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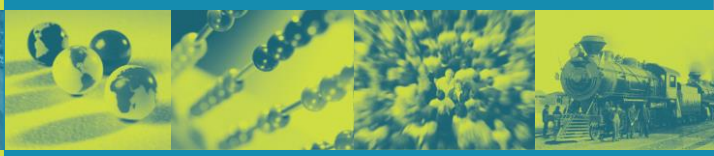

Optimal government transparency

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Abstract

This paper studies the economic conditions under which a government chooses to disseminate information among its creditors. The government receives private information about economic output and provides public information, either implicitly by the actions it takes, or explicitly by communicating the true value of output. In a dynamic model of endogenous sovereign default, I find that the government prefers to be more transparent when it has lower debt, expects a lower drop in output, and the probability of receiving a low output is higher. A higher probability of a recession lowers the bond price and brings the optimal borrowing to a level where a transparent government can repay even if it receives a low output. Hence, higher borrowing costs, due to higher default risk, make the government to choose more transparency. The result is supported by empirical evidence for OECD. I find that an increase in borrowing cost (proxy for increase in likelihood of recession) by 1% is associated with a future increase in information transparency by 6%.

JEL classification: E44,E02,F34,D80

Key words: endogenous default, asymmetric information, transparency, OECD.

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1 Introduction

Government transparency is an important characteristic in guaranteeing fiscal discipline and reducing economic uncertainty. There is a significant body of literature showing the negative effects of a lack of transparency. Among others, Gelos and Wei (2005) provide evidence that less transparent countries receive less investment and that during a crisis they are more likely to experience high capital outflows.[1] Marques et al. (2013) document that more opaque countries suffer more from financial globalization. Several economic crises have been partially worsened by a lack of transparency. For instance, in the late 90's Asian crisis, the Thai government was accused of allowing an extremely opaque financial sector to flourish, which is considered to be one of the key elements that triggered the financial turmoil of 1997. A decade later, in one of the worst recessions since The Great Depression, hidden debts of the Greek government added more panic to already vulnerable sovereign bond markets in 2009-2010.

Even though much evidence suggests that opaqueness has negative effects, there are still governments that choose to provide less transparent information about the economy's stance. A recent policy paper by the IMF[2] estimated that 23% of the unexpected increase in general government debt was due to incomplete information about the government's underlying fiscal position. In the present paper, I build a model that analyzes the conditions in which governments prefer to hide information about economic output, and in which they choose full disclosure. In particular, I focus on such macroeconomic aspects as public debt, the probability of a recession and the severity of the expected economic downturn.

I develop a dynamic model of endogenous sovereign default with private information. I assume a small open economy that lasts for three periods and is inhabited by a representative household, a government that can borrow in an external credit market, and a continuum of foreign risk-neutral lenders. At the beginning of the first period, the government decides whether to credibly disclose private information about economic output. Next, nature draws the endowment that the government will receive in the next few periods and the latter, depending on its transparency decision, reveals it publicly or not.

The government smooths consumption by selling one-period bonds in the credit market or defaulting on the accumulated debt. The market is not perfect due to the government's private information and contingent debt servicing. Therefore, the borrowing cost contains a risk premium reflecting the risk that the latter may renege on its contractual payments. Lenders update their beliefs about the government receiving a high endowment and repaying

[1] See Gande and Parsley (2014), Bernoth and Wolff (2008), Gavazza and Lizzeri (2009), Alt et al. (2006), etc., for different aspects of economy that can be affected by lack of transparency.

[2] approved by Cottarelli (2012)

its debt based on the government's defaulting or borrowing decisions.

The government that expects a high output is better off if lenders know the true state and offer a high bond price. The government that expects a low output would like to mimic the former's behavior so that it can borrow an amount that would otherwise be unaffordable. Since the commitment regarding disclosure of the economy's future state is made before it is known, the government faces a trade-off: greater transparency increases the benefits in good economic times, but leaves it without additional funds when it needs them the most. Therefore, one would expect that opaqueness is especially tempting when the probability of a recession is higher.

In the present paper, contrary to this intuition, I show that the government prefers to be less transparent when it is more likely to receive a high output, and commits to fully disclose private information when it expects the economy to be in a recession.

If the probability of receiving a low output is high, uninformed lenders increase the cost of borrowing. As a result, the optimal amount of debt under zero transparency is close to the one that the government can borrow during the recession if it truthfully reveals the economy's state. Therefore, it prefers to be fully transparent when the probability of a recession is high in order to enjoy higher consumption if it eventually receives a high endowment.

If a recession is less likely, the government is better off by being less transparent. When the probability of a bad economic state is lower, the price offered by foreign lenders increases and the amount of debt that a non-transparent government can borrow is higher. As a result, the expected loss in welfare if the economy is booming almost vanishes, while the gains if it is in recession increase. However, the lower the level of initial debt, the lower is the government's preference to be opaque. A less financially constrained government gains less from mimicking the behaviour of a booming economy. Given that the likelihood of experiencing a recession is also low, the expected welfare of the government before observing the economy's future state is higher if it is fully transparent.

Positive correlation between level of debt and transparency has been documented in several empirical papers (see Alt and Lassen (2006), Cottarelli (2012)). However, empirical literature is still silent about the effects of the change in likelihood of an economic recession on the level of government information transparency.

In the last section I corroborate the theoretical findings with empirical evidence. The theoretical model shows that when the probability of a recession increases - which translates into higher sovereign bond cost - the government prefers to be more transparent. Hence, I test if an increase in sovereign bond yield is associated with an increase in future government information transparency. Using data for OECD countries for the 1980-2010 period, I find a positive relationship between the two. More precisely, an increase of 1% in bond yields

raises the future information transparency index by 6%.

The paper relates to several strands of literature. The vivid interest about optimal transparency dates back to at least Kydland and Prescott (1977). Most of the literature (see for instance Walsh (2007), Stein (1989)) focused on the optimal disclosure of information about monetary policy targets by central banks. This paper differs from the latter as it looks at real, rather than monetary variables, and information friction relates to economic fundamentals, rather than policy instruments.

Another strand of literature that is related to optimal government transparency comprises the probabilistic voting models studied by Gavazza and Lizzeri (2009) and political agency models represented by Besley and Smart (2007). Their models focus on voters that do not observe the electoral promises and competition among different political parties. Gavazza and Lizzeri (2009) find that transparency on the expenditure side is welfare improving, while on the revenue side it can be counterproductive. Besides the fact that I study the relationship between the government and foreign lenders, I also focus on the underlying conditions of a lack of transparency rather than its beneficial effects.

The present paper is most closely related to Albornoz et al. (2014). Similar to this paper, the authors analyze the conditions under which the government finds it optimal to reveal information about economic output. They focus, however, on domestic market distortions like taxes and monopoly power. The authors show that whenever distortions are high enough, the government is willing to hide the information during bad times in order to countervail the negative effects that are coming from them. Hence the mechanism that affects the government's decision to be transparent is different from the one described in the present paper.

The benchmark model builds upon models of endogenous sovereign default started by Eaton and Gersovitz (1981). It is closely related to Sandleris (2008) who studies a model where the government has private information about economic fundamentals. The author explains why sovereigns choose to repay, suggesting that by repaying their debt, governments can signal their good type. Contrary to Sandleris (2008), this paper studies the conditions under which the government chooses to be transparent. Other papers that include asymmetric information in models of endogenous sovereign default are Alfaro and Kanczuk (2005) and D'Erasmo (2008). They present infinite horizon models where the government has private information about its type. In their models, governments differ in their patience level. D'Erasmo (2008) aims at replicating the debt levels that are observed in the data. Alfaro and Kanczuk (2005) study a model of adverse selection to show that delaying the default decision often exacerbates the recession. Contrary to the model studied in this paper, the government is only allowed to borrow an exogenously given amount of debt. Also, none of

Table 1: Environment

t=0	t=1	t=2
• Gov. starts with endowment y_0,	• Gov. receives endowment y_i, $\forall i \in \{c, b\}$,	• Gov. chooses to default or repay.
• Gov. chooses level of transparency $\{FT, NT\}$,	• Gov. decides whether to default or not; and issues new debt if it repays,	
• Gov. learns future endowments y_t, $\forall t \in \{1, 2\}$,	• Lenders update their beliefs by observing default or demanded debt; and revise price schedule.	
• Lenders set price schedule,		
• Gov. borrows from foreign lenders.		

these papers has the feature of optimal information choice to be revealed to other parties.

The rest of the paper is organized as follows. I set up the theoretical model in section 2. In sections 3 and 4, I characterize the equilibrium and explain the main results of the paper. Section 5 provides empirical evidence that corroborates the theoretical findings discussed earlier.

2 Model

I develop a simple setting of a small open economy, where the world's interest rate, r_t, is taken as given. The economy is inhabited by a representative household, a government and a continuum of risk-neutral competitive foreign lenders. The model includes two frictions: the sovereign issues only one-period non contingent bonds; and it has private information about its future fundamentals, y_t. The economy lasts for 3 periods, $t = 0, 1$ and 2. The summary of the general environment is listed in table 1.

2.1 Environment

The household maximizes the expected utility of consumption over the 3 periods:

$$\max_{\{c_t\}_{t=0,1,2}} E_0 \sum_{t=0,1,2} \beta^t u(c_t),$$

where the utility function, $u(c)$, is strictly increasing, weakly concave and twice differentiable, and $\beta \in (0, 1)$ is the discount factor. Every period, the household consumes the observed endowment and a transfer received from the government. The household is not allowed to participate in the credit market, therefore the government smooths its consumption by acting on its behalf and transferring the proceedings from credit market operations.

The government starts with an endowment y_0 and a signal that nature draws about the future state of economy. The signal is perfectly informative for the government and it reveals the future stream of endowments (i.e. the future state of economy). Lenders only know the distribution of fundamentals: a low state, y_c ("crisis"), with probability λ and a high state, y_b ("boom"), with probability $(1-\lambda)$, where $0 < y_c < y_b$ and $\lambda \in (0,1)$. The economy permanently stays in the initially drawn state starting from period $t = 1$. Besides making the analysis easier, this assumption resembles the persistence of output that is observed in real world economies.

Before observing the signal about the future states, the sovereign decides whether to be fully transparent (FT) and reveal the information about the fundamentals to foreign lenders. Although it can decide to be non-transparent (NT), the economy's state may still be revealed through the actions that the government takes, specifically the default decision and the level of debt it demands.

The debt is not enforceable, therefore the sovereign may choose to renege on its debt by comparing the benefits from the two states, default and repayment. If it defaults, the government is not allowed to participate in the credit market any longer and bears an additional cost in the form of lower future utility, $V^{Def} < V^{NDef}$. This is a classical approach to explain the government's willingness to repay its debt (see Eaton and Fernandez (1995), Alfaro and Kanczuk (2005)). In addition, Mendoza and Yue (2012) show that a model with endogenous default costs, in terms of output, has quantitatively similar results. If the sovereign repays, it decides upon the new level of debt.

The foreign lenders are willing to buy any amount of bonds as long as the expected returns equal the profits received by trading in the outside risk-free market. Since the government may default, the price offered by lenders, q_t, reflects the likelihood of the government reneging on its outstanding debt contract. When the government is fully transparent, lenders do not face any uncertainty and hence the interest rate does not include any risk premium for default. When the government chooses to be non transparent, lenders update their beliefs about the state of economy, π_t, by observing the repayment decision and the amount of newly contracted debt. There is only one piece of private information. Hence, the government's actions will either reveal the true state of the economy or leave the lenders' beliefs unchanged.

2.2 Government

The government maximizes the households' utility. It participates in the foreign credit market to smooth consumption over time. It sells in period t one period non-contingent

bonds at price q_t and repays next period the face value, b_{t+1}.[3] The debt is non-enforceable and the government may decide to default. If it defaults, the economy's resource constraint in period t is:

$$c_t = y_t.$$

If it repays the debt, it consumes:

$$c_t = y_t - b_t + q(b_{t+1})b_{t+1}.$$

It is convenient to solve the problem backwards, by writing the government's problem starting in the last period. At the beginning of period $t = 2$, the government receives the endowment y_i depending on the state $i \in \{b, c\}$ drawn at $t = 0$. If it defaults or has defaulted in the previous period, it only consumes the available endowment and suffers a cost in the form of lower future utility, V^{Def}. If it repays, it consumes the net endowment and has a higher residual future value. Let $D_{i,t}$ be the debt level where the government is indifferent between defaulting and repaying in period t. Then, the government's utility is given by:

$$V_{i,2} = \begin{cases} u(y_i - b_{i,2}) + \beta V^{NDef} & \text{if } b_{i,2} \leq D_{i,2} \\ u(y_i) + \beta V^{Def} & \text{if } b_{i,2} > D_{i,2} \end{cases}$$

At time $t = 1$, the sovereign makes two decisions: whether to default on the outstanding debt, and, if it repays - to choose the new level of debt. The government enters in period $t = 1$ with output y_i and debt contracted in the previous period, $b_{i,1}$. Utility is given by:

$$V_{i,1} = \begin{cases} u(y_i - b_{i,1} + q_{i,2}(b_{i,2})b_{i,2}) + \beta V_{i,2} & \text{if } b_{i,1} \leq D_{i,1} \\ u(y_i) + \beta(u(y_i) + \beta V^{Def}) & \text{if } b_{i,1} > D_{i,1}, \end{cases}$$

In period $t = 0$, the government makes two sequential decisions depending on the information it has at hand. Firstly, it chooses whether to be transparent or not, and then it decides upon the optimal level of debt. I abstract from the trivial case of default in the first period and assume that the government starts with zero debt. Note, however, that the initial endowment y_0 can be interpreted as the net output after repaying the outstanding debt. A lower y_0 is equivalent to a high initial debt. I adopt this interpretation for further discussion.

At the beginning of the first period, the government knows y_0, the probability distribution of the future states and the price function (which will be described below). It maximizes the

[3] $b > 0$ implies a positive amount of debt.

value over the three periods and chooses whether or not to reveal the information:

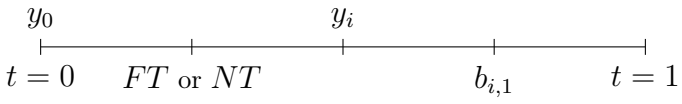
$$V_0 = \max\{V_0^{FT}, V_0^{NT}\}, \tag{1}$$

where $V_0^j, j \in \{FT,\ NT\}$ is given by:

$$V_0^j = \max_{b_{i,1}^j} \mathbb{E}\left\{ u(y_0 + q_{i,1}^j(b_{i,1}^j)b_{i,1}^j) + \beta V_{i,1}^j(y_i, b_{i,1}^j) \right\}, \quad i \in \{b, c\}.$$

The decision is taken before observing the state in which it will be tomorrow, therefore the government takes expectations over the endowment set.

Afterwards, it observes the future endowment and, given the commitment it made in the previous step, decides the level of debt. The sequence of events and decisions can be visualized in the timeline below, where the variables above the line show the available information, and below the line - the decisions that the government takes at each point of time.



2.3 Lenders

The foreign lenders are risk neutral, act competitively and can lend or borrow any amount in the outside market at the risk-free interest rate, r. They do not observe the realization of the endowments. Instead, lenders know the future income distribution and can update their beliefs about the economy's state by observing the repayment decision and the amount of newly contracted debt.

Let the lenders' initial beliefs about the economy being in a boom, π_{-1}, equal the probability of receiving a high endowment, $1 - \lambda$. Given that the government repays the debt in period $t = \{0, 1\}$, the lenders' subjective probability observing a high endowment is updated through Bayes rule:

$$\pi_t = \frac{\pi_{t-1} \Pr\Big(\{b_{t-1} \leq D_{b,t-1}\} \cap \{b_t = b_{b,t}\}\Big)}{\pi_{t-1} \Pr\Big(\{b_{t-1} \leq D_{b,t-1}\} \cap \{b_t = b_{b,t}\}\Big) + (1 - \pi_{t-1}) \Pr\Big(\{b_{t-1} \leq D_{c,t-1}\} \cap \{b_t = b_{c,t}\}\Big)} \tag{2}$$

. The numerator, $\Pr\Big(\{b_{t-1} \leq D_{i,t-1}\} \cap \{b_t = b_{i,t}\}\Big)$ takes into account the probability of

both facts: the government repaying the debt contracted in the previous period, b_{t-1} and borrowing the optimal level $b_{i,t}$, $i \in \{b, c\}$.

If the government defaults in period t, it finds itself in a permanent autarky and is not allowed to borrow. As a result, lenders form beliefs only upon observing the default-repayment decision:

$$\pi_t = \frac{\pi_{t-1} \Pr\left(b_t \leq D_{b,t}\right)}{\pi_{t-1} \Pr\left(b_t \leq D_{b,t}\right) + (1 - \pi_{t-1}) \Pr\left(b_t \leq D_{c,t}\right)} \tag{3}$$

.

In period $t = 2$, the government does not contract any debt, therefore beliefs are formed upon observing the repayment decision, as in eq. (3).

For the full characterization of the problem, it is necessary to specify the beliefs off the equilibrium path. I assume that, whenever the government finds it optimal to default regardless of the economic state, the latter is assumed to be in a boom.

Assumption 1. *Lenders beliefs off the equilibrium paths are:*

$$\pi_t = 1 \text{ if } \Pr(\{b_{t-1} \geq D_{b,t-1}\}) = \Pr(\{b_{t-1} \geq D_{c,t-1}\}) = 1.$$

Lenders are competitive, therefore the price is determined by the zero profit condition. They brake-even when the expected repayment, discounted at the risk-free rate, equals the value of debt. Therefore, given the lenders' beliefs, the price is given by the expected probability of the repayment weighted by the likelihood of the economy being in one of each state. It follows from the following equality:

$$q_t b_t = \pi_t \frac{\Pr(\{b_t < D_{b,t}\})}{1 + r} b_t + (1 - \pi_t) \frac{\Pr(\{b_t < D_{c,t}\})}{1 + r} b_t \tag{4}$$

. If assets are negative $b_t < 0$ (i.e. the government saves) then the price equals the price of a risk-free asset. If the government is expected to default on debt in both states, lenders offer a zero price and the only sustainable level of debt is $b_t = 0$. If the government is expected to default in one of the states, the price is lower than the risk-free one. As will be discussed further, the government is going to default only during the bad states. Therefore, under null transparency the government will overpay for the issued debt in the economy's good state and will underpay in the bad one. This trade-off ensures that for some conditions, the government is willing to reveal the economy's state and for some conditions it is willing to be opaque.

The competitive equilibrium of this economy can be defined as following:

Definition 2.1. *A competitive equilibrium is: (i) a set of beliefs updating functions* π_t^* $\forall t \in \{0,1,2\}$*; (ii) a set of bond prices* q_1^* *and* q_2^**; (iii) a set of borrowing* b_1^* *and* b_2^**; (iv) a set of transparency decisions* $d^* \in \{FT, NT\}$ *such that:*

1. b_1^**,* b_2^* *and* d^* *solve the government's problem (2.2) given prices;*
2. q_1^* *and* q_2^* *are determined by market clearing condition (4);*
3. *beliefs* π_t^* $\forall t \in \{0,1,2\}$ *are consistent with Bayes rules (2) and (3).*

The strategy of each player (government and lenders) is a mapping from one party's information set, that includes all the actions taken by the counterpart before its move, to each player's action set.

3 Equilibrium characteristics

3.1 Full Transparency

The only piece of private information is the economy's future state. When the government decides to commit to reveal the state, it can borrow at the risk-free rate any amount of debt which is lower than the threshold $D_{i,t}$. Since lenders perfectly observe the government's fundamentals, they will not lend above the level where the government can not repay the next period. Hence, the debt is riskless. Under full information, due to the endowment persistence, a government that receives a higher endowment is able to sustain a higher level of debt to output.

3.2 Null Transparency

When private information is present, lenders cannot tell apart the state of the economy, unless the sovereign takes any action to reveal it. Therefore, they charge a higher interest rate, expecting that the economy is also likely to be in a recession. If the economy is in a boom, the government would like to signal about the good state through the debt/default decision so that it can enjoy lower interest rates. The government experiencing an economic crisis would like to mimic the actions of being in a boom in order to take advantage of a lower cost of borrowing and the possibility of borrowing a higher amount, which would otherwise be unaffordable.

The following lemma shows that there exists a separating equilibrium, where the government repays if it receives a high endowment and defaults otherwise.

Lemma 3.1. *The default threshold for the government during an economic boom is higher than the one during a crisis, that is* $D_{b,t} > D_{c,t}$.

Proof: See Appendix.

Since there is only one piece of uncertainty, which is the endowment that the government receives, the actions taken by the latter either reveal the economic state entirely or not at all. Consequently, the lenders' beliefs regarding the economy's probability of being in a good state will update to one if the actions are revealing or remain the same if they are not.

If the government chooses to be opaque and has not revealed the economy's state so far, lenders can discern the former's state only by observing a default. The reason is the following. The government can borrow in the following two regions: (i) the region where the debt is lower than the threshold that the government in an economic crisis can repay next period, $b_t < D_{c,t}$; and (ii) the region where the debt is in between the two thresholds of default, $D_{c,t} < b_t < D_{b,t}$. The government will not borrow more than it can repay in the good state, since the price for debt $b_t > D_{c,t}$ equals zero. If the government contracts a level of debt in region (i), in the next period it will repay independent of the received endowment. If the government borrows in region (ii), it repays if the economy is in the good state and defaults otherwise. Therefore, lenders will be able to know the economy's state only if the government defaults. The revelation through the chosen level of debt is equivalent to choosing the full information. Note that it is the government that receives the low endowment that would like to mimic the actions of it being in an economic boom. If it borrows a level of debt that is different from the one that is optimal when the endowment is high, then a priori the government is better off if it is transparent.

By the end of the game, in period $t = 2$, the government will reveal the economy's state entirely. However, the information is relevant only in the first two periods, $t = 0, 1$, as in the last one the government does not borrow any more. Hence, even though the state of the economy is revealed in equilibrium, lenders cannot affect any future debt decision. The following three lemmas formalize each one of the observed equilibria under the null transparency.

Lemma 3.2 (**Separating Equilibrium**). *Suppose the government borrows* $b_1 > D_{c,1}$ *in period* $t = 0$*, then the economy's state is revealed in period* $t = 1$.

Let $b_1 > D_{c,1}$, then the state that nature draws is fully revealed in period 1. The government with a high endowment repays the debt , $b_1 < D_{b,1}$, and contracts any amount of debt, $b_2 < D_{b,2}$ at the risk-free interest rate. The government with a low endowment defaults and stays in permanent autarky.

Lemma 3.3 (**Pooling Equilibrium**). *Suppose the government borrows $b_1 < D_{c,1}$ and $b_2 > D_{c,2}$, then the economy's state is revealed in period $t = 2$.*

Let $b_1 < D_{c,1}$, and $b_2 > D_{c,2}$, then the government, independently of the state, repays the debt $b_1 < D_{c,1} < D_{b,1}$ in period $t = 1$ and defaults in period $t = 2$ if it finds itself in a recession. Since the government does not reveal the state in period 1, lenders carry on their beliefs that the economy is in a bad state with probability $1 - \lambda$. As a result, a government observing an economic boom will pay a higher cost for an amount of debt similar to the debt level under full transparency; and the government receiving a low endowment will contract the debt that otherwise would be unaffordable.

Lemma 3.4. *Suppose the government borrows $b_t < D_{c,t}$ in any period t. Independently of the state, the government repays the debt entirely and private information is not revealed.*

However some of these equilibria are not sustainable. The following propositions establish the conditions and the type of equilibrium that arises in the problem.

Proposition 3.5. *If the government that observes a high endowment finds it optimal to contract a debt level smaller than it can repay when it receives a low endowment, $b_{b,t} < D_{c,t}$, then it prefers to borrow $b_{c,t} \neq b_{b,t}$ and reveal the received endowment.*

Proof. Assume the government that enjoys a booming economy borrows the optimal level of debt $b^*_{b,1}(y_b) < D_{c,1}$ and $b^*_{b,2} < D_{c,2}$. Given that the maximum amount of debt it can borrow is the one it can repay next period, the government experiencing an economic crisis either mimics the actions of being in a boom or borrows the optimal amount of debt available at the risk-free rate. Since, $b'_2(b^*_1) > 0$ and $b^{*\prime}_1(y) > 0$, the government which receives a low endowment $y_c < y_b$ is better off by borrowing $b^*_{c,1} < b^*_{b,1}$ and $b_{c,2}(b^*_{c,1}) < b_{b,2}(b^*_{b,1})$. ■

The intuition is the following. Since during the boom the government finds it optimal to borrow in the safe region, where the interest rate is $(1 + r)^{-1}$, during the crisis it can not borrow debt in the risky zone by mimicking the actions of being in a boom. In the safe region the government that experiences a crisis can borrow any amount of debt at the risk-free interest rate. Given that the utility function is convex and the endowment is persistent, it is better off by borrowing a lower level of debt than it would during an economic boom.

Lemma 3.6. *The government contracts a decreasing stream of debt over time if it plays the Pooling Equilibrium, that is $b_1 > b_2$.*

Proof: See Appendix.

Proposition 3.7. *The Pooling Equilibrium is not sustainable.*

Proof. Assume there exists an equilibrium described in lemma 3.3 , and there exists an optimal amount of debt $b_2 > D_{c,2}$, $b_1 < D_{c,1}$ and $b_1 > b_2$ by lemma 3.6. Then, in period 2, the government that receives a low endowment defaults, where the default threshold $D_{c,1} = qb_2 < b_2$. It follows immediately that $b_1 < D_{c,1} = qb_2 < b_2$. This is true only if $b_1 < b_2$, which contradicts lemma 3.6. ■

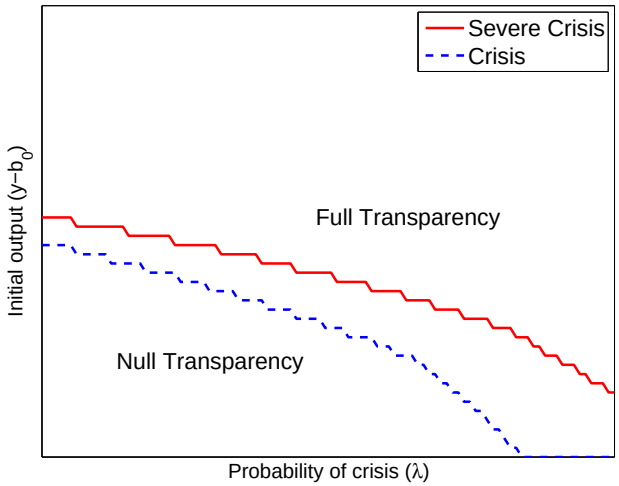
In the present model, the only type of equilibrium which is optimal to play under the null transparency is the equilibrium that reveals the information in period 1, which is described in lemma 3.2. The government during an economic crisis mimics the behavior of being in an economic boom and contracts a high level of debt in the first period, on which it eventually defaults. The government during a boom overpays for the debt borrowed in the risky region and reveals the state of the economy by repaying the debt next period. Therefore, in the second period it is able to borrow at the risk-free rate any amount below $b_2 < D_{c,2}$. The benefits from higher debt if the economy is in a crisis and the costs that come from lower debt due to the higher interest rate paid by the government during good times generate the trade-off that ensures the optimal level of transparency. In the next section, I will discuss the conditions that determine the level of transparency.

4 Optimal Transparency

This section highlights the economic conditions under which the government chooses to be opaque. I will analyze the results in the following three dimensions: the probability of receiving a low output (λ), the initial endowment or the level of indebtedness (y_0) and the severity of the crisis ($\underline{y}/\bar{y}$). A summary of the results is presented in Figure 1. It depicts the regions of the government's commitment to be transparent about the economy's future state. The government prefers to hide the economy's state when it has a higher initial debt, expects a bigger drop in output, or the probability of being in a recession is lower.

It is rather intuitive that the government with higher debt would like to be less transparent about the received endowment. A government with high debt depends more on external resources to finance its consumption. Lenders can offer a relatively better price during bad times if they are uninformed, and therefore, the government can roll over higher amounts of debt. It is also true that the government that experiences good times will have to pay a higher cost for the same amount of borrowing. However, a transparent government will be unable to roll over the debt if lenders know it is going to be in a recession. Therefore, since the government that receives a high endowment will be able to repay the higher debt and to smooth the consumption, it would a priori prefer to pay a higher cost during good times so

Figure 1: Transparency Regions of the Parameter Space



Notes: The regions of full and null transparency (commitment) as functions of initial endowment, probability of receiving a low endowment and the severity of crisis measured by $\underline{y}/\bar{y}$. As the last fraction decreases (crisis is more severe), the region of null transparency shifts rightwards.

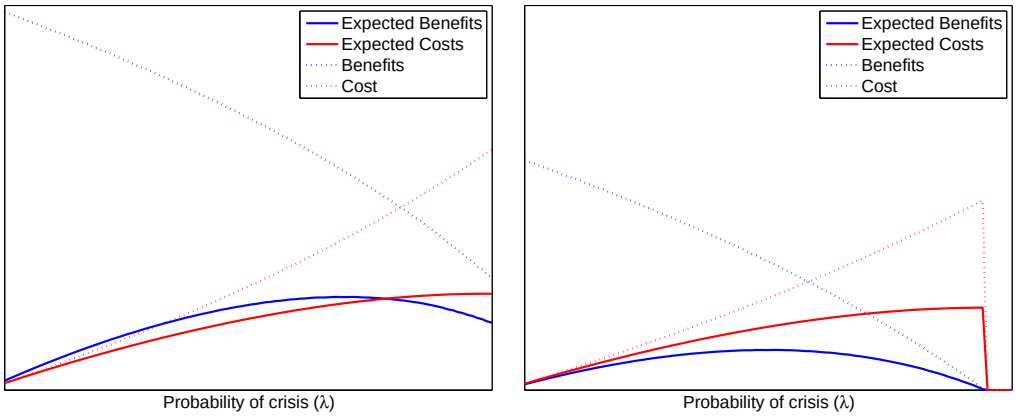
that it can borrow if a crisis, eventually, comes.

A similar story can be told about a government's willingness to be non-transparent when it expects a bigger drop in output. If the endowment is very low, the government's ability to repay the debt decreases. If the lenders were able to observe perfectly the bad economic state, the government would not have been able to borrow much. Hence, the benefits from mimicking the characteristic behavior of the good times are higher than the costs from paying a higher interest rate and contracting a lower amount of debt if it eventually receives a high endowment.

The government's preferences to commit to reveal the economy's state when the probability of a crisis is high is less intuitive. It should be recalled that lenders know the probability distribution of the states of the economy. Since this directly determines the borrowing cost, the higher is the probability of a recession, the higher the debt cost will be. As a result, the amount of debt that a non-transparent government finds optimal to contract during economic boom is close to the debt threshold that it is able to repay during recession. Given that during a recession, the non-transparent government can not benefit from mimicking the behavior of being in a boom, and during a boom, the government is always better off when lenders know the state, it prefers to be transparent if the probability of being in a recession is high.

However, when the government is less likely to experience a crisis, lenders offer a better price. The actual benefits from not being transparent increase, and likewise, its desire

Figure 2: Benefits and Costs from playing the Null Transparency strategy



(a) High debt at $t = 0$ (b) Low debt at $t = 0$

Notes: The graphs show the gained and foregone welfare from lower transparency for different levels of initial indebtedness (or the size of initial endowment). The dotted lines show the benefits/costs once the government observes its state and the bold lines show the expected values weighted by the probability of receiving the boom or crisis. The left panel shows the case of higher initial indebtedness, or lower y_0. Graphs are plotted for a given level of $\underline{y}/\bar{y}$.

to be opaque. At the same time, the lower the likelihood of a recession, the lower are the expected benefits at the time when the government does not know the endowment, and higher is the willingness to be more transparent. Therefore, the optimal transparency decision additionally depends on the degree a government is financially constrained and the severity of the potential crisis. As was mentioned above, when the government is initially less indebted and/or expects the crisis to be less severe, it prefers to commit to reveal the state of economy.

The actual and expected cost (benefit) graphs as functions of the probability of receiving a low endowment are plotted in figure 2. The benefit is the surplus in welfare once the government observes a low endowment and it chooses not to disclose it to the general public. The cost is the foregone welfare if the government prefers to be opaque and, eventually, receives a high endowment. Expected values are the benefits (costs) before nature reveals the state, that is actual benefits (costs) weighted by the probability of receiving a low (high) endowment.

Figure 2a depicts the cost and benefits of being non-transparent when the level of initial indebtedness is high (y_0 is low). When the government has high initial debt and experiences a low probability of being in a recession, the discrepancies between the costs and benefits from being opaque are very high. There are two effects going on. First, due to consumption smoothing behavior, the government with high initial debt is willing to borrow a higher

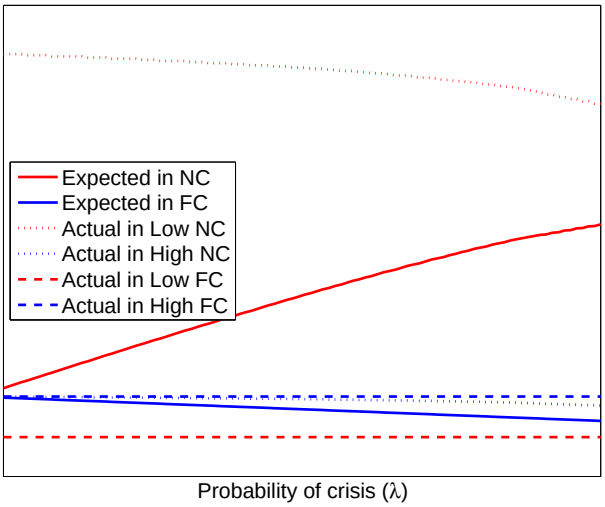
amount of debt. Hence, the benefits from being non transparent in an eventual recession are also high. Second, lower probability of a recession translates into lower borrowing cost, which makes debt more attractive, further increasing the benefits. Additionally, an interest rate approaching the risk-free rate allows the non-transparent government to borrow the amount of debt that a government during a boom could borrow if it were transparent. Hence the actual cost is almost zero while the benefits are high. Discrepancy between expected benefits and costs, though, is smaller due to lower probability of an eventual recession. Hence, the higher the level of initial indebtedness or the ratio of endowments between the two states, the lower the actual surplus and the desire to be non-transparent will be.

Figure 2b shows the case when the government has a relatively low initial debt, and the expected costs surpass the expected benefits from being non-transparent. Although the actual benefits from being opaque are higher, the probability of a crisis event is so low that the government is better off by committing to be fully transparent. The sudden jump to zero depicts the point where the government that experiences a recession is better off by revealing the economic state and contracting a lower level of debt. When the probability of an economic crisis is high, the borrowing cost increases and the government that receives a high endowment prefers a lower level of debt. Since the government is less financially constrained, it prefers to smooth consumption and be able to borrow in both states rather than defaulting on a level of debt that is marginally higher than its default threshold.

In figure 2a, a region can be observed in which the actual benefits surpass the costs, but the expected benefits do not. In this region, the government that chooses to be transparent has an incentive to renege on its commitment and mimic the behavior of a government receiving a high endowment. However, I assume that it is hard to break the commitment. One could think that the government can easily hide its state by providing less information, but it is hard to manipulate it. Frequently, countries show their information transparency commitment by adopting the internationally acknowledged regulations, like those developed by IMF or World Bank, which are very difficult to breach unnoticed.

The mechanism above was observed in two distinct crisis events: in Thailand (1997) and in Greece (2009). Both of these economies, before the crisis, enjoyed higher than average regional and OECD GDP growth rates, low inflation and pegged exchange rates to strong currencies: the US dollar, and the Euro respectively. As a result, they enjoyed low interest rates which allowed them to accumulate an unsustainable level of debt. Further, as it wa later revealed, they suffered from a lack of transparency in finance. Lower expectations about an upcoming crisis allowed them to mimic a good economic stance and roll-over high levels of foreign debt. However, once the regional and world economy had been hit by financial shocks, growth slowed down and a series of irregularities and hidden transaction scandals

Figure 3: Debt to GDP ratios



Notes: The graph shows the averaged over periods debt-to-output ratios for different cases. "Low" stands for the case in which a government receives low endowment, and "high", respectively the high. "Actual" shows the debt-to-output ratio that a government has after it knows all the information. Expected values are the weighted actual values by the probability of receiving a crisis/boom state.

emerged. As a result, governments had to default due to surging borrowing costs.

Figure 3 plots the average level of debt to output ratios for the expected and actual state of economies. As it can be seen, the highest level of debt to GDP is attained by a non-transparent bad economy. The lowest ratio is observed for the economy that is in crisis if it is fully transparent. Therefore, an economy that expects a low endowment will always be tempted to mimic the behavior of a government receiving a high endowment so that it can enjoy a higher level of debt and eventually higher consumption. Consistent with findings in the literature, the expected debt-to-GDP ratio is lower for a government that has better information about the state of its economy.[4] A similar result has been found in Gavazza and Lizzeri (2009) in a principal-agent framework where voters have less information than political parties.

Despite a higher level of debt that a non-transparent government can enjoy, it is not always optimal for the government during a crisis to be non-transparent. A high probability of crisis increases the cost of borrowing, and therefore increases the level of debt despite low net inflows. As a result, the cost of foregone utility from failure of consumption smoothing rises and the government in the bad state prefers full transparency.

[4]See for instance Alt and Lassen (2006) for a comprehensive analysis for 19 OECD countries; Cottarelli (2012) for empirical evidence performed for different income groups.

5 Transparency and creditor's expectations

This section provides empirical evidence on the relationship between information transparency and creditors' expectations about the state of the economy. For this purpose, I estimate a linear regression model using data for OECD countries. In line with the theoretical results, I find a positive relationship between the index of transparency and bond yields.

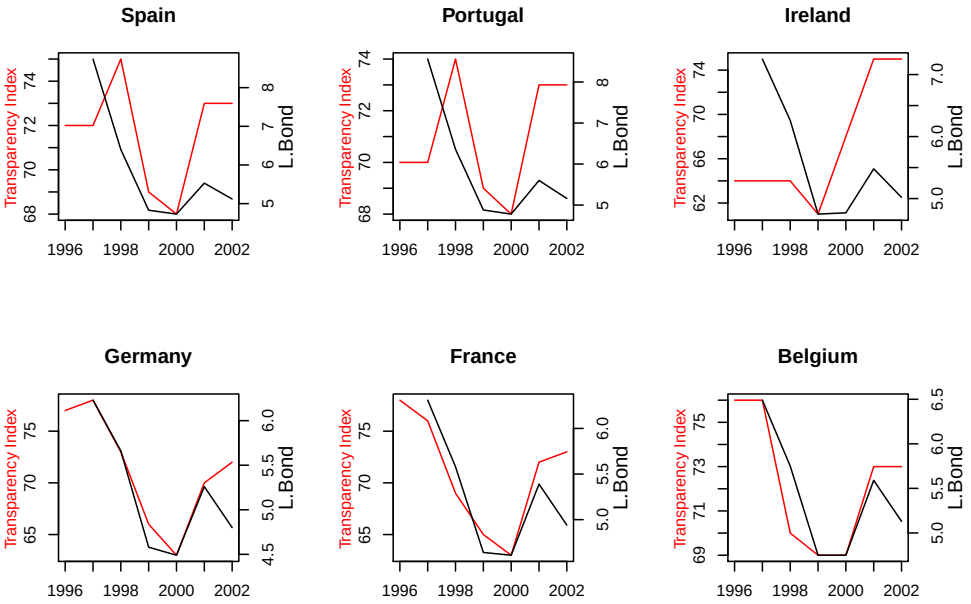
The analysis of OECD countries is preferred for several reasons. In comparison to emerging markets developed countries have more stable economies and, therefore, they are less prone to market fluctuations as a result of external shocks that affect bond yields. Furthermore, several developed countries have experienced an increase in sovereign bond yields due to the risk of default, which is the main mechanism developed in the theoretical part. Hence, in addition to longer available data series, OECD countries are also relatively homogeneous across many dimensions and serve as a good approximation of the model set-up studied in section 2.

The empirical model relies on two main variables: the market's perception of the economic situation and government transparency. To capture the first, I use the 10-year sovereign bond yield, which is highly correlated with the economic fundamentals and reflects the riskiness of government debt. Finding an appropriate measure of government transparency is less straightforward. There is no universal agreement on the assessment of government transparency and the literature proposes a variety of definitions, from the availability and clarity of the budget process to the commitment to policy decisions.

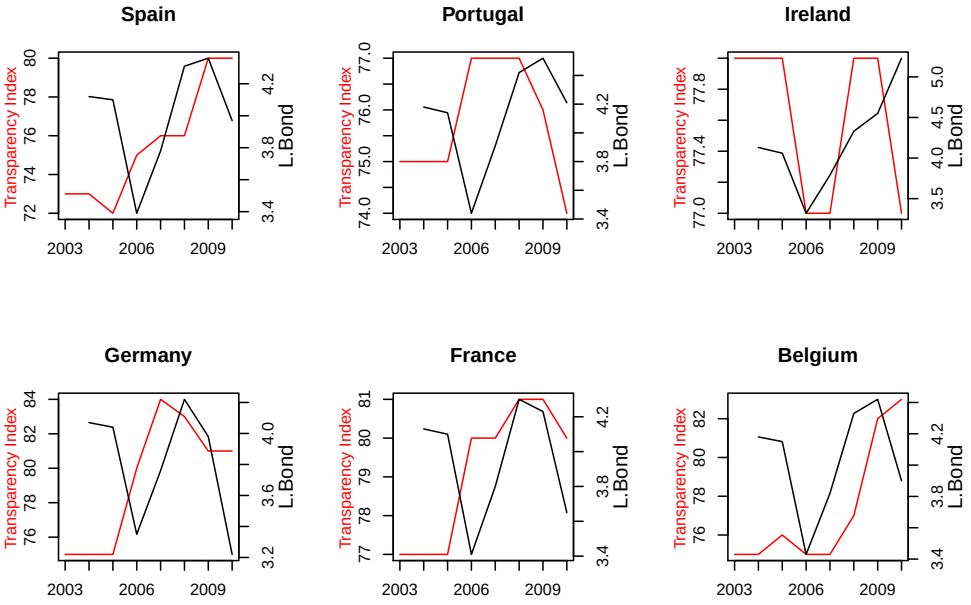
The index used in the present paper has been developed by Williams (2015). It is a composite index that captures the degree of government information transparency. Its construction is based on a methodology that is similar to the one used for the Corruption Perception Index. The index allows for comparison over a large time span and a large number of countries. It uses 29 variables from 21 sources ranging from well-known institutions, as well as measures constructed specifically for the study. The index reflects the amount of information released by the government that is published in major international statistical databases. It also includes the quality of information, that is the degree of the government's adherence to internationally accepted standards, and the government's ability to spread and communicate the information.

The data is annual and covers the period from 1980 to 2010. Summary statistics of the data can be found in appendix C. The data contain observations for 29 countries, however for a number of them, bond yield data is only available for later periods. Table 6 shows the correlation of the transparency index (TI) with fundamental variables. In line with the

Figure 4: Transparency Index and Previous period bond yield



(a) Period 1995-2003



(b) Period 2003-2010

Notes: The graphs show the level of transparency index (red line, left axis) and the previous period 10Y government bond yield (black line, right axis) in selected OECD countries.

existing empirical findings, countries that have higher transparency will also have lower bond yields, lower debt and higher growth per capita.

Figures 4 depicts the behavior of TI and one-year lagged bond yields for selected developed countries during the two periods before and after 2003. In all of these economies, the transparency index during the period of lower bond yields was decreasing. But it soared once the lenders increased borrowing costs. Worsened credit conditions and higher bond yields are associated with higher information transparency in the following year. This relationship is especially pronounced during the earlier period when countries registered a relatively low level of transparency overall, and there was a much higher room for improvement.

As it was shown in the theoretical model, when lenders expect a lower probability of an upcoming recession, indebted governments are better off by being less transparent and enjoying higher asset prices. However, once the probability of a crisis goes up and the cost of rolling over the debt increases, a government chooses to play the transparent strategy.

In what follows, I describe the empirical model that studies the relationship between transparency and market expectations. In order to take into account the time that a government needs to react to the market's punishing behavior and make appropriate legislative changes, the TI is regressed on the previous years bond yields. Additionally, this approach minimizes the possible endogeneity that might exist between TI and bond yields.

Another variable of interest is the interaction between bond yields and a dummy for countries that have lower transparency. Since the less transparent governments are more likely to have worse fundamentals they are more likely to postpone the release of additional information that might increase the borrowing cost. Therefore, I expect that sovereigns with a lower transparency index, on average, will have a lower positive response as a result of an increase in bond yields. I also test whether increasing debt amplifies the effect of soaring bond yields. To control for unobserved heterogeneity I use the fixed effects model. The model is given by:

$$TI_{i,t} = \beta_0 + \beta_1 bond_{i,t-1} + +\beta_2 bond_{i,t-2} + \beta_3 D(L)_{i,t-1} \times bond_{i,t-1} + \beta_5 bond_{i,t-1} \times debt_{i,t-1} + \beta_4 D(L)_{i,t-1} + \beta_5 ControlVars + \epsilon_{i,t} \quad (5)$$

where $D(L)$ is a dummy if economies have a TI lower than the yearly average. Control variables include the central government's debt-to-GDP ratio[5], deficit, log per-capita output growth, and current account. I include most of the variables that contain the bond price with a lag to take into account the fact that making significant changes in government ac-

[5]Estimation has also been performed for general government debt, but the results do not change significantly, and data is available for considerably shorter periods.

countability and information transparency needs approval by a legislative organ that requires time.

Table 2: Results for the period 1980 - 2010.

	Information Transparency Index			
	(1)	(2)	(3)	(4)
$bond_{i,t-1}$	0.720^{***}	0.444^{*}	0.499^{**}	0.522^{**}
	(0.276)	(0.244)	(0.243)	(0.258)
$bond_{t-2}$		0.385^{*}	0.362^{*}	0.369^{**}
		(0.215)	(0.186)	(0.187)
$D(L)_{i,t-1} \times bond_{i,t-1}$				-0.161
				(0.225)
$D(L)_{i,t-1}$			-2.769^{***}	-1.994
			(0.910)	(1.490)
$bond_{i,t-1} \times debt_{i,t-1}$	-0.005^{*}	-0.005^{*}	-0.003	-0.003
	(0.002)	(0.002)	(0.003)	(0.003)
$log(gpc)(+)$	Yes	Yes	Yes	Yes
CA(+)	Yes	Yes	Yes	Yes
deficit(-)	Yes	Yes	Yes	Yes
Observations	286	281	281	281
R^2	0.395	0.397	0.466	0.467
Adjusted R^2	0.354	0.353	0.413	0.412
Note:				*p<0.1; **p<0.05; ***p<0.01

The estimation results for baseline specification and the full dataset are presented in table 2. The sign of the control variables is reported next to the name. In line with the existing literature (see for ex. Alt et al. (2006)) higher growth per capita, a lower deficit and a positive current account balance are associated with higher transparency.

The first column reports the statistics of the relationship between the information transparency index and lagged bond yields without including additional explanatory variables, except the controls. The sign of the coefficient is positive and significant. Including additional dependent variables, as reported in subsequent columns, slightly decreases the effect of the previous year bonds. However, cumulatively the effect of change in market expectations on future transparency index is higher. The sign of the bond yields for both first and second lag is positive and significant in all the specifications.

The sign of the interaction term between dummy for less transparent countries and bond yields is negative as expected but not significantly different from zero. Hence, less transparent governments respond similarly to more transparent governments, that is an increase in borrowing cost is associated with improvement in the transparency index.

It is also interesting to note that, among the countries that have a higher debt level, an increase in bond yields leads to lower transparency. Hence the amount of debt out-weighs

Table 3: Results OECD: Spreads

	Information Transparency Index				
	(1)	(2)	(3)	(4)	(5)
$spread_{i,t-1}$	0.659**	0.307	0.642***	0.568*	0.119
	(0.265)	(0.291)	(0.217)	(0.307)	(0.321)
$spread_{i,t-2}$		0.342			0.289
		(0.234)			(0.202)
$D(L)_{i,t-1} \times spread_{i,t-1}$				0.137	0.432
				(0.471)	(0.435)
$D(L)_{i,t-1}$			−2.945***	−2.987***	−2.764***
			(0.922)	(0.976)	(0.936)
$spread_{i,t-1} \times debt_{i,t-1}$	−0.005*	−0.004	−0.004	−0.005*	−0.004
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
log(GPC)(+)	Yes	Yes	Yes	Yes	Yes
CA (+)	Yes	Yes	Yes	Yes	Yes
deficit (-)	Yes	Yes	Yes	Yes	Yes
Observations	260	250	260	260	250
R^2	0.277	0.291	0.383	0.383	0.379
Adjusted R^2	0.244	0.254	0.336	0.334	0.327
Note:					*p<0.1; **p<0.05; ***p<0.01

the government willingness to be transparent. This is in line with the theoretical results that showed that, everything else equal, a government with higher sovereign debt provides less information.

Given that the data for the whole period is not complete, and most of the data is available from 1995, I report the results for the period 1995-2010 in table 9. Though the results slightly change quantitatively, qualitatively they remain similar to the baseline estimation. The coefficient on the first lag of bond yields is positive and significantly different from zero, though the second lag does not seem to play a role in the later period.

5.1 Robustness

In order to check the robustness of the results, I perform several other estimations using different specifications of the main variables. In particular, table 3 reports the coefficients of the effect of spreads[6] instead of the bond yields, and tables 4 and 10 report the results for log specification of the benchmark model.

The results remain unchanged. The coefficients on bond yield spreads are still positive, though in some specifications not significant. Particularly the effects are weakened when adding the second lag.

[6]The spreads are computed as the difference between the bond yield of a country of interest and the bond yield of the United States.

The log specification also shows a positive relationship between borrowing costs and information transparency. The coefficients of log bond yields for the first lag are positive and significant. However, the second lag does not show any particular correlation. An increase in the bond yield by 1% leads to an increase in next year's transparency index by 5.9%. An estimation on the sample that starts in 1995 delivers similar results.

Table 4: Results OECD

	log(ITI)			
	(1)	(2)	(3)	(4)
$log(bond)_{i,t-1}$	0.051**	0.036*	0.049**	0.059**
	(0.022)	(0.021)	(0.020)	(0.023)
$log(bond)_{i,t-2}$		0.020		
		(0.022)		
$D(L)_{i,t-1} \times log(bond)_{i,t-1}$				−0.037
				(0.024)
$D(L)_{i,t-1}$			−0.040***	0.017
			(0.014)	(0.037)
$log(bond)_{i,t-1} \times debt_{i,t-1}$	−0.0002	−0.0002	−0.0001	−0.0001
	(0.0002)	(0.0002)	(0.0002)	(0.0002)
log(GPC)(+)	Yes	Yes	Yes	Yes
CA (+)	Yes	Yes	Yes	Yes
deficit (-)	Yes	Yes	Yes	Yes
Observations	286	281	286	286
R^2	0.373	0.369	0.455	0.464
Adjusted R^2	0.334	0.328	0.406	0.412
Note:				*p<0.1; **p<0.05; ***p<0.01

6 Conclusion

The literature that studies the effects of government transparency on economic outcomes highlights the beneficial effects of transparency. However, during several financial crises, we witnessed distinct events when governments were opaque about their fundamentals. The opaqueness of the financial sector in Thailand before the 1997 crisis, and more recent cases like the hidden debts of local governments in Spain, the manipulation of statistics by the Argentinian and the Greek governments show that there are cases when governments prefer to be less transparent about the state of their economies. In the present paper, I highlight different economic conditions that induce the sovereign to be more opaque about their fundamentals. In a model of endogenous sovereign default, I show that a government chooses to be more transparent when it has lower debt, expects a lower drop in output, and the probability of a recession is higher.

When the probability of a recession is higher, the price offered by uninformed lenders is very close to the one they offer to a government if it receives a low output. As a result, the cost from being opaque almost vanishes, while the benefits if it is in a good economic state increase. Therefore, a government that expects (along with lenders) an economic downturn prefers to be more transparent about the economy's state in order to enjoy higher consumption by borrowing more in case it eventually ends up in a good state. The theoretical result is supported by empirical evidence and I find a significant positive relationship between borrowing cost and future transparency indicator.

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Appendices

A Proof of Lemma 3.1

Proof. $D_{c,2} < D_{b,2}$

By definition, $D_{c,2}$ and $D_{b,2}$ satisfy the following equation

$$u(y_c) - u(y_c - D_{c,2}) = \beta(V^{ND} - V^D) = u(y_b) - u(y_b - D_{b,2}). \tag{6}$$

Since $u''(y) < 0$ and u is decreasing in D_2, from $u(y_b - D_{b,2}) - u(y_c - D_{c,2}) = u(y_b) - u(y_c)$ it follows that $D_{c,2} < D_{b,2}$. ■

Proof. $D_{c,1} < D_{b,1}$

By definition, $D_{c,1}$ and $D_{b,1}$ satisfy the following equation:

$$u(y_i - D_{i,1} + q(b_{2,i})b_{2,i}) + \beta \max\{u(y_i - b_{2,i}) + \beta V^{NDef}, u(y_i) + \beta V^{Def}\} = u(y_i) + \beta V_{i,2}^{Def} \tag{7}$$

Assume, without loss of generality, that the level of optimal debt b_2 is such that the government in crisis borrows in period one as much as to be indifferent between defaulting and repaying in the next period. Hence,

$$u(y_c - D_{c,1} + q(D_{c,2})D_{c,2}) = u(y_c), \tag{8}$$

and $D_{c,1} = q(D_{c,2})D_{c,2}$. Due to concavity of the utility function, the condition 7 for the government with high endowment becomes:

$$u(y_b - D_{b,1} + q(D_{c,2})D_{c,2}) = u(y_b) - \beta(u(y_b - D_{c,2}) - u(y_b) + \beta(V^{NDef} - V^{Def})) = 0 \tag{9}$$

Given $\beta(u(y_b - D_{c,2}) - u(y_b) + \beta(V^{NDef} - V^{Def})) > 0$, then from equation 9 follows that $D_{b,1} - q(D_{c,2})D_{c,2} > 0$. Hence:

$$D_{b,1} > q(D_{c,2})D_{c,2} = D_{c,1}$$

■

B Proof of Lemma 3.6

The government solves the following problem when it is playing the pooling equilibrium:

$$\max_{b_1,b_2} \quad u(y_0 + \tfrac{1}{1+r}b_1) + \beta u(\bar{y} - b_1 + \tfrac{1-\lambda}{1+r}b_2) + \beta^2 u(\bar{y} - b_2) + \beta V^{Ndef} \tag{10}$$

$$\text{s.t. } D_{1,c} - b_1 \geq 0, \tag{11}$$

where $D_{1,c} = qb_2$, as the government in crisis is not able to repay in period 3.

For, $\gamma \geq 0$, the F.O.C. wrt to b_2 is:

$$\frac{1-\lambda}{1+r}u'(c_1) - \beta u'(c_2) + \gamma\frac{1-\lambda}{1+r} = 0.$$

The following inequalities hold:

$$\frac{1-\lambda}{1+r}u'(c_1) - \beta u'(c_2) \leq \frac{1-\lambda}{1+r}u'(c_1) - \beta u'(c_2) + \gamma\frac{1-\lambda}{1+r} = 0, \tag{12}$$

and

$$u'(c_1) \leq \frac{\beta(1+r)}{1-\lambda}u'(c_2). \tag{13}$$

Let's consider the case when the constraint is not binding, $\gamma = 0$, then

$$u'(c_1) = \frac{\beta(1+r)}{1-\lambda}u'(c_2). \tag{14}$$

Given $\beta(1+r) = 1$, then $\frac{\beta(1+r)}{1-\lambda} > 1$ and $u'(c_1) > u'(c_2)$. Hence, $\bar{y} - b_1 + \frac{1-\lambda}{1+r}b_2 < \bar{y} - b_2$ and $b_1 > (1 + \frac{1-\lambda}{1+r})b_2 > b_2$.

Let's consider the case when constraint is binding, $\gamma > 0$ and $D_{1,c} = b_1^* = qb_2$. By definition of pooling equilibria, a government in good times finds it optimal to contract $b_2^* > D_{2,c}$. Let's assume that the government in crisis finds it optimal to mimic a government in boom and contracts the same level of debt. The government in crisis then consumes its endowment in period 1 and defaults in period 2. Hence, the terminal value of utility in period 2, equals to V^{Def}. As a result, it has the following utility function:

$$V_0(b_1^*, b_2^*) = u(y_0 + \frac{1}{1+r}b_1^*) + \beta u(y_c) + \beta^2 u(y_c) + \beta^3 V^{Def}.$$

Government in crisis can have the same stream of consumption if it consumes $b_2 = 0$ and hence not default in the last period. Therefore, the terminal value of consumption is $V^{NDef} > V^{Def}$ and the utility obtained by mimicking the government in boom is lower, $V_0(b_1^*, b_2^*) < V_0(b_1^*, b_2) = 0$. As a result, the government in crisis finds it optimal to deviate and the equilibrium when the constraint is binding is not sustainable.

C Summary statistics

Table 5: Summary statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
Transparency Index	overall	69.79	9.67	37	88	N = 865
	between		5.80	59.03	80.22	n = 29
	within		7.77	38.54	92.08	T-bar = 29.82
Bond Yield	overall	6.89	3.29	1	17.66	N = 648
	between		1.55	2.735	9.27	n = 29
	within		2.89	1.02	15.81	T-bar = 22.34

Table 6: Correlation matrix

	TI	Bond	Debt	log(gpc)
TI	1.0000			
Bond	-0.1831*	1.0000		
Debt	-0.1415*	-0.0861*	1.0000	
log(gpc)	0.6891*	-0.7596*	-0.0117	1.0000

$*$ - significant at 5% level

Table 7: Summary of bond yield 10Y OECD

Country Name	Mean	Std. Dev.	Freq.
Australia	9.08	3.57	31
Austria	5.45	1.68	21
Belgium	7.31	3.12	31
Canada	7.74	3.34	31
Chile	6.22	.47	6
Czech Republic	4.51	.79	10
Denmark	6.38	2.53	24
Finland	6.73	3.27	23
France	7.68	3.90	31
Germany	6.03	1.94	31
Greece	5.46	1.66	13
Hungary	7.61	.85	11
Iceland	4.94	.98	19
Ireland	8.34	4.11	31
Israel	6.11	1.51	14
Italy	6.45	3.14	19
Japan	2.73	1.84	22
Latvia	6.51	2.80	10
Luxembourg	4.68	1.57	14
Mexico	8.60	1.00	9
Netherlands	6.29	2.21	31
New Zealand	9.27	3.70	31
Norway	7.37	3.22	26
Poland	6.46	1.63	10
Portugal	5.67	2.31	17
Slovenia	4.51	.84	8
Spain	9.25	4.72	31
Sweden	6.96	3.23	24
Switzerland	3.95	1.25	31
United Kingdom	7.91	3.26	31
United States	7.10	2.97	31
Total	6.81	3.27	672

Table 8: Summary of Information Transparency Index

Country	Mean	Std. Dev
Australia	79.96	3.91
Belgium	69.33	6.85
Canada	78.96	3.61
Chile	66.73	10.54
Denmark	66.06	6.15
Finland	75.83	3.96
France	73.23	4.95
Germany	75.4	5.22
Greece	60.53	7.88
Hungary	64.5	13.75
Iceland	65.83	6.80
Ireland	65.66	9.01
Israel	63.6	8.32
Italy	70.03	3.96
Japan	70.76	10.13
Latvia	69.15	7.55
Mexico	59.43	9.29
Netherlands	73.93	3.64
New Zealand	70.8	8.91
Norway	72.96	6.31
Poland	62.43	14.95
Portugal	66.3	8.19
Slovenia	74.25	8.85
Spain	67.96	7.19
Sweden	75.3	7.95
Switzerland	70.7	5.18
United Kingdom	77.93	6.25
United States	80.4	3.97
Total	70.13	9.47

D Results for the period 1995-2010

Table 9: Model specification in levels

	Information Transparency Index				
	(1)	(2)	(3)	(4)	(5)
$bond_{i,t-1}$	0.784**	0.726*	0.839***	1.063***	0.907**
	(0.351)	(0.382)	(0.305)	(0.350)	(0.408)
$bond_{i,t-2}$		0.058			0.083
		(0.184)			(0.167)
$D(L)_{i,t-1} \times bond_{i,t-1}$				−0.449	−0.201
				(0.353)	(0.301)
$D(L)_{i,t-1}$			−3.021***	−0.849	−1.773
			(0.948)	(1.876)	(1.809)
$bond_{i,t-1} \times debt_{i,t-1}$	−0.006*	−0.006*	−0.004	−0.004	−0.004
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
log(GPC)(+)	Yes	Yes	Yes	Yes	Yes
CA (+)	Yes	Yes	Yes	Yes	Yes
deficit (-)	Yes	Yes	Yes	Yes	Yes
Observations	260	250	260	260	250
R^2	0.281	0.299	0.390	0.410	0.391
Adjusted R^2	0.247	0.261	0.342	0.358	0.338
Note:					*p<0.1; **p<0.05; ***p<0.01

Table 10: Model specification in logs

	log(ITI)			
	(1)	(2)	(3)	(4)
$log(bond)_{i,t-1}$	0.047**	0.042*	0.046**	0.055**
	(0.023)	(0.025)	(0.022)	(0.024)
$log(bond)_{i,t-2}$		−0.007		
		(0.011)		
$D(L)_{i,t-1} \times log(bond)_{i,t-1}$				−0.026
				(0.025)
$D(L)_{i,t-1}$			−0.040***	0.001
			(0.013)	(0.039)
$log(bond)_{i,t-1} \times debt_{i,t-1}$	−0.0002	−0.0002	−0.0001	−0.0001
	(0.0002)	(0.0002)	(0.0003)	(0.0003)
log(GPC)(+)	Yes	Yes	Yes	Yes
CA (+)	Yes	Yes	Yes	Yes
deficit (-)	Yes	Yes	Yes	Yes
Observations	260	250	260	260
R^2	0.275	0.290	0.378	0.391
Adjusted R^2	0.242	0.253	0.332	0.342
Note:				*p<0.1; **p<0.05; ***p<0.01