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Abstract

Recent empirical research suggests that country-level and firm-level governance institutions are substitutes with respect to their effect on firm value. In this paper we demonstrate that these institutions may become complements once we look at the decline in firm's value during a crisis. Specifically, we find that the decline in companies' valuation during the financial crisis of 2007-2009 was more sensitive to firm-level transparency in countries with stronger investor protection. We propose a theoretical model that reconciles our findings with the results in the literature. In our model, during "normal times" strong firm-level governance is crucial to attract outside financing in countries with weak investor protection, but is less important in countries with good investor protection. During the crisis, however, corporate governance becomes important even in regimes with strong investor protection, and, as a result, *relative* importance of firm-level governance increases in countries with good investor protection.

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1 Introduction

The global economic crisis of 2007-2009 led to substantial decrease in stock prices around the world. The magnitude of this fall, however, was different across countries and firms. Recent studies show that in normal times firm-level governance and country-level investor protection are substitutes in terms of their effect on firms' market values (Durnev and Kim, 2005; Klapper and Love, 2004; Bruno and Claessens, 2010).[1] That is, firm-level corporate governance has a stronger impact on firm value in weaker legal regimes. In contrast to these studies, we focus on the role of interaction between country-level and firm-level governance institutions during an economic crisis. We provide evidence that these institutions are compements when we consider their effect on the decline in firm value during a crisis. Specifically, we find that the drop in firm value during the financial crisis of 2007-2009 was significantly more sensitive to firm-level transparency in countries with better investor protection.

We offer a theoretical model to explain why this might happen. The basic idea of the model is that a firm during the crisis loses value for two reasons: a lower NPV of its projects (direct reason) and a loss of access to outside financing due to agency problems (indirect reason). The extent of the agency problem in equilibrium depends on both country-level institutions and firm-level corporate governance. If the agency problem is severe enough, only projects with a sufficiently large NPV can be financed with outside funds.

In normal times, strong country-level institutions are enough to limit the agency problem and ensure that all firms can raise outside financing for all their projects with positive NPV. Therefore, firms' market valuations in good countries are not sensitive to

[1] Some papers, e.g., Doidge, Karolyi and Stulz (2007) and Aggarwal et al. (2010), argue that country-level institutions and firm-level governance theoretically might be complements, as firms located in weaker legal regimes find it optimal to practice lower quality corporate governance. This is not necessarily a contradiction. Corporate governance and legal institutions can be substitutes in terms of their effect on firms' market values and, at the same time, complements from the point of view of controlling shareholders, who often determine corporate governance practices in their firms. That can happen because a controlling shareholder is concerned not only with the value of his shares, but also with private benefits he can derive. Suppose, for example, that in weaker legal environment corporate governance has a stronger effect on firm value, but it also has a stronger effect on controlling shareholders' ability to divert value. Then, it may well be the case that precisely due to this effect, controlling shareholders in such regimes have stronger incentives not to adhere to good corporate governance norms in order to be able to expropriate minority shareholders.

corporate governance. In countries with poor investor protection, however, the agency problem is more severe, and the ability to attract outside financing (consequently, the set of projects that receive funding) depends strongly on a firm's corporate governance quality. Thus, in agreement with the previous empirical literature, firms' market values are sensitive to corporate governance in weak legal regimes.

A sudden crisis makes the prospects of all firms worse, which exacerbates the agency problem, so that after the crisis firms with weak corporate governance start having problems with outside financing even in countries with strong institutions. Only the combination of good firm-level governance and strong country-level institutions proves to be enough to ensure that the cost of stealing is so high that even in bad times insiders are able to guarantee an adequate rate of return to outside investors, which allows firms to continue raising funds for all their positive NPV projects. As a result, after a crisis firm value becomes sensitive to corporate governance in countries with strong institutions, just as it was in countries with weak institutions beforethe crisis.

In countries with weak institutions, crisis affects the access to outside funds for all firms regardless of the quality of their corporate govenance and investors remain as sensitive to firm-level transparency as before the crisis. Hence, crisis does not change the way corporate governance affects firm value in such countries. Thus, the model predicts a greater sensitivity of the percentage drop in firms' market valuations to firm-level governance in countries with a higher quality of institutions.

Empirically, we test the model's predictions using the data on the quality of corporate governance as measured by the S&P transparency scores and stock prices of 843 individual firms in 38 countries during 2007-2009 financial crisis. We look at the percentage change in valuation of individual companies and estimate how the influence of firm-level quality of corporate governance depends of the quality of institutions at the country level. We use a number of measures of institutional quality at the country level, and our results prove to be consistent across different measures. To deal with unobserved heterogeneity, we control for country and industry fixed effects. Since a financial crisis comes as a large unexpected shock, we argue that the firms do not have enough time to adapt to the new circumstances and are stuck with corporate governance practices that were chosen before the crisis. Thus, to the extent that the crisis is an unexpected event, our estimates are not biased due to reverse causality.

Our main contribution is to show that during the crisis firm-level transparency had

a stronger effect on the stock price decline in countries with more developed institutions protecting investors. This result is novel, as the previous works have not considered the interaction between country-level and firm-level governance institutions during a crisis. It suggests that the role of firm-level corporate governance in the performance of firms during a crisis depends on the quality of country-level institutions, and this effect is more pronounced in countries with better investor protection.

We also find that in line with the findings of Johnson et al. (2000) and Mitton (2002) for the East Asian crisis of 1997-1998 both firm-level transparency and the quality of investor protection positively affected stock price performance during the recent crisis. Thus, our results indicate that the relationship between firm value and governance institutions is general and not specific to a particular crisis (e.g. Asian crisis).

Starting from the seminal work by Gompers et al (2003), there is extensive literature that shows that corporate governance practices of firms affect their performance both in US (e.g., Bebchuk and Cohen, 2005; Bebchuk, Cohen, and Ferrell, 2009) and elsewhere (e.g., Black, Love, and Rachinsky, 2006; Black, Jang, and Kim, 2006; Black and Khanna, 2007; Durnev and Kim, 2005; Klapper and Love, 2004; Aggarwal et al., 2010; Bruno and Claessens, 2010; Chhaochharia and Laeven, 2009).[2] It has been also shown that better country-level institutions result in higher valuation of companies (La Porta et al., 2002; Klapper and Love, 2004).[3]

Our paper is more closely related to two subsets of this literature. First, a few studies have analyzed the interaction between country-level institutions and firm-level corporate practices in non-crisis environment. Durnev and Kim (2005) and Klapper and Love (2004) show that a positive relationship between corporate governance and firm value is stronger in countries with weaker legal systems. Similar results are obtained in Bruno and Claessens (2010).

Second, there is a number of papers that address the role of corporate governance specifically during a crisis, but without studying the interaction between country-level institutions and firm-level corporate governance. Like our paper, most of these papers

[2]Love (2011) provides an extensive survey of this literature.

[3]At the same time, studies by Durnev and Kim (2005), Aggarwal et al. (2010), Chhaochharia and Laeven (2009) suggest that the relationship between country-level investor protection and firm value may become insignificant once individual firms' governance and other characteristics are controlled for. The study by Bruno and Claessens (2010) implies that a more stringent legal environment may even hurt firm value.

find that better corporate governance institutions at both firm-level and country-level are associated with better stock performance during a crisis. Johnson et al. (2000) show that during the the Asian crisis of 1997-1998 developing countries with better corporate governance experienced smaller depreciation of exchange rate and reduction of stock market index. Mitton (2002) provides empirical evidence that during the crisis East Asian firms with better disclosure quality showed better stock price performance. Baek et al. (2004) find a similar result specifically for Korean firms. Lemmon and Lins (2003) find that the cumulative stock returns of East Asian firms over the crisis period were substantially lower for firms in which managers had high levels of control rights, but had separated their control and cash flow ownership. Bae et al. (2012) study 2001-2002 Argentina crisis in addition to the 1997-1998 Asian crisis. In contrast to earlier studies, the authors examine not only the downfall but also the recovery of stock prices. For both Asian and Latin American samples, they find that firms with weaker corporate governance experienced a larger drop in their share values during the crisis and larger rebound during the recovery period.

Two recent studies challenge the view that poor corporate governance contributes to the stock price downfall during a crisis. In contrast to the previous works, they look at the recent, 2007-2008, crisis. Erkens et al. (2012) analyze the performance of financial institutions during the crisis. In contrast to other studies, they find that firms with more independent boards and greater institutional ownership experienced worse stock performance during the crisis. Their further exploration suggests an explanation for these findings: institutional shareholders encouraged more risk-taking prior to the crisis, while independent boards pressured managers to raise equity capital during the crisis, which resulted in a wealth transfer from the existing shareholders to debt holders.[4] The authors do not find any significant relation between firm performance and country-level institutions. Beltratti and Stulz (2012) document that during the 2007-2008 crisis banks with more shareholder-friendly boards performed worse. The authors argue that this result may be due to the fact that policies that more shareholder-friendly boards encouraged before the crisis increased shareholder returns then, but led to unexpectedly large losses during the crisis. Consistent with this explanation, the paper finds a negative correlation between the stock returns of banks prior to the crisis and their stock returns during the crisis.

[4]At the same time the paper finds that equity raisings helped firms survive during the crisis.

In contrast to these studies, we focus on the interaction between firm-level and country-level institutions. In addition, our results differ from these papers in two important respects. First, we look at the performance of non-financial firms. This is an important difference, as the nature of non-financial assets is very different from that of financial institutions, and hence, the effect of the crisis for the two types of firms could be very different. Second, our corporate governance variable is transparency, while the two mentioned papers focused on board characteristics and ownership structure.

The paper is structured as follows. Section 2 provides a simple theoretical model. Section 3 describes the data, section 4 presents empirical results, and section 5 concludes.

2 Model

2.1 Setup

Consider an entrepreneur (E) running a firm with no assets in place.[5] E owns share α in the firm, while the rest belongs to outside shareholders. The firm has no cash and, hence, needs to resort to outside financing in order to invest. We assume that the firm raises funds by selling equity[6]. The firm has transparency[7] level t, which is exogenous[8] and is independent of other parameters of the model[9]. Information is symmetric, the financial market is perfectly competitive, and there is no discounting in the model. All

[5]The assumption about no assets is made for the sake of simplicity. Crisis in our model only reduces the profitability of new investment opportunities. With assets in place, it would be natural to assume that their value also goes down. That would complicate the derivations but would not change the qualitative results of the model.

[6]This is not a crucial assumption and is made for simplicity. Essentially, we just need that firms with a higher agency problem (i.e., a lower cost of diverting profits for E) encounter a greater difficulty in raising outside funds.

[7]For brevity, and in order to be consistent with the empirical part, we use term transparency, although t in our model can be more generally interpreted as the quality of corporate governance in a firm.

[8]We believe that it is impossible to change the quality of corporate governance overnight. For example, a quick look at the largest Russian firms, for which transparency scores are available for crisis years 2008-2010, reveals almost no significant changes in transparency over the three years.

[9]Independence of transparency of other parameters is a stronger assumption than its exogeneity during a crisis. It was shown in the previous literature that firm-level corporate governance is affected by the need for outside finance, investment opportunities, ownership structure as well as country-level institutions. However, these and other parameters, of course, do not fully explain variation in transparency across companies. Our model, thus, should be best viewed as a model explaining the effects of exogenous variation in transparency for given values of other parameters.

agents are risk-neutral.

The firm has an investment opportunity that requires fixed investment I and yields return R. The value of I is random and distributed uniformly on $[0, 1]$. E can steal any fraction x of R, but there is a cost of stealing that equals $(k+t)xR$, where k is the quality of shareholder protection in the country.[10] The timing is as follows.

$\tau = 0$. An unexpected crisis occurs. The effect of a crisis is a sudden drop of the return from R to δR, where $\delta < 1$.

$\tau = 1$. The value of I is realized. E tries to raise outside funds by selling β shares. The existing shares are normalized to 1, so that if he sells β, the total amount of shares becomes $1 + \beta$.

$\tau = 2$. If E succeeds to raise financing, he undertakes his stealing decision.

$\tau = 3$. The payoffs are realized. If no funds were raised, E obtains 0 utility.

We are interested in the drop in the company's value at $\tau = 0$. For simplicity, we assume that a crisis is totally unexpected, i.e. that the pre-crisis market valuation of the firm presumes a zero likelihood of a crisis.[11]

Assumption 1. $R > 1$, that is, all projects have a strictly positive NPV before the crisis.

This assumption is crucial for our model to deliver a difference in the effect of transparency on the decrease in the firm's value among countries with different levels of shareholder protection. Essentially, due to this assumption, transparent firms in countries with good institutions will lose relatively little value in crisis, because they will "lose" a lower share of projects compared to other firms. We think that Assumption 1 is quite plausible for the pre-crisis "rosy times": most investors perceive firms' prospects

At the same time, our model can be extended to allow for the firm's investment opportunities and country level shareholder protection to positively affect transparency without changing our qualitative results.

[10] Our results do not rely on the assumption of additivity between transparency and shareholder protection in the cost-of-stealing function. In particular, in order to obtain just our main results, any $f(k, t)$ continuous and increasing in both arguments would suffice. If, in addition, we want that, consistently with the previous empirical literature, our model produces a stronger sensitivity of a firm's value to its corporate governance in countries with weaker legal regimes in " normal" times, we additionally need that $f_1(k, t)f_2(k, t) + f_{12}(k, t)(f(k, t) - 1) > 0$. This condition is not very restrictive. In particular, $k + t$ always satisfies it, and kt satisfies it for $kt > 1/2$.

[11] Incorporating a positive perceived probability of a crisis would result in a smaller stock price reaction to a crisis for all firms and would not qualitatively change our results.

as being very good, meaning a very low likelihood (zero in our setup) of negative NPV projects.

In Subsection 3.3 we discuss the role of Assumption 1 in detail and argue that this assumption can be dropped, and R can be allowed to belong to the support of the distribution of I, under some plausible assumptions on the distribution function of I. In such a modified model our qualitative results would not change, while the algebra would become much more cumbersome.

2.2 Transparency and value in normal times

Consider the firm's value before a crisis under the assumption that a crisis is unexpected, i.e. the probability of the crisis is zero. If no crisis happens, at $\tau = 2$ the objective function of E is

$$U \equiv \frac{\alpha}{1+\beta}(1-x)R + xR - (k+t)xR \tag{1}$$

The solution of this problem depends on the value of $k+t$:

$$\begin{cases} x = 1 \ if \ k+t < 1 - \dfrac{\alpha}{1+\beta} \\ x = 0 \ if \ k+t \geq 1 - \dfrac{\alpha}{1+\beta} \end{cases} \tag{2}$$

The latter inequality is E's incentive compatibility constraint

$$k + t \geq 1 - \frac{\alpha}{1+\beta} \tag{IC}$$

The investors' participation constraint is

$$\frac{\beta}{1+\beta}(1-x)R \geq I \tag{P}$$

Clearly, the investors will not provide funds unless (IC) holds. Thus, financing will occur iff there exists such $\beta \in [0,1]$ that both (IC) and (P) are satisfied. Hence, the condition for financing is:

$$\begin{cases} for \ k+t < 1-\alpha, \ financing \ never \ occurs \\ for \ k+t \in [1-\alpha, 1), \ financing \ occurs \ whenever \ I \leq \widehat{I} \equiv \dfrac{k+t+\alpha-1}{\alpha} R < R \\ for \ k+t \geq 1, \ financing \ occurs \ whenever \ I \leq R \end{cases} \tag{3}$$

Thus, when the cost of stealing is sufficiently low ($k+t < 1$), not all positive NPV projects receive funding. The greater $k+t$ is, the more difficult it is to steal, and more projects get financed.

Since capital markets are perfectly competitive, the value of the firm after the realization of I but before financing is the NPV of the project whenever the project is financed, i.e., $R - I$. (Equivalently, it is the fraction of the return that accrues to the existing shareholders, i.e., $\frac{1}{1+\beta}R$. Given that (P) is binding, it equals exactly $R - I$). Since not all projects are financed, the firm's value before the realization of I is

$$V = \begin{cases} 0, \ when \ k + t < 1 - \alpha \\ \int_0^{\min\{1,\widehat{I}\}} (R - I)dI, \ when \ k + t \in [1 - \alpha, 1) \\ \int_0^{\min\{1,R\}} (R - I)dI, \ when \ k + t \geq 1 \end{cases} \tag{4}$$

We do not analyze the case of $k + t < 1 - \alpha$ as it is not particularly interesting and empirically plausible. [12]

So, we make the following assumption.

Assumption 2. $k + t \geq 1 - \alpha$.

Given that $R > 1$ due to Assumption 1, it is easy to derive from (4) that before the crisis the value of the company V_b is

$$V_b = \begin{cases} \left[\frac{k+t+\alpha-1}{\alpha} - \frac{1}{2}\left(\frac{k+t+\alpha-1}{\alpha}\right)^2 \right] R^2, \ when \ k + t \in [1 - \alpha, 1 - \alpha + \frac{\alpha}{R}) \\ R - \frac{1}{2}, \ when \ k + t \geq 1 - \alpha + \frac{\alpha}{R} \end{cases} \tag{5}$$

The intuition behind this expression is as follows. For a sufficiently small cost of stealing (below $1 - \alpha + \frac{\alpha}{R}$), the set of projects being financed is $[0, \widehat{I}]$, with $\widehat{I} < 1$. That

[12] First of all, this case does not provide any implications for the change in the firm's value during the crisis. Secondly, firms with zero value do not exist in the market, and, therefore, analyzing them is irrelevant from the empirical viewpoint. (If we introduced assets in place in the model, firms with $k+t < 1-\alpha$ would still have a zero value, because entrepreneurs in such firms would not only fail to raise outside funds but also steal all value generated by the assets,provided that the cost of stealing cash flows is the same regardless of whether they are generated by the assets in place or by new projects). Also, $k + t < 1 - \alpha$ essentially implies that the firm simultaneously is from a too bad country, has too poor corporate governance, and has too low ownership concentration. It is rather implausible to observe such firms publicly traded, while our paper as well as other literature on the relationship between corporate governance and firm value study listed corporations.

is, not all projects are financed due to the agency problem, and the higher the cost of stealing is, the more projects receive funding, and the greater the firm's value is. This is why in this zone V_b is sensitive to both t and k. As the cost of stealing becomes large enough (above $1-\alpha+\frac{\alpha}{R}$), all projects are financed, and the firm's value is not sensitive to the cost of stealing anymore.

Before we proceed to the effects of a crisis, let us show that our model is consistent with the previous literature (Durnev and Kim (2005), Klapper and Love (2004)) which argues that the value of the company is positively related to corporate governance, and that this effect is stronger in weaker legal regimes.

Proposition 1 *The value of the company before a crisis V_b is positively (weakly) related to t, and this relationship is weakly stronger for lower k.*

Proof. For $t \in [1-\alpha-k, 1-\alpha+\frac{\alpha}{R}-k)$, $\frac{dV_b}{dt} = \frac{R^2}{\alpha^2}(1-k-t) > 0$. V_b grows until it reaches $R-\frac{1}{2}$ at $t = 1-\alpha+\frac{\alpha}{R}-k$, and for $t \geq 1-\alpha+\frac{\alpha}{R}-k$ it remains constant.

For $t \in [1-\alpha-k, 1-\alpha+\frac{\alpha}{R}-k)$, $\frac{dV_b}{dtdk} = -\frac{R^2}{\alpha^2} < 0$. For $t > 1-\alpha+\frac{\alpha}{R}-k$, $\frac{dV_b}{dtdk} = 0$. At $t = 1-\alpha+\frac{\alpha}{R}-k$, an increase in k makes $\frac{dV_b}{dt} = 0$, and a decrease in k makes $\frac{dV_b}{dt}$ strictly positive. ■

Figure 1, line V_b, provides a graphical illustration of Proposition 1. V_b is an increasing, concave function of the cost of stealing. Hence, for given t, if we increase k the curve becomes flatter, that is, the sensitivity of firm value to transparency declines.

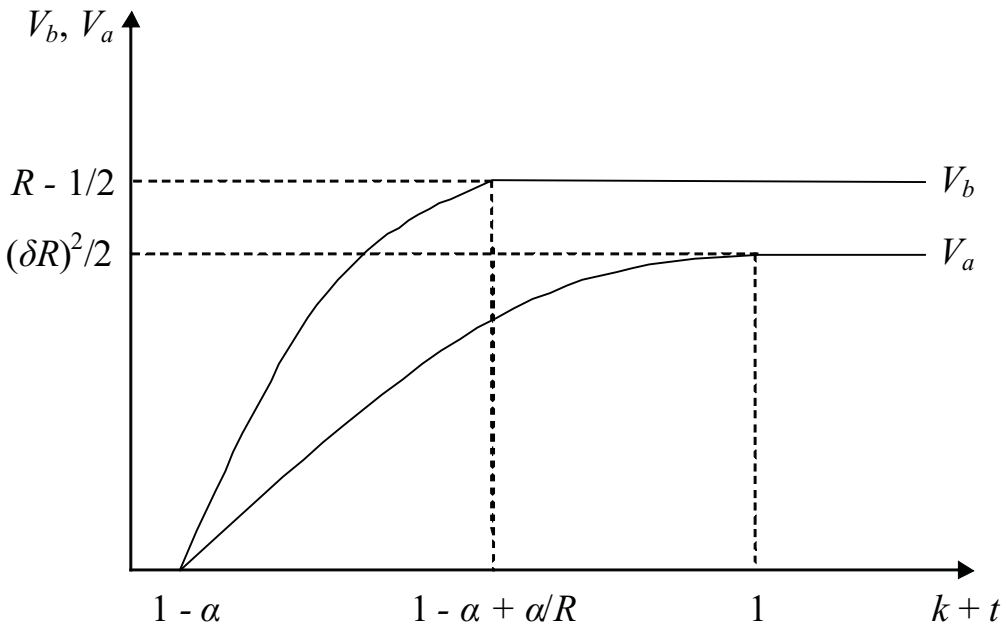

Figure 1. Firm value before and after crisis.

2.3 Effects of a crisis

Now, consider the effects of a crisis. The return from any investment drops from R to δR, $\delta < 1$. Cases $\delta R > 1$ and $\delta R < 1$ yield the same qualitative results with the same intuition, so, for the sake of brevity, we only present the case when $\delta R < 1$.

Assumption 3. $\delta R < 1$.

This assumption implies that the crisis makes the projects with a small positive NPV (that is, requiring a too big investment outlay) become negative NPV projects. These projects will not be financed after a crisis regardless of the degree of the agency problem. In order to determine the value of the firm after a crisis, V_a, we can use formula (4) replacing R with δR (note that formula (4) is valid for any value of the return). This yields

$$V_a = \begin{cases} \left[\dfrac{k+t+\alpha-1}{\alpha} - \dfrac{1}{2}\left(\dfrac{k+t+\alpha-1}{\alpha}\right)^2\right](\delta R)^2, \ when\ k+t \in [1-\alpha, 1) \\ \dfrac{(\delta R)^2}{2}, \ when\ k+t \geq 1 \end{cases} \tag{6}$$

The second line in this expression looks different from the corresponding line in formula (5) because now the set of projects receiving funding is limited by $\delta R < 1$. Otherwise, the intuition for formula (6) is the same as for (5).

However, there is an important difference between the two expressions, which will be crucial for our subsequent results. For $k+t \in [1-\alpha+\frac{\alpha}{R}, 1)$, a crisis changes the value of the firm from being insensitive to the cost of stealing to being sensitive to it. This is due to the fact that a crisis exacerbates the agency problem so that the set of projects that receive financing becomes sensitive to $k+t$. For $k+t \geq 1-\alpha+\frac{\alpha}{R}$, all projects were financed before a crisis, because $\widehat{I} \equiv \frac{k+t+\alpha-1}{\alpha}R$ was greater than 1. After a crisis, threshold $\widehat{I}$ turns into $\delta\widehat{I} \equiv \frac{k+t+\alpha-1}{\alpha}\delta R$, which is less than δR for $k+t<1$. Thus, for $k+t \in [1-\alpha+\frac{\alpha}{R}, 1)$ only projects with $I \in [0,\ \delta\widehat{I})$ receive funding after a crisis, and the upper bound of this segment is sensitive to the cost of stealing.

We are interested in the percentage drop in the firm's value due to a crisis, or, equivalently, in the ratio V_a/V_b:

$$\frac{V_a}{V_b} = \begin{cases} \delta^2, \ when\ k+t \in \left[1-\alpha, 1-\alpha+\frac{\alpha}{R}\right) \\ \dfrac{\left[\frac{k+t+\alpha-1}{\alpha} - \frac{1}{2}\left(\frac{k+t+\alpha-1}{\alpha}\right)^2\right](\delta R)^2}{R-\frac{1}{2}}, \ when\ k+t \in \left[1-\alpha+\frac{\alpha}{R}, 1\right) \\ \dfrac{\frac{(\delta R)^2}{2}}{R-\frac{1}{2}}, \ when\ k+t \geq 1 \end{cases} \tag{7}$$

In the first zone, the firm's value is sensitive to the cost of stealing both before and after a crisis, so that the ratio of the values becomes totally insensitive to either k or t. In the second zone, the firm's value turns from insensitive into sensitive. Finally, in the third zone, the firm's value remains insensitive to the cost of stealing after the crisis. Figure 2 provides a graphical illustration of expression (7).

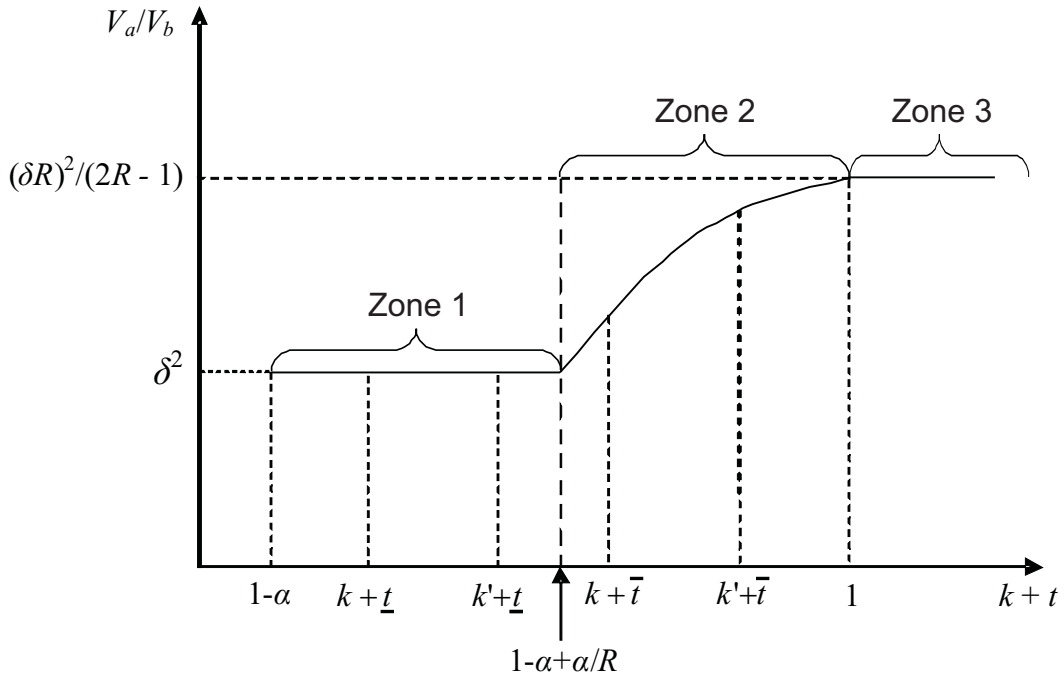

Figure 2. The drop in the firm's value as a function of the cost of stealing.

It can be easily shown that the ratio in the second zone is higher than that the ratio in the first zone, and the ratio in the third zone is higher that in the second zone. Notice also, that within the second zone the ratio is higher the higher $k+t$ is. Hence, we obtain that the percentage drop in the company's value is higher when $k+t$ is lower. Thus, we have the following proposition.

Proposition 2 *The percentage drop in the company's value is (weakly) greater when: (1) for a given quality of legal institutions, the company is less transparent; (2) for a given level of transparency in the company, the quality of legal institutions is poorer.*

The intuition is as follows. There are two effects of a crisis on the firm's value. The direct effect in the drop in the return from R to δR. The second, indirect, effect is the reduction in the set of projects that receive financing. For a very high cost of stealing (zone 3, $k+t \geq 1$), the agency problem is negligible, so all projects with positive NPV are financed, and the set of financed projects is reduced exactly by the subset of projects whose NPV becomes negative. The set of projects the firm "loses" is $(\delta R, 1] \subset (\delta R, R]$, that is the firm loses *less* than share $1-\delta$ of projects.

For an intermediate cost of stealing (zone 2, $k+t \in \left[1-\alpha+\frac{\alpha}{R}, 1\right)$), due to the agency problem, the firm additionally loses some projects that continue to have a positive NPV, as the firm loses all projects $(\delta\widehat{I}, 1]$, and $\delta\widehat{I} < \delta R$ in this zone. Since $\delta\widehat{I} < \delta R$, the share of projects lost is *higher* than that in zone 3. Therefore, the value drop is larger in this zone. Since $\delta\widehat{I}$ falls as $k+t$ goes down, the reduction in the set of projects increases, and the value drop increases, with a decrease in $k+t$. Notice, however, that the share of projects the firm loses in the second zone is still *lower* than $1-\delta$, because $(\delta\widehat{I}, 1] \subset (\delta\widehat{I}, \widehat{I}]$.

Finally, when the cost of stealing is too low (zone 1, $k+t \in \left[1-\alpha, 1-\alpha+\frac{\alpha}{R}\right)$), the firm loses projects $(\delta\widehat{I}, \widehat{I}]$, that is, exactly share $1-\delta$ of projects. Hence, the percentage drop in the firm's value is highest in this zone.

Proposition 2 is in line with the findings obtained by Johnson et al. (2000) and Mitton (2002) for the East Asian crisis of 1997-98, suggesting that both strong corporate governance and solid country-level legal institutions positively affect stock price performance during a crisis.

Let us finally consider how the effect of transparency on the percentage change in the company's value is affected by the legal environment. Suppose t is distributed on $[\underline{t}, \overline{t}]$ such that $k+\underline{t} < 1-\alpha+\frac{\alpha}{R}$ and $k+\overline{t} < 1$, as depicted in Figure 2. An increase from k to k' shifts the whole range $[k+\underline{t},\ k+\overline{t}]$ to the right (the new segment is $[k'+\underline{t},\ k'+\overline{t}]$), that is, from the zone where the ratio V_a/V_b is mostly insensitive to transparency to the zone where it is mostly sensitive to transparency. Hence, if the change is as depicted in Figure 2, an increase in the quality of institutions results in the greater sensitivity of the percentage drop in the firm's value to its transparency. The difference between low and high k becomes especially pronounced when $[k+\underline{t},\ k+\overline{t}]$ is entirely inside $\left[1-\alpha, 1-\alpha+\frac{\alpha}{R}\right)$ and $[k'+\underline{t},\ k'+\overline{t}]$ is entirely inside $\left[1-\alpha+\frac{\alpha}{R}, 1\right)$.

In general, however, the comparison of sensitivity is not that clear-cut. If we move *within* the second zone to the right and then to the third zone sensitivity falls. Therefore, if $k+\underline{t} \geq 1-\alpha+\frac{\alpha}{R}$, an increase in k will unambiguously lead to a lower sensitivity of the value ratio to transparency.

Moreover, even if $k+\underline{t} < 1-\alpha+\frac{\alpha}{R}$ (and $k+\overline{t} < 1$), an increase in k, while expanding the segment where V_a/V_b is sensitive to t, reduces the "average" sensitivity on *this* segment, because the value ratio is a concave function in the second zone. Intuitively, however, the"average" sensitivity on the *whole* set of t increases, provided that $k'+\overline{t} < 1$: essentially, we obtain a new segment on the right with $\frac{d(V_a/V_b)}{dt} > 0$ with the length

equal to the reduction of the segment with $\frac{d(V_a/V_b)}{dt} = 0$. In order to formalize this reasoning, let us introduce the following definition.

Definition 1 *We will say that the value ratio V_a/V_b is more sensitive (positively) to transparency for k' than for k if there exists a bijection $f(s)$ from $[k + \underline{t},\ k + \overline{t}]$ to $[k' + \underline{t},\ k' + \overline{t}]$, with $s \in [k + \underline{t},\ k + \overline{t}]$ and $f(s) \in [k' + \underline{t},\ k' + \overline{t}]$, such that $\frac{d(V_a/V_b)}{dt}$ at $f(s)$ is weakly greater than $\frac{d(V_a/V_b)}{dt}$ at s for any s and **strictly** greater at least for some s.*

Informally speaking, the definition requires that by "reshuffling" points in $[k'+\underline{t},\ k'+\overline{t}]$ we are able to achieve that $\frac{d(V_a/V_b)}{dt}$ is uniformly weakly greater on $[k' + \underline{t},\ k' + \overline{t}]$ than on $[k + \underline{t},\ k + \overline{t}]$ and strictly greater at least at one point. Though the requirement in our definition is weaker than the requirement of a (weakly) uniform (i.e., for all t) increase of $\frac{d(V_a/V_b)}{dt}$ when raising k from k to k', it makes sense if we speak about "average" sensitivity. If t is distributed uniformly, then, if the condition of the definition is satisfied, the expected sensitivity of the value ratio on $[k' + \underline{t},\ k' + \overline{t}]$ is higher than on $[k + \underline{t},\ k + \overline{t}]$. In fact, the condition of our definition imply more than just greater average sensitivity, because greater average sensitivity can be achieved even without this condition if $\frac{d(V_a/V_b)}{dt}$ becomes high enough on just some subset of $[k' + \underline{t},\ k' + \overline{t}]$.

Figure 3 illustrates the definition. The graph on the right represents an increase from k to k'. Segments $[k + \underline{t},\ k + \overline{t}]$ and $[k' + \underline{t},\ k' + \overline{t}]$ are each split in two subsegments in such a way that subsegment ω_2' is exactly the same as ω_2, while subsegments ω_1 than on ω_1' have the same length (i.e., ω_1 is essentially moved in front of ω_2 to become ω_1'). The correspondence $f(s)$ here is as follows: for all s from ω_2 $f(s) = s$, and for all s from ω_1 $f(s) = s + \overline{t} - \underline{t}$, where l is the length of ω_2. In subsegment ω_2' function V_a/V_b and, hence, $\frac{d(V_a/V_b)}{dt}$ are exactly the same as in ω_2 by construction, but $\frac{d(V_a/V_b)}{dt}$ is "uniformly" strictly greater on ω_1' than on ω_1. Thus, according to Definition 1, V_a/V_b is more sensitive on $[k' + \underline{t},\ k' + \overline{t}]$ than on $[k + \underline{t},\ k + \overline{t}]$.

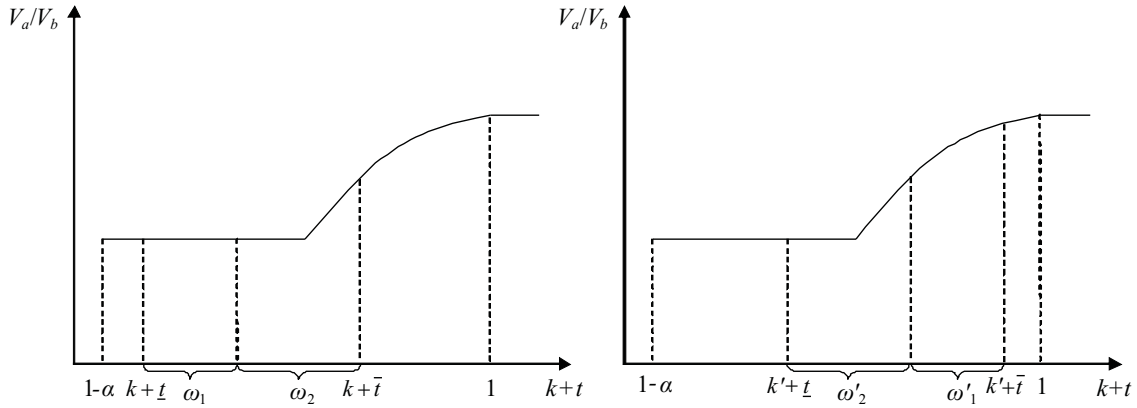

Figure 3. Quality of institutions and sensitivity of the value drop to transparency.

The above analysis leads to the following key proposition.

Proposition 3 *Suppose* $k+\underline{t} < 1-\alpha+\dfrac{\alpha}{R}$ *and* $k'+\bar{t} \in \left(1-\alpha+\dfrac{\alpha}{R}, 1\right]$, *with* $k' > k$. *Then* V_a/V_b *is more sensitive to transparency on* $[k'+\underline{t},\ k'+\bar{t}]$ *than on* $[k+\underline{t},\ k+\bar{t}]$. *Moreover, if* $k+\bar{t} < 1-\alpha+\dfrac{\alpha}{R}$ *and* $k'+\bar{t} > 1-\alpha+\dfrac{\alpha}{R}$, *then* V_a/V_b *is weakly more sensitive to transparency on* $[k'+\underline{t},\ k'+\bar{t}]$ *than on* $[k+\underline{t},\ k+\bar{t}]$ *for* ***any*** t *and strictly more sensitive for some* t.

The second part of the proposition formulates the obvious conditions under which the value ratio becomes more sensitive to transparency not just in the sense of our definition, but uniformly. This proposition rationalizes our empirical finding that the percentage drop in firms' values in response to the recent crisis was more sensitive to transparency in stronger legal regimes. We will now discuss it in more detail.

2.4 Discussion of sensitivity of the value drop to transparency

Let us summarize the analysis of sensitivity. If we start from $[k+\underline{t},\ k+\bar{t}]$ lying entirely inside $\left[1-\alpha, 1-\alpha+\dfrac{\alpha}{R}\right)$, raising k will not affect sensitivity of the percentage drop in value at the beginning, but as $k+\bar{t}$ reaches $1-\alpha+\dfrac{\alpha}{R}$, a further increase in k leads to greater sensitivity until either $k+\underline{t}$ reaches $1-\alpha+\dfrac{\alpha}{R}$ or $k+\bar{t}$ reaches 1. If the former happens first, increasing k further results in lower sensitivity of the value ratio to transparency. If the latter happens first, a further increase in k will initially not affect sensitivity (a decrease in the flat segment in the first zone will translate one-to-one into

an increase in the flat segment in the third zone), but as $k+\underline{t}$ reaches $1-\alpha+\frac{\alpha}{R}$, sensitivity will fall.

Thus, for very large k, a further increase in k does not lead to a greater sensitivity of V_a/V_b to transparency. Our goal, however, is not to prove that an improvement in the legal environment *always* leads to a higher sensitivity of the value drop to transparency; we just want to show that such relationship is *possible* and provide a plausible explanation for that.

Essentially, what drives the result of Proposition 3 is the fact that, following a crisis, the firm's value becomes sensitive to transparency even in countries with good institutions. This, in turn, is driven by the fact that more transparent firms in good countries lose a lower proportion of projects, and, hence, the percentage drop in their value is smaller. As we have explained in the discussion after Proposition 2, a firm for which $k+t \geq 1-\alpha+\frac{\alpha}{R}$ loses either $(\delta\widehat{I},1]$ (for $k+t<1$) or $(\delta R,1]$ (for $k+t>1$). Thus, unless $k+t$ is too large (so that $k+t>1$), the percentage reduction in the set of projects is sensitive to transparency, as $\widehat{I}$ depends on t.

Assumption 1 is crucial to ensure the existence of a zone where the drop in the firm's value is sensitive to the cost of stealing, i.e., it is crucial for our results of both Proposition 2 and Proposition 3. It can be shown that, if $R \leq 1$, $V_1/V_0 = \delta^2$ regardless of the value of $k+t$. However, as we have earlier mentioned our results can still be generated in a setup where R is allowed to belong to the support of the distribution of I, if we make certain (plausible) assumptions on the distribution function of I. In particular, it is sufficient that the distribution of I satisfies the following properties:

1. it is twice-differentiable everywhere in the interior on its support and single-modal;
2. the mode I_m is strictly inside the distribution support;
3. $R > I_m$.

A normal distribution (truncated at zero), for example, fits these requirements, provided that $R > I_m$. Our argument is illustrated in Figure 4. Suppose that in a good country $\widehat{I} < R$ for all t (equivalently, $k+\overline{t}<1$) and average $\widehat{I}$ (i.e., $\widehat{I}$ for average t) is rather far from the mode so that the slope of the density $f(\cdot)$ is rather steep. Suppose that in a bad country k is low enough that average $\widehat{I}$ is close to the mode. The share of the projects that a firm loses is $\frac{F(\widehat{I})-F(\delta\widehat{I})}{F(\widehat{I})} = 1-\frac{F(\delta\widehat{I})}{F(\widehat{I})}$, where $F(\cdot)$ is the cumulative distribution function of I.

Notice that if $F(\cdot)$ were a uniform distribution, as in our basic model, the share of the projects lost would be independent of $\widehat{I}$ regardless of k (provided that $\widehat{I} < R$). When the density function is as depicted in Figure 4, all firms in a bad country lose approximately the same percentage of projects, because the density function is "on average" almost flat close to the mode (that is, we have a situation similar to the one in our basic model with a uniform distribution). In other words, $F(\cdot)$ is close to linear, and $\dfrac{F(\delta\widehat{I})}{F(\widehat{I})}$ is not very sensitive to $\widehat{I}$. Hence, a percentage drop in the value is similar for all firms in a bad country. In contrast, in a good country, the density function is very responsive to changes in $\widehat{I}$. Therefore, the share of the projects a firm loses decreases with $\widehat{I}$, and, hence, more transparent firms experience a smaller percentage drop in their value.[13]

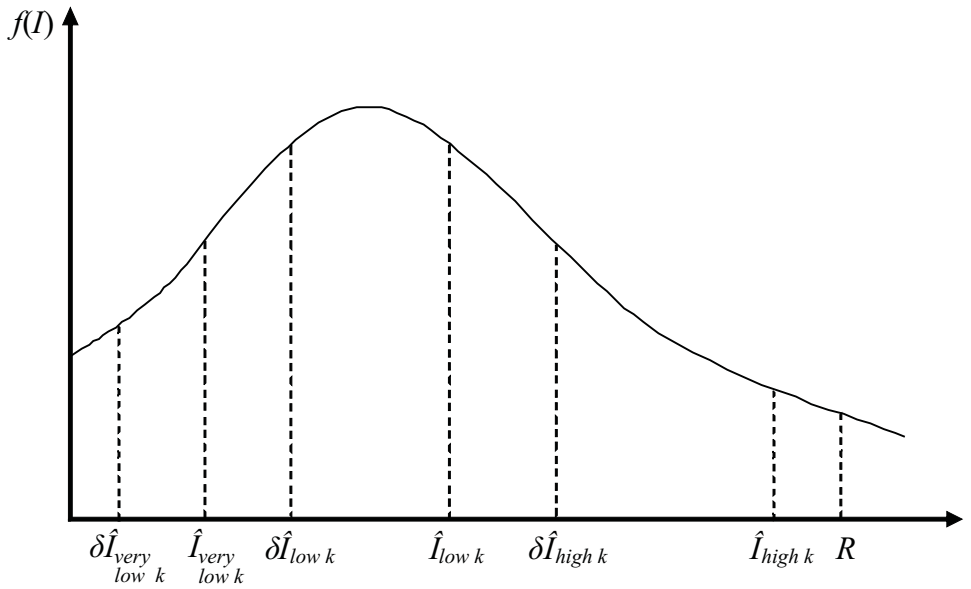

Figure 4. Loss of projects under alternative assumptions on the distribution of I.

In fact, a distribution of I like the one in Figure 4 could even produce a positive relationship between transparency and a percentage drop in the firm's value for a country with very weak institutions if in such a country average $\widehat{I}$ is sufficiently lower than I_m.

[13] If $\widehat{I} > R$ (equivalently, $k + t > 1$) for some firms in a good country, then these firms finance all positive NPV projects both in "normal" times and after a crisis ($\widehat{I} > R$ implies $\delta\widehat{I} > \delta R$). Therefore, for them the drop in the value will be $1 - \dfrac{F(\delta R)}{F(R)}$, which is independent of t. Thus, just as in the basic model, for a too high cost of stealing, the drop in the firm's value becomes insensitive to transparency.

Indeed, since lower transparency implies lower $\widehat{I}$, more transparent firms will lose a greater share of their projects than more transparent firms, because for $I < I_m$ the density function is increasing.[14]

2.5 Empirical hypothesis

Proposition 3 generates the main prediction which we are going to test in the empirical part. More specifically, we estimate the following regression:

$$\left(\frac{price\,in\,crisis}{price\,before\,crisis}\right)_{ic} = \beta_0 + \beta_1 transp_i + \beta_2 inst_c \times transp_i + \beta_3 controls_i + \phi_c + \upsilon_i \quad (8)$$

Here the dependent variable is percentage fall in price of firm i in country c, $transp_i$ is firm-level transparency, $inst_c$ is the quality of investor protection in country c, and ϕ_c is a country fixed effect. Proposition 3 corresponds to the hypothesis that β_2 is positive and significant.

Though it is not the focus of our analysis, we also check whether the results of Proposition 2 are supported by the data. The first part of Proposition 2 corresponds to the hypothesis that the aggregate effect of transparency, captured by $\beta_1 + \beta_2 inst$, is positive and significant. The second part of the proposition implies that the aggregate effect of legal institutions on the change in firm value is positive. To test this prediction we replace country fixed effects ϕ_c with $\beta_4 inst_c$ and test whether $\beta_4 + \beta_2 transp$ is positive and significant.

3 Data

Our sample consists of 843 firms from 38 countries and 60 industries. We include only those firms for which we could obtain Transparency & Disclosure (T&D) score measured by the Standard & Poor's agency and which are part of OSIRIS Industrial Database (i.e., we exclude financial companies). Summary statistics are presented in Table 1, and pairwise correlations between country-level variables are shown in Table 2.

[14] Note that empirically we obtain such a relationship for countries with a very low quality of institutions in our empirical estimations, but this effect turns out to be insignificant

3.1 Firm-level transparency

As a measure of firm-level transparency, we use Transparency & Disclosure (T&D) score measured by the Standard & Poor's agency. Standard & Poor's compiles the scores by examining firms' annual reports, regulatory filings and websites for disclosure of about 100 items[15] related to the ownership structure and investor rights, financial and operational information, board and management structure, process and remuneration. Scores for each of the items are added with certain weights and converted to a percentage score. In our final sample the score ranges from 5 to 89. For our study we use the latest available scores before June 2007, the beginning of the crisis in the market of sub-prime mortgages in the US.

3.2 Institutional variables

We use a number of measures of the quality of legal investor protection. First, we use two World Governance Indicators (WGI) measures of Kaufmann et al. (2008): government effectiveness and the rule of law. Both measures are based on expert estimates. Government effectiveness aims to assess the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Rule of Law assesses the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement and property rights. Both measures vary from -2.5 to +2.5 with higher value corresponding to better legal enforcement.

Second, we use two variables from the International Country Risk Guide (ICRG), specifically law and order and bureaucratic quality. The law and order index takes into account the strength and impartiality of the legal system and popular observance of the law. The index' values range from 0 to 6, the higher the better. The quality of the bureaucracy is a variable, ranging from 0 to 4, with higher scores given to countries where the bureaucracy has higher strength and expertise to govern without drastic changes in policy or interruptions in government services.

Third, we use La Porta et al (LLSV, 1998) index of anti-director rights as revised by Djankov et al (DLLS, 2008). The index is formed by adding one point for each regulation which protects minority shareholders, related to the following six areas: (1) vote by mail;

[15]The exact number of items slightly varies from country to country, reflecting country-specific disclosure practices and regulations.

(2) obstacles to the actual exercise of the right to vote (i.e., the requirement that shares be deposited before the shareholders' meeting); (3) minority representation on the board of directors through cumulative voting or proportional representation; (4) an oppressed minority mechanism to seek redress in case of expropriation; (5) preemptive rights to subscribe to new securities issued by the company; and (6) the right to call a special shareholder meeting. The range for the index is from 0 to 6.

We also use several measures of corruption. First, we use "control of corruption" variable from the World Bank's World Governance Indicators dataset compiled by Kaufman et al. (2008). This variable aggregates individual data sources underlying the aggregate indicators are drawn from a diverse variety of survey institutes, think tanks, non-governmental organizations, and international organizations. It measures perceptions of the extent to which public power is exercised for private gain and "capture" of the state by elites and private interests. The original index ranges from -2.5 to +2.5, with higher value corresponding to less corruption.

Second, we use the Corruption Perception Index compiled by Transparency International, an international non-governmental organization. Transparency International uses data from 13 sources, including surveys of business people and assessments by country analysts, originated from 11 independent institutions. All sources measure the overall extent of corruption (frequency and/or size of bribes) and provide a ranking of countries. Corruption Perception Index is computed as the average standardized value from different sources. The original index varies from 0 to 10, where higher value means less corruption.

Third, we also use ICRG Corruption index, which is a part of their Political Risk Index. It is an expert-based estimate of "corruption within a political system." It takes into account both financial corruption faced by business, i.e. the extortion of bribes, and political corruption, e.g. excessive patronage or secret party funding. The index ranges from 0 to 6, with higher values meaning less corruption.

For all the measures we use values for the last year available for each country before 2007.

3.3 Stock price

Our main dependent variable is the stock price at the lowest point during the financial crisis with value in June 2007 normalized at 100. We look for daily closing stock prices

of all companies in the sample and find its minimum value in 2007-2009. The starting date (June 2007) is chosen as the beginning of the crisis in the market of sub-prime mortgages in the US. We take the end of 2009 as the end of our time span, because the stock markets across the world started their recovery in early 2009. The source of data is Yahoo Finance.

3.4 Control variables

To avoid the omitted variable bias, we control for the variables which in the previous literature were found to affect the stock price decline during crisis. We use log(sales) to proxy for the firm's size and leverage to proxy for the firm's financial vulnerability. The source of the data is OSIRIS Industrial. We use industry fixed effects in all specifications, to account for potential industry-specific shocks; we also control for the firm's beta. To control for country's time invariant characteristics, depending on specification, we include either country fixed effects or such country-level variables as log(GDP) to proxy for the size of the economy and market capitalization to GDP to proxy for stock market development. These variables are from World Bank's World Development Indicators (WDI).

4 Empirical Results

4.1 Firm-level transparency and legal protection

To test our main hypothesis, we estimate equation (8) using different measures of legal investor protection as a proxy for country level institutions. Table 3 summarizes our findings. The results in columns 1-8 for WGI and ICRG measures suggest that the effect of transparency on firm's value during the crisis is indeed stronger in countries with better investor protection: in all specifications except one β_2 (the coefficient for the interaction term) is positive and significant at 5% level. This implies that in a country that is one standard deviation above the mean value of rule of law, one additional standard deviation in transparency leads to 6.0 percentage points smaller decline in firm value, while in a country one standard deviation below the mean value of rule of law, one additional standard deviation in transparency leads to 1.1 percentage points smaller decline in firm value.

The last row of Table 3 reports aggregate effects of transparency and disclosure,

computed at the mean value of institutional variables, along with the significance levels for the corresponding Wald test. In most specifications with country fixed effects the aggregate effect of transparency is positive and significant, with the only exception of a specification with anti-director rights as a measure of investor protection. The magnitudes of the effect are remarkably consistent across columns, ranging from 0.14 to 0.17, depending on specification. The sizes of coefficients imply that one standard deviation increase in transparency leads to 1.9-2.3 percentage points smaller decline in firm value during the crisis. These results are consistent with our Proposition 2 and are in line with the the findings of Mitton (2002) for the East Asian crisis of 1997-1998.[16]

Results in columns 9-10 show that the interaction effect between transparency and the LLSV anti-director rights measure is not statistically significant and neither is the aggregate effect of the LLSV variable. The lack of significance might be the evidence that the practice of investor protection is more important during the crisis, when formal rules become less important, whereas measures of corruption and law enforcement might be better able to capture the effect of pre-crisis institutional quality. We explore this possibility in the next subsection.

In addition, consistently with Proposition 2 and findings in Johnson et al (2000), stronger country-level institutions result in a lower decline in the stock price. The aggregate effect is substantial: one standard deviation change in the quality of institutions for a mean value of transparency leads to 7.3 percentage points increase in firm's value for government effectiveness, 7.8 percentage points increase for WGI rule of law, 7.2 percentage points increase for ICRG bureaucracy quality, and 3.5 percentage points decrease for ICRG law and order variable.[17]

4.2 Firm-level transparency and corruption

The reality of investor protection in a country might be very different from *de jure* quality of legal investor protection. Therefore, the measures of corruption,which reflects for the quality of legal enforcement,could be even more important for the effect of a crisis on firm value.

[16]Note that for some extreme values of institutional variables, far from media values in the sample, the effect of disclosure becomes insignificant and might even change its sign, but these occasional negative effects never become strong enough to be statistically significant for any country in the sample.

[17]These numbers are based on the coefficients in columns 1, 3, 5, and 7, i.e. on the specifications without country fixed effects.

Table 4 shows the results of estimation of equation (8) where different corruption variables are used as measures of institutional quality. The set of controls is the same as in the previous table. The results are consistent with our main hypothesis: in all specifications, the coefficient of interest is positive and significant at 5% or 1% level. This implies that, for example, that in a country that is one standard deviation above the mean level of WGI corruption, one additional standard deviation in transparency leads to 4.6 percentage points smaller decline in a firm value, while in a country one standard deviation below the mean level of WGI corruption, one additional standard deviation in transparency leads to only 0.7 percentage points smaller decline in a firm value.

The last row of Table 4 reports aggregate effects of transparency and disclosure, computed at mean values of corruption variables. The significance levels are indicated by the number of stars. Similar to Table 3, the aggregate effect of transparency is positive and significant, in all specifications if we use country fixed effects. The magnitude of the effect is 0.16 and it is consistent across columns and with Table 3. The sizes of coefficients imply that one standard deviation increase in transparency leads to 2.2-2.3 percentage points smaller decline in firm value during the crisis.

Similarly to the legal protection variables, corruption measures have a positive effect on stock price performance during the crisis. One standard deviation change in corruption for a firm with mean value of transparency would lead to 5.7percentage points higher value for the Transparency International measure, 6.4 percentage points higher value for the WGI measure, and 4.1 percentage points higher value for the ICRG measure.

Overall, the results for corruption measures are consistent across different specifications, and their magnitudes are close to each other and to the magnitudes of the effects of other institutional variables in Table 3.

In sum, our empirical results, reported in Tables 3 and 4, are consistent with predictions of both Proposition 2 and Proposition 3.

5 Conclusion

In this paper we examine how a global crisis affects the relationship between transparency and firm value, and show that this relationship may strongly depend on the quality of legal institutions. The previous literature has found that in normal times firm-level corporate governance is a substitute for country-level investor protection in terms of

their effect on firm value (Durnev and Kim, 2005; Klapper and Love, 2004; Bruno and Claessens, 2010). Using transparency scores, as measured by Standard & Poor's, for firms in 41 countries, as well as various indicators of the quality of country-level institutions, we show that during the 2007-2009 global crisis firm-level and country-level institutions were complements in terms of their impact on the decline in firm's market values. In particular, firm-level transparency played a more important role in countries with strong legal protection. While in weak legal environments a drop in firms' market valuations was more pronounced , firm's transparency in such countries had no or little impact on its stock price reaction to the crisis. In contrast, in countries with strong institutions less transparent firms lost significantly (both economically and statistically) greater share of their value than more transparent companies.

We offer an agency theory based model to explain our findings. Its main idea is that in normal times in countries with strong shareholder protection firm-level transparency has a small effect on access to outside finance, whereas in countries with weak institutions firm-level transparency has a strong effect on access to outside finance and, as a result, on firm value. During a crisis, firm-level transparency becomes important for convincing investors to provide funds even in countries with good institutions, whereas its role in countries with bad institutions remains unchanged. Thus, the *relative* importance of firm-level transparency during a crisis increases in strong legal regimes. As a result, the effect of transparency on the *change* in the value of firms is stronger in countries with good institutions.

Notice that our results do not suggest that transparency becomes unimportant in weak legal environments in crisis, as the firm value continues to depend on transparency in such countries. Instead, our result implies that in crisis firm-level disclosure practices suddenly gain importance for firms located in countries with high quality institutions.

Our results contribute to the debate on the role of corporate governance practices around the world. Further research is needed to find if our results can be generalized for other crises and other types of corporate governance institutions.

References

[1] Aggarwal, R., Erel, I., Stulz, R., Williamson, R., 2010, "Differences in Governance Practices between U.S. and Foreign Firms: Measurement, Causes, and Consequences," Review of Financial Studies, 23, 3131-3169.

[2] Bae, Kee-Hong, Jae-Seung Baek, Jun-Koo Kang, and Wei-Lin Liu, 2012, "Do Controlling Shareholders' Expropriation Incentives Imply A Link between Corporate Governance and Firm Value? Theory and Evidence," Journal of Financial Economics, 105, 412-435.

[3] Baek, Jae-Seung, Jun-Koo Kang, and Kyung Suh Park, 2004, "Corporate Governance and Firm Value: Evidence From the Korean Financial Crisis," Journal of Financial Economics, 71, 265-313.

[4] Bebchuk, L.A., and A. Cohen, 2005, "The Costs of Entrenched Boards," Journal of Financial Economics, 78, 409-433.

[5] Bebchuk, L.A., Cohen, A., and A. Ferrell , 2009, "What Matters in Corporate Governance?", 22, 783-827.

[6] Beltratti, A., and R. Stulz, 2012, "The Credit Crisis Around the Globe: Why Did Some Banks Perform Better?" Journal of Financial Economics, 105, 1-17.

[7] Black, B., Jang, H., and W. Kim, 2006, "Does Corporate Governance Predict Firms' Market Values? Evidence from Korea," Journal of Law, Economics and Organization, 22, 366-413.

[8] Black, D., and V. Khanna, 2007, "Can Corporate Governance Reforms Increase Firms' Market Values? Evidence from India," Journal of Empirical Legal Studies 4, 749–96.

[9] Black, Bernard S., Inessa Love, and Andrei Rachinsky, 2006, "Corporate Governance Indices and Firms' Market Values: Time Series Evidence from Russia," Emerging Markets Review, 7, 361–79.

[10] Bruno, V., and S. Claessens, 2010, "Corporate Governance and Regulation: Can There Be Too Much of A Good Thing?" Journal of Financial Intermediation, 19, 461-482.

[11] Chhaochharia, V., and L. Laeven, 2009, "Corporate Governance Norms and Practices," Journal of Financial Intermediation, 18, 405-431.

[12] Djankov, S., La Porta, R., Lopez-de-Silanes, F., and A. Shleifer, 2008, "The Law and Economics of Self-Dealing," Journal of Financial Economics, 88, 430-465.

[13] Doidge, Craig, Andrew Karolyi, and Rene Stulz, 2007, "Why Do Countries Matter So Much for Corporate Governance," Journal of Financial Economics, 86, 1-39.

[14] Durnev, A., and Kim, E. H., 2005, "To Steal or Not to Steal: Firm Attributes, Legal Environment, and Valuation," Journal of Finance 60, 1461-1493.

[15] Erkens, D., Hung, M., and P. Matos, 2012. "Corporate Governance in the 2007-2008 Financial Crisis: Evidence from Financial Institutions Worldwide, " Journal of Corporate Finance, 18, 389-411.

[16] Johnson, Simon H., Boone, Peter D., Breach, Alasdair, and Eric Friedman, 2000, "Corporate Governance in the Asian Financial Crisis, 1997-98," Journal of Financial Economics, 58, 141-186.

[17] Klapper, L.F., and I. Love, 2004, "Corporate Governance, Investor Protection and Performance in Emerging Markets," Journal of Corporate Finance, 10, 703-728.

[18] La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer, and Robert Vishny, 1998, "Law and Finance," Journal of Political Economy, 106, 1113-1155.

[19] La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer, and Robert Vishny, 2002, "Investor protection and corporate valuation," Journal of Finance, 57, 1147–1170.

[20] Lemmon, Michael L., and Karl V. Lins, 2003, "Ownership Structure, Corporate Governance, and Firm Value: Evidence from the East Asian Financial Crisis," Journal of Finance, 58, 1445-1468.

[21] Love, Inessa, 2011, "Corporate Governance and Performance around the World: What We Know and What We Don't," World Bank Research Observer, 26, 42-70.

[22] Mitton, Todd, 2002, "A Cross-Firm Analysis of the Impact of Corporate Governance on the East Asian Financial Crisis," Journal of Financial Economics, 64, 215-241.

Table 1. Summary statistics.

Variable	Mean	Stnd. Dev.	Obs.
Disclosure	59.61	13.96	896
Stock decline	46.06	21.66	900
Beta	0.90	0.49	862
Log (Sales)	15.38	2.47	896
Leverage	0.79	10.69	879
Market Capitalization to GDP Ratio	129.52	60.94	900
Log (GDP)	28.49	1.58	900
Government Effectiveness (WGI)	1.25	0.66	900
Rule of Law (WGI)	1.15	0.79	900
Bureaucracy Quality (ICRG)	3.51	0.82	894
Law & Order (ICRG)	4.82	0.72	894
Anti-Director Rights (LLSV)	8.64	1.84	840
Corruption			
Transparency International	6.73	1.93	894
WGI	1.07	0.80	900
ICRG	3.61	0.99	894

Table 2. Correlation Table for Country-level Variables.

	Market Capitalization to GDP Ratio	Log (GDP)	Government Effectiveness (WGI)	Rule of Law (WGI)	Bureaucracy Quality (ICRG)	Law & Order (ICRG)	Rule of Law (LLSV)	Transparency International Corruption Index	WGI Corruption Index
Log (GDP)	0.05								
Government Effectiveness (WGI)	0.45	0.36							
Rule of Law (WGI)	0.41	0.44	0.98						
Bureaucracy Quality (ICRG)	0.24	0.52	0.89	0.92					
Law & Order (ICRG)	0.33	0.35	0.83	0.84	0.71				
Anti-Director Rights (LLSV)	0.33	0.64	0.84	0.87	0.80	0.70			
Transparency International Corruption Index	0.45	0.35	0.96	0.96	0.85	0.85	0.85		
WGI Corruption Index	0.42	0.25	0.96	0.95	0.84	0.85	0.80	0.99	
ICRG Corruption Index	0.35	0.34	0.84	0.89	0.79	0.86	0.76	0.93	0.92

Table 3. Interaction of firm-level Transparency and Country-level Measures of Quality of Institutions.

	Dependent variable: Stock price at the lowest point during financial crisis with June, 2007 = 100									
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Government Effectiveness (WGI) * Disclosure	0.302***	0.203**								
	[0.0913]	[0.0976]								
Government Effectiveness (WGI)	-6.915									
	[4.735]									
Rule of Law (WGI) * Disclosure			0.274***	0.220**						
			[0.0644]	[0.103]						
Rule of Law (WGI)			-6.439							
			[3.835]							
Bureaucracy Quality (ICRG) * Disclosure					0.181**	0.167				
					[0.0802]	[0.110]				
Bureaucracy Quality (ICRG)					-1.966					
					[5.200]					
Law & Order (ICRG) * Disclosure							0.268**	0.241**		
							[0.104]	[0.106]		
Law & Order (ICRG)							-11.16***			
							[3.994]			
Anti-director Index (LLSV) * Disclosure									-0.0399	-0.00938
									[0.0843]	[0.106]
Anti-director Index (LLSV)									4.061	
									[5.179]	
Disclosure	-0.427***	-0.102	-0.380***	-0.0953	-0.646**	-0.436	-1.285**	-1.031*	0.204	0.154
	[0.118]	[0.136]	[0.0875]	[0.143]	[0.274]	[0.395]	[0.542]	[0.523]	[0.345]	[0.394]
Beta	-7.975**	-9.450**	-7.875**	-9.543**	-7.977**	-9.565**	-7.554**	-9.431**	-7.505**	-9.326**
	[3.364]	[4.261]	[3.260]	[4.257]	[3.230]	[4.262]	[3.134]	[4.298]	[3.150]	[4.371]
Log (Sales)	1.191***	1.157***	1.108***	1.160***	1.244***	1.150***	0.904***	1.134***	0.923***	1.145***
	[0.275]	[0.333]	[0.261]	[0.335]	[0.272]	[0.335]	[0.248]	[0.325]	[0.225]	[0.331]
Leverage	0.0785***	0.0790***	0.0748***	0.0812***	0.0837***	0.0811***	0.0765***	0.0835***	0.0713***	0.0738***
	[0.0181]	[0.0182]	[0.0180]	[0.0176]	[0.0186]	[0.0183]	[0.0182]	[0.0179]	[0.0190]	[0.0209]
Market Capitalization to GDP Ratio	0.00295		0.00545		0.0130		0.0316**		0.0250*	
	[0.0101]		[0.0105]		[0.00822]		[0.0131]		[0.0144]	
Log (GDP)	0.951		0.509		-0.179		1.613*		1.647**	
	[0.617]		[0.639]		[0.798]		[0.876]		[0.783]	
Country fixed effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	843	843	843	843	837	837	837	837	837	837
R-squared	0.19	0.26	0.19	0.26	0.19	0.25	0.16	0.26	0.14	0.25
Aggregate effect of disclosure	-0.0379	0.160**	-0.0507	0.168**	0.00175	0.162**	0.0118	0.137*	0.0522	0.118

Notes: Standard errors clustered by country in brackets, *** p<0.01, ** p<0.05, * p<0.12. Stock performance is a minimum stock price over the crisis period (June, 2007 - March, 2009) with June 2007 = 100. Leverage is LT debt over total sales. Beta is the market one year pre-crisis beta. All firm variables correspond to pre-crisis period (as of end 2006). Aggregate effect of disclosure is computed at mean value of institutional variables.

Table 4. Interaction of firm-level Transparency and Country-level Measures of Corruption.

	Dependent variable: Stock price at the lowest point during financial crisis with June, 2007 = 100					
	1	*2*	*3*	*4*	*5*	*6*
Transparency International* Disclosure	0.101***	0.0735**				
	[0.0333]	[0.0354]				
Transparency International	-3.085**					
	[1.426]					
WGI* Disclosure			0.243***	0.176**		
			[0.0778]	[0.0843]		
WGI			-7.795**			
			[3.560]			
ICRG* Disclosure					0.207***	0.183**
					[0.0723]	[0.0784]
ICRG					-8.209**	
					[3.736]	
Disclosure	-0.731***	-0.342	-0.302**	-0.0410	-0.775**	-0.512
	[0.262]	[0.262]	[0.123]	[0.125]	[0.293]	[0.317]
Beta	-7.673**	-9.512**	-7.521**	-9.387**	-7.512**	-9.569**
	[3.204]	[4.291]	[3.179]	[4.279]	[3.126]	[4.323]
Size	1.055***	1.137***	1.028***	1.151***	0.891***	1.137***
	[0.277]	[0.328]	[0.266]	[0.331]	[0.256]	[0.329]
Leverage	0.0764***	0.0839***	0.0740***	0.0807***	0.0750***	0.0847***
	[0.0185]	[0.0183]	[0.0177]	[0.0181]	[0.0183]	[0.0178]
Market Capitalization to GDP	0.0141		0.0164		0.0254**	
	[0.0112]		[0.0129]		[0.0122]	
Log (GDP)	1.407		1.624**		1.474*	
	[0.861]		[0.758]		[0.855]	
Country fixed effects	No	Yes	No	Yes	No	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	843	843	837	837	807	807
R-squared	0.19	0.26	0.14	0.25	0.17	0.22
Aggregate disclosure effect	-0.0453	0.160**	-0.0497	0.163**	-0.0309	0.156**

Notes: Standard errors clustered by country in brackets, *** p<0.01, ** p<0.05, * p<0.12. Stock performance is a minimum stock price over the crisis period (June, 2007 - March, 2009) with June 2007 = 100. Leverage is LT debt over total sales. Beta is the market one year pre-crisis beta. All firm variables correspond to pre-crisis period (as of end 2006). Aggregate effect of disclosure is computed at mean value of corruption variable.

Table 5. List of countries.

	Mean Disclosure, S&P	Government Effectiveness, WGI	Rule of law, WGI	Bureaucratic quality, ICRG	Law and order, ICRG	Anti-Director Rights, LLSV	Corruption, TI	Corruption, WGI	Corruption, ICRG
ARGENTINA	29.1	-0.1	-0.6	3.0	3.0	2.0	2.7	-0.4	2.5
AUSTRALIA	61.5	1.7	1.7	4.0	5.5	4.0	8.7	1.9	5.0
AUSTRIA	60.2	1.7	1.9	4.0	6.0	2.5	8.4	1.9	5.0
BELGIUM	51.6	1.7	1.2	4.0	5.0	3.0	7.4	1.2	4.0
BERMUDA	60.9	1.0	0.9					1.3	
BRAZIL	32.7	-0.1	-0.4	2.0	2.5	5.0	3.7	-0.2	1.5
CANADA	60.7	1.9	1.8	4.0	6.0	4.0	8.6	1.9	5.0
CHILE	37.3	1.2	1.2	3.0	5.0	4.0	7.3	1.4	4.5
CHINA	49.2	0.0	-0.5	2.0	4.5	1.0	3.4	-0.5	2.0
DENMARK	58.8	2.2	1.9	4.0	6.0	4.0	9.5	2.4	5.5
FINLAND	74.6	2.1	1.9	4.0	6.0	3.5	9.6	2.5	6.0
FRANCE	67.9	1.5	1.4	3.0	5.0	3.5	7.2	1.5	3.5
GERMANY	56.0	1.6	1.7	4.0	5.0	3.5	8.0	1.8	5.0
GREECE	68.0	0.7	0.8	3.0	4.5	2.0	4.4	0.4	2.0
HONG KONG	47.0	1.8	1.6	3.0	5.0	5.0	8.2	1.9	4.0
INDIA	40.4	0.0	0.2	3.0	4.0	5.0	3.1	-0.2	2.5
INDONESIA	36.2	-0.3	-0.7	2.0	3.0	4.0	2.2	-0.7	1.0
IRELAND	75.3	1.6	1.7	4.0	6.0	5.0	7.5	1.7	4.0
ITALY	59.9	0.5	0.3	2.5	4.0	2.0	5.0	0.4	2.5
JAPAN	54.8	1.5	1.4	4.0	5.0	4.5	7.3	1.4	3.5
KOREA	46.5	1.1	0.8	3.0	5.0	4.5	4.8	0.4	2.5
MALAYSIA	45.4	1.1	0.6	3.0	4.0	5.0	5.1	0.4	2.0
MEXICO	23.1	0.2	-0.4	3.0	3.0	3.0	3.5	-0.2	2.0
NETHERLANDS	61.6	1.7	1.7	4.0	6.0	2.5	8.8	2.0	5.0
NEW ZEALAND	71.1	1.7	1.8	4.0	5.5	4.0	9.5	2.3	5.5
NORWAY	57.8	1.9	1.9	4.0	6.0	3.5	8.8	2.1	5.0
PAKISTAN	40.2	-0.5	-0.8	2.0	3.0	4.0	2.3	-0.8	1.5
PERU	23.0	-0.5	-0.8	2.0	3.0	3.5	3.5	-0.3	2.5
PHILIPPINES	28.2	-0.0	-0.4	3.0	2.5	4.0	2.5	-0.7	2.0
PORTUGAL	58.4	0.8	1.0	3.0	5.0	2.5	6.5	1.0	4.0
RUSSIA	56.4	-0.4	-0.9	1.0	4.0	4.0	2.5	-0.8	2.0
SINGAPORE	60.1	2.0	1.6	4.0	5.0	5.0	9.4	2.1	4.5
SOUTH AFRICA	38.3	0.7	0.2	2.0	2.5	5.0	4.6	0.4	2.5
SPAIN	52.2	0.9	1.1	3.0	5.0	5.0	6.9	1.1	4.0
SWEDEN	61.7	1.8	1.8	4.0	6.0	3.5	9.2	2.2	5.0
SWITZERLAND	56.3	1.9	1.8	4.0	5.0	3.0	9.0	2.1	4.5
THAILAND	53.3	0.4	0.0	2.0	2.5	4.0	3.5	-0.2	1.5
TURKEY	20.4	0.2	0.0	2.0	4.5	3.0	3.5	0.1	2.5
UK	70.2	1.7	1.7	4.0	5.5	5.0	8.6	1.8	4.5
USA	70.0	1.5	1.6	4.0	5.0	3.0	7.4	1.3	4.0
VENEZUELA	30.6	-1.0	-1.4	1.0	3.0	1.0	2.3	-1.0	1.5