# For Online Publication:

# Internet Appendix of "Short-term Corporate Debt Around the World" *


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**Proof of Proposition**

**i)** In this case, the project type is public information and debt repayment is enforced at zero cost. That is, if an entrepreneur diverts cash flows (when $\theta > 0$) he will be caught and forced to repay debt. Hence, short-term debt is not required as a commitment device. Furthermore, because $0 < X_S < X_R < I$ , entrepreneurs cannot fully repay financiers by issuing only short-term debt on date 0. If an entrepreneur issues a mix of short-term debt and long-term debt on date 0, he incurs issuance costs of $2c$. Both types of firms reduce the issuance costs to $c$ by issuing only long-term debt. Furthermore, for the R-type the use of short-term debt would imply an expected financial distress cost of $(1-p)C$. Therefore, both types of entrepreneurs issue only long-term debt on date 0 to minimize the issuance costs and eliminate the financial distress costs associated with short-term debt.

**ii)** a) The proof is conducted in two steps: First, we derive the conditions for the existence of the separating $\theta = 0$ equilibrium if · Second, we derive the maximum value of $\theta$ such that the above conditions are satisfied. To begin with, let the superscript 1 denote short-term debt while the superscript 2 denotes long-term debt. The face value of debt (*D*) represents the required amount of debt repayment at maturity.

When $\theta = 0$, rational financers will require that the face value of short-term debt issued by the S-type is not higher than $X_S$ ($D_S^1 \leq X_S$). Because the S-type project succeeds with certainty on both dates 1 and 2, both short-term and long-term debt issued by the S-type are riskless. Under full-information, the face value of total debt issued by the S-type is *I*, given competitive financiers. The face value of long-term debt issued by the R-type is given by:

$$pD_R^2 + (1-p)X_R = I \qquad \Rightarrow \qquad D_R^2 = X_R + \frac{I - X_R}{p} > I \tag{A1}$$

If both types issue only long-term debt, the R-type would mimic the S-type and the equilibrium would be pooling. The face value of long-term debt in such a pooling equilibrium can be obtained from the following zero-profit condition:

$$\lambda D_P^2 + (1-\lambda)\left[pD_P^2 + (1-p)X_R\right] = I \qquad \Rightarrow \qquad D_P^2 = X_R + \frac{I - X_R}{\hat{p}} \tag{A2}$$

where $\hat{p} \equiv \lambda + (1-\lambda)p$ is the average success probability of a project at date 1. In a pooling equilibrium where both types issue long-term debt, the under-pricing of the S-type debt relative to the full-information face value of the S-type debt, *I*, is:

$$D_P^2 - I = \frac{(1-\lambda)(1-p)(I-X_R)}{\hat{p}} \quad \text{(A3)}$$

The S-type will have an incentive to reveal its type only if the benefit of doing so exceeds the cost. The benefit is the elimination of the mispricing and the cost is the additional issuance cost, $c$. Hence, the S-type will have an incentive to reveal its type only if $c < \frac{(1-\lambda)(1-p)(I-X_R)}{\hat{p}}$.

The R-type will not mimic the S-type only if the expected cost of mimicking (i.e. the expected cost of financial distress) exceeds the expected benefit (i.e. the overpricing of debt issued by the R-type if he mimics the S-type given market beliefs):

$$(1-p)C > (1-p)(D_S^1 + D_S^2 - X_R) \quad \text{(A4)}$$

From the zero-profit condition corresponding to the S-type, given market beliefs under a separating equilibrium, we have:

$$D_S^1 + D_S^2 = I \quad \text{(A5)}$$

Substituting (A5) into (A4), we obtain:

$$(I - X_R) < C \quad \text{(A6)}$$

Therefore, if $C > I - X_R$ and $c < \frac{(1-\lambda)(1-p)(I-X_R)}{\hat{p}}$, a separating equilibrium arises where the S-type is financed by a mix of long-term debt and a small amount of short-term debt, whereas the R-type is financed by only long-term debt.

We then derive the maximum value of $\theta$ such that the above conditions are satisfied. The separating equilibrium exists only if the R-type can raise *I* by issuing only long-term debt. This is possible only if the expected output not diverted exceeds *I*:

$$(1-\theta)(1+p)X_R \geq I \quad \Rightarrow \quad \theta \leq 1-\frac{I}{(1+p)X_R} \equiv \underline{\theta}_R \tag{A7}$$

The corresponding condition for the S-type is:

$$(1-\theta)2X_S \geq I \quad \Rightarrow \quad \theta \leq 1-\frac{I}{2X_S} \equiv \underline{\theta}_S \tag{A8}$$

The assumption $(1+p)X_R = 2X_S$ implies $\underline{\theta}_R = \underline{\theta}_S = \underline{\theta}$.

Therefore, for any $0 \leq \theta \leq \underline{\theta}$ , a separating equilibrium arises where the S-type a mix of long-term debt and a small amount of short-term debt while the R-type issues only long-term debt.

**b)** For $\theta > \underline{\theta}$, the R-type cannot raise *I* by issuing only long-term debt. He also has to issue some short-term debt. As a result, the separating equilibrium collapses and a pooling equilibrium arises where both types issue a mix of short-term and long-term debt. The face value of short-term debt issued, $D_P^1$, is determined such that the financiers expect to recover their investments. That is, the sum of expected cash flows for financiers on date 1 and date 2 is no less than *I*:

$$[\lambda D_P^1 + (1-\lambda)pD_P^1] + [\lambda(1-\theta)(2X_S - D_P^1) + (1-\lambda)(1-\theta)(X_R + pX_R - pD_P^1)] \geq I$$

Taking into account that $2X_S = (1+p)X_R$, we obtain:

$$D_P^1 \geq \frac{I-(1-\theta)2X_S}{\hat{p}\theta} \equiv \underline{D}_P^1 \tag{A9}$$

We can now obtain $\bar{\theta}_P$ by setting $D_P^1 = X_S$ (the maximum face value of short-term debt which can be repaid by the S-type):

$$\theta \leq \frac{2X_S - I}{[2 - p - \lambda(1-p)]X_S} \equiv \bar{\theta}_P \qquad \text{(A10)}$$

Note that the numerator in (A10) is not affected by changes in $\lambda$ but the denominator decreases with $\lambda$ (since $p < 1$). From (A9), the minimum face of short-term debt in the pooling equilibrium, $\underline{D}_P^1$, decreases with $\lambda$ (as the numerator is not affected by $\lambda$ but the denominator increases with $\lambda$).

In the above pooling equilibrium, the amount of funds raised through short-term debt equals the market value of the short-term debt issued. This is given by:

$$V_P^1 = \hat{p}\underline{D}_P^1 \qquad \text{(A11)}$$

Substituting (A9) into (A11), we obtain:

$$V_P^1 = \frac{I - 2X_S}{\theta} + 2X_S \qquad \text{(A12)}$$

Because $2X_S > I$, the amount of funds raised through short-term debt, $V_P^1$, increases with $\theta$. Hence, the ratio $V_P^1 / I$ also increases with $\theta$ (since I is exogenously given).

Finally, we can obtain the implicit interest rate on the short-term debt, which reflects the default probability, in terms of the parameters of the model. This interest rate is given by:

$$r_P^1 = \frac{\underline{D}_P^1 - V_p^1}{V_p^1} = \frac{1 - \hat{p}}{\hat{p}} \qquad \text{(A13)}$$

Note that $r_P^1$ does not depend on $\theta$ (since $\hat{p}$ does not depend on $\theta$).

Given that the yield of long-term debt is zero, the implicit interest rate on total debt issued is given by:

$$r_P = \frac{r_P^1 V_p^1}{I} \qquad \text{(A14)}$$

Therefore, the average yield of total debt issued $r_P$ increases with $\theta$.

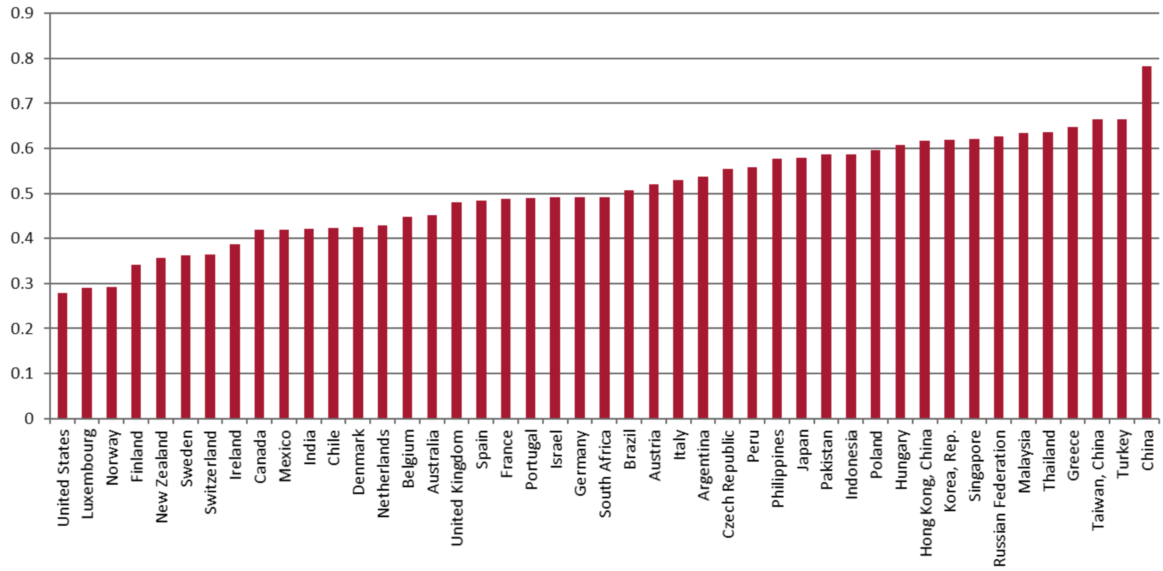
## Table A1: Fama-MacBeth estimations

The tables below present our estimation results for the determinants of corporate debt maturity structure based on Fama-MacBeth estimations. The dependent variables are STD/TD, STD/TA, and (STD + Payables)/TA, respectively. STD/TA is short-term debt divided by total asset of a firm. Payables/TA is account payables divided by total asset of a firm. (STD + Payables)/TA is the sum of short-term debt and account payables divided by total asset of a firm. Definitions of other variables are in Appendix. The absolute values of t-statistics are in brackets, calculated with Newey and West's standard errors with three lags. All regressions include industry dummies. *,**,*** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

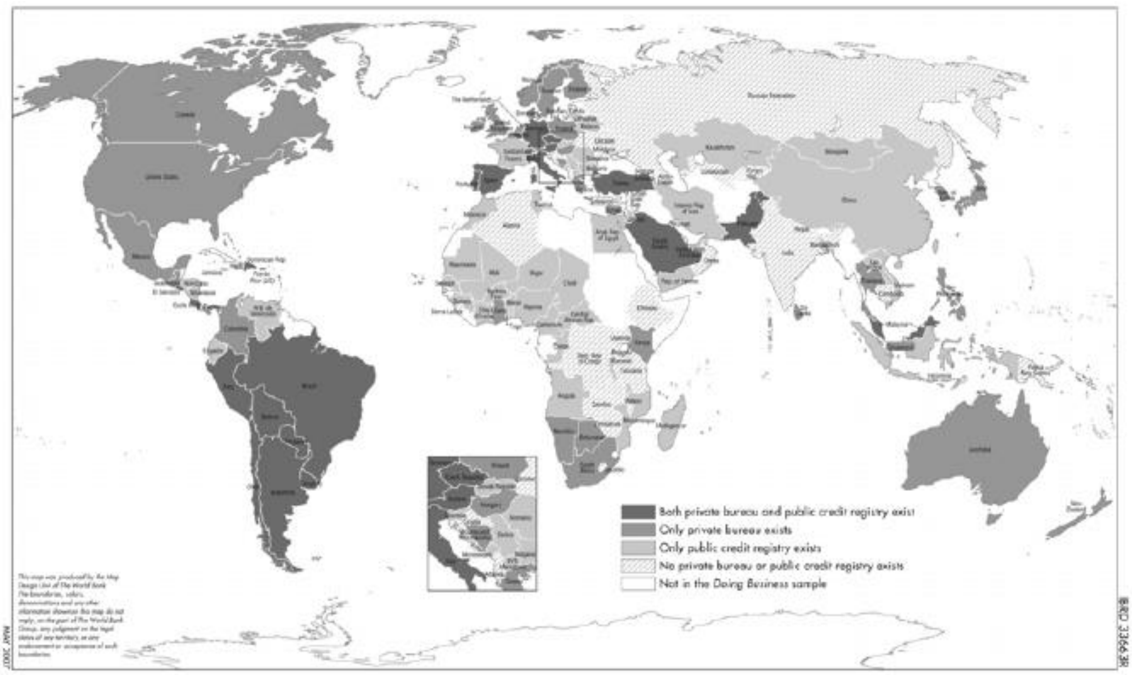
| | 1 | 2 | 3 |
|---|---|---|---|
| | STD/TD | STD/TA | (STD + Payables)/TA |
| Depth of Credit Info | -0.038 | -0.013 | -0.028 |
| | [5.72]*** | [5.95]*** | [14.71]*** |
| Creditor Rights | -0.069 | -0.008 | -0.050 |
| | [7.68]*** | [1.34] | [7.07]*** |
| Depth of Credit Info *Creditor Rights | 0.017 | 0.004 | 0.011 |
| | [11.16]*** | [4.75]*** | [13.75]*** |
| Corruption | 0.028 | 0.010 | 0.014 |
| | [10.73]*** | [8.61]*** | [10.56]*** |
| D Bankruptcy Code | 0.057 | 0.043 | 0.038 |
| | [4.84]*** | [10.95]*** | [8.71]*** |
| D Developed Country | -0.138 | -0.037 | -0.022 |
| | [9.12]*** | [6.42]*** | [3.34]*** |
| GDP growth | 0.003 | 0.002 | -0.000 |
| | [1.31] | [1.72] | [0.49] |
| Inflation | 0.003 | 0.000 | -0.000 |
| | [2.82]** | [0.76] | [0.04] |
| Deposits /GDP | 0.001 | 0.000 | 0.000 |
| | [5.72]*** | [3.85]*** | [4.18]*** |
| Deposit Insurance Coverage | -0.026 | -0.005 | -0.002 |
| | [4.58]*** | [1.42] | [0.46] |
| D Banking Crisis | -0.045 | -0.009 | -0.014 |
| | [3.34]*** | [1.20] | [1.01] |
| Size | -0.036 | -0.002 | -0.005 |
| | [13.11]*** | [2.07]* | [6.12]*** |
| Fixed Assets | -0.268 | -0.007 | -0.127 |
| | [9.02]*** | [0.58] | [4.80]*** |
| ROA | -0.068 | -0.183 | -0.251 |
| | [3.32]*** | [7.42]*** | [11.21]*** |
| Leverage | -0.076 | | |
| | [5.71]*** | | |
| Market to Book | -0.002 | -0.000 | -0.000 |
| | [3.02]*** | [0.50] | [0.51] |
| Constant | 1.132 | 0.106 | 0.344 |
| | [31.87]*** | [3.97]*** | [10.43]*** |
| Observations | 263,152 | 265,910 | 248,591 |
| R-squared | 0.25 | 0.21 | 0.26 |

## Figure A1: Average short-term debt to total debt ratios

This figure presents the average short-term debt to total debt ratios of firms in each country for the 1991-2010 period. The countries are ordered with the share of short-term corporate debt increasing from left to right.




## Figure A2: Existence of public or private credit registries around the world




Source: World Bank.