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Kiel Working Paper No. 994

Determinants of Short-Term Debt

by

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July 2000

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Determinants of Short-Term Debt*

Abstract:

One key focus of the on-going debate on the integration of international financial markets have been measures to lengthen the maturity of foreign debt. Short-term debt is typically considered to be volatile and thus a potential trigger of currency crises. In contrast to the vivid policy debate on these issues, there is relatively little theoretical and empirical evidence on the determinants of short-term debt. This paper summarizes the theoretical literature on the issue and presents a stylized theoretical model, which focuses on the risks and benefits of short-term debt under conditions of uncertainty. Empirical evidence shows that the level of economic development, the presence of financial centres, and the share of loans to banks have a positive impact on the share of short-term loans. OECD membership, in contrast, has a negative influence.

Keywords: foreign debt maturity

JEL-classification: F21, F23, G21

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* The authors would like to thank Ralph Heinrich as well as the participants of a seminar at the Kiel Institute of World Economics for most helpful comments on an earlier version. All errors and inaccuracies are solely in the author's own responsibility.

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1 Motivation

One key focus of the on-going debate on the integration of international financial markets have been measures to lengthen the maturity of foreign debt, as short-term debt is typically considered to be highly volatile.¹ High shares of short-term external debt expose countries to the risks of „sudden stops“ or abrupt reversals of capital flows, to attacks on the domestic currency and to banking crises, which ultimately leave the economy to bear real costs of recessionary readjustments.² Furman and Stiglitz (1998) provide empirical support for a high predictive power of short-term debt relative to reserves for the recent crises in emerging markets.³ Increasing the costs of short-term capital flows by means of transaction taxes of the Chilean type has thus become a typical element of proposals to reform the international financial system.

In contrast to the vivid policy debate on these issues, there is relatively little theoretical and empirical evidence on the determinants of short-term debt. Most empirical work dealing with the determinants of international capital flows focuses on the relative importance of push versus pull factors but does not provide a breakdown by maturity of capital flows. Recent theoretical work on the structure of international capital flows has stressed the features of debt versus equity rather than long- versus short-term capital (Razin et al. 1998). An exception is a recent paper by Rodrik and Velasco (1999), which derives an endogenous term-structure of short- and long-term debt and empirically assesses the determinants of the former. For a panel of 32 developing countries, Rodrik and Velasco find that the share of short-term debt is positively related to GDP per capita and the size of the financial system of the recipient country but not to foreign trade activities. This is in contrast to results of Buch (2000) for the maturity structure of foreign assets of German banks and which show a positive link between foreign trade activities and the share of short-term assets.

¹ Claessens, Dooley and Warner (1995), in contrast, provide evidence against the conventional wisdom that short-term flows are more volatile, less stable and less predictable than long-term flows.

² For a discussion on the evidence and consequences of capital account reversals see Calvo and Reinhart (1999).

³ Interestingly, however, as documented by Kaminsky, Lizondo, and Reinhart (1998), very few empirical studies on currency crises have considered short-term capital inflows (debt) as an explanatory variable, and only in one of them short-term capital inflows to GDP are found statistically significant, but only when weak fundamentals and low reserves are observed.

The present paper departs from the earlier evidence in two regards. *First*, we summarize the theoretical literature on the issue and present a stylized theoretical model, which considers the risks and benefits of short-term debt under conditions of uncertainty. In contrast to Rodrik and Velasco (1999), we focus on the solvency rather than the liquidity risk of projects. The model shows that a combination of short- and long-term debt can be a rational response to uncertainty about future project outcomes. *Second*, we present empirical evidence on the determinants of short-term debt, which makes use of a novel dataset. More specifically, we are using data recently provided by the Bank for International Settlements (BIS) on external claims of the BIS reporting countries, including bilateral claims of these countries. In contrast to earlier data, this provides us with the opportunity to analyze determinants of short-term debt of developing *and* developed countries.

Although our empirical part focuses on international bank lending, we yet capture the major share of short-term capital flows. Throughout the 1980s and 1990s, international bank lending has retained its dominant position in private debt financing.⁴ More importantly, banks have been serving as almost the single source for short-term lending. Table 1 shows some statistics on the mean and volatility of international bank lending by comparing the 1980s and 1990s. With a large surge of the average level of short-term claims within a decade and more than a double increase in volatility, a thorough investigation into determinants of short-term capital flows becomes even more challenging.

--- insert Table 1 about here ---

The paper is structured as follows. Section 2 starts with the summary of the theoretical literature on the determinants of debt maturity, then presents the model and investigates its properties. Section 3 focuses on the determinants of short-term debt flows and provides empirical results. Section 4 concludes and summarizes the main lessons.

⁴ See also Eichengreen and Mody (1999).

2 Determinants of Short-Term (Foreign) Debt

2.1 Debt Maturity and Asymmetric Information

So far, the determinants of short-term debt have been analyzed mainly in a closed-economy setting (see e.g. Rajan 1992, Diamond 1993). More recently, the focus of the analysis has shifted to an international one although a consistent framework, which allows for an analysis of the interplay between micro-economic factors (such as asymmetries in information) and macroeconomic factors (such as the role of monetary and exchange rate policies) is still lacking. Incorporating macroeconomic factors would be important because, as Kaminsky and Reinhard (1998) show, a major factor behind changes in the composition of capital inflows away from long-term FDI towards short-term capital flows in Asia have been sterilization policies which held domestic interest rates at high levels.

In contrast to closed-economy models, models of international bank lending need to take at least two specific features into account. *First*, foreign lending exposes banks to foreign exchange risks. Even if investors such as banks are perfectly risk neutral, risk enters the objective function because international banking regulations such as enshrined in the Basel Accord require banks to hold a certain amount of equity against their risky assets. *Second*, foreign lending activities differ from their domestic counterparts because asymmetries of information tend to be more pronounced in an international as compared to a domestic context. In this section, we briefly review the existing theoretical literature on the issue and derive a list of potential determinants of the share of short-term debt.

Rajan (1992) analyzes the impact of information asymmetries on the choice of investment finance. A firm can choose between short- and long-term bank loans as well as bond finance from arm's length lenders. The superior information that banks obtain about the type of the project affords them with bargaining power over the firm. It can be shown that the lower the bargaining power of the owner of the firm, the greater are the firm's preferences for long-term loans. This is because, under short-term bank finance, the bank has an explicit right to renegotiate contract terms while, under long-term bank finance, renegotiation takes place only if the bank gives up some of its control rents. Choosing long-term contracts thus allows the firm to limit the bargaining power of the bank. Empirically, we should find that if the bargaining power of banks is high *ex ante*, debt maturity

should be high as well. Another implication of this model is that the advantages of short-term bank lending are declining in the costs of acquiring information about investment projects.

In Diamond (1993), borrowers with private information about their credit ratings choose the maturity as well as the seniority of debt. This choice has two important effects, first, it affects the possibility that the lenders can remove the borrower from control, and, second, it influences the information sensitivity of refinancing the project, i.e. the degree of how much new information about the project can change the costs of its further financing. The paper distinguishes between „good“ and „bad“ projects and argues that owners of a good project will prefer short-term debt, while owners of bad projects would prefer only long-term debt. This is because, on the one hand, choosing short-term debt will make possible a repricing of further financing of projects upon new information that arrives at the time when initial short-term debt expires. On the other hand, short-term debt makes the project vulnerable to lenders' liquidation decision in which case borrowers (projects' owners) lose their control rents. Hence, the maturity structure of a debt contract will also depend on the size of control rents. For sufficiently large control rents, when borrowers prefer protecting control to information sensitivity, the share of long-term debt will be relatively high.

2.2 Debt Maturity and Liquidity Risk

While the models of Rajan and Diamond have been concerned with financing choices in closed economies, financial crises in international markets in the late 1990s have stimulated research into the linkages between debt maturity, the term structure of interest rates, and the possibility of self-fulfilling currency runs. Rodrik and Velasco (1999) assume an investment project, which can be financed by short- and long-term debt. A two-stage investment process is assumed, and the project yields only a fixed liquidation value after one period. Project returns are certain, hence there is no solvency risk. Lenders may, however, decide to withdraw their funds after one period. This liquidity risk drives a wedge between contractual short- and long-term lending rates.

In this framework, the term structure of (contractual) interest rate can be linked to the share of short term debt by distinguishing three different scenarios: (i) short- and long-term interest rates equal the world risk-free interest rate for low levels of short-term debt; (ii) short-term interest are lower than long-term rates for intermediate levels of short-term debt since, in this case, long-term debt can-

not be repaid fully if short-term lenders refuse to roll over their loans; (iii) for high levels of short-term debt, when even short-term debt cannot be fully repaid, the interest rate on it will bear a risk premium. Thus, borrowers that take into account this endogeneity will not choose short-term financing, because, being less expensive in the contractual sense, it is not cheaper in the expected value sense.⁵

Whereas Rodrik and Velasco model liquidity risk via an exogenous probability of lenders' refusal to roll over short-term debt, solvency risk is likely to be at least as important for the choice of debt maturity. This risk can be introduced as a random realization of the project that endogenously determines the probability of continuation versus liquidation of the project.

Below we present a stylized model of the lender-borrower relationship under initial uncertainty concerning the future realization of project returns. However, the relationship is not explicitly modeled, as in Rajan (1992) and Diamond (1993), where the choice of maturity of bank debt is determined by factors representing both lenders' and borrowers' bargaining power, also implying that both parties are entitled to make a decision on continuing or liquidating the project. Our model rather focuses on the incentives of lenders to diversify the maturity of their (international) claims under conditions of uncertainty about future project returns. Although such uncertainty also prevails in a domestic context, it is likely to be more severe in an international one. This is because foreign investors tend to be less well-informed about the host economy and because exchange rate and political risks prevail. Rather than modeling these risks explicitly, we assume that the degree of uncertainty and the costs of obtaining information are higher internationally than domestically.

2.3 Debt Maturity and Insolvency Risk

Consider a small open economy that exists for two periods. A single tradable good is produced and consumed by a continuum of identical risk-averse agents. At date 0, the country contracts with risk-neutral foreign investors for implementation of a two-period investment project of an initial size normalized to one. In period 1, investment decisions are made and assets are purchased to produce and consume the single good in period 2.

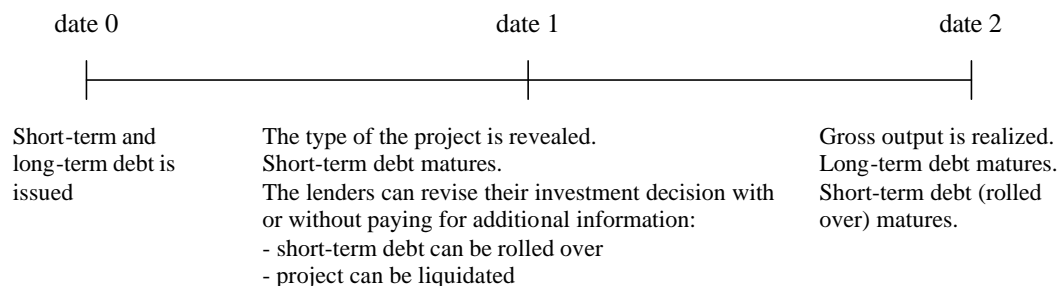
⁵ Results of Chang and Velasco (2000) support these conclusions. In this paper, depositors and creditors decide to run on a bank upon realization of some publicly observed random variable that, however, does not affect the fundamentals of the economy.

Since borrowers are assumed to have no net wealth at their disposal, the project needs to be financed with external funds. We assume debt finance only. Short-term debt contractually lasts one period, at the end of which the investor can either require repayment or decide to roll over the debt for one more period. In case of a roll-over, interest payment of period one is capitalized and falls due at the end of period 2. Long-term debt contractually matures in two periods, with the discretion of liquidation given to the investor after one period. Since we assume competitive behavior on both lenders' and borrowers' side, lenders take the domestic short-term and long-term interest rates, r^S and r^L , respectively, as given. We also abstract from changes in the short-term interest rate from one period to another and assume that $(1+r^S)^2 < (1+r^L)$.

The liquidation of the project at date 1 yields a constant liquidation value, which is smaller than the amount of the initial investment. Being a residual claimant, the borrower is always interested in the continuation of the project, unless there are additional negative effects, which are not modeled here. For simplicity, the riskless interest rate is assumed to be zero, there is no discounting, and perfect competition on the side of the lenders is assumed.

The realization of the project is uncertain both to the lenders and the borrower when the debt contract is signed at date 0. At date 1, when the investment into productive capital has been made by the borrower, the type of the project can be observed at no cost. We assume that the project yields a return that depends on a random productivity factor e , i.e. total output, which is produced at the end of period 2 is given by $F(\cdot)(1+e)$. If the realization of e exceeds some threshold level, the lenders want to continue financing. But, having short-term claims and rolling them over entails costs to holders of short-term debt. These costs can arise from a number of sources, which are not explicitly modeled in the present paper. It is conceivable, for instance, that competition for financing increases at date 1, which would suppress the rate of return in period 2. In addition, there might be some transaction cost for writing a new loan contract. If e is below a certain threshold level, the lenders want to terminate lending. In this case, early liquidation of long-term debt becomes costly for the long-term lenders: seniority of short-term over long-term loans after one period imposes an externality on long-term lenders since they receive only that share of the liquidation value that remains after servicing short-term debt.

Combining the above assumptions, the timing of events can be summarized as follows:



Depending on the realization of e , three scenarios are possible: for very low values of e , it is profitable to liquidate the project and collect the liquidation value; for some intermediate range of e , when the gross output of the project is still less than the contractual repayment, the lenders share the output; and for high values of e , the lenders are fully serviced according to the debt contract.⁶

Let s and $(1-s)$ denote the shares of short- and long-term debt, respectively, c give the per-unit cost of rolling over short-term debt, and L be the (fixed) liquidation value of the project. R is the total contractual return to the lenders in period 2 if short-term debt has been rolled over where $R = s \cdot (1+r^S)^2 + (1-s) \cdot (1+r^L)$.

Hence, lenders face a trade-off between the costs of rolling over short-term loans for a good project and liquidating long-term loans for a bad project. We would then expect that the share of short-term debt increases in the probability that the project yields a bad outcome and in the costs of liquidation and decreases in the costs of rolling over short-term debt. Notice that the trade-off described above which creates scope for a mixture of short- and long-term debt in equilibrium emerges without assuming asymmetries in information between borrower and lender.

Scenario 1: „Bad“ project

In cases when the realized productivity factor is very low, the lenders will prefer liquidation to continuation of the project. However, since we assume that short-term debt is senior to long-term debt in period 1, the threshold levels of e which make the two types of lenders indifferent between liquidation and continuation will also be different. For short-term lenders, the threshold, \underline{e}^S , can be obtained

⁶ Such a pay-off structure allows for the presence of a limited liability constraint imposed on the lenders, as well as of an individual rationality constraint for the borrower assuming that in case of the continuation of the project the borrower demands at least non-negative expected utility.

by equating the debt-service under liquidation, $s(1+r^S)$, and the repayment as a fraction of the realized output net of roll-over costs, $sF(1+e)-sc$. That is, $\underline{e}^S = (1+r^S + c/F) - 1$.

Similarly, another threshold can be obtained for long-term lenders, recalling that they get the residual of what remains of the liquidation value after short-term debt is serviced, $\underline{e}^L = (L - s(1+r^S))/(1-s)F - 1$. Comparing these thresholds, it is easy to see that $\underline{e}^S > \underline{e}^L$. To simplify the further presentation, we choose only the higher of these thresholds, \underline{e}^S , as the one relevant for lenders' decision on further participation in the project. The reason for this is that partial liquidation which would occur for intermediate values of e , between \underline{e}^S and \underline{e}^L , when short-term lenders prefer to quit but long-term lenders are better off by continuing to finance, can be excluded either by assuming a fixed-size project or by ruling out coordination between lenders. In a more realistic setup, however, the threshold would be an intermediate level of e depending on relative bargaining power of each type of lenders.

Scenario 2: „Intermediate“ project

For intermediate values of e , lenders stay in the project but the gross output realized is not enough to cover fully the contractual debt service. In this case, lenders proportionally share the output. Assuming that all debt contractually due after two periods has the same maturity, the net pay-off that short-term and long-term lenders get is then $sF(1+e)-sc$ and $(1-s)F(1+e)$, respectively. There will be a unique threshold, for which the output equals the contractual return, $\bar{e} = (R/F) - 1$. Notice, that \bar{e} depends on the share of short-term debt in the debt contract.⁷

Scenario 3: „Good“ project

For values of e higher than \bar{e} , gross output will be higher than the contractual return, implying that lenders are paid according to the terms of the debt contract and the surplus is allocated to the borrower.

We summarize these and the returns to short- and long-term lenders (Table 2).

--- insert Table 2 about here ---

⁷ This threshold does not imply any decision point in the lenders' strategy, but is rather to be used in calculating the total expected return to each type of lenders obtained as a sum of weighted returns in various states of nature.

Notice that the probability of reaching the good state is a function of the share of short-term debt: $\frac{\partial p_G}{\partial s} = \frac{\partial p_G}{\partial R} \frac{\partial R}{\partial s}$. Without additional assumptions on the interest rates on short- and long-term debt, the sign of the second term on the RHS would be undetermined. However, since by assumption short-term debt is repaid fully in the case of liquidation, we have followed Rodrik and Velasco (1999) in assuming that long-term interest rate exceed short-term interest rate, i.e. $\frac{\partial p_G}{\partial s} > 0$.

From this, we can derive the expected returns on short- and long-term debt, respectively:

$$E[R^S] = p_B s(1 + r^S) + (1 - p_B - p_G)s[F(1 + e) - c] + p_G s[(1 + r^S)^2 - c]$$

$$E[R^L] = p_B [L - s(1 + r^S)] + (1 - p_B - p_G)(1 - s)F(1 + e) + p_G(1 - s)(1 + r^L)$$

In equilibrium, the share of short-term debt s^* should be chosen such that expected rates of return on short- and long-term debt are equal, $E[R^S] / s^* = E[R^L] / (1 - s^*)$. Obviously, short-term debt is preferred to long-term debt if the LHS of the equation exceeds the RHS. Let Z denote the difference between expected rates of return on long- and short-term debt in equilibrium, $Z = E[R^L] / (1 - s^*) - E[R^S] / s^*$, i.e.

$$Z = \frac{1}{1 - s^*} [p_B (L - (1 + r^S))] + c(1 - p_B) + p_G [(1 + r^L) - (1 + r^S)^2].$$

We further assume that the expected rate of return on long-term debt is more sensitive to changes in the share of short-term debt than its short-term counterpart, $\partial Z / \partial s^* > 0$. It is easy to show that $\partial Z / \partial r^S < 0$, $\partial Z / \partial r^L > 0$, $\partial Z / \partial L > 0$ and $\partial Z / \partial c > 0$. Applying the implicit function theorem we can find the derivatives of the share of short-term debt with respect to the parameters of the model, and namely, to the short- and long-term interest rates, the liquidation value and the costs of roll-over of short-term debt.⁸ Thus, we finally obtain that the equilibrium share of short-term debt is a positive (negative) function of the interest rate on short-term (long-term) debt and a negative function of the costs of rolling over short-term debt. Since a high liquidation value (a low degree of illiquidity) of the project makes long-term lending more attractive, the share of short-term loans falls in the liquidation value. In sum, $s^* = s^*(r_+^S, r_-^L, L, c_-)$.

⁸ Notice that the average value of the project's output, F , drops when comparing expected rates of return on long- and short-term debt in equilibrium.

2.4 Extensions and Summary of Determinants

The above results can naturally be extended for the case of asymmetric information between the lenders and the borrower, when the former cannot costlessly observe the type of the project and have to implement costly monitoring. Introducing some fixed costs of information will shift the thresholds of ϵ up, thus increasing the probability of having a bad project, and making short-term lending more preferable.

An additional problem that arises particularly in an international context is a coordination problem among creditors.⁹ If there are many creditors and if information about individual claims is not readily observable by others, the amount of short-term lending might exceed what would be observed under perfect information. The situation of South-East Asia is a case in point. Prior to the recent financial crises, the Asian economies were typically praised for the relatively solid external financing and the high shares of foreign direct investments. When the crises ensued, however, the relatively high share of short-term financing was realized. To a substantial degree, this misperception was due to a lack of timely information on international investment positions, which has spurred increased efforts to improve statistics in this regard.¹⁰

An important application of the above model would be to investigate into the link between maturity profile of a country's foreign liabilities and its level of economic development. For more advanced economies we can expect that the degree of liquidity of an investment project will be higher, whereas the costs of roll-over and the general level of interest rates as well as the degree of information asymmetries will be lower compared to developing countries. Moreover, probability distribution of shocks for developed economies is more likely not to have "fat tails" and to have a positive mean, implying a lower probability of having a bad project, thus, more incentives for foreign investors to lend long-run. Clearly, the overall impact of these factors on the equilibrium level of short-term debt is not straightforward and depends on relative weights of individual effects. An econometric testing could be more illuminating in finding the direction of the overall effect, the results of which are discussed in the empirical part of the paper.

⁹ We owe this point to Ralph Heinrich.

¹⁰ As one of responses to the recent turmoil in international financial markets, the IMF and other international organizations have initiated a number of measures to improve the process of data dissemination on national financial macrostatistics and aggregated microprudential information (IMF 2000b).

Hence, the possible determinants of the share of short-term (foreign) debt can be summarized as follows (expected sign in brackets):

Information costs and risks (+): As shown above, large uncertainty about future project returns and high costs of obtaining information are likely to tilt the maturity of foreign lending towards short-term debt. The longer the maturity of a loan contract, the greater will, for instance, be the exposure to exchange and interest rate risks. Although these risks can in principle be hedged, hedging yet involves costs and may not completely remove risks.

Costs of liquidation (+): Once negative information arrives, liquidation of a long-term debt can be expected to be more costly than a roll-over of a short-term debt in case of positive information. The lower the costs of liquidation are, the higher is the liquidation value, and the more restricted are the lender's incentive to liquidate long-term debt, thus making short-term debt more desirable.

State of development of the financial system (-): As discussed above, it is conceivable that a higher degree of financial sophistication, such as an existence of well-developed bond and equity markets, reduces the costs of liquidation of long-term debt and thus increases the incentives to lend long-term.

Importance of relationship lending (-): An aspect that has not been addressed in the models above are the benefits of maintaining long-term customer relationships. In a dynamic setting, information of a lender on the borrower will not be exogenous but will rather depend on past relationships between borrower and lender. Building such borrower relationships, in turn, is costly to the lender, and these costs can be recovered more easily under long-term contracts. Hence, short-term debt will expose the lender to the risk of losing this initial investment in case the borrower credibly threatens to switch to another financier.

Bargaining power (-): Following Rajan (1992), a high bargaining power of lenders should increase the maturity of the loan contract.

Maturity matching: The lenders themselves have liabilities of diversified maturities, such as short-term and long-term deposits on the balance sheets of banks. Hence, banks with a high share of short-term liabilities will tend to prefer short-term assets.

Regulations: Lenders' incentives in choosing the maturity structure may be affected by regulations that stimulate a particular term-structure of capital flows. The Basel Accord, which defines capital adequacy requirements for internationally active banks, is a case in point. For lending to non-OECD countries, the Accord differentiates between short- and long-term lending. The risk weight for

loans to banks with headquarters outside the OECD is 20 (100) percent for loans with a maturity of less (more) than 1 year. *Ceteris paribus*, this distinction can be expected to raise the share of short-term lending to non-OECD countries.

Type of project/borrower: Trade and investment finance are the two main purposes of international bank lending. Since the former typically implies a shorter duration of projects, we would expect a positive relationship between trade activities and the share of short-term debt.

3 Empirical Evidence on the Determinants of Short-Term Debt

3.1 Earlier Work

Despite the increased interest of policy makers in the determinants of short-term capital flows, empirical evidence on these factors is relatively scarce. Although a host of studies has been concerned with the determinants of capital flows, particularly to developing countries, these studies do typically not distinguish capital flows of different maturities. Rather, the traditional literature distinguishes between “push” and “pull” factors relating them to the forces in the external (foreign) and internal (domestic) environment of emerging economies, respectively.¹¹ The general conclusion that can be drawn from the literature presented is that international capital flows are determined by both push and pull factors, and that the relative importance of these varies over time and between countries.

An exception is the work by Rodrik and Velasco (1999). They find, for a panel of 32 developing countries, that the share of short-term debt is positively related to the ratio of M2 over GDP and to per-capita income. Foreign trade activities, measured as the ratio of imports over GDP or a corruption index, in contrast, do not have a significant impact on the maturity structure of foreign debt. These results are obtained when estimating the model either for a cross-section of coun-

¹¹ Calvo, Leiderman, and Reinhart (1993, 1994), Fernandez-Arias (1996), Fernandez-Arias and Montiel (1996), Agenor and Hoffmaister (1998), Chuhan, Claessens, and Mamingi (1998), Hernandez and Rudolf (1995). Taylor and Sarno (1997) distinguish also between permanent and transitory shifts in determinants of capital flows, claiming that permanent shifts induce long-run changes in the pattern of net flows, while transitory changes result in short-term changes in net flows, which may be reversed over time.

tries for the year 1995 or in form of a panel with fixed effects for the years 1988-1997.

Buch (2000) uses data on the stocks of foreign assets of German banks, which is provided by the Deutsche Bundesbank in its Balance of Payments Statistics. Estimates for a cross-section of up to 73 countries for the years 1990 and 1997 reveal that both short- and long-term assets are highly correlated with foreign trade links. In relative terms, short-term assets are affected to a greater degree, which contradicts the results of Rodrik and Velasco (1999). As regards the impact of regulatory restrictions, the evidence has been mixed. While the presence of financial centres (and thus a relatively liberal regulatory regime) has had a positive impact on foreign banking assets throughout, EU and OECD membership have been of smaller statistical and economic significance. There is even some evidence for a negative impact of OECD membership on total assets, which runs counter to the argument that the BIS capital adequacy standards have biased lending decisions towards lending to these countries. Panel cointegration tests have pointed to different determinants of short- and long-term banking assets. There has been evidence for a statistically significant link between short-term assets, on the one hand, trade, GDP, and exchange rate volatility, on the other hand. Long-term assets, in contrast, were related to trade activities only. These results suggest that an increase in short-term assets might be a by-product of economic development in the sense of lower exchange rate volatility, increased trade activities, and growth in GDP.

In the empirical literature on the determinants of foreign bank lending, activities of domestic firms in the foreign market have typically been used to proxy information costs and existing customer contacts.¹² This literature has primarily focused on US banks and on the determinants of FDI in banking, which has been shown to be positively related to FDI in the non-financial sector. This supports the hypothesis that banks follow their customers abroad. Yet, the direction of causality between foreign activities of banks and non-financial firms is typically not addressed explicitly. Likewise, it is conceivable that omitted factors are driving FDI in both sectors. Most studies thus control for market size (measured by GDP or the size of the population) and foreign trade activities. Typically, market size and foreign trade links exert a positive impact on the foreign direct investment of banks. Entry regulations have a negative influence.

¹² See Buch (2000) for a survey of the literature.

Buch (2000) uses data on foreign activities (FDI and foreign assets) of German banks. The results show a strong and positive correlation between foreign activities of banks and demand conditions as captured by (per capita) GDP and foreign activities of German firms, i.e. FDI in the non-banking sector or foreign trade activities. There is evidence that EU membership and the abolition of capital controls have promoted foreign lending but not FDI of banks, thus weakly supporting the hypothesis that the two are substitutes.

Moshirian and Van der Laan (1998) analyze the determinants of foreign assets of banks from Germany, the UK, and the US in a portfolio framework on the basis of quarterly data for the years 1985–1995. In contrast to earlier studies on the determinants of international asset choices of banks, they find that FDI of non-banks has a significantly *negative* influence for all three countries. This supports the hypothesis that FDI abroad is a substitute for bank credits to foreigners. Moreover, they find a positive coefficient on the foreign liabilities of the country under study, suggesting that capital in- and outflows are positively related.

Potthoff (1992) analyzes the determinants of short-term foreign claims and liabilities of German banks for the years 1984 to 1989 by distinguishing the currency structure of banks' foreign activities. He finds that, apart from exchange rate changes, net foreign claims of German banks are determined by credit demand of German firms on the Euromarket, activities of foreign investors on the German capital market, and market interventions of foreign central banks. Grüner (1996) studies the international portfolio decisions of German investors for the years 1975–1994 on the basis of a multi-sectoral, international portfolio model for investment in the US, Japan, and the rest of the world. However, the results of these studies do not provide evidence on the factors determining the maturity of foreign loans. Moreover, investment decisions of banks versus non-banks are not distinguished, and data disaggregated by country are not used.

3.2 Determinants of Short-Term Bank Loans

The present paper goes beyond the earlier empirical evidence by using a more complete dataset recently compiled by the Bank for International Settlements (BIS) for mid-1999. Previously, the BIS has reported claims of banks located in the BIS reporting area on countries outside this area only.¹³ Hence, the question whether determinants of (short-term) claims on developed and developing countries differ could not be answered. Our results thus differ from Rodrik and Velasco (1999) because not only claims on developing countries but also on industrialized countries are considered and from Buch (2000) because we look at claims of all BIS reporting countries, not only Germany.

More specifically, we are using data for a cross-section of 57 countries, which are the recipients of about 95 percent of all international bank loans. A complete list of countries as well as of the variables used is given in the Appendix. The share of short-term loans in total loans to these countries is used as a dependent variable in the following regression:

$$y_i = x_i \mathbf{b} + \mathbf{e}_i$$

where y_i = share of short-term debt of country i , x_i = country-specific explanatory variables, and \mathbf{e}_i = error term. We are using the log of GDP per capita as a proxy of the state of development of the host country. Following the literature (Rodrik and Velasco 1999), we would expect a positive coefficient because short-term debt indirectly fosters investment and growth, and is thus positively linked with the productivity of the economy. The ratio of imports over GDP is used as a proxy for the importance of foreign trade financing, hence the expected coefficient would be positive. The ratio of M2 over GDP captures the size of the financial system which, as has been argued above, could have a negative impact on the share of short-term bank loans if it proxies the degree of liquidity of investments. In addition, lending to banks is typically of a more short-term nature than lending to non-bank customers. Hence, we are including the share of loans to banks to control for this.

Finally, a number of dummy variables are included to control for regulatory restrictions. OECD membership could have a positive impact on cross-border lending because the capital adequacy standards of the BIS, which have been issued in 1988, assign a lower risk-weight for lending to OECD members as com-

¹³ The reporting countries are the Group of Ten countries plus Luxemburg, Austria, Denmark, Finland, Ireland, Norway, and Spain.

pared to non-members. Short-term cross border lending in particular is encouraged as it receives a lower risk weight than long-term lending (Rodrik and Velasco 1999). Hence, we would expect a negative link between OECD membership and the share of short-term loans.

Additionally, EU membership is included as a proxy for regulatory restrictions because the adoption of the Single Market program and the adoption of the Second Banking Directive in 1992 have been intended to level the playing field for financial institutions across Europe. The adoption of the principles of mutual recognition, home country supervision, and minimum harmonization of banking regulations should have eased the provision of financial services abroad. In a similar vein, the abolition of capital controls can be expected to have fostered cross-border asset holdings. Generally, because EU membership can be expected to reduce uncertainty, it could be expected to increase the share of long-term loans. At the same time, the EU dummy is highly correlated with the share of lending to banks and GDP per capita (Table 3), which may render it insignificant.

--- insert Table 3 about here ---

Unfortunately, because we are using total external bank claims on a given country, we are not able to include a dummy variable capturing the exchange rate regime. Some countries in our sample have fixed exchange rates vis-à-vis some reporting countries and flexible rates vis-à-vis others.

In a first step, we have re-estimated the base-line equations of Rodrik and Velasco (1999). The results are shown in columns 1 and 2 of Table 4. The most striking result is that, although we are using a much larger cross-section of countries, including about 20 developed countries, and a more recent sample (1999 versus 1995), we obtain similar, albeit somewhat lower coefficients:¹⁴ an increase in GDP per capita by one percent raises the share of short-term loans by about 0.05 (Rodrik and Velasco: 0.08 percent); an increase in the share of M2 over GDP raises it by about 0.09 (versus 0.17 percent). The import share is found to be insignificant. As in Rodrik and Velasco, the estimated equations explain roughly one third of the variation of short-term debt.¹⁵

--- insert Table 4 about here ---

These results already suggest that determinants of short-term debt of developed and developing countries do not differ much. To test this more explicitly, we in-

¹⁴ Almost identical coefficients, in contrast, are obtained if we take the log of the share of short-term debt as a dependent variable.

¹⁵ Note that Rodrik and Velasco do not report the constant term.

clude a dummy variable for OECD members in a second step and interact this with the explanatory variables (column 3). The three interaction terms are insignificant, hence the hypothesis that the coefficients for OECD and non-OECD countries differ can be rejected. At the same time, the OECD dummy taken in isolation has a significantly negative coefficient, thus reflecting the bias towards short-term lending inherent in the risk-weighting for non-OECD members.

We have then included a number of additional explanatory variables, i.e. dummies for EU membership, for the presence of a financial centre, and the share of loans granted to banks in total foreign loans (column 4). Of these, OECD membership and the share of loans to banks have a significant negative and positive impact, respectively, on the share of short-term loans while the significance of the share of M2 over GDP drops to the 20 percent level. Yet, significance of this variable is restored if the insignificant dummies for EU membership and the presence of a financial centre are dropped (column 5). There is, at the same time, evidence for a negative link between the import share and the share of short-term loans. Overall, the equation now explains about 48 percent in the variance of the dependent variable, which is a considerable improvement over and above the baseline equation.

Several additional variables have been included in the final equation to check the robustness of our results. Since it has been argued that the recent financial crises in Asia have been triggered by a high share of short-term foreign liabilities, we have included a dummy variable for Asian countries. This dummy had a positive impact on the share of short-term debt, although the significance level was only in the range of 25 percent.

In addition, a country's rating can be used as a proxy for the risk premium attached by international capital markets. Hence, we have included the log of the rating published by Euromoney, i.e. of an index, which increases as country risk falls. If lenders prefer to lend short-term to more risky countries, we would thus expect a negative coefficient on this variable. The opposite turned out to be true, however. If anything, the coefficient on the rating variable has been positive, albeit at a 20 percent level of significance only. Because of a high correlation between the rating and other explanatory variables, GDP per capita and the import share turned out to be insignificant. Hence, we used the residual of a regression of the rating on all other variables in order to extract the orthogonal component of the rating (see also Eichengreen and Mody 1999). This residuum, however, was insignificant (column 7).

Finally, we have dropped GDP per capita to check whether the remaining results remained unchanged (column 8). As argued above, we do not have a strong theoretical explanation why the state of development of a country (which is proxied by GDP per capita) should have a positive impact on the share of short-term debt. While the coefficients on M2 over GDP and the financial centre dummy were hardly affected, the OECD dummy was less significant in this equation. Also, the equation's R^2 fell to 0.39. In other words, GDP per capita explains about 8 percentage points of the variation in the share of short-term debt across countries.

In summary, we have found strong support for the positive link between economic development, measured by GDP per capita or the size of the financial sector, and the share of short-term loans in total foreign liabilities. A comparison with the results of Rodrik and Velasco shows that these results are robust against changes in the composition of countries, notably the inclusion of developed countries. OECD membership has, if anything, a negative impact on the share of short-term loans while borrowing of commercial banks was shown to be linked positively. This latter result is due to the more short-term nature of transactions on the interbank market as compared to investment financing of non-financial borrowers.

4 Summary

Pursuant to the recent financial crises in Asia and elsewhere, there has been a vivid debate on the risks and benefits of short-term capital flows. The contribution of this paper has been twofold. On the one hand, we have presented a simple stylized model of (international) bank lending which has stressed the key economic role of short-term debt in the presence of uncertainty. We have employed a general set-up in which both short-term debt can be rolled over and long-term debt can be liquidated. Both options, however, entail costs. Under uncertainty about future project returns, lenders have incentives to choose a combination of short- and long-term debt. More specifically, the optimal share of short-term debt will depend positively on the short-term interest rate and a degree of illiquidity of the project and will depend negatively on the long-term interest rate and the costs of rolling over of short-term debt.

These results have been derived in a baseline model where both borrower and lender can observe the actual realization of the project at the beginning of the

second period. Allowing for asymmetries in information between borrower and lender would yield some additional insights. Investment into information will make the lender more reluctant to liquidate the project and will provide additional incentives to rollover the short-term debt. Although not shown in the model, a further conjecture can be made that increasing the costs of short-term loans can be sub-optimal because of the liquidation of longer-term loans in case of bad project realizations is costly as well. A key policy implication would be to increase the flow of information through, for instance, more standardized reporting standards.

In a second step, we have used data on the maturity structure of international bank lending to analyze the determinants of short-term bank loans for about 55 recipient countries. Although we are using a substantially larger dataset than earlier work by Rodrik and Velasco (1999), we confirm their basic result with the share of short-term loans being a positive function of GDP per capita and the size of the financial system of the host country. Generally, the results suggest that determinants of short-term bank loans are similar for developed and developing countries. At the same time, regulatory restrictions were found to have an impact on the maturity structure of foreign bank lending. OECD membership, in particular, has a negative impact on the share of short-term foreign loans, due to the risk-weighting implied in the BIS capital adequacy standards. This effect must be taken into account when assessing the welfare implications of the Basel Accord.¹⁶ A positive impact of EU membership on the maturity of foreign bank loans could, in contrast, not be established.

¹⁶ In fact, though it has been recognized that the current Basel Accord may have encouraged greater short-term lending, no empirical evidence to assess that impact has been provided (BIS 1999a). Moreover, “A New Capital Adequacy Framework” suggested by the Basel Committee acknowledges that the maturity of a claim is one of the factors that determine the overall credit risk to banks and that even short-term commitments entail some risk. In general, however, maturity should be considered together with other factors, such as quality of borrowers, which makes it difficult to assess more explicitly the impact of maturity of claims (BIS 1999b).

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Table 1 — Maturity Composition and Volatility of International Bank Lending

	Mean		Volatility			
	1980s	1990s ^a	Standard deviation		Coefficient of variation ^c	
	1980s	1990s ^a	1980s	1990s	1980s	1990s
	<i>(In constant US-dollar billion, 1995=100)</i>				<i>(Ratio)</i>	
Total claims						
All countries	685.9	789.1	74.6	106.0	0.11	0.13
o/w: Developing countries ^b	538.0	622.9	57.7	101.1	0.11	0.16
Short-term claims						
All countries	298.3	408.4	25.4	84.1	0.09	0.21
o/w: Developing countries	232.0	323.1	16.7	81.1	0.07	0.25
Long-term claims						
All countries	344.9	328.6	66.7	21.7	0.19	0.07
o/w: Developing countries	273.8	267.4	60.5	16.4	0.22	0.06

a) Data for 1990s cover the period until mid-1997, excluding the impact of the Asian crises on the volatility of bank lending. — b) The difference between claims against all countries and developing countries constitutes the claims against developed countries outside the BIS reporting area and is not representative. — c) Coefficient of variation is measured as a ratio of standard deviation over mean.

Sources: BIS (2000 and earlier issues), IMF (2000a), own calculations.

Table 2 — Project Returns Under Solvency Risk

Type of project	Bad	Intermediate	Good
Project return	$F(1 + \mathbf{e} \mathbf{e} \leq \mathbf{e}^s) < L$	$F(1 + \mathbf{e} \mathbf{e}^s \leq \mathbf{e} \leq \bar{\mathbf{e}}) \leq R$	$F(1 + \mathbf{e} \mathbf{e} \geq \bar{\mathbf{e}}) > R$
Probability	p_B	$1 - p_B - p_G$	p_G
Return to short-term debt	$s(1 + r^s)$	$s[F(1 + \mathbf{e}) - c]$	$s[(1 + r^s)^2 - c]$
Return to long-term debt	$L - s(1 + r^s)$	$(1 - s)F(1 + \mathbf{e})$	$(1 - s)(1 + r^L)$

Table 3 — Correlation Matrix

	GDP per capita	Import/GDP	M2/GDP	Share of interbank lending	Share of short-term lending	EU	OECD	Financial centre	Asia
GDP per capita	1.00								
Import/GDP	0.20	1.00							
M2/GDP	0.39*	0.24	1.00						
Share of interbank lending	0.62*	0.17	0.47*	1.00					
Share of short-term lending	0.56*	0.10	0.46*	0.56*	1.00				
EU	0.52*	-0.05	0.25	0.40*	0.24	1.00			
OECD	0.60*	-0.14	0.18	0.48*	0.20	0.62*	1.00		
Financial centre	0.34*	0.54*	0.51*	0.33*	0.34*	0.08	-0.03	1.00	
Asia	-0.39*	0.24	0.16	-0.16	0.01	-0.28*	-0.35*	0.05	1.00

* = significant at the 10-percent level

Table 4 — Cross-Section Estimation Results

	Dependent variable: short-term foreign liabilities / total foreign liabilities							
	1	2	3	4	5	6	7	8
Intercept								0.33*** (11.19)
Log GDP per capita	0.05*** (16.16)	0.05*** (14.12)	0.06*** (11.07)	0.05*** (9.48)	0.05*** (11.17)	0.05*** (10.85)	0.03 (1.45)	
M2 / GDP	0.09*** (2.90)	0.09** (2.85)	0.10* (1.70)	0.05 (1.37)	0.06* (1.86)	0.05* (1.78)	0.10* (1.87)	0.07* (1.85)
Imports / GDP		-0.01 (-0.09)	-0.05 (-0.54)	-0.09 (-1.41)				
(log GDP per capita) * OECD			0.00 (0.01)					
(M2 / GDP) * OECD			-0.00 (-0.01)					
OECD			-0.10 (-0.31)	-0.09** (-2.31)	-0.10** (-2.51)	-0.09** (-1.99)	-0.09** (-1.99)	-0.05 (-1.04)
(Imports/GDP) * OECD			-0.00 (-0.36)					
EU				-0.01 (-0.26)				
Financial centre				0.05 (0.91)				
Share of loans to banks				0.31*** (2.98)	0.30** (2.39)	0.31** (2.49)	0.30** (2.49)	0.42*** (3.10)
Asia						0.04 (1.23)		
log Rating (residual)							0.03 (0.75)	
R ²	0.36	0.37	0.35	0.48	0.47	0.47	0.49	0.39
Jarque-Bera (prob.)	0.31	0.31	0.34	0.42	0.40	0.62	0.59	0.33
White test (prob.)	0.83	0.59	0.05*	0.31	0.12	0.03*	0.09	0.00***
N	57	57	57	55	57	57	54	57

t-values in brackets. *** (**, *) = significant at the 1 (5, 10)-percent level.

Source: own calculations.