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In 2007 all ECB publications feature a motif taken from the €20 banknote.

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Abstract:

This paper investigates bond issuance of non-financial corporations in advanced economies during the period 1999-2003, attempting to understand motives for issuing in foreign currency, and determinants for the choice of currency. We consider the following influences on the currency choice when issuing foreign currency denominated debt: the microeconomic characteristics of the firm, the macroeconomic institutional environment and the financial particularities of the bond issue. We find that in addition to cost minimisation, hedging motives and the desire to establish an investor base influences the choice of currency. At the same time, market conventions and regulation also affect the choice.

Keywords: Bond issuance, Foreign currency denominated debt, Panel logit, nested logit, conditional logit

JEL classification: C25, E44, F23, G32

Non-Technical Summary

Since its introduction the euro gained significant ground as a currency for international debt issuance and is now one of the three most preferred currencies internationally. Excluding all issuers that were euro area residents, net issuance of bonds in euro in 2006 amounted to 287bn USD, or 21.7% of total international bond issuance. In December 2006 the euro share in the stock of international debt securities reached between 27.8% and 47%, depending on the measure used. Over the last year, issuance of euro-denominated bonds from the emerging markets in Africa increased substantially. However, among the top twenty issuers in euro denominated bonds there are only two non-financial corporations. Hence, this paper asks: What drives non-financial firms to issue bonds in foreign currency? Which companies display a "home bias" in bond issuance? And what determines a firm's appetite for issuing bonds in euro?

We find that a main driver for issuing bonds in foreign currency is the attempt to hedge exposure to foreign exchange volatility. But the firm's choice appears to be constrained by regulatory differences and market idiosyncrasies. In particular, information asymmetries concerning the regulatory framework abroad make is costly to issue in another currency, which reduces the number of small bond issues in foreign currency. Market idiosyncrasies in the different currency areas affect the choice of currency of corporate bond issuers. Specifically, the length of sovereign benchmark yield curves differs widely across currency areas, which impacts the choice of currency. Corporate bonds with long maturity tend to be issued in British pounds, as the underlying sovereign curve has the longest duration compared to the curves in the US, Japan and the euro area.

We set up a new database that combines 8,022 bond issues covering the period 1999 to 2003, i.e. the first five years after the introduction of the euro. In total, 2,471 firms issued 12,210 bonds worldwide during that period, according to our database. After combining the bond data with balance sheet information, the sample comprises 9,233 bonds. After incorporating subsidiary information for the firms, we end up with 8,022 issues in the four main currencies dollar, euro, yen and pound, which we use to investigate reasons for firms in the UK, the US, Japan and the euro area to issue bonds in a foreign currency. The four currency areas represent the most sophisticated bond markets and account for 91% of total bond issuance.

Our sample shows a strong home bias of issuers – 86% of bonds are issued in the firm's home currency with notable variation across countries: while UK firms issue only 41% of their bonds in their home currency, this is true for 56% of bonds from euro area corporations, 93% of bonds by Japanese and even 96% of US companies. A regional bias towards US firms also noteworthy; they account for more than 50% of all bond issues (4,675 out of 8,022), while euro area (1,331 or 16.6%), Japanese (1,554 or 19.4%) and UK firms (462 or 5.8%) are much less active bond issuers. The bias towards the US currency is even more pronounced, as 5,127 issues are denominated in US dollar, while 1,616 bonds were denominated in yen, 983 in euro and 296 in pounds.

We find that firms issue foreign currency bonds mainly to hedge exposure to foreign currency risk. This is true both for the whole sample and for the subset of US firms. Whether measured by the

proportion of foreign subsidiaries or by M&A activity abroad, foreign exposure increases the likelihood of issuing in foreign currency. This confirms the hypothesis of previous studies that more geographically diversified firms are more likely to use foreign currencies to issue bonds for hedging purposes.

Strategic considerations also play a role in the decision to issue in foreign currency. Specifically, large companies are more active in international bond issuance. This is likely to be due to three reasons. First, large companies may want to diversify their investor base across currency regions. Second, large firms may also face constraints in raising funds in their domestic markets. Third, large firms may be better known abroad, easing access and lowering borrowing costs in foreign bond markets. For US firms, we also find that firm leverage raises the likelihood to issue in foreign currency, supporting the idea that US credit constrained firms may find it easier to borrow abroad.

Regulatory differences appear to constrain bond issuance in foreign currency, since issuing abroad involves substantial fixed transaction costs. Hence, only larger issues in foreign currency are economical and firms prefer to issue small bonds in domestic currency. Fixed transaction costs are likely a result of regulatory differences, including legal advice concerning disclosure and taxation issues, and of road showing costs to overcome information asymmetries. All of these create a "home bias" in bond issuance for issues in smaller size. The largest bond issues tend to take place in euro but also pound and yen are preferred to the dollar for large issues.

Finally, market idiosyncrasies in the swap and the sovereign bond markets constrain the choice of currency in bond issuance. Longer bond duration reduces the likelihood of issuing in foreign currency. Long duration may make it expensive to swap foreign proceeds into domestic currency, as counterparty risk rises along the duration spectrum. More importantly, the break down into currency effects shows that duration is closely associated with the average duration of the underlying government bond markets. Market idiosyncrasies appear to play an important role when deciding the currency of issuance.

The paper shows that even for the corporate bond market in the US, the UK and the euro area, regulatory differences appear to curtail bond issuance. Harmonizing regulatory systems would facilitate cross-currency bond issuance for smaller issues – and that means smaller companies – which is likely to result in more efficient allocation of funds.

The findings also emphasize the role of the government bond market. Even in the highly developed countries that this paper considers, corporate bond issuance is affected by the extension of the underlying sovereign bond yield curve. The extension of the sovereign yield curve remains an important benchmark for corporate issuance in a given currency. Governments that want to deepen particular segments of the corporate yield curve can support this by building a liquid benchmark in that part of the duration spectrum.

Appetite for issuance in euro is driven by foreign firms' attempt to reduce exposure to currency volatility, the ability to tap into a market that can absorb large issues, while it may be hampered by costs of regulation and the relatively short duration of the sovereign yield curve.

1. *Introduction*

At the time of the introduction of the euro in 1999 the US dollar dominated international financial transactions. Forecasts about the role of the euro in international bond markets ranged from an extremely limited role of the euro to a significant sell-off of dollar assets in favour of euro assets. While Frankel (1995) suggests that "there is little likelihood that some other currency will supplant the dollar as the world's premier reserve currency by the year 2020", Portes and Rey (1998) argue that "[g]iven the euro's fundamentals (…) the dollar will have to share the number-one position".

In fact, the euro has gained significant ground as one of the three preferred currencies in international capital markets since its introduction. In the last seven years there has been a continuous increase in the share of debt finance raised in euro. The European Central Bank (2003) reports a steady increase in the share of the euro in the stock of international debt securities from 20 percent in Q3 1998 to above 30 percent in Q1 2003. While the US dollar is still the most widely used settlement currency in foreign exchange markets and trade invoicing, the data indicate a prominent advance of the euro in international bond markets. Indeed, BIS (2004) data suggest that since early 2002 euro denominated issuance of bonds and notes has exceeded issuance in US dollars.

Detken and Hartmann (2000) were the first to focus on factors that affect the optimal asset portfolio allocation among different currencies after the emergence of the euro. The paper considers factors related to market size, liquidity and transaction costs on one hand and factors related to risk diversification on the other. It finds that market size and liquidity effects that lower transaction costs take time to materialize. In addition, the data suggest no marked long-term changes in the structure of international investments with respect to portfolio risk considerations that would lead to a portfolio rebalancing towards the euro.

Geis, Mehl and Wredenborg (2004) create a new database to analyse in some detail the issuers and holders of euro-denominated international bonds. They find that outside the euro area, the market is dominated by private sector issuance, particularly from Anglo-Saxon countries. Moreover, the international use of the euro has a strong regional focus, with the City of London playing an important role on both the supply and the demand sides, and as an intermediary. The euro area itself is shown to be an important driver of the international role of the euro, as euro area investors are significant purchasers of euro-denominated bonds issued by non-euro area residents.

This paper attempts to further the understanding of this development by looking at the factors that drive the choice of currency in bond issuance by non-financial corporations. Studying the determinants of the currency-denomination decision of bond issues at the level of the firm we try to explain why the euro has become increasingly popular as a currency of issuance. We investigate various factors that influence the choice of currency when issuing Foreign Currency Denominated

Debt (FCDD): the microeconomic characteristics of the firm, the macroeconomic institutional environment and the financial particularities of the bond issuance.

The paper contributes to the literature by extending the dimensions of the currency decision problem. Earlier research has looked at debt issuance in home or foreign currency, while we consider a choice between many currencies. Keloharju and Niskanen (1997) use a panel of Finnish companies to examine the firms' currency decision when issuing long-term debt. Nandy et al. (2002) extend the country coverage, using a panel of both Canadian and UK firms. Another body of literature (see Galindo, Panizza and Schiantarelli (2003) for a survey) focuses on the impact of exchange rate fluctuations on debt composition and firm balance sheets. Mohapatra (2004) investigates the influence of the exchange rate regime on the choice of issuing debt in home or foreign currency. Finally, a paper by Esho et al. (2001) looks at the related market of syndicated loans, concentrating on the choice of home against foreign currency by East Asian firms.

A second contribution to the literature consists in substantially extending the data coverage of previous studies, which have focussed on few countries and have used survey data. Kedia and Mozumdar (2003) are the first who extend the binary currency choice to a multivariate problem. However, their paper looks at FCDD by US companies only, giving it a strong regional focus. By contrast, we create a new dataset, which is representative of bond issuance in advanced economies as defined by the IMF.[5] International bond issues from Thompson Financial are matched with firm-level balance sheet data, drawn from Van Dijk's Osiris database and linked with macro data from various sources, as explained in the appendix.

We find that the choice of currency depends on both cost minimization and strategic considerations. Hedging motives affect costs, while strategic supply and demand effects concern mainly the limited capacity of the domestic bond market. Finally, we find that the choice of currency reflects the need to follow established market conventions as well as the costs of overcoming regulation.

The rest of the paper is organised as follows. Section 2 outlines the theoretical explanations suggested in the literature why companies may decide to issue FCDD. Section 3 discusses the econometric technique used, while section 4 explores the dataset. Section 5 presents the empirical results, and a final section concludes.

2. *Theoretical Background*

Consider a firm that attempts to minimise borrowing costs when issuing debt. The firm's CFO chooses the currency of issuance, taking as given the macroeconomic environment, the microeconomic characteristics of the firm itself and the financial set-up of the bond issue. The

[5] For a definition, see IMF "World Economic Outlook" (2004, Statistical Appendix, Table B).

different costs that the firm may incur are captured by International Accounting Standard IAS 23, according to which borrowing costs consist of three parts, which are discussed below: interest costs (section 2.1), foreign exchange differences (section 2.2) and debt issue transaction costs (section 2.3). In addition, the firm may take strategic considerations into account (section 2.4).

2.1 Interest rate costs

Interest rates differentials between two currencies affect the choice of currency when raising debt, as borrowers will issue in the currency with the lowest interest cost. In perfect markets, arbitrage would remove any difference between the expected interest rate costs in different currencies. However, price differences have been observed empirically for protracted periods of time. Recent evidence comes from the related literature on syndicated bank loans. Carey and Nini (2004) report that interest rate spreads on syndicated loans to corporate borrowers are smaller in Europe than in the US.

The empirical divergence in borrowing costs is explained by a strong home bias of lending firms. Other explanations for continued differences in interest rates include political risk (Aliber 1973, Doodley and Isard 1980), differences in tax rates (Levi, 1977; Shapiro, 1984) and different creditor rights (LaPorta et al, 1998). Market participants suggest that interest rate differentials between euro and US dollar denominated bonds may also be due to investors' desire to diversify their portfolios.

We estimated our models adding the interest rate differential among the explanatory variables.[6] However, its sign was unstable across regressions and its coefficients turned out to be insignificant across all specifications. Finally, including the interest rate differential did not alter any of the other results. This mirrors recent evidence on increased market integration and low price differences. Accordingly, we decided not to include the interest rate differential in the regressions, as our results are not consistent with a failure of the uncovered interest parity conditions.

In addition, established market conventions in a currency area may determine the specifics of a bond that can be placed in a currency area. We look at duration as such a feature. Since corporate bonds tend to be priced off the government yield curve the duration of corporate bonds in a currency area is likely to follow the expansion of the government curve. Especially bonds of longer duration depend on a liquid benchmark. Hence, the duration of corporate bonds will tend to mirror the duration of the government curve. At the microeconomic level, this implies that a firm is more likely to issue a bond with long duration in a currency area where the government bond curve displays a long duration.

[6] See the definition of interest rate differential in table 9, in the appendix.

2.2 *Foreign exchange costs*

Previous studies have found that firms issue FCDD to hedge their foreign currency risk exposure (Keloharju and Niskanen, 1997; Esho et al., 2001; Nandy, 2002; Kedia and Mozumdar, 2003). This incentive is particularly strong if the firm has exchange rate sensitive assets or revenues. Financial risk managers try to cover currency risk exposure at different time horizons, differentiating between translation risk and transaction risk. Transaction risk refers to (short-term) exchange rate risk from operational revenues – currency cash flow, purchases, or sales in another currency –, while translation risk arises from the (long-term) translation of overseas assets and liabilities into domestic currency.

Operational revenues arise within a time frame of up to one year. As a result, transaction risk may be hedged using currency options or forward contracts, as the currency derivatives market up to one year is rather liquid. Over three-quarters of the total amount outstanding is in this segment (Bank for International Settlements 2004). In fact, this is the usual method of neutralising short-term currency risk.

By contrast, the translation of overseas assets involves long-term exposure, often exceeding five years. This market segment is considerably less liquid with only nine percent of the total amount outstanding in currency options and forward contracts. This market segment is small because of the need to secure the currency swap by collateral, which makes the transaction costly for long-run debt. As a result, the proceeds from bonds in foreign currency with long duration are difficult to swap back into domestic currency. Because it is less simple for a firm to hedge long-term liabilities in the currency derivative market, companies use "natural" hedges, i.e. they borrow in the currencies of the countries where their assets are located. Recently, Huffmann and Makar (2004) have found empirical support for this behavioural pattern of using forward contracts for the short period, while issuing FCDD for long-term hedging.

Exchange rate movements influence the exchange rate risk incurred when holding unhedged foreign assets. Previous work has in particular investigated the influence of the exchange rate regime on FCDD, finding a positive impact of exchange rate flexibility on FCDD. Esho et al. (2001) suggest that a floating exchange rate should lead to higher FCDD issuance. However, the effect is ambiguous as firms may take into consideration exchange rate volatility as a measure of the risk premium, which would reduce their inclination to issue bonds in foreign currency. At the sectoral level, Mohapatra (2004) finds that firms with primarily domestic currency earnings issue FCDD in fixed exchange rate regimes, while tradable good producers are the dominant foreign borrowers in flexible exchange rate regimes.

2.3 Transaction costs

Transaction costs of bond issuance may differ across currencies. Higher transaction costs may result from tax treatment, regulatory barriers, or disclosure requirements. In addition, capital controls or information asymmetries may isolate local markets, reducing efficiency due to lower competition in trading and clearance systems, among traders and investment bankers, and lower listing and monitoring standards.

Recently, increased competition between investment banks has decreased underwriting fees and favoured the growth of bond issues. The consolidation of the European markets in particular has greatly reduced the advantage of local knowledge for national banks and has attracted global underwriters. Most importantly, the regulatory requirements on currency matching for institutional investors' portfolios are easier to fulfil in the larger currency area, reducing the segmentation of the euro bond market (Santos and Tsatsaronis (2003) and Melnik and Nissim, (2004)). The entry of global investment banks in the euro bond market may have been a further stimulus to the supply of corporate debt in Europe. Since tax and regulatory issues are difficult to capture numerically at the macro level, we consider such cross-country differences by incorporating country dummies into our regressions.

In addition, fixed issuance costs may make it prohibitively expensive to place a small bond in foreign currency. In particular, legal fees resulting from different tax treatments, regulations and disclosure requirements and one off costs for road showing an issue abroad may raise the fixed cost of a bond issue in foreign currency. Hence, bonds in foreign currency are likely to be larger than comparable bonds in the firm's domestic currency.

2.4. Strategic supply and demand effects

In addition to minimising immediate borrowing costs, strategic considerations with regard to the company's overall goal to ensure sustainable low borrowing costs may affect the decision in which currency to borrow.

On the demand side, a large amount of potential investors in a given currency area may raise the issuer's interest to issue in that currency in order to establish an investor base in that market. In other words, building a reputation, or visibility, as a borrower may be a strategic incentive to borrow in a particular currency. FCDD may also work as a signalling device, demonstrating that the firm is willing to commit to higher standards of corporate governance and disclosure, which may make the firm more attractive also to domestic investors, thereby also reducing its domestic borrowing costs.

On the supply side, firms may have financing needs that exceed the capacity of the local market. This may make it necessary to diversify into bonds denominated in other currencies so as to tap a wider investor base. In the same vein, the firms' creditworthiness may be an incentive for firms to issue

abroad. However, the sign of this effect is unclear. Keloharju and Niskanen (1997) suggest that FCDD is positively correlated with variables that proxy creditworthiness, such as firm size and credit rating. Kedia and Mozumdar (2003) suggest that more subsidiaries in a region may also contribute to building reputation as a borrower in a market. Esho et al. (2001) find a positive correlation between FCDD and leverage using data from emerging markets. The interpretation of this result depends on how we understand leverage. As documented in a large body of literature, investors see a more leveraged firm as less creditworthy.[7] Hence, Esho's finding suggests that less creditworthy firms are more likely to be looking for funds abroad.[8]

3. *Methodology*

We present a static cost-minimization model, which is tractable and lends itself to empirical estimation. A firm decides to issue a bond in a given currency if doing so will minimise borrowing costs. There are J different currencies. Firms are indexed by subscript i. Under alternative j, the i^{th} firm faces a technology T_{ij} describing the feasible operations it can undertake. T_{ij} depends on the attributes of the firm and the currency. Minimising borrowing costs subject to T_{ij} yields the restricted cost function C_{ij}^* which depends on characteristics of the firm's technology, the firm's market environment and the attributes of the currency choice. In other words the j^{th} currency will be picked by the i^{th} firm if

$$C_{ij}^* = \min\{C_{ik}^*; k = 1, \ldots K\}.$$

While we do not observe the minimization process, we have information on the choice of currency. A statistical model using a discrete dependent variable can be used to estimate the probability of any currency being chosen over any other currency.[9] Assume that the restricted cost function of firm i can be written as:

$$C_{ij} = c + \beta X_{ij} + \gamma Z_i + \varepsilon_{ij},$$

where $C_{ij} = \ln C_{ij}^*$, c is a constant term, $X_{ij} = [\ln X_{ij1}^*, \ldots \ln X_{ijm}^*]$ is a vector of the m observable characteristics for the j^{th} currency and the characteristics of the i^{th} firm, which vary across currencies. $Z_i = [\ln Z_i^*]$ is a vector of firm i's characteristics, such as firm size, leverage, etc., which are constant across currencies. Finally, β and γ are vectors of unknown coefficients to be estimated, and ε_{ij} is a random term denoting the unobservable advantages to the i^{th} firm from issuing in the j^{th} currency

[7] For an overview, see Hubbard (1998).
[8] The referee pointed out to us that leverage might also be interpreted as the firm's cost effectiveness in bond issuance. While we were unable to substantiate such an interpretation with either market participants or in the literature, this would mean that the positive correlation between leverage and bond issuance abroad signals that the firm exploits its positive domestic reputation by issuing abroad.
[9] On discrete choice models see McFadden (1984).

which is assumed to be independently distributed across i and j. We assume that the error term follows a Weibull distribution. Given J different options, the probability that currency j will be chosen satisfies:

$P(j|x) = P\,[C_{ij}(T_i, X_{ij}) < C_{ik}(T_i, X_{ik}) \text{ for } j \neq k]$.

McFadden (1980) shows that under these conditions the probability that firm i chooses currency j is given by:

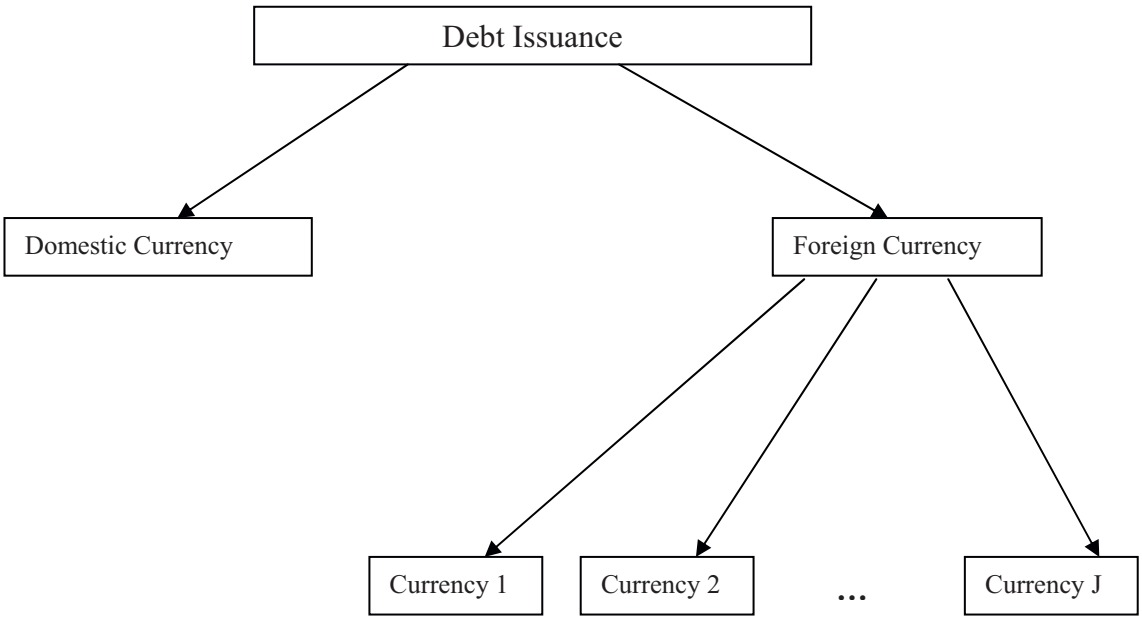
$$(1) \qquad P(\text{i chooses currency j}) = \exp(\beta X_{ij}) / \sum_{j=1}^{J} \exp(\beta X_{ij}).$$

Note that in this conditional logit model the βs are the coefficients of the currency characteristics. The firm's characteristics Z_i cancel out, since they do not vary across currency alternatives. However, the model can be modified to allow for firm specific effects by creating dummy variables for the currency choices and interacting each of them with the firms' individual characteristics Z_i.

A particular feature of the conditional logit model is that it requires the relative probabilities for any two alternatives (i.e. the odds ratio P_j/P_k) to depend only on the attributes of those two alternatives (the Independence from Irrelevant Alternatives (IIA) property). This implies that adding another alternative or changing the characteristics of a third alternative should not affect the relative odds of picking alternative j over alternative k.

Specifically, it is assumed that adding the domestic currency to the choice set would not alter the relative odds of any other two currencies being chosen. Even though firms have become increasingly multinational in recent decades, the major operations of most companies are conducted in the country of domicile. We model the currency decision as a two-step procedure, as shown in the decision tree in Figure 1. In the first step the firm decides whether to issue debt in domestic or in foreign currency. Once it has decided to issue in foreign currency, it chooses among a menu of foreign currencies. While estimating the model, we include a dummy for the domestic currency for each firm. Testing the significance of this domestic dummy will show whether firms prefer their domestic currency. In a separate regression we consider the choice between domestic and (any) foreign currency in a logit model to understand the first step of the currency choice.

Figure 1: The Firm's decision tree regarding the currency choice of bond issuance



This particular structure of the decision process suggests another approach of modelling the choice, which permits considering the domestic currency as a particular case with a different weight than the rest of the currencies. Therefore, we group the currency alternatives into two subsets – domestic and foreign (the domestic subgroup contains only one currency) – and relax the IIA assumption between the subgroups while keeping it within the subgroups. The complete decision tree may be modelled as a nested logit model (cf. Train 2003, Ch. 4 for a survey). The nested logit model requires IIA to hold across subsets (twigs) in the branch, but not across branches. In addition, it allows for explicit estimation of the firm-specific characteristics' influence on the choice of currency. The firm-specific cost levels associated with the decisions of issuing in domestic and foreign currency are:

(2) $C_i(\text{foreign currency}) = \gamma^{FC} Z_i + e_i^{FC}$

(2a) $C_i(\text{domestic currency}) = \gamma^{DC} Z_i + e_i^{DC}$,

where Z_i are firm characteristics, e_i is the error term and FC and DC stand for foreign and domestic currency, respectively. The null alternative here is not to issue a bond. The probability of issuing in a foreign currency is then:

(3) $P(\text{firm i chooses a foreign currency}) = \exp(\gamma^{FC} Z_i)/[1 + \exp(\gamma^{FC} Z_i) + \exp(\gamma^{DC} Z_i)]$,

which is the standard multinomial logit equation, i.e. the nested logit combines a conditional logit model for the choice between twigs with a multinomial logit model for the choice between branches.

The assumption is that the choice between the twigs satisfies the IIA property and comes after the choice between branches. In our context, this means that the choice between the domestic and any foreign currency is independent from the choice between foreign currencies. This gives the domestic currency a special significance in the choice-set, as suggested by the theory.
From equations (1) and (3) the probability of choosing a particular foreign currency is:

(4) P(firm i chooses currency j)

= P[(i chooses j| i chooses foreign currency)]*P[i chooses foreign currency]

= $[\exp(\beta^{FC}X_{ij})/\Sigma_{j=1}^{J}\exp(\beta^{FC}X_{ij})]*[\exp(\gamma^{FC}Z_i+\lambda^{FC}I_i^{FC})]/[1+\exp(\gamma^{FC}Z_i+\lambda^{FC}I_i^{FC}) + \exp(\gamma^{DC}Z_i + \lambda^{FC}I_i^{FC})]$,

where $I_i^{FC} = \log(\Sigma_{j=1}^{J}\exp(\beta^{FC}X_{ij}))$.

Using full information maximum likelihood on (4) and the corresponding equation for the domestic nest, we estimate β^{FC}, β^{DC}, γ^{FC} and γ^{DC}.[10] The variable I_i^{FC} is called inclusive value and is the utility derived from having available all alternatives in the foreign currency branch. If the coefficient of this inclusive value $\lambda^{FC} = 1$, the IIA holds for all alternatives, and the complete decision may be modelled using a conditional logit. We use this information as an additional test for the correct model specification.

In practice the estimation of a nested logit model requires a completely balanced panel data set. We do not have sufficient observations to run a nested logit using all firms. Therefore we present estimates from the nested logit model for the subsample of US companies, which comprise the largest and the most complete subset of the data, allowing for a balanced panel structure.

As discussed above, strategic as well as cost considerations figure into a firm's decision to issue debt. We do not explicitly account for dynamic effects. For example, it may be argued that a firm that issued a bond in euros may be more likely to issue in euros again. In particular, after the introduction of the euro initially shy firms may have become more confident in choosing the euro based on previous experience or general market sentiment. This question is beyond the scope of this study and is left for future research.

4. Bond Issues and Company-Level Data

To permit an empirical investigation of the currency decision in bond issuance, we created a new bond issue database from different sources. Firm-level balance sheet data, drawn from Van Dijk's

Osiris database, were matched with bond issuance data from Thompson Financial and linked with macroeconomic data from the IMF and the BIS. This high level of disaggregation of the data was needed to gain insights into the issuance process and the currency decision at the level of each single issue. We are interested in the interplay between the supply and the demand side of the bond market. Firm-level characteristics as well as macroeconomic variables influence both sides of the market. The data cover the period 1999 to 2003, i.e. the first five years after the introduction of the euro.

The final dataset is the result of a multi-staged selection process (Table 1). Company data from the Osiris database, featuring almost 25,000 companies worldwide, marked the starting point of the exercise. From this set, active industrial companies listed on a stock exchange and domiciled in developed economies according to the IMF definition were selected. This yielded 16,500 companies.

Many firms in the sample had a single shareholder owning more than 50 percent of the shares, indicating that these companies might be subsidiaries of the respective shareholder.[11] Subsidiaries, however, are likely to decide on the issuance of international bonds, including the preferred currency, in close coordination with the holding company. Thus, it could be misleading to link bond issuances by these companies with the respective balance sheet data, as in fact the holding company's characteristics would be more appropriate to explain the financing decisions taken by the subsidiary. For example, data on a subsidiary may indicate strong financing needs, which would be attenuated by a bond issuance if the firm were a stand-alone company. As a subsidiary of another company, such financing needs may be fulfilled by transfers from the parent company instead. For these reasons, companies with a single shareholder holding more than 50% of the shares were withdrawn from the sample, reducing the number of companies to 9,760.

The remaining sample included many companies that are small in terms of assets and/or numbers of employees. To keep data manageable, firms from the first quartile of the distribution by total assets in US dollar terms in any year and of employees in at least one year were discarded.[12] Applying these criteria produced a sample of 4,424 companies. To guarantee continuity in the reported data, companies with less than three years of consecutive balance sheet data were removed from this initial set, reducing the total number of companies to 1,711.

[10] In this case the domestic nest in the estimation is degenerate as it includes only one currency (but a different one across firms).

[11] Firms have been selected from the A+ through B- category of independence according to the Osiris 'ownership data' definition, where A means "no shareholders recorded with more than 24.9% direct or total ownership"; B means "no shareholders recorded with more than 49.9% direct or total ownership. One or more shareholders recorded with more than 24.9% direct or total ownership".

[12] In terms of assets, company size in the final sample ranges from USD 91,000 to USD 180 billion. In terms of employment, company size ranges from ten to 1.5 million employees.

Table 1: Overview of information available in Bond and Firm Level Databases

	Number of firms	*Number of bond issues*
Industrial companies in Osiris database	24,883	-
Listed, active, companies in adv. Economies	16,500	-
Largest shareholder owns less than 50 %	9,760	-
2nd to 4th quartile in assets in all years	5,464	-
2nd to 4th quartile in employees in one year	4,424	-
Three consecutive years of balance sheet data	1,711	
Active issuers in 1999 – 2003	2,471	12,210
Matched bond issue and balance sheet data	1,586	9,233
of which:		
Located & issuing in US, euro area, Japan, UK	1,496	8,361
Domestic issues	1,468	7,461
M&A activity related to bond issue	921	5,295
Subsidiary information	1,383	8,448

Source: Van Dijk Osiris and Thomson ONE databases, and authors' calculations.

In a second step, the company data from Van Dijk's Osiris database were combined with bond issue data from Thomson Financial. According to this source, a total of 12,210 bonds were issued by 2,471 companies domiciled in industrial countries over the period 1999 – 2003. Matching issue data with firm level information resulted in 9,233 issues from 1,586 firms. Thus, on average each company included in the sample issued slightly more than one bond per year over the review period. Average bond duration is 9.4 years, with the bulk of issues lying in the five to ten years range and reaching up to fifty years. Note that there are three possible definitions of international bonds (Detken and Hartmann, 2000). The "narrow" definition of international bonds refers to debt securities issued in a currency other than the home currency of the borrower. The "broad" measure adds to the "narrow" measure the issuance of debt securities denominated in the home currency of the borrower provided that it is targeted at international investors (e.g. through a syndicate of banks). This paper focuses instead on the "global" definition of international bond, which also includes all domestic issues targeted at the domestic market.

Table 2 provides information on the geographical distribution of the companies issuing bonds covered by the sample (column 1), the currency distribution of bonds issued (column 2), and the number of domestic bonds issued by companies of the respective countries (column 3). It reveals that the sample has a regional bias towards the United States, accounting for more than 50 percent of all issues (4,727 out of 9,233 issues). The bias towards the US currency is even more pronounced, as 5,443 issues are denominated in the US dollar. 1,630 bonds were issued in yen, while 1,060 were denominated in euro. Relating the number of domestic issues to the number of bonds issued by companies in the respective country provides a measure of home bias in issuance. It is particularly strong in the US, as 4,490

issues out of a total of 4,727, i.e. 95% of US companies' issues were denominated in US dollar. By contrast, firms from the euro area chose the euro in only 52% of the cases (744 out of 1,428).

Table 2: Distribution of issues by issuer domicile and currency

Country / Currency	Number of bonds issued by companies from	Number of bonds issued in currency	Number of domestic issues by companies from
US / USD	4,727	5,443	4,490
Japan / JPY	1,563	1,630	1,449
Euro area / EUR	1,428	1,060	744
UK / GBP	484	302	191
Korea / KRW	311	296	278
Taiwan / TWD	252	210	206
Canada / CAD	197	60	30
Switzerland / CHF	89	83	36
Sweden / SEK	58	5	2
Australia / AUD	50	90	24
Singapore / SGD	26	25	8
Hong Kong / HKD	21	21	3
Norway / NOK	15	6	0
Denmark / DKK	10	2	0
Israel / ILS	2	0	0
All countries / currencies	*9,233*	*9,233*	*7,461*

Source: Thomson ONE databases, and authors' calculations

As the number of observations is very small for several countries, the full dataset would not yield reliable econometric results. At the same time, the predominant part of total issues, or 91% out of 9,233 were issued in the four main currencies by firms domiciled in the euro area, the US, the UK, or Japan. Similarly, most firms (1,496 out of 1,711) are located in these four regions. Accordingly, the focus of the empirical exercise lies on firms that issue in the four main currencies and are domiciled in the US, the euro area, the UK, or Japan, leading to a total of 8,022 issues (Table 3).

Table 3: Distribution of bond issuance by country and currency in the four main regions

Region	EUR	GBP	USD	JPY	Total
Euro area	744	54	441	92	1331
United Kingdom	124	191	107	40	462
United States	101	49	4,490	35	4,675
Japan	14	2	89	1,449	1,554
Total	*983*	*296*	*5,127*	*1,616*	*8,022*

Source: Thomson ONE databases, and authors' calculations

A closer look at this group of bonds reveals that for all four currencies, the largest share of issuance comes from the domestic market (the main diagonal in Table 3). In all regions outside the euro area, euro area residents are the second most important issuers in terms of bonds issued over the period under consideration (row 1). For the euro as an issuing currency (column 1), UK resident firms are the most important non-resident issuers, accounting for 124 out of 983, or one-eighth of all euro-denominated issues.

4.1. Empirical Variables

The following variables were used to capture the effects discussed in section 2. The empirical variables and expected signs of the respective coefficients are collected in table 4.

Table 4: Empirical proxies and expected signs

Variable	*Proxy*	*Expected effect on the probability of choosing a foreign currency*
Interest rate costs	Duration	?
Exchange rate costs (hedging)	Share of subsidiaries in currency area	+
	M&A activity in target area in the past 6 months	+
Exchange rate costs (risk)	Past volatility vs home currency	–
Regulation	Principal	+
Transaction costs	Bond market capitalisation	+
Strategic supply	Total firm assets	+
Reputation/leverage	Total liabilities/total assets	+
Investor demand	Deposits/GDP	+

Concerning interest rate costs (section 2.1), we consider the duration of the bond as an important influence on the choice of currency. Since corporate bonds tend to be priced off the government yield curve the duration of corporate bonds in a currency area is likely to follow the expansion of the government curve. Particularly for longer duration, a liquid benchmark is instrumental for issuing a corporate bond. Hence, the duration of corporate bonds will tend to mirror the duration of the government curve. In other words, a firm is more likely to issue a bond with long duration in a currency area with long duration of the government bond curve.

Long-term risks that may raise foreign exchange costs (section 2.2) were represented by subsidiaries and M&A activity abroad. Since comparable data on subsidiaries' assets are unavailable for all countries in our sample, the share of subsidiaries in a given currency area over the total number of subsidiaries (including the subsidiaries in the home country) is used as a proxy for hedging motives. Even though the number of subsidiaries does not necessarily proxy for the absolute exposure to a currency, this variable captures the relative significance of one currency as opposed to another for the firm. More subsidiaries in a currency area are expected to raise FCDD in that currency.

It is noteworthy that the number of subsidiaries in a currency area may also capture the firm's ability to issue in that currency, as more subsidiaries signal a larger presence of the firm in the market of issuance. Investors are more likely to be familiar with the firm or to have interacted with some of the subsidiaries. More "air time" may increase the firm's perceived creditworthiness in that market.

According to market participants, firms frequently issue bonds to finance M&A activity (cf. also De Bondt and Marqués, 2004). To account for this fact, we consider the mergers and acquisitions in which the companies have engaged in the country of the issue currency as another proxy for foreign exposure. We collect information on M&A activity from Thomson Financial.[13]

Experts from the industry have indicated that firms usually finance an acquisition with a short-term bank loan of up to one year. Following the acquisition the loan is then refinanced by debt issuance; most issues are completed within six months of the acquisition. Firms may receive a different rating in the aftermath of an acquisition, which may necessitate a road show to advertise the bond issue.[14] As the process takes time we allow for a lag between the merger and the bond issue. However, firms acquire other firms frequently. In order to avoid attributing too many issues to the same merger or vice versa, we allow a 6-month window after the merger during which we consider all bond issues potentially motivated by it. We match a bond issue with a corresponding merger or acquisition if the bond has been issued up to six months after the merger or acquisition.

It is not uncommon for the same company to engage in more than one acquisition in the same month or even on the same day. For example, in December 1999 Rentokil bought eight companies in seven countries. To avoid double-counting of such transactions, we group M&A transactions within months. Thus, if a company has acquired three other companies within the same month and has also issued a bond over the next six months, we match the bond issue with all three acquisitions. To account for the size of the M&A transaction, we sum the values of the three M&As. In order to understand whether the currency of bond issuance depends on the region of the M&A, we create a dummy that is equal to one for the currency area of each of the targeted companies.

As regards exchange rate risk, firms are likely to take into consideration exchange rate volatility as a measure of the risk premium. Firms are assumed to take into consideration past volatilities represented by the annual variance of the local currency against the currency of issuance. Exchange rate volatility is a measure of the risk premium and we expect a negative influence of foreign exchange volatility on FCDD.

[13] 1,349 of the 1,586 companies in the sample have pursued merger and acquisition activities during the period 1999-2003. During these four years, the average firm acquired more than eight other firms bringing the total number of M&A transactions to 13,962. For about half of these transactions (6,793), Thomson also provides the value of the transaction, corresponding to 1,251 companies.

[14] We are grateful to Scott Lampard for explaining to us the details of M&A financing.

A direct measure of transaction costs (section 2.3) is available only for a small subsample. As a proxy, we assumed transaction costs to depend negatively on bond market size. Hence, total bond market capitalisation in the region of issuance was used, which ought to have a stimulating effect on FCDD.[15] A remark is in order concerning reverse causality of bond market capitalisation. Since the dependent variable in our estimation is a discrete choice variable and not the size of the bond issue, we do not consider the effect of other firms' choice on bond market capitalisation to be important. To confirm this, we calculated the correlation of bond market capitalisation with the principal amount of the issue and found that the correlation is significantly negative in Japan (-0.30), the UK (-0.81) and the euro area (-0.23), while it is significantly positive in the US (0.64). Note that this may indicate that large bond issues in the US raise the bond market capitalisation there rather than high market liquidity being an attraction to issue in US dollar.[16]

We represent differing regulation and tax treatments across countries by country dummies, as a representation of these effects at the macroeconomic level appears intrinsically difficult. At the microeconomic level, the decision to issue in a foreign currency should depend on the size of a bond issue, since issuing abroad involves fixed costs, such as legal costs, or road showing the issue. This may make it uneconomical to issue in smaller size in foreign currency. Hence, we incorporate the principal amount of each bond issue and expect a positive relation between the principal amount of a bond issue and choice to issue in foreign currency.

Strategic supply and demand effects (section 2.4) consist of several parts. Demand effects, i.e. the effects of a larger investor base in a region, are measured by deposits per GDP in the target area. We also use firm leverage as an indication for the firm's reputation. A remark is in order concerning reverse causality of this variable, as firms' choice of currency may affect the decision to whether to issue bonds or equity. However, talks with market participants assured us that the choice of debt issuance is taken prior to the choice of currency (cf. the decision tree in figure 1). Hence, the choice of currency does not affect firm leverage.

5. *Empirical Results*

Following the estimation structure suggested in section 3, this section starts by presenting the factors influencing the choice between domestic and foreign currency. Second, we present determinants of the choice among different foreign currencies including a dummy variable to capture domestic bond issuance. A third part presents results from a nested logit model for US companies, assuming that the decision-tree takes the form in Figure 1, where the first level decision is between domestic and foreign currencies and the second level decision is between the different foreign currencies. Test results

[15] Alternatively, a negative relation between bond market capitalisation and bond issuance in that market could indicate saturation of a market.
[16] However, Rajan and Zingales (1995) find that the choice between public (stocks and bonds) and private financing (bank loans) reflects the fact that bank-oriented systems tend to have illiquid capital markets.

corroborate the need for a nested structure. This model is estimated using the full-information maximum likelihood estimator implemented in Stata.

5.1. Domestic vs. Foreign Issuance

Consider the choice of domestic against foreign currency without regard to the particular foreign currency chosen. In terms of Figure 1, this means looking at the first level of the firm's choice only. Table 5 gives the logit estimates together with standard errors, which are robust to heteroscedasticity. The lower part of the table shows the pseudo-R^2, which measures the improvement of the regression fit against a regression on a constant only.

The dependant variable is a dummy that assumes a value of one if the firm issues in foreign currency, and zero otherwise. In this binary model, the share of subsidiaries is specified as the share of all foreign subsidiaries over the total number of subsidiaries. Similarly, the M&A dummy represents all M&A activity abroad during the six months prior to the bond issue.

Exposure to foreign currency risk as measured by the proportion of foreign subsidiaries contributes to the choice of a foreign currency. The results confirm the hypotheses put forward in previous studies that more geographically diversified firms are more likely to use foreign currencies to issue bonds for hedging purposes.

Second, M&A activity abroad has a significant influence on bond issuance in foreign currency. However, bond issuance to support M&A activity abroad is not limited to the currency of the foreign company which is being acquired. Firms also issue bonds in their domestic currency even when acquiring foreign companies. This finding is supported by the fact that the largest share of issuance is in domestic currency for all four currencies considered (Table 3). Third, the results suggest that larger corporate bond market capitalisation in the target region positively influences FCDD issuance. Assuming that larger bond markets may be linked with lower transaction costs, this corroborates the notion that lower transaction costs may be an incentive to issue in foreign currency.

Table 5: Logit estimates for the choice between issuance in domestic and foreign currency.

	1	2	3	4	5
Share of Subsidiaries	**6.20**		**6.40**		**6.18**
	(0.26)		(0.27)		(0.26)
M&A dummy		**0.29**	**0.27**		
		(0.05)	(0.06)		
Bond market capitalisation				**1.50**	
				(0.30)	
Log(Total assets)	**0.18**	**0.15**	**0.18**	**0.14**	**0.17**
	(0.04)	(0.03)	(0.04)	(0.03)	(0.04)
Deposits/GDP					0.07
					(0.08)
Number of Observations	7781	7781	7781	7781	7739
Pseudo-R^2	0.55	0.33	0.55	0.34	0.54
Log-pseudo-likelihood	-1498	-2211	-1486	-2190	-1489

Note: The dependant variable is a dummy equal to 1 if the firm issues in foreign currency and 0 for domestic currency. All regressions include country and year fixed effects. Standard errors in parentheses. Parameters that are significant at the 5%-level are shown in bold type.

Considering strategic effects, supply side considerations appear to have a bearing on the currency decision. Larger firm size has a positive effect on the probability of issuing in foreign currency, confirming the hypothesis that firms may need to tap a foreign bond market due to limitations of the domestic market. Firm size may also act as a proxy for reputation outside the domestic market. Larger firms may be better known abroad, easing access and lowering borrowing costs in foreign bond markets. By contrast, higher domestic deposits per GDP in the country of the issue currency do not raise the likelihood of issuing FCDD. While the coefficient on this variable is positive as expected, it is not statistically significant.

Table 6 expands the explanatory variables list and considers possible borrowing constraints on the firm side. The effect of firm leverage on FCDD is positive and significant in model 1 (but negative and insignificant in model 2), supporting the notion that firms that have exhausted the possibilities of the local market are more likely to issue debt abroad. This may reflect an attempt to diversify the investor base to avoid a simultaneous removal of invested funds in reaction to a macroeconomic or financial shock to the economy. We tend to prefer models 1, 3, and 5 to models 2, 4 and 6, as they have a considerably better fit (larger R^2 and log-likelihood). As the effect is not always significant however, the results do not permit firm conclusions.

Models 3 to 6 include two measures for constraints when minimising borrowing costs, the duration of the bond and the principal amount of the issue. We find a negative effect of bond duration on issuing in foreign currency. This may reflect the difficulty in swapping receipts from FCDD into domestic

currency. Bond issue size has a varying but always significant effect beyond a firm's foreign exposure (models 5 and 6). We regard the positive coefficient of model 5 (which we consider more reliable than model 6) as a tentative indication that firms reflect a large fixed cost block of FCDD by only considering FCDD for large issues.

Table 6: Logit estimates including borrowing constraints.

	1	2	3	4	5	6
Share of Subsidiaries	**6.30**		**6.20**		**6.30**	
	(0.26)		(0.26)		(0.26)	
M&A dummy		**0.29**		**0.31**		**0.26**
		(0.05)		(0.05)		(0.05)
Log(Total assets)	**0.20**	**0.15**	**0.16**	**0.13**	**0.17**	**0.18**
	(0.04)	(0.03)	(0.04)	(0.03)	(0.04)	(0.03)
Log(Duration)			**-0.26**	**-0.40**		
			(0.06)	(0.05)		
Log(Leverage)	**1.50**	-0.05				
	(0.33)	(0.25)				
Log(Principal)					**0.04**	**-0.13**
					(0.02)	(0.03)
Number of Observations	7781	7781	7684	7684	7781	7781
Pseudo-R^2	0.55	0.33	0.55	0.34	0.55	0.34
Log-pseudo-likelihood	-1485	-2211	-1476	-2163	-1498	-2199

Note: see Table 5

5.2. *Currency Choice of Foreign Issuance*

Now assume that all currencies, including the domestic one, are equivalent to the firm. If there were perfect hedging opportunities and the transaction costs were equivalent between currencies, the firm should be indifferent between its "home" currency and any other alternative. A conditional logit model works on the basis of this theoretical assumption. The decision tree has only one branch and as many twigs as the number of currencies (including the domestic one). Table 7 gives the results of the conditional logit estimation. The default currency is the US dollar, hence all odds ratios reflect the probabilities that firms choose a given other currency (euro, pound, or yen) *over* the dollar.[17] Note that the sample size has increased by a factor of four, because also in this model rejections are considered as decisions, i.e. a firm that issues bonds in euros does *not* issue in yen, sterling, or dollars.

We test whether the domestic currency has a special significance by including a dummy variable, which assumes a value of one whenever the currency of issue is the home currency of the issuer's parent firm, and zero otherwise. We test for the significance of the coefficient on the "domestic"

[17] The choice of base currency is a matter of representation; the results do not depend on the base currency.

dummy to evaluate the hypothesis that all currencies are considered equal in the decision process of the firms. In all specifications, the domestic dummy is large and significant, indicating a strong "home bias" in bond issuance. The regressions also include choice-specific intercepts, which are significant in some specifications. In particular, the pound is less likely to be chosen as issuance currency than the dollar, while the euro is a more likely choice.[18] The lower part of the table looks at influencing variables' effects on choosing one particular currency. However, the coefficients are not stable and not significant across specifications.

The conditional logit model includes both currency-level and issue-level variables. While the first set of variables has the same effect across currencies, the effect of the latter differs between currency areas. Issue-level variables capture the interaction of firm or issue-level characteristics with each one of the currencies considered. Negative coefficients signal a lower likelihood to prefer a given currency to the dollar, while positive ones indicate an increased probability vis-à-vis the US currency, independently of the other alternatives available, including the domestic one.

Firm exposure in a given currency increases the probability of issuing debt in that currency relative to the US dollar. The results hold with both proxies for exposure – the fraction of subsidiaries abroad and the M&A activity. This gives additional support to the hypothesis that hedging is an important consideration in the firm's decision process. A notable exception is the UK pound. Insignificant and negative coefficients signal that foreign M&A activity does not drive issuance in that currency. Similarly, the share of foreign subsidiaries appears to be insignificant as a driver for euro issuance. Having more subsidiaries may also contribute to having a reputation in a given market, which may blur the distinction between the hedging motive and the firm's ability to issue in a currency due to its perceived creditworthiness in that market.

As expected, we find that higher currency volatility reduces the likelihood of FCDD. Firms appear to take past currency movements into account when considering the risk of issuing bonds in a non-domestic currency.

Looking at the currency break down for the principal amount and duration of the issue on the choice of currency shows considerable cross-currency differences. Firms prefer to issue larger bonds in a non-dollar currency. In particular, the largest bond issues tend to take place in euro but also pound and yen are preferred for large issues to the dollar. This supports the view that issuing abroad involves substantial fixed costs. Fixed transaction costs are likely a result of legal advice concerning disclosure and taxation issues as well as of road showing to overcome information asymmetries. Hence, larger issues of FCDD are more likely to be economical.

[18] A concern may be that these constants capture a large part of the variation. The pseudo-R^2 in Tables 7 and 10 compares our model with one including the choice-specific constants only. Specifically, the pseudo-R^2 is one minus the ratio of the log-likelihoods of the two models (McFadden, 1974)

Columns 6 and 7 in table 7 also suggest that a longer duration increases the chances of issuing in US dollar over the euro and yen, while the pound sterling is preferred for even longer durations. The coefficients reflect the duration is the underlying government bond markets. Average duration for government bonds is longest in the UK, shorter in the US and shortest in the euro area and Japan. As corporate bond issuance tends to use the sovereign market as a benchmark, the effect of duration on issuing in different currencies reflects market idiosyncrasies due to the established treasury markets in each currency area.

Bond market capitalisation of a currency region – which we interpret as lower transaction costs – appears to be unimportant for the decision in which currency to issue. The coefficients are all statistically insignificant.

Considering strategic effects, larger company size contributes to the probability of issuing in USD, as across all specifications larger firms prefer the dollar against all three alternative currencies. The size and prominence of the US financial markets may be a reason to issue debt in dollars. Deposits per GDP have a positive coefficient in all the specifications, although not significantly so. Firm leverage (not shown) supports significantly issues in yen, likely a result of Japanese firms displaying high leverage by international standards, or reflecting a demand for foreign debt by Japanese investors willing to diversify.

Table 7: Conditional logit estimates for choosing between foreign currencies.

	1	2	3	4	5	6	7
JPY constant	-0.02	0.00	**0.85**	-0.18	-0.54	-0.64	1.08
	(0.22)	(0.22)	(0.21)	(0.43)	(0.58)	(0.52)	(0.59)
GBP constant	**-1.58**	**-1.68**	**-0.94**	-2.31	-3.98	-3.45	**-7.77**
	(0.31)	(0.30)	(0.26)	(1.65)	(2.20)	(1.99)	(2.01)
EUR constant	**0.92**	**0.86**	**1.49**	0.76	**0.91**	**-1.99**	**-1.32**
	(0.23)	(0.23)	(0.23)	(0.43)	(0.43)	(0.34)	(0.37)
Domestic dummy	**2.53**	**2.08**	**2.14**	**2.53**	**1.89**	**2.00**	**2.18**
	(0.06)	(0.14)	(0.13)	(0.06)	(0.15)	(0.15)	(0.16)
Volatility		**-0.66**	**-1.12**		**-0.77**	**-0.65**	**-0.48**
		(0.20)	(0.19)		(0.21)	(0.21)	(0.22)
Deposits/GDP					0.78	0.09	0.44
					(0.53)	(0.50)	(0.50)
Bond market capitalisation				-0.22	0.26		
				(0.48)	(0.53)		
Subsidiary share x JPY	**3.06**	**2.87**		**3.06**	**2.61**	**2.57**	**3.03**
	(0.29)	(0.30)		(0.29)	(0.31)	(0.31)	(0.33)
Subsidiary share x GBP	**0.52**	**0.75**		**0.52**	**1.03**	**0.82**	**0.71**
	(0.25)	(0.25)		(0.25)	(0.26)	(0.26)	(0.29)
Subsidiary share x EUR	0.30	0.32		0.30	0.37	0.40	0.08
	(0.23)	(0.23)		(0.23)	(0.25)	(0.25)	(0.26)
M&A dummy x JPY			**2.66**		**2.09**	**2.09**	**2.34**
			(0.72)		(0.72)	(0.72)	(0.73)
M&A dummy x GBP			-0.23		-0.38	-0.41	-0.11
			(0.39)		(0.41)	(0.41)	(0.50)
M&A dummy x EUR			**1.64**		**1.70**	**1.41**	**1.33**
			(0.24)		(0.24)	(0.25)	(0.25)
Log(total assets) x JPY	**-0.09**	**-0.09**	**-0.11**	**-0.09**	**-0.07**	**-0.08**	**-0.13**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)	(0.03)
Log(total assets) x GBP	**-0.06**	**-0.06**	**-0.09**	**-0.06**	**-0.05**	**-0.05**	-0.03
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Log(total assets) x EUR	**-0.17**	**-0.16**	**-0.21**	**-0.17**	**-0.17**	**-0.15**	**-0.16**
	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
Principal x JPY						**0.10**	**0.14**
						(0.04)	(0.04)
Principal x GBP						**0.26**	**0.20**
						(0.06)	(0.06)
Principal x EUR						**0.51**	**0.57**
						(0.04)	(0.04)
Duration x JPY							**-0.73**
							(0.08)
Duration x GBP							**1.26**
							(0.11)
Duration x EUR							**-0.44**
							(0.07)
Number of Observations	29968	29261	31342	29968	27122	27122	26774
Pseudo-R^2	0.68	0.69	0.69	0.68	0.69	0.70	0.71
Log-pseudo-likelihood	-3275.8	-3201.9	-3350.8	-3275.7	-2992.7	2872.0	-2693.4

Note: The dependent variable is a dummy variable for the currency choice. The estimated outcome is the probability of choosing a given currency (euro, yen, or pound) over the US dollar. All regressions include country and year fixed effects. Standard errors in parentheses.

5.3. *Currency Choice in Bond Issuance by US Companies*

This section reports results from a nested logit specification applied to US companies. This model estimates the complete decision tree in figure 1. The domestic currency is the USD and the foreign currencies are the euro, the yen and the pound sterling. Here we only consider US-based firms, which form the largest subset of the data that form a balanced panel. We cannot credibly compare the results from the previous estimations with those reported in this section since the sample is very different. Table 10 in the appendix reports the output from the conditional logit estimation for the restricted sample of US companies.

The decision to issue in the domestic rather than the foreign currency is influenced by the characteristics of the firm and the currencies' attributes. As opposed to the conditional logit model, in the nested logit specification the choice between the euro, yen and sterling is assumed independent of each other, but not of the attributes of the dollar, as it is the domestic currency. In terms of Figure 1, recall that here the IIA hypothesis holds between twigs but not between branches. This implies that the choice of any foreign currency is not independent from the alternative twig 'domestic', while under the twig 'foreign', the probability of choosing e.g. euro against yen is independent of the pound, the other 'foreign currency' in the same twig.

Table 8 reports the coefficient estimates and standard errors from the nested logit model. The coefficients show how each variable affects the probability that US firms issue domestic bonds versus foreign bonds, where the set of foreign currency alternatives includes euro, yen and sterling. A Hausman/McFadden (1984) likelihood ratio test for the nesting (heteroscedasticity) against the null hypothesis of homoscedasticity (no need for nesting) is reported at the bottom of the table. The test compares the likelihood of a non-nested conditional logit model with the nested logit model. In all cases, test results support the use of the nested logit, confirming the observation from the conditional logit estimation that the domestic currency is unconditionally preferred to other currencies.

The decision to issue in foreign currency is influenced by two sets of coefficients: (a) the firm-specific characteristics apply at the first decision level affecting the probability of choosing foreign versus domestic. In terms of equation (4), this corresponds to P[i chooses foreign currency]; (b) the currency-specific characteristics apply instead to the bottom level of the decision tree (Figure 1), affecting the probabilities of choosing a certain foreign currency once the foreign branch has been chosen at the first level. In terms of equation (4), this corresponds to: P[(i chooses j| i chooses foreign currency)].

As in previous models, hedging motives appear again as a prominent factor for determining FCDD issuance. The coefficients for foreign subsidiaries and in most cases, M&A activity abroad are highly

significant and sizeable, underlining the finding that hedging motives are predominant considerations for FCDD issuance. If a firm has high share of subsidiaries or M&A activity in a given currency, this positively affects the choice of this currency for FCDD issuance. By contrast, lower transaction costs measured by bond market capitalisation raise the probability to issue bonds in a given foreign currency significantly only in some cases.

Table 8: Nested logit model for US firms.

	1	2	3	4	5	6	7
Bond market capitalisation	0.10	0.09	0.10	0.11	**0.13**	**0.12**	0.03
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.04)
Deposits/GDP							-0.07
							(0.06)
Share of Subsidiaries	**3.18**	**2.94**	**2.91**	**3.20**		**3.40**	**3.50**
	(0.33)	(0.34)	(0.34)	(0.34)		(0.33)	(0.38)
M&A dummy		**0.57**	0.30	**0.62**	**1.05**		0.34
		(0.19)	(0.19)	(0.19)	(0.18)		(0.21)
Log(Total assets)	-0.00	-0.01	0.00	-0.04	**-0.14**	-0.04	-0.05
	0.03	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Log(Leverage)			0.87	**1.89**	**1.93**	**1.88**	**2.33**
			(0.48)	(0.47)	(0.44)	(0.46)	(0.55)
Log(Principal)				**0.39**	**0.31**	**0.40**	**0.43**
				(0.06)	(0.06)	(0.06)	(0.06)
Log(Duration)				-0.16	**-0.28**	-0.14	-0.19
				(0.09)	(0.08)	(0.10)	(0.10)
Number of observations	17548	17548	17548	17216	18280	17216	13888
Log-pseudo-likelihood	-856.3	-851.5	-849.8	-811.1	-915.5	-816.8	-691.1
LR test: $Chi^2(1)$	132.1	138.1	107.6	134.6	67.3	130.0	122.2

Note: The dependent variable is a dummy variable for the currency choice. The estimated outcome is the effect on the probability of choosing any given foreign currency (euro, yen, or pound) over the domestic currency US dollar. Standard errors in parentheses. The Chi^2 LR test is the Hausman/MacFadden (1984) test of the IIA hypothesis. The test is based on the idea that if a subset of the choice set is truly irrelevant with respect to the other alternatives, omitting it from the model will not lead to inconsistent estimates. The 95 percent critical value of Chi2(1) is 3.84.

On the strategic side, the direction of influence of firm assets on FCDD is ambiguous. The exclusion of subsidiaries raises the significance of total assets' coefficients, as was the case in the conditional logit estimation. This may indicate that both variables are partially capturing the same effect. The negative sign of total assets suggests that bigger US firms prefer to issue US dollar denominated bonds, reflecting the larger market size for US dollar denominated bonds.

Looking at the effects of market structures on the choice of currency, the duration of the bond appears to be an impediment to FCDD. This is in line with the previous results of table 6, reflecting the fact that US companies choose the currency of issuance considering the duration of the underlying sovereign bond markets. Alternatively, the negative coefficients of the variable 'duration'

might be interpreted as a sign of lower confidence in the strength of the US dollar given that the results refer to US companies. However, the results from Table 10 in the appendix support the first explanation but not the latter one.

The positive effect of the principal amount of the bond issue on the probability to issue in foreign currency corroborates earlier finding for US firms. They react to fixed costs of issuing abroad, which result from differing regulatory frameworks and information costs, which imply that issuers have to engage in road showing when issuing abroad.

Finally, firm leverage appears to raise the likelihood to issue FCDD, supporting the idea that US credit constrained firms may find it easier to borrow abroad. This is in line with the earlier results for the whole sample that have suggested increased yen issuance by leveraged companies. With regard to the previously quoted contradictory findings whether credit constrained firms tend to borrow more in foreign market or are unable to do so, our dataset appears to support the hypothesis that credit constrained firms are more likely to borrow from international bond markets than in their home market.

6. *Conclusions*

Starting from the observation that the use of the euro as a financing currency in international bond markets has increased between 1999 and 2003, this paper contributes to understanding this movement by investigating the driving factors behind firms' decision to issue foreign currency denominated debt. Based on a new dataset at the single bond issue level for the period 1999 – 2003, we analyse the determinants of currency choice in bond issuance by corporations in developed economies.

The research design split the question in two parts, the firm's choice to issue bonds in foreign as opposed to domestic currency and the choice between several foreign currencies. The choice between domestic and foreign currency appears to be determined by the attempt to hedge foreign exposure. In addition, strategic considerations for diversifying the investor base may lead in particular large companies to issue in foreign currency. Large firms may also face constraints in raising funds in their local markets and may have a better reputation internationally. For both reasons, larger companies appear to be more active in international bond issuance.

The choice between foreign currencies, including the euro, yields similar results. As before, cost effects and strategic considerations appear to influence the firm's decision. For FCDD issuance these results imply that the main motivations underlying the decision to issue bonds in a particular currency are the attempt to hedge firms' foreign exposure, as the proxies used for foreign exposure are

significant and with the expected sign. At the same time, we do not find evidence for the effort of some issuers to broaden their investor base into countries with a higher deposit to GDP ratio.

The paper also finds support for the notion that bond issue characteristics, including issue principal amount and duration, influence the decision in which currency to issue. A larger bond size tends to be associated with issues in euro, pound and yen, while smaller issues are predominantly done in dollars. This is in line with the notion that regulatory differences and information asymmetries impose costs that make it uneconomical to issue in smaller size in foreign currency.

Our results also suggest that longer duration may make it expensive to swap foreign proceeds into domestic currency. Alternatively, this result may be interpreted as a sign of lower confidence in the strength of the US dollar against the euro over the long-term. More importantly, the break down into currency effects shows that duration is closely associated with the average duration of the underlying government bond markets. Market idiosyncrasies appear to play an important role when deciding the currency of issuance.

From a company perspective, the results suggest that the firm's choice of currency is influenced by both macroeconomic factors and microeconomic considerations. On the macroeconomic side, the size of the domestic market appears to affect the firm's ability to issue domestically and may support the case for foreign versus domestic currency when issuing a bond. On the microeconomic side, factors such as firm size, the firm's exposure to a currency area, as well as issue size and bond duration, have a bearing on the currency choice of bond issuance.

Appendix

Table 9: Data Sources and Definitions

Variable	Definition/ unit	Source
Total Assets	(thousand USD)	Osiris
Deposits	Deposits held by commercial banks and OFIs (local currency)	IMF, IFS annual data
M&A issue abroad	1 if M&A in target country within 0/1-2/3-6/0-6 months	Thomson Financial
Exposure	Number of subsidiaries in target country	Osiris
Principal amount	Issue size (million USD)	Thomson Financial
Bond market capitalisation	Domestic bond market debt issued in domestic currency targeted at residents (USD)	BIS International Capital Market Statistics
GDP	Nominal GDP (local currency/in USD)	IMF, IFS annual data/IMF, WEO annual data
Interest rate differential	Long-term government bond yield differential (percentage points)	IMF, IFS monthly data
Leverage	Ratio of total liabilities to total assets.	Osiris
Duration	Maturity date minus issue date (days)	Thomson Financial
Eurobond	1 if market area is "Euro" and private placement is "yes"	Thomson Financial
EBITDA	(thousand USD)	Osiris
Interest rate expenses	(thousand USD)	Osiris

Table 10: Conditional logit estimates for choosing between foreign currencies: US firms

	1	2	3	4	5	6
JPY constant	**-4.24**	**-4.83**	**-6.52**	**-3.90**	**-5.89**	**-5.47**
	(0.87)	(1.00)	(1.15)	(1.32)	(1.58)	(1.38)
GBP constant	**-4.25**	**-4.57**	**-13.73**	**-7.51**	**-22.01**	-6.54
	(0.77)	(0.81)	(3.23)	(1.23)	(4.46)	(3.37)
EUR constant	**-5.29**	**-5.71**	**-7.74**	**-6.50**	**-8.43**	**-7.67**
	(0.64)	(0.73)	(1.04)	(0.93)	(1.26)	(0.89)
FX Volatility		0.70		0.81	0.74	0.79
		(0.52)		(0.53)	(0.56)	(0.54)
Deposits/GDP					1.14	0.36
					(1.05)	(0.90)
Bond market capitalisation			**-2.90**		**-2.27**	
			(0.96)		(1.09)	
Share of subsidiaries x JPY	13.97	14.35	13.85	14.34	15.33	15.42
	(8.65)	(8.62)	(8.61)	(8.91)	(8.83)	(8.71)
Share of subsidiaries x GBP	**3.48**	**3.48**	**3.58**	**3.39**	**3.80**	**3.63**
	(0.63)	(0.63)	(0.62)	(0.69)	(0.72)	(0.61)
Share of subsidiaries x EUR	**4.24**	**4.22**	**4.32**	**4.28**	**4.05**	**4.13**
	(0.48)	(0.48)	(0.48)	(0.48)	(0.49)	(0.48)
Log(Leverage) x JPY				-0.93		
				(1.04)		
Log(Leverage) x GBP				**3.10**		
				(0.76)		
Log(Leverage) x EUR				1.01		
				(0.63)		
Log(total assets) x JPY	-0.04	-0.04	-0.05	-0.06	**-0.17**	**-0.16**
	(0.06)	(0.06)	(0.06)	(0.07)	(0.07)	(0.07)
Log(total assets) x GBP	-0.07	-0.07	-0.07	-0.06	**-0.10**	-0.09
	(0.05)	(0.05)	(0.05)	(0.06)	(0.05)	(0.05)
Log(total assets) x EUR	0.03	0.03	0.03	0.02	-0.01	-0.00
	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)	(0.04)
Principal x JPY					**0.33**	**0.40**
					(0.14)	(0.14)
Principal x GBP					**0.30**	0.19
					(0.10)	(0.10)
Principal x EUR					**0.39**	**0.42**
					(0.10)	(0.09)
Duration x JPY					**-0.62**	
					(0.16)	
Duration x GBP					**1.55**	
					(0.23)	
Duration x EUR					**-0.45**	
					(0.13)	
Number of Observations	17616	17488	17616	17420	16292	16611
Pseudo-R^2	0.86	0.86	0.86	0.86	0.87	0.86
Log-pseudo-likelihood	-854.7	844.8	-850.0	-832.6	-746.4	-791.2

Note: The dependent variable is a dummy variable for the currency choice. The estimated outcome is the probability of choosing a given currency (euro, yen, or pound) over the US dollar. All regressions include country and year fixed effects. Standard errors in parentheses.

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