and assignment uncertainty ($\hat{\sigma}_{c,t}$) that are based on all observations during the judges' term in equation (8). We refer to a judge's type that is based on all observations as the fully-informed judge type. The motivation for this design is that if firms and banks have an ability to predict judges' decisions based on their characteristics or due to expected economic shocks, the estimates of courts' debtor-friendliness and assignment uncertainty based on the fully-informed judge types should predict agents' decisions.

The results are gathered in Table 11. In short, we do not observe evidence of firms' and banks' actions reflecting more informed priors. Neither courts' debtor-friendliness nor the assignment uncertainty based on fully-informed judge types predict loan volumes. While we find some significant estimates for the fully-informed debtor-friendliness measure for the riskiest and safest firms in columns II and IV, these point in opposite directions and are difficult to reconcile economically.

The results in Table 11 also suggest that firms and banks do not use a more sophisticated model to predict judge types compared to our model in which each decision is only determined by a judge's type. If firms and banks used a more sophisticated model, we should find that the court-level measures based on fully-informed judge types have some predictive power, since these measures should be closer to the measures that would be based on a superior learning model. The fact that the measures based on fully-informed judge types do not independently predict loan volumes suggests that firms and banks are not using a superior model to predict judge types.

Court Choice In our analysis, in a given month, we assign firms that can choose between two courts to the more debtor-friendly court. This is a simplifying assumption because the results in Table 4 suggest that firms also take into account the current level of assignment uncertainty when choosing a court to file for restructuring. In addition, debtor-friendliness and assignment uncertainty also affect the probability of whether a firm files for restructuring in the first place. Thus, estimating a model to assign firms to a court based on both debtor-friendliness and assignment uncertainty is a complex problem without a straightforward solution.

However, there is a simple way to assess to what extent the ability to choose between two courts affects our estimates by restricting the sample to firms without such a choice and comparing the estimates to the full sample. Because each court zone has only one court for which firms do not have a choice between two courts (the city with a District Court that also has a High Court), court zone-month fixed effects would absorb the variation in court-level measures. Thus, we replace court zone-month fixed effects with month fixed effects.

The results are shown in Table 12. For comparison, we estimate the results from Table 5, column I, with month fixed effects instead of court zone-month fixed effects in column I. In columns II to V, we restrict the sample to firms that have no choice between courts. We find that the results become slightly stronger in magnitude for this sample, which is consistent with an imperfect allocation of firms with a choice between two courts to a specific court, introducing noise in the estimation. This implies that, if anything, the results from the main analysis may slightly underestimate the effects of courts' debtor-friendliness and legal uncertainty. Nevertheless, including all firms in our estimation has the benefit of allowing us to include a more stringent set of fixed effects, specifically court zone-month fixed effects, and to use a more representative sample of firms in Korea. As a consequence, we use the full sample of firms in the main analysis in the paper.

6.2 Macroeconomic Shocks

Next, we assess whether macroeconomic shocks are correlated with our debtor-friendliness or legal uncertainty measures, in which case they may constitute confounding factors biasing the estimates in the paper, a concern that applies to many other measures of uncertainty (see, e.g., Bloom, 2014).

Macro-economic Conditions and Legal Uncertainty While judge assignment in Korea follows institutional rules that are orthogonal to economic considerations, the judges' decisions and their dispersion may be affected by macro-economic conditions. For example, in a boom, judges may be more optimistic about the prospects of distressed firms, leading them to decide in their favor more often and more uniformly. This in turn may make judges appear more debtor friendly and may reduce assignment uncertainty precisely when economic conditions are more favorable. Since favorable economic conditions may also increase credit demand and supply, a correlation between economic conditions and courts' debtor-friendliness and assignment uncertainty could drive a positive relationship between courts' debtor-friendliness and loan volumes and a negative relationship between assignment uncertainty and loan volumes.

To assess whether our measures are related to economic conditions, we compute their correlation with local GDP growth. Specifically, we aggregate city- and county-level GDP measures at the court-district level to compute court-specific measures of GDP growth. We find weak and insignificant correlations between local economic growth and our measures. Specifically, the correlation between economic growth and debtor-friendliness is 0.04 with a p-value of 0.630, the correlation between the number of decisions per judge and economic growth is -0.17 with a p-value of 0.054, and the correlation between economic growth and assignment uncertainty is -0.09 with a p-value of 0.301, and the correlation between the completion of judges' term and economic growth is 0.03 with a p-value of 0.745. This suggests that our measures are not related to economic conditions, which further implies that our results are not affected by macro-economic shocks.[24]

[24]For the number of judge decisions, the p-value is close to 5 percent. However, if anything, the negative correlation

Industry-Level Shocks and Legal Uncertainty Besides general economic conditions, industry-specific shocks that are not captured by aggregate local GDP growth could affect our estimation following the same line of argument. To mitigate this concern, we include industry-time fixed effects in equation (8). This ensures that we compare firms assigned to different courts within the same court zone that operate in the same industry. The results are reported in Table 13. We find that adding industry-month fixed effects leaves the results qualitatively unchanged with similar economic magnitudes.

6.3 Remaining Concerns

Finally, we discuss remaining concerns related to the interpretation of the main results in the paper that are not directly related to assumptions about agents' learning or economic shocks.

Differences in Bank Quality Differences in bank quality across courts may affect case outcomes and loan volumes, which in turn may lead to a correlation between courts' debtor-friendliness or assignment uncertainty with loan volumes. For example, lower bank quality may reduce the size of credit markets and also make the outcome of restructuring cases more unpredictable and more favorable for debtors. To mitigate concerns about differences in bank quality affecting the results, we saturate equation (8) by adding bank month fixed effects, which exploits the fact that the same bank lends to firms assigned to different courts. This keeps bank quality fixed by comparing firms allocated to different courts borrowing from the same bank. The results are reported in Table 14. We find that the results are qualitatively unaffected and quantitatively similar after controlling for bank quality through bank-month fixed effects. This suggests that differences in bank quality across courts do not explain the results in the paper.

Endogenous Judge Allocation to Courts While the rules determining the allocation of judges to different courts and different divisions are orthogonal to economic considerations, there could be implicit rules or preferences in appointing judges that could induce a correlation between judge

would imply a negative association between the number of observations per judge and loan volume, which is the opposite of what we find.

types and assignment uncertainty with loan levels. For example, if younger judges are more likely to be appointed to courts in booming regions, while at the same time young judges are more debtor friendly and as a more homogeneous group make more similar decisions, the relationship between higher loan volumes and higher debtor-friendliness or lower assignment uncertainty could be driven by the judge allocation process.

Two of our results suggest that endogenous allocation of judges does not take place in a systematic way that could explain our results. First, if there was a systematic allocation of judges as described above, we would expect banks and firms to be able to predict judge types and adjust their expectations. However, the results in Table 11 suggest that firms and banks are not able to predict judge types any better than our model which is independent of judge characteristics. Second, as documented in Section 6.2, we do not observe any correlation between courts' debtor-friendliness or assignment uncertainty with the business cycle. Together, this suggests that endogenous judge appointments do not generate a correlation between our measures of debtor-friendliness and legal uncertainty with loan volumes.

Judge Learning Since most bankruptcy judges are appointed without prior exposure to bankruptcy cases, they may learn on the job and their decisions may improve over time. Thus, there could be an increase in the quality of decisions over time, which may also affect credit markets. If, at the same time, the debtor-friendliness or assignment uncertainty systematically change over judges' term, this could bias the estimates in the paper. For example, if the quality of decisions is lower and judges are more inconsistent at the beginning of their term, this may lead to an increase in assignment uncertainty and may have a negative effect on credit markets.

To assess whether this is the case, we plot the time series evolution of courts' average debtor-friendliness and average assignment uncertainty over judges' term in Figure 5. We find that both the average level of debtor-friendliness and assignment uncertainty are remarkably stable over their term. Thus, courts' average debtor-friendliness and average assignment uncertainty do not seem to be correlated with the quality of judges' decisions.

7 Discussion and Implications

In this section, we discuss the economic and legal implications of our analysis. While we generally highlight the positive effect of reducing legal uncertainty on economic activity, we also point out that reducing legal uncertainty may have negative consequences that need to be taken into account when designing policy.

Judicial System There are several ways to reduce legal uncertainty through reform of the judicial system. Since judges' decision making may be subject to biases (see, e.g., Frank, 1931), the random assignment of cases to individual judges is meant to promote fairness and confidence in the judicial process (see, e.g., Shayo and Zussman, 2011; Abrams et al., 2012). Our analysis highlights a potential cost that arises as a result of random judge assignments: assignment uncertainty. Because assignment uncertainty is diversifiable, the cost of random judge assignment is higher when potential plaintiffs and defendants are not able to diversify this type of uncertainty.

Compared with a judicial system with specialized judges that stay in the same court for a long period of time, regular rotations of judges across different courts and court divisions expands judges' skills by exposing them to different areas of the law and reduces the risk for cronyism to emerge. However, frequent changes in judicial appointments also generate higher parameter uncertainty. Because parameter uncertainty cannot be diversified, it affects even areas in which plaintiffs and defendants are diversified.

Legal System There is a significant literature that studies the economic consequences of legal systems and, in particular, legal origins (see, e.g., La Porta et al., 1998; La Porta et al., 1999; Djankov et al., 2007). Our analysis suggests that legal traditions may also have implications for legal uncertainty. Most countries today follow one of two major legal traditions: common law or civil law. One of the key differences between both systems is that civil law is codified, whereas common law is largely based on precedent. With respect to legal uncertainty, both systems have advantages and disadvantages. Codification in civil law ensures that there is clear guidance for judicial decisions. As such, clearer guidance on the application of the law and more limited judicial discretion reduces both assignment and decision uncertainty.

In contrast, reliance on precedent may generate uncertainty if there is no clear precedent. Moreover, stronger adherence to precedent is a double-edged sword with respect to legal uncertainty. While it may reduce legal uncertainty by making future decisions more predictable, it also implies that individual decisions may systematically affect legal disputes going forward, making legal uncertainty more systematic and harder to diversify.

Legislation Less frequent and less drastic changes in legislation reduce uncertainty about the legal regime, which is systematic legal uncertainty that cannot be diversified. Ways to reduce drastic changes in legislation and therefore legal regimes include longer election cycles, political systems with more checks and balances, and parliamentary rules and systems that foster consensus such as filibuster rules and multiple-party systems.

Transparency In recent years, a debate about the predictability of judge assignments and judge decision has emerged among academics, industry practitioners, and policy makers (see, e.g., Hüther and Kleiner, 2022).[25] Our analysis highlights a trade-off between the benefits of allowing agents to reduce uncertainty by establishing predictable patterns that govern judicial process both at the institutional level—assignment of cases to judges—and at the level of judges' individual decision making, and higher concerns regarding data protection, privacy, and fairness and equity. In particular, higher transparency, for example, about legal proceedings and decisions, may allow market participants to better predict legal outcomes, which can reduce both idiosyncratic and systematic legal uncertainty.

Boundary of the Firm Our analysis has broader implications for the boundary of the firm. Legal disputes often arise when two parties enter a contract. As contracts are inherently incomplete, legal disputes may arise that are subject to legal uncertainty. To the extent that transactions within the firm are less exposed to contractual incompleteness, moving transactions into the firm by vertical integration may reduce the extent to which a firm is exposed to legal uncertainty.

[25] For the recent debate on the use of judicial analytics see, for example, "Big Data: Legal Firms Play 'Moneyball'," Financial Times, February 6, 2019, and "France's Judicial Analytics Ban Unlikely to Catch On in U.S.," Bloomberg Law, June 5, 2019.

In addition, horizontal integration may allow firms to reach size and economies of scale through diversifying their business relationships, which allows them to reduce their exposure to idiosyncratic legal uncertainty through diversification. These insights also have implications for horizontal and vertical mergers and acquisitions by providing an additional motive for mergers and acquisitions.

Intermediation Just like any other type of idiosyncratic uncertainty, idiosyncratic legal uncertainty can be diversified by large institutions such as conglomerates, insurance companies, or banks. For example, in the context of bankruptcy law, specialized firms, such as hedge funds, that buy up and consolidate distressed debt may serve as intermediaries that can diversify legal uncertainty (see, e.g., Jiang et al., 2012; Lim, 2015; Ivashina et al., 2016).

In the legal industry, law firms take on exposure to legal uncertainty by being paid from the proceeds of a case rather than being paid a flat fee. This, in turn, reduces the exposure of individuals or firms to legal uncertainty. As such, law firms can be seen as institutions that take on and diversify idiosyncratic legal uncertainty.

Besides the role of law firms, other institutions may be able to diversify legal uncertainty. For example, in recent years litigation funding has emerged as a way to finance lawsuits by third parties such as small investment funds (see, e.g., Martin, 2004). Investment funds financing a number of lawsuits can diversify legal uncertainty. Further, a market for insurance against variation in the outcome for legal cases can absorb idiosyncratic legal uncertainty. There are several products offered by insurance companies that can absorb at least some aspects of legal uncertainty such as standard legal insurance as well as more recent types of insurance such as litigation risk insurance.

8 Concluding Remarks

In this paper, we study how legal uncertainty affects economic activity. Our model shows that legal uncertainty reduces economic activity. In addition, we show that legal uncertainty can be classified into idiosyncratic and diversifiable sources of legal uncertainty and systematic and nondiversifiable sources of legal uncertainty. We test the prediction of the model using micro-level data on bankruptcy judges and corporate loans from Korea and find broad support for the empirical predictions of the model.

Our paper is a first step to understand the implications of legal uncertainty for economic outcomes. Even the simple model we develop in this paper has broad economic and policy implications. This suggests that further exploring economic implications of legal uncertainty has the potential to generate novel economic insights and policy implications. One potential avenue for future research is to explore whether and how individuals or firms mitigate their exposure to legal uncertainty. For example, firms may obtain more legal advice and structure transactions in a way to minimize the probability and the uncertainty of potential lawsuits. In addition, while we explore a specific source of legal uncertainty—bankruptcy law—to identify the effects of legal uncertainty on economic activity, there are many other potential sources of legal uncertainty arising from different areas of the law that affect a wide range of economic activities and markets.

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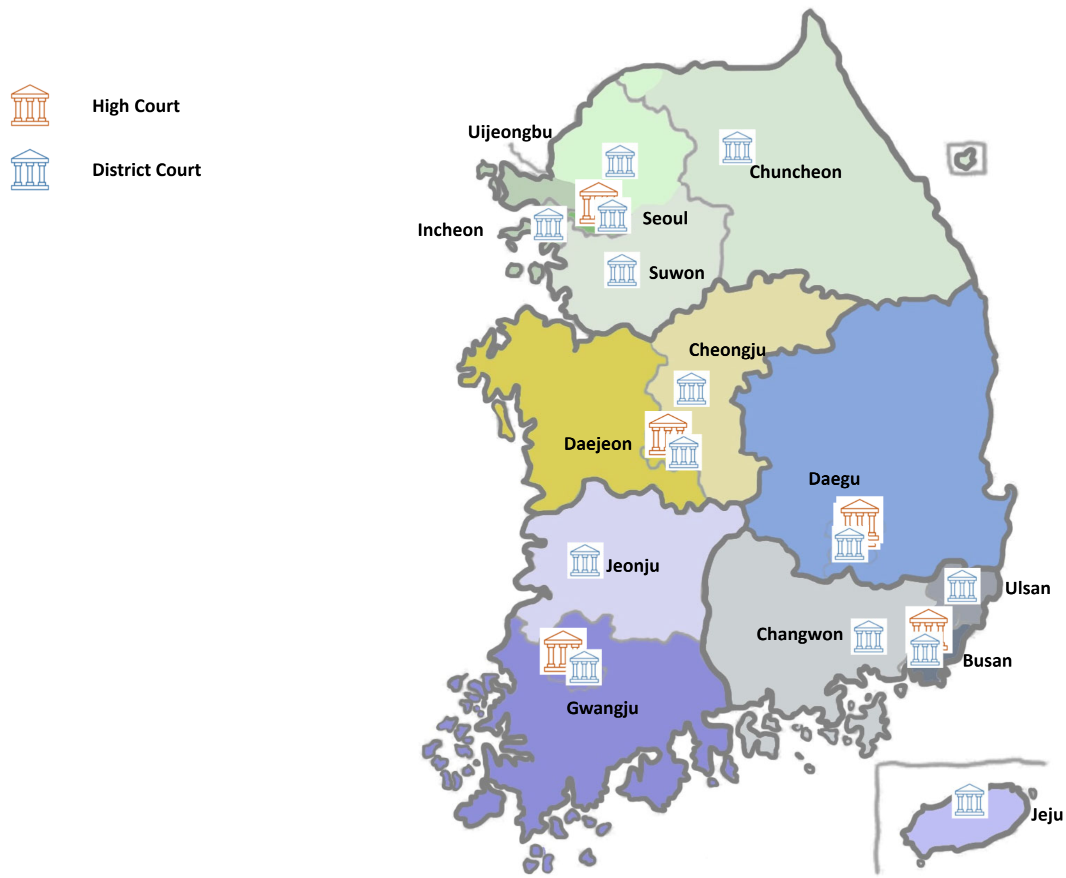
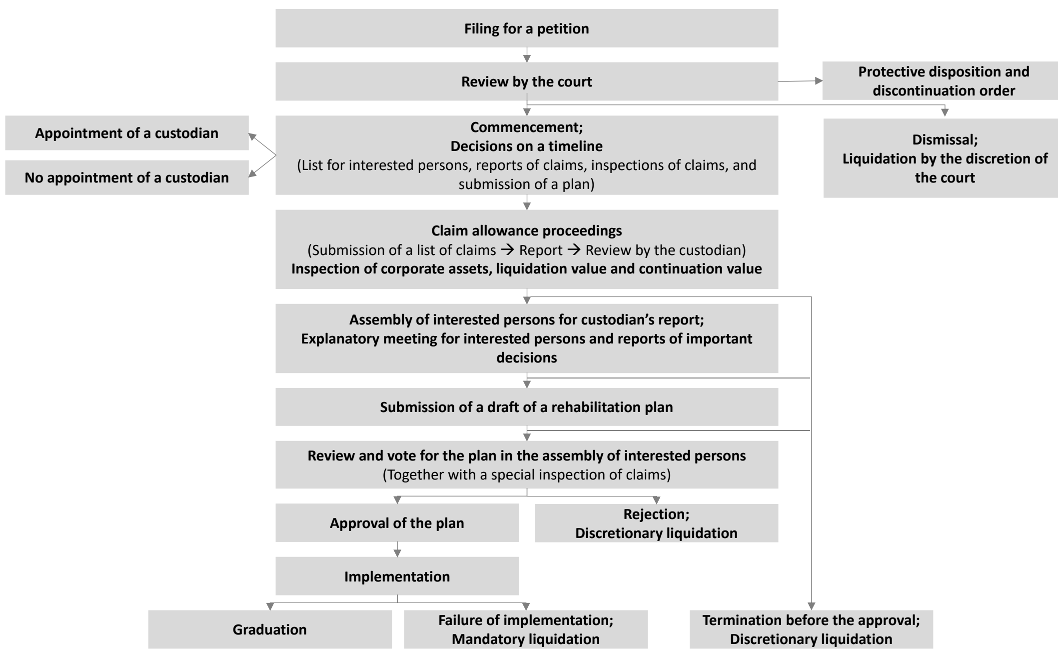
Figure 1: Court Zones



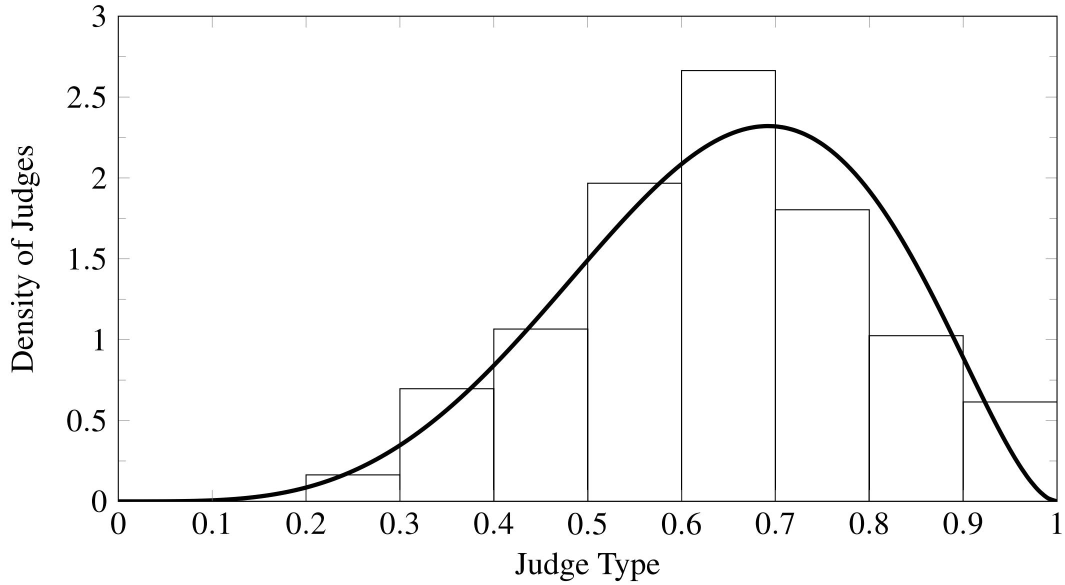
This figure shows the locations of District Courts and High Courts in Korea. In addition, each court zone is illustrated by a different color: Green for Zone 1 (Seoul), yellow for Zone 2 (Daejeon), blue for Zone 3 (Daegu), gray for Zone 4 (Busan), and purple for Zone 5 (Gwangju).

Figure 2: In-court Restructuring Process



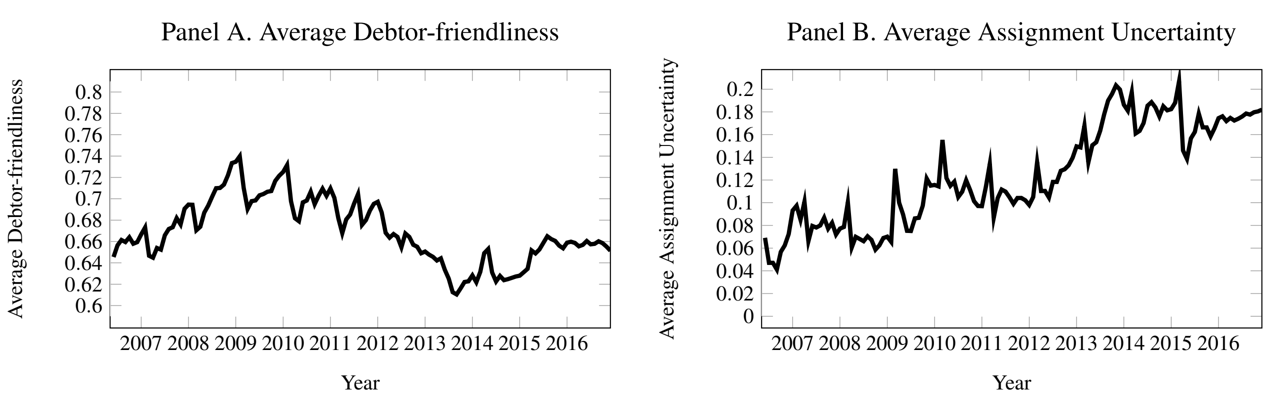
This figure summarizes the steps of the in-court restructuring process in Korea discussed in detail in Section 3.

Figure 3: Judge Type Distribution



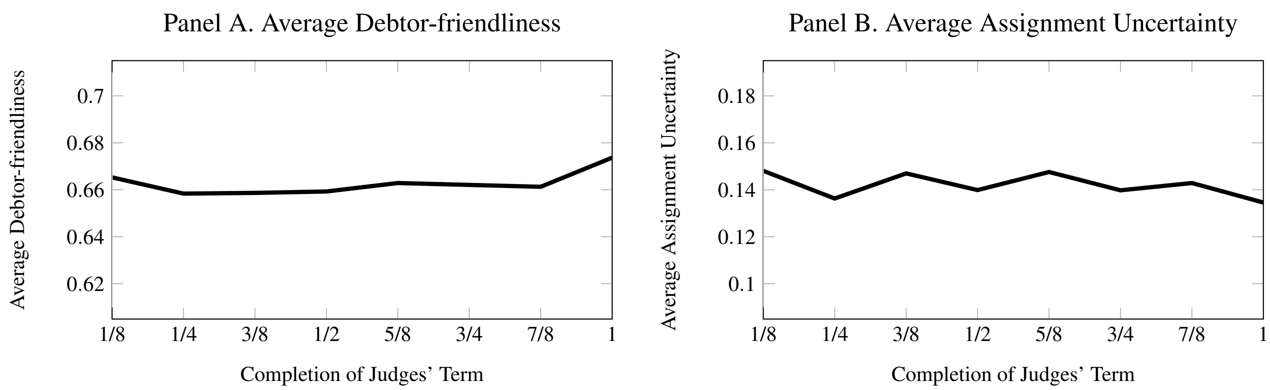
This figure depicts the histogram of the empirical distribution of fully-informed judge types across all courts and terms in the data and the beta distribution for our calibrated parameters $\alpha_0 = 5.038$ and $\beta_0 = 2.796$. On the x-axis, 0 indicates a perfectly creditor-friendly judge and 1 indicates a perfectly debtor-friendly judge.

Figure 4: Average Debtor-friendliness and Assignment Uncertainty over Time



This figure plots the average debtor-friendliness (Panel A) and the average assignment uncertainty (Panel B) across all 14 courts over time, where the x-axis displays the year in January of each year.

Figure 5: Average Debtor-friendliness and Assignment Uncertainty over Judges' Terms



This figure plots the average debtor-friendliness (Panel A) and the average assignment uncertainty (Panel B) over judges' terms at a court as a function of the fraction of the judges' term that has been completed.

Table 1: Court Zones

Administrative region	District Court	High Court
	Zone 1: Seoul	
Gangwon-do	Chuncheon	Seoul
Incheon	Incheon	Seoul
West Gyeonggi-do	Incheon	Seoul
Seoul	Seoul	Seoul
South Gyeonggi-do	Suwon	Seoul
Cheorwon-gun*	Uijeongbu	Seoul
North Gyeonggi-do	Uijeongbu	Seoul
	Zone 2: Daejeon	
Chungcheongbuk-do	Cheongju	Daejeon
Chungcheongnam-do	Daejeon	Daejeon
Daejeon	Daejeon	Daejeon
Sejong	Daejeon	Daejeon
	Zone 3: Daegu	
Daegu	Daegu	Daegu
Gyeongsangbuk-do	Daegu	Daegu
	Zone 4: Busan	
Busan	Busan	Busan
Gyeongsangnam-do	Changwon	Busan
Ulsan	Ulsan	Busan
Yangsan	Ulsan	Busan
	Zone 5: Gwangju	
Gwangju	Gwangju	Gwangju
Jeollanam-do	Gwangju	Gwangju
Jeju-do	Jeju	Gwangju
Jeollabuk-do	Jeonju	Gwangju

This table lists the District Courts and High Courts allocated to each administrative region in Korea. While Cheorwon-gun is part of Gangwon-do, it is assigned to a different court for geographical reasons.

Table 2: Descriptive Statistics

Panel A: Legal data	
Number of cases	4,688
Case length	19.39 months
Number of decisions	23,900
Number of judges	327
Term length	23.57 months
Panel B: Loan data	
Number of firms	125,663
Individual loan volume	189 million KRW
Firm-level loan volume	1,326 million KRW
Interest rates (annual data)	0.0417
Panel C: Accounting data	
Number of firms	337,484
Employees	30
Total Assets	9,567 million KRW
Total Sales	9,678 million KRW
Investment	0.0219
Return on assets	0.0416
Leverage	0.4749

This table reports descriptive statistics from legal data in Panel A, from loan data in Panel B, and from accounting data in Panel C.

Table 3: Judge Decisions

Decision	Coding
Accept case	Debtor-friendly
Prohibit seizure of assets	Debtor-friendly
Extension of plan submission period	Debtor-friendly
Approve debtor's plan	Debtor-friendly
Grant debtor request for modification of plan	Debtor-friendly
Successful graduation from procedure	Debtor-friendly
Dismissal of case	Creditor-friendly
Allow seizure of assets	Creditor-friendly
Reject extension of plan submission period	Creditor-friendly
Reject debtor's plan	Creditor-friendly
Reject debtor request for modification of plan	Creditor-friendly
Failed graduation from procedure	Creditor-friendly

This table lists the debtor-friendly and creditor-friendly decisions of judges in the data.

Table 4: Restructuring Filings

Dep. var.: $F_{c,t}$	I	II	III
$\mu_{c,t-1}$	7.3723***	8.6188***	4.0545***
	[1.6474]	[2.2645]	[1.2204]
$\sigma_{c,t-1}$	-9.0353***	-10.3372***	-3.0620***
	[1.6088]	[2.1285]	[1.1470]
$N_{c,t-1}$	0.0002	0.3632	0.7554**
	[0.4831]	[0.6670]	[0.3558]
$\tau_{c,t-1}$	1.5685***	1.5753***	0.1055
	[0.4153]	[0.5500]	[0.2964]
Court FE	yes	yes	yes
Month FE	yes	-	-
Court Zone-Month FE	no	yes	yes
Observations	1,182	1,182	1,182
R-squared	0.752	0.827	0.707

This table shows the results of estimating equation (7). The dependent variable $F_{c,t}$ is the number of restructuring filings in court c in month t. The variable $\mu_{c,t-1}$ is the average judge type in court c computed based on judges' decisions up to the end of month $t-1$. The variable $\sigma_{c,t-1}$ is the standard deviation of judge types in court c computed based on judge decisions up to the end of month $t-1$. The variable $N_{c,t-1}$ is the average number of observed decisions across all judges in court c at the end of month t divided by 100. The variable $\tau_{c,t-1}$ is the fraction of the current judges' term at court c that is completed at the end of month $t-1$. The bottom section provides information on fixed effects and the clustering of standard errors. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 5: Credit: Firm-bank Relationship Level

Dep. var.: $\log(L_{ij,t})$	I	II	III	IV
Sample	all	high risk	med risk	low risk
$\mu_{c,t-1}$	0.1444***	0.5340***	0.0207	-0.0524
	[0.0297]	[0.0648]	[0.0474]	[0.0451]
$\sigma_{c,t-1}$	-0.0627***	-0.1345***	-0.0259*	-0.0191
	[0.0088]	[0.0196]	[0.0139]	[0.0133]
$N_{c,t-1}$	0.0141***	0.0341***	0.0108***	0.0070*
	[0.0024]	[0.0054]	[0.0039]	[0.0037]
$\tau_{c,t-1}$	-0.0283***	-0.1070***	-0.0113*	-0.0104*
	[0.0040]	[0.0090]	[0.0063]	[0.0059]
Firm FE	yes	yes	yes	yes
Bank FE	yes	yes	yes	yes
Court Zone-Month FE	yes	yes	yes	yes
Clustered SE	firm	firm	firm	firm
Observations	37,295,810	6,324,656	13,086,811	17,884,343
R-squared	0.540	0.578	0.564	0.518

This table shows the results of estimating equation (8). Columns I and V show estimation results for the full sample, column II shows estimation results for the subset of firms with an interest coverage ratio below 2, column III shows estimation results for the subset of firms with an interest coverage ratio between 2 and 5, and column IV shows estimation results for the subset of firms with an interest coverage ratio above 5. The dependent variable $\log(L_{ij,t})$ is the log of the total loan amount between bank j and firm i in month t. The variable $\mu_{c,t-1}$ is the average judge type in court c computed based on judges' decisions up to the end of month $t-1$. The variable $\sigma_{c,t-1}$ is the standard deviation of judge types in court c computed based on judges' decisions up to the end of month $t-1$. The variable $N_{c,t-1}$ is the average number of observed decisions across all judges in court c at the end of month t divided by 100. The variable $\tau_{c,t-1}$ is the fraction of the current judges' term at court c that is completed at the end of month $t-1$. The bottom section provides information on fixed effects and the clustering of standard errors. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 6: Credit: Extensive Margin

Dep. var.: $E_{ij,t}$	I	II	III	IV
Sample	all	high risk	med risk	low risk
$\mu_{c,t-1}$	0.0476***	0.0365***	0.0401***	0.0577***
	[0.0013]	[0.0029]	[0.0022]	[0.0019]
$\sigma_{c,t-1}$	-0.0065***	-0.0109***	-0.0100***	-0.0019**
	[0.0003]	[0.0008]	[0.0006]	[0.0005]
$N_{c,t-1}$	0.0004**	0.0020***	0.0002	0.0002
	[0.0002]	[0.0004]	[0.0003]	[0.0002]
$\tau_{c,t-1}$	-0.0028***	-0.0060***	-0.0054***	0.0000
	[0.0002]	[0.0004]	[0.0003]	[0.0003]
Firm FE	yes	yes	yes	yes
Bank FE	yes	yes	yes	yes
Court Zone-Month FE	yes	yes	yes	yes
Clustered SE	firm	firm	firm	firm
Observations	78,938,489	12,418,510	27,156,072	39,363,907
R-squared	0.004	0.004	0.004	0.004

This table shows the results of estimating equation (8). Column I and shows estimation results for the full sample, column II shows estimation results for the subset of firms with an interest coverage ratio below 2, column III shows estimation results for the subset of firms with an interest coverage ratio between 2 and 5, and column IV shows estimation results for the subset of firms with an interest coverage ratio above 5. The dependent variable $E_{ij,t}$ takes the value of 1 if a lending relationship between firm j and bank i is established in month t and -1 if a lending relationship between bank j and firm i is terminated in month t. The variable $\mu_{c,t-1}$ is the average judge type in court c computed based on judges' decisions up to the end of month $t-1$. The variable $\sigma_{c,t-1}$ is the standard deviation of judge types in court c computed based on judges' decisions up to the end of month $t-1$. The variable $N_{c,t-1}$ is the average number of observed decisions across all judges in court c at the end of month t divided by 100. The variable $\tau_{c,t-1}$ is the fraction of the current judges' term at court c that is completed at the end of month $t-1$. The bottom section provides information on fixed effects and the clustering of standard errors. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 7: Credit: Firm Level

Dep. var.: $\log(L_{i,t})$	I	II	III	IV
Sample	all	high risk	med risk	low risk
$\mu_{c,t-1}$	0.2023***	0.8330***	0.0571	0.1063
	[0.0432]	[0.0776]	[0.0661]	[0.0675]
$\sigma_{c,t-1}$	-0.0489***	-0.1912***	0.0220	-0.0097
	[0.0129]	[0.0227]	[0.0194]	[0.0205]
$N_{c,t-1}$	0.0075**	0.0292***	0.0009	0.0051
	[0.0038]	[0.0067]	[0.0058]	[0.0059]
$\tau_{c,t-1}$	-0.0285***	-0.1572***	-0.0094	-0.0153*
	[0.0058]	[0.0114]	[0.0087]	[0.0089]
Firm FE	yes	yes	yes	yes
Court Zone-Month FE	yes	yes	yes	yes
Clustered SE	firm	firm	firm	firm
Observations	4,781,023	662,371	1,600,430	2,518,222
R-squared	0.828	0.879	0.842	0.792

This table shows the results of estimating equation (9). Column I shows estimation results for the full sample, column II shows estimation results for the subset of firms with an interest coverage ratio below 2, column III shows estimation results for the subset of firms with an interest coverage ratio between 2 and 5, and column IV shows estimation results for the subset of firms with an interest coverage ratio above 5. The dependent variable $\log(L_{i,t})$ is the log of the total loan amount of firm i in month t. The variable $\mu_{c,t-1}$ is the average judge type in court c computed based on judges' decisions up to the end of month $t-1$. The variable $\sigma_{c,t-1}$ is the standard deviation of judge types in court c computed based on judges' decisions up to the end of month $t-1$. The variable $N_{c,t-1}$ is the average number of observed decisions across all judges in court c at the end of month t divided by 100. The variable $\tau_{c,t-1}$ is the fraction of the current judges' term at court c that is completed at the end of month $t-1$. The bottom section provides information on fixed effects and the clustering of standard errors. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 8: Credit: Demand and Supply

Dep. var.: $R_{i,t}$	I	II	III	IV
Sample	all	high risk	med risk	low risk
$\overline{\mu}_{c,t}$	0.0117***	0.0227***	0.0051	-0.0033
	[0.0042]	[0.0063]	[0.0089]	[0.0073]
$\overline{\sigma}_{c,t}$	-0.0021*	-0.0029*	-0.0001	-0.0016
	[0.0012]	[0.0017]	[0.0024]	[0.0022]
$\overline{N}_{c,t}$	-0.0011	-0.0027**	0.0017	0.0007
	[0.0009]	[0.0013]	[0.0019]	[0.0018]
$\overline{\tau}_{c,t}$	0.0015**	0.0015*	-0.0002	0.0022*
	[0.0007]	[0.0009]	[0.0013]	[0.0013]
Firm FE	yes	yes	yes	yes
Court Zone-Month FE	yes	yes	yes	yes
Clustered SE	firm	firm	firm	firm
Observations	41,490	22,186	7,258	12,046
R-squared	0.701	0.717	0.660	0.662

This table shows the results of estimating equation (10). Column I shows estimation results for the full sample, column II shows estimation results for the subset of firms with an interest coverage ratio below 2, column III shows estimation results for the subset of firms with an interest coverage ratio between 2 and 5, and column IV shows estimation results for the subset of firms with an interest coverage ratio above 5. The dependent variable $R_{i,t}$ is average interest rate of all loans of firm i in year t. The variable $\overline{\mu}_{c,t}$ is the mean of the average judge type in court c over all months in year t. The variable $\overline{\sigma}_{c,t}$ is the average standard deviation of judge types in court c over all months in year t. The variable $\overline{N}_{c,t}$ is the average of the average number of observed decisions across all judges in court c at the end of a month over all months in year t divided by 100. The variable $\overline{\tau}_{c,t}$ is the average fraction of the current judges' term at court c that is completed at the end of a month over all months in year t. The bottom section provides information on fixed effects and the clustering of standard errors. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 9: Real Effects

Dep. var.: $I_{i,t}$	I	II	III	IV
Sample	all	high risk	med risk	low risk
$\overline{\mu}_{c,t}$	0.0020	0.0766***	-0.0248*	0.0004
	[0.0063]	[0.0153]	[0.0139]	[0.0078]
$\overline{\sigma}_{c,t}$	-0.0070***	-0.0152**	-0.0016	0.0011
	[0.0017]	[0.0041]	[0.0039]	[0.0022]
$\overline{N}_{c,t}$	0.0005	0.0094***	-0.0032	-0.0006
	[0.0015]	[0.0035]	[0.0029]	[0.0035]
$\overline{\tau}_{c,t}$	-0.0035***	-0.0147***	-0.0047*	0.0012
	[0.0012]	[0.0027]	[0.0028]	[0.0015]
Firm FE	yes	yes	yes	yes
Court Zone-Month FE	yes	yes	yes	yes
Clustered SE	firm	firm	firm	firm
Observations	748,548	160,301	148,819	439,428
R-squared	0.285	0.251	0.301	0.304

This table shows the results of estimating equation (10) with $I_{i,t}$ as the dependent variable. Column I shows estimation results for the full sample, column II shows estimation results for the subset of firms with an interest coverage ratio below 2, column III shows estimation results for the subset of firms with an interest coverage ratio between 2 and 5, and column IV shows estimation results for the subset of firms with an interest coverage ratio above 5. The dependent variable $I_{i,t}$ is the change in fixed assets over total assets for firm i in year t. The variable $\overline{\mu}_{c,t}$ is the mean of the average judge type in court c over all months in year t. The variable $\overline{\sigma}_{c,t}$ is the average standard deviation of judge types in court c over all months in year t. The variable $\overline{N}_{c,t}$ is the average of the average number of observed decisions across all judges in court c at the end of a month over all months in year t divided by 100. The variable $\overline{\tau}_{c,t}$ is the average fraction of the current judges' term at court c that is completed at the end of a month over all months in year t. The bottom section provides information on fixed effects and the clustering of standard errors. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 10: Different Priors

Dep. var.: $\log(L_{ij,t})$	I	II	III	IV
Sample	all	high risk	med risk	low risk
Panel A: $\alpha_0+\beta_0=5$				
$\mu_{c,t-1}$	0.1133***	0.4559***	0.0035	0.0342
	[0.0260]	[0.0570]	[0.0416]	[0.0395]
$\sigma_{c,t-1}$	-0.0566***	-0.1160***	-0.0246**	-0.0214*
	[0.0073]	[0.0162]	[0.0115]	[0.0110]
$N_{c,t-1}$	0.0106***	0.0290***	0.0122***	0.0026
	[0.0026]	[0.0057]	[0.0042]	[0.0040]
$\tau_{c,t-1}$	-0.0292***	-0.1054***	-0.0117*	-0.0116**
	[0.0040]	[0.0089]	[0.0063]	[0.0059]
Observations	37,295,810	6,324,656	13,086,811	17,884,343
R-squared	0.540	0.578	0.564	0.518
Panel B: $\alpha_0+\beta_0=10$				
$\mu_{c,t-1}$	0.1723***	0.5869***	0.0303	0.0726
	[0.0328]	[0.0717]	[0.0522]	[0.0499]
$\sigma_{c,t-1}$	-0.0651***	-0.1410***	-0.0233	-0.0174
	[0.0101]	[0.0224]	[0.0160]	[0.0152]
$N_{c,t-1}$	0.0075***	0.0255***	0.0100**	0.0011
	[0.0025]	[0.0055]	[0.0040]	[0.0037]
$\tau_{c,t-1}$	-0.0288***	-0.1098***	-0.0126**	-0.0104*
	[0.0040]	[0.0090]	[0.0063]	[0.0059]
Firm FE	yes	yes	yes	yes
Bank FE	yes	yes	yes	yes
Court Zone-Month FE	yes	yes	yes	yes
Clustered SE	firm	firm	firm	firm
Observations	37,295,810	6,324,656	13,086,811	17,884,343
R-squared	0.540	0.578	0.564	0.518

This table shows the results of estimating equation (8). In Panel A, we set the strength of the prior to $\alpha_0+\beta_0=5$, and in Panel B, we set it to $\alpha_0+\beta_0=10$. Column I shows estimation results for the full sample, column II shows estimation results for the subset of firms with an interest coverage ratio below 2, column III shows estimation results for the subset of firms with an interest coverage ratio between 2 and 5, and column IV shows estimation results for the subset of firms with an interest coverage ratio above 5. The dependent variable $\log(L_{ij,t})$ is the log of the total loan amount between bank j and firm i in month t. The variable $\mu_{c,t-1}$ is the average judge type in court c computed based on judge's decisions up to the end of month $t-1$. The variable $\sigma_{c,t-1}$ is the standard deviation of judge types in court c computed based on judges' decisions up to the end of month $t-1$. The variable $N_{c,t-1}$ is the average number of observed decisions across all judges in court c at the end of month t divided by 100. The variable $\tau_{c,t-1}$ is the fraction of the current judges' term at court c that is completed at the end of month $t-1$. The bottom section provides information on fixed effects and the clustering of standard errors. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 11: Informed Priors

Dep. var.: $\log(L_{ij,t})$	I	II	III	IV
Sample	all	high risk	med risk	low risk
$\mu_{c,t-1}$	0.1466***	0.3356***	0.0494	0.1292***
	[0.0284]	[0.0623]	[0.0454]	[0.0433]
$\sigma_{c,t-1}$	-0.0607***	-0.1599***	-0.0501**	-0.0094
	[0.0138]	[0.0311]	[0.0220]	[0.0209]
$\hat{\mu}_{c,t}$	-0.0026	0.2135***	-0.0277	-0.0812***
	[0.0173]	[0.0381]	[0.0284]	[0.0261]
$\hat{\sigma}_{c,t}$	-0.0010	0.0058	0.0153	-0.0028
	[0.0072]	[0.0159]	[0.0114]	[0.0110]
$N_{c,t-1}$	0.0141***	0.0333***	0.0116***	0.0071**
	[0.0024]	[0.0053]	[0.0038]	[0.0036]
$\tau_{c,t-1}$	-0.0285***	-0.1011***	-0.0100	-0.0125**
	[0.0041]	[0.0092]	[0.0065]	[0.0061]
Firm FE	yes	yes	yes	yes
Bank FE	yes	yes	yes	yes
Court Zone-Month FE	yes	yes	yes	yes
Clustered SE	firm	firm	firm	firm
Observations	37,295,810	6,324,656	13,086,811	17,884,343
R-squared	0.540	0.578	0.564	0.518

This table shows the results of estimating equation (8). Column I shows estimation results for the full sample, column II shows estimation results for the subset of firms with an interest coverage ratio below 2, column III shows estimation results for the subset of firms with an interest coverage ratio between 2 and 5, and column IV shows estimation results for the subset of firms with an interest coverage ratio above 5. The dependent variable $\log(L_{ij,t})$ is the log of the total loan amount between bank j and firm i in month t. The variable $\mu_{c,t-1}$ is the average judge type in court c computed based on judges' decisions up to the end of month $t-1$. The variable $\sigma_{c,t-1}$ is the standard deviation of judge types in court c computed based on judges' decisions up to the end of month $t-1$. The variables $\hat{\mu}_{c,t}$ and $\hat{\sigma}_{c,t}$ are equivalent to the their monthly counterparts with the exception that they are based on all judge decisions over their full term at the court rather than all judge decisions up to the end of month $t-1$. The variable $N_{c,t-1}$ is the average number of observed decisions across all judges in court c at the end of month t divided by 100. The variable $\tau_{c,t-1}$ is the fraction of the current judges' term at court c that is completed at the end of month $t-1$. The bottom section provides information on fixed effects and the clustering of standard errors. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 12: Firms without Choice of Court

Dep. var.: $\log(L_{ij,t})$	I	II	III	IV	V
Sample	all		high risk	med risk	low risk
$\mu_{c,t-1}$	0.1546***	0.1920***	0.5540***	-0.0689	0.1054**
	[0.0194]	[0.0283]	[0.0602]	[0.0455]	[0.0427]
$\sigma_{c,t-1}$	-0.0210**	-0.0284*	-0.1615***	-0.1395***	0.0244
	[0.0082]	[0.0163]	[0.0356]	[0.0259]	[0.0244]
$N_{c,t-1}$	0.0150***	0.0184***	0.0534***	0.0032	0.0121***
	[0.0017]	[0.0027]	[0.0065]	[0.0045]	[0.0040]
$\tau_{c,t-1}$	-0.0346***	-0.0406***	-0.1409***	-0.0139**	-0.0133***
	[0.0026]	[0.0034]	[0.0076]	[0.0054]	[0.0050]
Firm FE	yes	yes	yes	yes	yes
Bank FE	yes	yes	yes	yes	yes
Month FE	yes	yes	yes	yes	yes
Clustered SE	firm	firm	firm	firm	firm
Observations	37,295,810	19,582,255	3,126,211	6,678,389	9,777,655
R-squared	0.540	0.549	0.581	0.575	0.529

This table shows the results of estimating equation (8). In column I we use the full sample. In columns II to V, we restrict the sample to firms that cannot choose between two courts. Column III shows estimation results for the subset of firms with an interest coverage ratio below 2, column IV shows estimation results for the subset of firms with an interest coverage ratio between 2 and 5, and column V shows estimation results for the subset of firms with an interest coverage ratio above 5. The dependent variable $\log(L_{ij,t})$ is the log of the total loan amount between bank j and firm i in month t. The variable $\mu_{c,t-1}$ is the average judge type in court c computed based on current judges' decisions up to the end of month $t-1$. The variable $\sigma_{c,t-1}$ is the standard deviation of judge types in court c computed based on current judges' decisions up to the end of month $t-1$. The variable $N_{c,t-1}$ is the average number of observed decisions across all judges in court c at the end of month t divided by 100. The variable $\tau_{c,t-1}$ is the fraction of the current judges' term at court c that is completed at the end of month $t-1$. The bottom section provides information on fixed effects and the clustering of standard errors. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 13: Industry Shocks

Dep. var.: $\log(L_{ij,t})$	I	II	III	IV
Sample	all	high risk	med risk	low risk
$\mu_{c,t-1}$	0.1222***	0.5953***	0.0549	0.0287
	[0.0302]	[0.0668]	[0.0482]	[0.0459]
$\sigma_{c,t-1}$	-0.0458***	-0.1458***	-0.0331**	-0.0047
	[0.0090]	[0.0201]	[0.0142]	[0.0136]
$N_{c,t-1}$	0.0104***	0.0343***	0.0092**	0.0029
	[0.0025]	[0.0056]	[0.0040]	[0.0038]
$\tau_{c,t-1}$	-0.0167***	-0.1085***	-0.0055	0.0021
	[0.0041]	[0.0094]	[0.0065]	[0.0061]
Firm FE	yes	yes	yes	yes
Bank FE	yes	yes	yes	yes
Industry-Month FE	yes	yes	yes	yes
Court Zone-Month FE	yes	yes	yes	yes
Clustered SE	firm	firm	firm	firm
Observations	37,295,810	6,324,656	13,086,811	17,884,343
R-squared	0.541	0.579	0.564	0.519

This table shows the results of estimating equation (8). Column I shows estimation results for the full sample, column II shows estimation results for the subset of firms with an interest coverage ratio below 2, column III shows estimation results for the subset of firms with an interest coverage ratio between 2 and 5, and column IV shows estimation results for the subset of firms with an interest coverage ratio above 5. The dependent variable $\log(L_{ij,t})$ is the log of the total loan amount between bank j and firm i in month t. The variable $\mu_{c,t-1}$ is the average judge type in court c computed based on judges' decisions up to the end of month $t-1$. The variable $\sigma_{c,t-1}$ is the standard deviation of judge types in court c computed based on judges' decisions up to the end of month $t-1$. The variable $N_{c,t-1}$ is the average number of observed decisions across all judges in court c at the end of month t divided by 100. The variable $\tau_{c,t-1}$ is the fraction of the current judges' term at court c that is completed at the end of month $t-1$. The bottom section provides information on fixed effects and the clustering of standard errors. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 14: Bank Quality

Dep. var.: $\log(L_{ij,t})$	I	II	III	IV
Sample	all	high risk	med risk	low risk
$\mu_{c,t-1}$	0.1095***	0.5268***	-0.0209	0.0225
	[0.0303]	[0.0664]	[0.0484]	[0.0459]
$\sigma_{c,t-1}$	-0.0403***	-0.1243***	-0.0025	0.0031
	[0.0090]	[0.0202]	[0.0143]	[0.0136]
$N_{c,t-1}$	0.0085***	0.0299***	0.0064	-0.0001
	[0.0025]	[0.0055]	[0.0039]	[0.0037]
$\tau_{c,t-1}$	-0.0255***	-0.1077***	-0.0109*	-0.0052
	[0.0041]	[0.0093]	[0.0065]	[0.0061]
Firm FE	yes	yes	yes	yes
Bank-Month FE	yes	yes	yes	yes
Court Zone-Month FE	yes	yes	yes	yes
Clustered SE	firm	firm	firm	firm
Observations	37,295,810	6,324,656	13,086,811	17,884,343
R-squared	0.546	0.583	0.568	0.528

This table shows the results of estimating equation (8). Column I shows estimation results for the full sample, column II shows estimation results for the subset of firms with an interest coverage ratio below 2, column III shows estimation results for the subset of firms with an interest coverage ratio between 2 and 5, and column IV shows estimation results for the subset of firms with an interest coverage ratio above 5. The dependent variable $\log(L_{ij,t})$ is the log of the total loan amount between bank j and firm i in month t. The variable $\mu_{c,t-1}$ is the average judge type in court c computed based on judges' decisions up to the end of month $t-1$. The variable $\sigma_{c,t-1}$ is the standard deviation of judge types in court c computed based on judges' decisions up to the end of month $t-1$. The variable $N_{c,t-1}$ is the average number of observed decisions across all judges in court c at the end of month t divided by 100. The variable $\tau_{c,t-1}$ is the fraction of the current judges' term at court c that is completed at the end of month $t-1$. The bottom section provides information on fixed effects and the clustering of standard errors. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

A Proofs and Extensions

A.1 Proofs

Proof of Lemma 1. We have

$$\mathbb{E}\left[P-C+\sum_{i=1}^{N}\frac{1-\Lambda_i}{N}D\right]=P-C+\sum_{i=1}^{N}\frac{1-\mathbb{E}\left[\Lambda\right]}{N}D=P-C+\left(1-\mathbb{E}\left[\mathbb{E}[\Lambda|\theta]\right]\right)D,$$

and

$$\begin{aligned}
\operatorname{Var}\left[P-C+\sum_{i=1}^{N}\frac{1-\Lambda_i}{N}D\right] &= \frac{D^2}{N^2}\left(\mathbb{E}\left[\operatorname{Var}\left[\sum_{i=1}^{N}\Lambda_i\middle|\theta\right]\right]+\operatorname{Var}\left[\mathbb{E}\left[\sum_{i=1}^{N}\Lambda_i\middle|\theta\right]\right]\right)\\
&= \frac{D^2}{N^2}\left(\mathbb{E}\left[\sum_{i=1}^{N}\operatorname{Var}\left[\Lambda_i|\theta\right]\right]+\operatorname{Var}\left[\sum_{i=1}^{N}\mathbb{E}\left[\Lambda_i|\theta\right]\right]\right)\\
&= \frac{D^2}{N^2}\left(\mathbb{E}\left[N\operatorname{Var}\left[\Lambda|\theta\right]\right]+\operatorname{Var}\left[N\mathbb{E}\left[\Lambda|\theta\right]\right]\right)\\
&= \frac{D^2}{N}\mathbb{E}\left[\operatorname{Var}\left[\Lambda|\theta\right]\right]+D^2\operatorname{Var}\left[\mathbb{E}\left[\Lambda|\theta\right]\right],
\end{aligned}$$

which proves the statement. ■

Proof of Proposition 2. The demand constraint of a producer is identical to the baseline model and given by (1). The supply constraint can be derived from Lemma 1 and is given by

$$P\geq C-\left(1-\mathbb{E}\left[\mathbb{E}[\Lambda|\theta]\right]\right)D+\frac{\gamma}{2}D^2\left(\frac{1}{N}\mathbb{E}\left[\operatorname{Var}\left[\Lambda|\theta\right]\right]+\operatorname{Var}\left[\mathbb{E}\left[\Lambda|\theta\right]\right]\right).$$

The result then follows directly from the demand and supply constraint as discussed in Section 2.2. ■

Proof of Proposition 3. Denote the producer's payoff by V and the supplier's payoff by W. The conditional expectation and the conditional variance of the producer's payoff are given by

$$\mathbb{E}[V|\eta] = R - \left(1 - \left(\eta\mathbb{E}[\Lambda_f] + (1-\eta)\mathbb{E}[\Lambda_c]\right)\right) D - P,$$

and

$$\mathrm{Var}[V|\eta] = \left(\eta\, \mathrm{Var}[\Lambda_f] + (1-\eta)\, \mathrm{Var}[\Lambda_c]\right) D^2,$$

respectively. Hence

$$\mathbb{E}[V] = \mathbb{E}\left[\mathbb{E}[V|\eta]\right] = R - \left(1 - \left(q\mathbb{E}[\Lambda_f] + (1-q)\mathbb{E}[\Lambda_c]\right)\right) D - P,$$

and

$$\begin{aligned}\mathrm{Var}[V] = \mathbb{E}[\mathrm{Var}[V|\eta]] + \mathrm{Var}[\mathbb{E}[V|\eta]] = \\ \left(q\, \mathrm{Var}[\Lambda_f] + (1-q)\, \mathrm{Var}[\Lambda_c]\right) D^2 + q(1-q)D^2 \left(\mathbb{E}[\Lambda_c] - \mathbb{E}[\Lambda_f]\right)^2.\end{aligned}$$

The conditional expectation and the conditional variance of the supplier's payoff are given by

$$\mathbb{E}[W|\eta] = P - C + \left(1 - \left(\eta\mathbb{E}[\Lambda_f] + (1-\eta)\mathbb{E}[\Lambda_c]\right)\right) D,$$

and

$$\mathrm{Var}[W|\eta] = \left(\eta\, \mathrm{Var}[\Lambda_f] + (1-\eta)\, \mathrm{Var}[\Lambda_c]\right) D^2,$$

respectively. Hence

$$\mathbb{E}[W] = \mathbb{E}\left[\mathbb{E}[W|\eta]\right] = P - C + \left(1 - \left(q\mathbb{E}[\Lambda_f] + (1-q)\mathbb{E}[\Lambda_c]\right)\right) D,$$

and

$$\begin{aligned}\mathrm{Var}[W] &= \mathbb{E}\left[\mathrm{Var}[W|\eta]\right] + \mathrm{Var}\left[\mathbb{E}[W|\eta]\right] \\ &= \left(q\, \mathrm{Var}[\Lambda_f] + (1-q)\, \mathrm{Var}[\Lambda_c]\right) D^2 + q(1-q)D^2 \left(\mathbb{E}[\Lambda_c] - \mathbb{E}[\Lambda_f]\right)^2.\end{aligned}$$

As a result, production requires

$$R - C \geq \gamma D^2 \left(q \operatorname{Var}[\Lambda_f] + (1-q) \operatorname{Var}[\Lambda_c] + q(1-q) \left(\mathbb{E}[\Lambda_c] - \mathbb{E}[\Lambda_f] \right)^2 \right),$$

which completes the proof. ■

Proof of Lemmas 2 and 3. We have

$$\mathbb{E}[\Lambda | \theta] = \frac{1}{J} \sum_{j \in J} \mathbb{E}\left[\lambda_j | \theta_j\right],$$

and we thus get

$$\operatorname{Var}[\mathbb{E}[\Lambda|\theta]] = \frac{1}{J^2} \operatorname{Var}\left[\sum_{j \in J} \mathbb{E}\left[\lambda_j | \theta_j\right]\right] = \frac{1}{J^2} \sum_{j \in J} \operatorname{Var}\left[\mathbb{E}\left[\lambda_j | \theta_j\right]\right].$$

Simple derivations further implies that

$$\operatorname{Var}[\Lambda|\theta] = \frac{1}{J} \sum_{j \in J} \operatorname{Var}\left[\lambda_j | \theta_j\right] + \frac{1}{J} \sum_{j \in J} \left(\mathbb{E}\left[\lambda_j | \theta_j\right] - \frac{1}{J} \sum_{k \in J} \mathbb{E}[\lambda_k | \theta_k] \right)^2,$$

and

$$\mathbb{E}[\operatorname{Var}[\Lambda|\theta]] = \frac{1}{J} \sum_{j \in J} \left(\mathbb{E}\left[\lambda_j\right] - \frac{1}{J} \sum_{k \in J} \mathbb{E}[\lambda_k] \right)^2 + \frac{1}{J} \sum_{j \in J} \operatorname{Var}\left[\lambda_j\right] - \frac{1}{J^2} \sum_{j \in J} \operatorname{Var}\left[\mathbb{E}\left[\lambda_j | \theta_j\right]\right],$$

which completes the proof.

A.2 Model Extension with $\pi \in [0,1]$

We denote by $\nu \in \{0,1\}$ the random variable that describes whether there is a legal dispute, where $\nu = 1$ denotes a legal dispute. In particular, $\mathbb{P}(\nu = 1) = \pi$. We further assume that ν and Λ are independent. The producer's payoff is given by $V = R - (1-\Lambda)\nu D - P$. Its conditional expectation and conditional variance are given by

$$\mathbb{E}[V|\nu] = R - (1 - \mathbb{E}[\mathbb{E}[\Lambda|\theta]])\nu D - P,$$

and

$$\mathrm{Var}[V|\nu] = \nu^2 D^2 \,\mathrm{Var}[\Lambda] = \nu D^2 \left(\mathbb{E}[\mathrm{Var}[\Lambda|\theta]] + \mathrm{Var}[\mathbb{E}[\Lambda|\theta]]\right),$$

respectively. Hence,

$$\mathbb{E}[V] = \mathbb{E}[\mathbb{E}[V|\nu]] = R - (1 - \mathbb{E}[\mathbb{E}[\Lambda|\theta]])\pi D - P,$$

and

$$\mathrm{Var}[V] = \mathbb{E}[\mathrm{Var}[V|\nu]] + \mathrm{Var}[\mathbb{E}[V|\nu]] = \\ \pi D^2 \left(\mathbb{E}[\mathrm{Var}[\Lambda|\theta]] + \mathrm{Var}[\mathbb{E}[\Lambda|\theta]]\right) + \pi(1-\pi) D^2 (1 - \mathbb{E}[\mathbb{E}[\Lambda|\theta]])^2.$$

The supplier's payoff is given by $W = P - C + (1-\Lambda)\nu D$. Its conditional expectation and conditional variance are given by

$$\mathbb{E}[W|\nu] = P - C + (1 - \mathbb{E}[\mathbb{E}[\Lambda|\theta]])\nu D,$$

and

$$\mathrm{Var}[W|\nu] = \nu^2 D^2 \,\mathrm{Var}[\Lambda] = \nu D^2 \left(\mathbb{E}[\mathrm{Var}[\Lambda|\theta]] + \mathrm{Var}[\mathbb{E}[\Lambda|\theta]]\right),$$

respectively. Hence,

$$\mathbb{E}[W] = \mathbb{E}[\mathbb{E}[W|\nu]] = P - C + (1 - \mathbb{E}[\mathbb{E}[\Lambda|\theta]])\pi D,$$

and

$$\mathrm{Var}[W] = \mathbb{E}\left[\mathrm{Var}[W|v]\right] + \mathrm{Var}\left[\mathbb{E}[W|v]\right] =$$
$$\pi D^2 \left(\mathbb{E}[\mathrm{Var}\left[\Lambda|\theta\right]] + \mathrm{Var}[\mathbb{E}\left[\Lambda|\theta\right]]\right) + \pi(1-\pi)D^2(1-\mathbb{E}[\mathbb{E}\left[\Lambda|\theta\right]])^2.$$

We can follow the same steps as in Section 2.2 to derive the demand and supply constraints. Using the two constraints, it follows that there exists an input price that leads to production if and only if

$$R - C \geq \gamma D^2 \left(\pi \left(\mathbb{E}[\mathrm{Var}\left[\Lambda|\theta\right]] + \mathrm{Var}[\mathbb{E}\left[\Lambda|\theta\right]]\right) + \pi(1-\pi)(1-\mathbb{E}[\mathbb{E}\left[\Lambda|\theta\right]])^2\right),$$

which completes the proof. ■