



# Maturity mismatch and financial crises: Evidence from emerging market corporations

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## ABSTRACT

Substantial attention has been paid in recent years to the risk of maturity mismatch in emerging markets. Although this risk is microeconomic in nature, the evidence advanced thus far has taken the form of macro correlations. We evaluate this mechanism empirically at the micro level by using a database of over 3000 publicly listed firms from fifteen emerging markets. We measure the risk of maturity mismatch by estimating, at the firm level, the effect on investment of the interaction of short-term exposure and aggregate capital flight. This effect is (statistically) zero, contrary to the prediction of the maturity–mismatch hypothesis. This conclusion is robust to using a variety of different estimators, alternative measures of capital flows, and controls for devaluation effects and access to international capital. We do find evidence that short-term-exposed firms pay higher financing costs, and have lower equity valuations, but not that this reduction in net worth translates into a drop in investment or sales.

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## 1. Introduction

The risk of “maturity mismatch” for emerging-market firms has received considerable attention in recent years. Although business assets are (stereotypically) installed for the long term and therefore illiquid, capital–market frictions and distortions may induce firms to issue debt with relatively short maturity. Should aggregate credit conditions shift suddenly, these same firms, unable to renew their debt, might have to curtail investment and perhaps liquidate. On the aggregate level, reliance on short-term external debt may render entire economies vulnerable to a collapse in output and investment due to capital-account reversals. Proponents of this view include Sachs et al. (1996), Furman and Stiglitz (1998), Radelet and Sachs (1998), and Chang and Velasco (1999), all of whom argue that excessive reliance on short-term external debt leaves emerging-market economies vulnerable to a ‘financial panic’ as in the stylized model of Diamond and Dybvig (1983).<sup>2</sup> These discussions were

largely inspired by the financial crises that affected East Asia and Latin America in the 1990s. The idea took on particular poignancy in reference to the emerging markets of East Asia, where the corporate sector was highly leveraged leading up to the crisis, and where much of their debt was at the short term.<sup>3</sup>

That such a scenario is logically possible is by now beyond doubt. That such a mechanism is of quantitative importance, however, remains an empirical question. Unfortunately, the ‘macro’ observation that crises occur with greater frequency in economies that have more short-term indebtedness (or more short-term indebtedness relative to international reserves) does not constitute sufficient evidence of this mechanism.<sup>4</sup> ‘Weaker’ economies and those exposed to larger shocks may in equilibrium issue debt at shorter durations. Moreover, in equilibrium, capital flight will almost mechanically be associated with a decline in investment, but it will not necessarily be the ultimate or even the proximate cause.

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<sup>2</sup> An alternative view is that the Asian financial crises largely reflected policy distortions in the region, in particular distortions that led to excessive borrowing by corporations and excessive lending by domestic banks (Corsetti et al., 1999; Johnson et al., 2000; McKinnon and Pill, 1998).

<sup>3</sup> The idea that maturity mismatch can amplify a liquidity shock, and thereby depress real activity, has also enjoyed a resurgence in recent days with the end of the housing boom and subsequent global financial crisis of the late 2000s.

<sup>4</sup> Both Radelet and Sachs (1998) and Rodrik and Velasco (1999) find that higher ratios of short-term debt over reserves increase the probability of a large capital-account reversal.

Instead, we examine this mechanism at the micro level by examining the behavior of corporate investment.<sup>5</sup> If the decline in investment is due to a liquidity shock originating from external investor panic, then those firms with the greatest short-term net financing needs should see the largest drop in investment. If, on the other hand, the collapse in investment is due to distortions that led to overborrowing in the run-up to the crisis, then there is no reason *a priori* to expect a larger collapse in investment in this particular group of firms. The analysis therefore involves comparing firms that differ in their potential exposure to liquidity shocks. In particular, we argue that firms with excessive short-term debt should suffer most from a 'financial panic'.<sup>6</sup>

We assemble a database with accounting information (including the maturity composition of liabilities) for approximately 3000 publicly listed non-financial firms in emerging markets. The countries represented in this sample consist of five from East Asia (Indonesia, Malaysia, Philippines, South Korea, and Thailand), seven from Latin America (Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela), and three additional emerging markets (Israel, South Africa, and Turkey). These data cover some of the largest emerging markets for 1990s, a period of substantial capital-account volatility for most of these countries. In addition, there are firms in our sample that hold substantial amounts of short-term debt net of liquid assets. These elements constitute the two ingredients necessary for examining the proposed mechanism. The choice of publicly listed firms is determined exclusively by the availability of accounting data. Additionally, we concentrate on the non-financial sector of the economy, as it is here that investment decisions are ultimately carried out.

The specific empirical strategy is to assess whether firms with more short-term exposure – defined as the gap between short-term debt and liquid assets – invest less in the aftermath of a *sudden stop* in capital flows.<sup>7</sup> We do so by estimating reduced-form equations for investment. The proposed mechanism centers on the interaction of short-term indebtedness with a dummy for periods in which the economy experienced a sudden stop, and so the key variable in the analysis is

$$(\text{Short} - \text{Term Exposure})_{i, t-1} \times (\text{Dummy for Sudden Stop})_t$$

for firm  $i$  at time  $t$ . This analysis allows us to better understand whether the marginal unit of debt is allocated across firms in such a way as to generate the large risk suggested by the maturity-mismatch hypothesis. The hypothesis is that we should estimate a strong and negative effect of this interaction.

The main empirical result is that the *investment response* of relatively short-term-exposed firms during sudden-stop episodes is statistically indistinguishable from that of firms that hold predominantly long-term debt. This finding is robust to the inclusion of controls for pre-existing firm differences as well as to the interaction of these controls with aggregate macroeconomic variables. We find this non-result in spite of the central prediction of the maturity-mismatch hypothesis: firms with more short-term exposure should invest substantially less following an episode of capital flight.

This result is robust to a wide variety of changes in the econometric specification. First, we obtain similar findings when controlling for access to external capital, changing relative prices, affiliation with a

conglomerate, or the currency composition of debt. Second, we show that these results do not arise because of censoring due to bankruptcy. Further, we find similar results to the baseline using alternative measures of capital flows, alternative normalizations of the accounting data, a variety of different estimators, and several different definitions of short-term exposure.

Note that we do not claim that capital flight is not associated with investment collapses. Indeed, in the data we use, there is a strong, negative correlation between the two. Instead, we find that a sudden stop does not differentially affect non-financial corporations (hereafter, 'corporates') with higher liquidity needs. Moreover, the lack of any such relationship, we argue, indicates that liquidity shocks caused by investor panic may simply not be of quantitative importance for these firms in this period, suggesting that other factors are driving capital-account reversals and associated investment collapses.<sup>8</sup>

Nor do we suggest that balance-sheet variables do not affect firm-level outcomes in periods of capital flight. On the one hand, we find that short-term-exposed corporations face higher interest charges, some of which they pay immediately and some of which are apparently recapitalized as debt going forward. Exposed firms also appear to sell some of their assets at a loss, consistent with a 'fire sale'. The market-to-book ratio of these firms drops differentially more for those with greater short-term exposure. Thus, while some readers might take issue with our ability to measure every aspect of short-term exposure, these results show that our *ex ante* measure does indeed predict *ex post* declines in net-worth and liquidity during these episodes. All in all, the equity holders of these firms lose, and the relevant counterparties (debtholders, for example) gain. Nevertheless, this transfer of resources out of the firm does not appear to affect productive outcomes. In other words, we show that, in these crises, short-term exposure led to a reduction in net worth, but do not find evidence of an impact on real activity. In contrast, we do find that highly leveraged corporations – regardless of the maturity structure of debt – do suffer larger relative drops in investment following sudden stops.

A few remarks on the interpretations of our results are appropriate at this juncture. First, nothing in this study should be construed as a universal negative regarding the existence or scope of creditor panics. Our analysis is specific to the episodes considered and refers to the corporates in our sample. Second, there might be spillover effects of short-term exposure during a crisis that we cannot measure with this research design; nevertheless, because we compare the average response of firms across levels of exposure, any multiplier among the group of short-term-exposed firms is built into our estimate. Third, even if our estimates do not measure a causal impact – in the sense that they represent the counterfactual effect on a randomly chosen firm – the parameter we report below is still useful in interpreting the role of maturity mismatch in these crises. Some or all of the (presumably negative) causal effect of being short-term exposed during a crisis could be attenuated by *matching*: firms that are best able to manage rollover risk should be the ones that take on additional short-term exposure. The risk in these crises associated with maturity mismatch is a function of how mismatch is allocated across firms, and our estimate is the composite of these causal and matching components, which is informative about the unconditional effect of maturity mismatch on firm behavior in these episodes. This being said, one should not extrapolate our results to situations where average exposure is higher or to firms well outside the support of the exposure distribution in our sample. Fourth, our results are consistent with a model in which sudden stops are driven by a broad correction of firms' optimal capital stock after the crisis. Put simply, if future growth expectations plummet, firms will not want to expand anyway,

<sup>5</sup> Ours is not the first paper to look at the firm-level response to financial crises in Asia. Claessens et al. (2000a,b) found corporate profits of Asian firms in 1998 to be lower for firms with higher leverage and a higher share of short term debt in 1996. Borensztein and Lee (2000) on the other hand, fail to find an impact of firm financial structure pre-crisis on performance of Korean firms during the crisis.

<sup>6</sup> Note that our analysis does not depend on whether corporations finance themselves directly from abroad. Even if banks intermediate all of the external debt, it should still be the case that exposed firms suffer the largest investment drops.

<sup>7</sup> We follow Calvo et al. (2004) in defining a sudden stop as a large reduction in the net financial account. See Section 2 for the full definition.

<sup>8</sup> While the focus of the present study is the corporate sector, we present evidence in Section 4 showing that the responses to these macro shocks of corporates and of the broader economy are actually quite similar in magnitude.

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