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Who Drove the Boom in Euro-Denominated Bond Issues?

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Abstract

We make use of micro-level data for over 45,000 private bond issues by over 5000 firms from 22 countries in 1990-2006 to analyze the impact that the launch of the EMU had on their currency denomination. The use of the micro data allows us to isolate the “euro effect” on new and seasoned bond issuers while conditioning on individual issue characteristics. To our knowledge, ours is the first systematic analysis of this topic at the micro level. We find that the impact on new issuers is larger than on seasoned issuers and that most of the increase in the euro-denominated bond issuance by seasoned borrowers was along the “extensive” margin, i.e. borrowers switching currency denomination of their issues. Insofar as new entrants to the bond market will define the overall currency composition in the long run, these results imply that aggregate studies might be underestimating the euro effect. We also find that to a large extent the increase in euro issuance was “at the expense” of U.S. dollar issuance, suggesting that euro competes with the U.S. dollar as a currency of choice for international financial transactions.

JEL classification: F34, F36

Key words: bond markets, monetary union, currency risk, original sin, liquidity

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1 Introduction

Firms issuing in international bond markets face a choice of currency issue. Issuing in domestic currency avoids “currency mismatch” issues for firms whose revenues are biased towards their domestic currencies. There may also be increased administrative costs associated with marketing an issue in a foreign currency. On the other hand, foreign “vehicle currencies,” such as the dollar, are likely to have achieved substantial cost reductions through economies of scale. Increases in the volume of transactions in a given currency raises analyst coverage, hedging opportunities, and the set of potential customers. While currency denomination choices are made at the firm level, they are likely to have aggregate implications. A viable domestic-currency bond market may provide stability at the aggregate level to firms in countries facing currency devaluations, even those who in more tranquil periods may have chosen to issue in foreign currencies.

The choice of invoice currency in international goods transactions has been studied extensively. Early studies emphasized choosing a currency to reduce transactions costs, e.g. Swoboda (1968), while more recent studies have stressed minimizing exposure to macroeconomic volatility [e.g. Giovannini (1988)] and network effects [e.g. Rey (2001) and Goldberg and Tille (2008)]. These same concerns should arise in the currency-denomination decision for bond issuance. In this paper, we investigate the determinants of currency denomination in bond issuance by examining the impact of the launch of the euro on world bond markets using micro-level data.

There is a large outstanding literature providing evidence of a “euro-effect” on firm financing decisions at the aggregate level. Galati and Tsatsaronis (2003) and Pagano and Von Thadden (2004) find large effects of the advent of the euro on volumes and yield spreads in European bond markets. Similarly, Lane (2006a) and (2006b) find evidence of a euro-area bias in international bond portfolio movements. Spiegel (2008) finds evidence of a euro-area bias among Portuguese and Greek commercial bank borrowers subsequent to EMU accession.

The introduction of the euro has been shown to lead to a reduction in the cost of issuance in euro relative to pre-monetary union national currencies [e.g. Santos and Tsatsaronis (2006)]. Coeurdacier and Martin (2006) find that the advent of the euro has resulted in a 14% to 17% reduction in transactions costs. Kim, Moshirian, and Wu (2006) confirm that the launch of the EMU corresponded to a period of increased financial market integration in European stock and bond markets. Melnik and Nissim (2006) find that the introduction of the euro reduced the cost of issuing bonds in euro relative to the cost of issuing in national currencies of future EMU member countries. Drudi (2007) demonstrates that euro area firms moved from bank to bond financing subsequent to the launch of the EMU.

Our data set includes all bonds issued in international bond markets by private firms with nationality of operations in one of 22 countries active in international bond markets. Our sample period is 1990-2006, so that we include 9 years before the EMU took effect and 8 years afterwards. To our knowledge, our paper is the first to bring a large micro-level data set to bear on this issue.¹ The use of micro-level data allows us to condition on the currency of each bond issue, its size, its maturity, its governing law, and the true issuer's nationality. The latter is especially important because it allows us to distinguish between changes attributable to the advent of the monetary union, and those attributable to issuer nationality effects and because, as Warnock and Cleaver (2003) point out, analysis based on aggregate data is subject to a bias due to offshore bond issuance.

We first examine the impact of the advent of the euro on firm financing decisions in a multinomial logit specification. Firms choose their currency of issue between US dollars, euro, yen, British pounds, or another currency. We separate non-financial firms from financial firms, as they are likely to be less adept at hedging on average and hence more likely to be influenced by the increased scale economies associated with issuing in euro. We then split our sample into four regions: financial

¹Melnik and Nissim (2006) do look at a smaller sample of 316 eurobond issues, but the focus of their study is on changes in the terms of borrowing, rather than volumes. Santos and Tsatsaronis (2006) show that the arrival of the euro led to a reduction in the underwriting fees of corporate bonds issued in the new currency due to increased competition.

centers, EMU insiders, small outsiders, which are defined as all countries outside the European Union whose currency is not one of main issuing currencies, and non-EMU EU members.

Our results confirm an economically and statistically significant impact of the advent of the euro on non-financial firms, but not on financial firms. Our point estimates indicate that, other things being equal, the probability that a non-financial firm bond issue was denominated in euro was 35 percentage points higher after the advent of the EMU, while the probability that it was denominated in U.S. dollars was 34 percentage points lower. This indicates that most of the increase in euro-issuance was “at the expense” of U.S. dollar issuance. We find similar impacts for issuers from financial centers, but the effect that is half that size for issuers from the euro area and small outsider countries, and we find no significant effect for non-EMU EU countries.

Our results for “small outsider countries,” are of particular interest. They speak to the desirability of encouraging the formation of local currency bond markets.² These are the types of countries that typically pursue policies to encourage local bond market development, and the responsiveness of individual firms from these countries to the launch of the euro is an indicator of how sensitive they are likely to be to changes in the scale of their domestic market as well.

We then isolate the overall EMU effect into three channels, two on the “extensive margin” and one on the “intensive margin.” We associate growth on the extensive margin with euro-denominated issues by firms that were not issuing in euro previously. There are obviously two types of such firms; unseasoned firms that are issuing in the international bond market for the first time, and seasoned firms that previously issued in a currency other than euro. On the “intensive margin,” seasoned firms that already issued in currencies of future EMU members may respond to the decreased cost of issuing in euro by increasing the volume of their euro-denominated issues.

Unseasoned firms may lack incentives linking them to a specific currency market. These may include fixed costs associated with launching in a currency for the first time, or long-term

²See, for example, Eichengreen and Luengnaruemitchai (2004).

relationships with firm underwriters or important customers in certain currency bond markets. The literature supports the existence of such fixed costs. Cai, Helwege, and Warga (2007) find that IPO bonds are subject to more underpricing, while Gande, Puri, and Saunders (1999) find that IPO bonds carry higher spreads than bonds of seasoned issuers, and Hale and Santos (2008) find that firms pay higher spreads on their IPO bonds than on subsequent issues.

Over time, the decisions made by unseasoned issuers are likely to drive the global pattern of currency denomination. A substantial portion of issuers exit over time. Moreover, the forces that tie issuers to a currency, such as informational asymmetries across markets, are likely to diminish over time. As such, if unseasoned firms are systematically more sensitive to changes in market volumes, such as those associated with the advent of the euro, aggregate studies of the initial response to the launch of the EMU are likely to underestimate the magnitude of the longer run impact of the EMU.

To investigate this channel, we restrict our sample to unseasoned issuers. We again find a significant positive impact, of about the same magnitude as for the full sample, of the launch of the euro on the probability of issuing in euro.

We then examine the impact of the euro on the probability of switching to euro-denominated bonds. We limit our sample to the set of issues by seasoned firms that issued both before and after the launch of the EMU. We find that the probability that a non-financial firm issuing in euro or the national currency of a future EMU country will continue to issue in euro increases by 14 percentage points after the launch of EMU. However, we do not find a significant impact of the EMU launch on the probability that a non-financial firm issuing in another currency would move into euro. This implies that seasoned firms were just as likely to switch from other currencies to euro after the EMU, but once they did switch, they were much more likely to stay with the euro after the launch of the EMU.

To thoroughly isolate the components of the overall increase in euro-denominated issues, we

next compare changes in volumes issued in euro and other currencies by new and seasoned firms. We find a positive, but insignificant impact of the launch of the euro on the volume of euro-denominated issues by firms that issued both in future euro-area national currencies prior to the launch of the EMU and in euro afterwards. In contrast, we find a positive statistically and economically significant impact among all seasoned firms. As such, our results provide weak evidence that the euro effect among seasoned firm was stronger among those that had previously not issued in euro. We also find that the impact of the EMU on unseasoned issuers was higher than for the full sample. This would be expected as unseasoned issuers would be more inclined to respond to the enhanced scale opportunities presented by the launch of the euro if there are fixed costs of issuing in a currency for the first time, as in Hale and Santos (2008).

Overall, then, our results suggest that the bulk of the euro effect was attributable to increases in euro-denominated issues on the extensive margin, among firms that either were issuing for the first time or that had previously issued in a non-euro-area currency, with the strongest impact for unseasoned firms. Indeed, in our sample the volume of euro-denominated issues by unseasoned firms after the launch of the EMU amounted to almost 81% of total euro-denominated issuance, while before the EMU the corresponding share was less than 52%.

The remainder of this paper is divided four sections. Section 2 lays out in detail our empirical approach. Section 3 describes our data sources and characterizes the sample. Section 4 presents our empirical results. Section 5 concludes with final remarks.

2 Empirical approach

Not all countries have firms that borrow internationally. Therefore, we only observe foreign (and foreign currency) bond issues for a relatively small subset of countries. If the same set of variables explain whether or not borrowers in a country borrowed internationally and whether or not they

choose a certain currency denomination of their bond, there is a possibility of selection bias. To address this issue, we estimate a selection equation concerning the determinants of issuing internationally. Our selection equation is a probit regression for as many countries as we can get data for with the dependent variable being an indicator of whether private firms operating in a particular country issued an international bond in a given year. We use as explanatory variables the variables that are found to affect international capital flows.³ From this regression we construct an inverse mills ratio imr , which we include as a regressor among other country-specific time-varying control variables, in our currency denomination regressions.

Our goal is both to measure the size of the effect of EMU on currency denomination of international bonds and to estimate the relative importance of the three margins along which this effect could potentially work: firms entering the international bond market for the first time choosing to issue in euro, firms already in the international bond market changing their issue currency in favor of euro, and firms issuing in multiple currencies altering their currency shares in their overall portfolio in favor of the euro. We begin by analyzing the currency composition of bond issues in the full sample of bonds by estimating a multinomial logit system of equations as follows

$$I(CUR_{ifct} = k) = \alpha_c^k + \beta^k I(t > 1999) + \mathbf{X}'_i \gamma_1^k + \mathbf{Y}'_t \gamma_2^k + \mathbf{Z}'_{ct} \gamma_3^k + \varepsilon_i^k, \quad (1)$$

where k is one of the currencies: U.S. Dollar, a euro area currency (to which we would refer to euro even in the period before the EMU), Japanese Yen, or British Pound. All other currencies are grouped into the category “Other” and represent the base category. CUR_{ifct} is a currency in which bond i issued by a firm f from country c in year t is denominated. α_c are country fixed effects, \mathbf{X}_i is a set of bond-specific control variables, \mathbf{Y}_t is a set of global variables that only vary over time, \mathbf{Z}_{ct} is a set of country-specific time-varying control variables.

Our coefficients of interest are the β^k 's, which measure how the probability of issuing a bond

³The results of this regression are reported in the Appendix Table A.1.

in each of the four currencies k versus any other currency has changed after the EMU took effect. Thus, the multinomial logit approach will allow us not only to see whether the probability of issuing in euro increased after the launch of the EMU but also at what other currency’s “expense” this change might have occurred.

Next, we identify three margins along which the EMU effect could take place: (a) firms entering the international bond market for the first time might be more likely to choose euro as a currency of their bond issue; (b) seasoned firms that issued in other currencies might be more likely to switch to euro in their subsequent issues after the EMU; and (c) firms that have issued in euro area currencies before the EMU may increase the amount they borrow in euro versus the amount they borrow in another currency.

We first estimate the same model as represented by equation (1), but limit our sample to the first international bond issued by a given borrower. As we described above, the idea here is to isolate the effects of the EMU on new entrants to the international bond market that are not yet bound with ties to a specific underwriter or market.

Second, we focus on seasoned borrowers that issued at least one international bond before the EMU took effect and at least one international bond after the EMU took effect. This sample allows us to investigate whether the probability of switching to euro–denominated bonds has changed after the launch of the EMU. As above, we estimate a multinomial logit regression, but this time there are four possible outcomes for each issue: a switch from non–euro denomination to euro, a switch from euro to non–euro, both current and previous issues in euro, and both current and previous issues in non–euro. The last case serves as a base category in the specification

$$I(CUR_{ifct} = k, CUR_{i-1fct} = j) = \alpha_c^{kj} + \beta^{kj} I(t > 1999) + \mathbf{X}'_i \gamma_1^{kj} + \mathbf{Y}'_t \gamma_2^{kj} + \mathbf{Z}'_{ct} \gamma_3^{kj} + \varepsilon_i^{kj}, \quad (2)$$

where j represents the currency in which the previous bond issued by firm f was denominated,

euro or non-euro, and k is defined as before, except all non-euro currencies are now lumped into one category. All other variables are defined as above and only firms that issued before and after the EMU are included in order for the results not to be driven by firms that either exit the sample before the EMU or enter the sample after the EMU took effect. As before, we are interested in the β^{kj} coefficients that indicate the probability changes associated with the launch of the EMU.

As a final test, we aggregate our data at a country-year level. This allows us to consider borrowing volumes in addition to the frequency of issues in any given currency. To continue focusing on the three possible margins along which the euro effect could have taken place, we construct four sets of aggregates: (a) total borrowing in euro and in all currencies combined by firms in each country-year, (b) amount borrowed through first international bond issues (first for each firm) in each country-year in euro and in all currencies combined, (c) amount borrowed in euro and in all currencies combined by firms that issued in international bond market both before and after EMU took effect, and (d) amount borrowed in euro and in all currencies combined by firms that issued *in euro* in the international bond market both before and after EMU took effect. Using these aggregates, we calculate the share of euro-denominated bonds in the total amount borrowed in each country-year for each of the four sets of firms. With these shares (SH) as our dependent variables we estimate four linear regressions with country fixed effects.

$$SH_{ct} = \alpha_c + \beta I(t > 1999) + \mathbf{Y}'_t \gamma_2 + \mathbf{Z}'_{ct} \gamma_3 + \varepsilon_{ct}. \quad (3)$$

As discussed below, comparisons of these four linear regressions allows us to estimate the relative importance of each of these three channels in terms of volumes as well as numbers of issues for the three euro effect channels we consider.

3 Data and Sample Description

An important advantage of our analysis is the use of micro-level data. Our bond data is made up of a list of bond issues and provide ample information on bond issue characteristics and some information on the issuer. The information on the issuer allows us to identify the true nationality of the issuer, whether the issuer’s main operation is in the financial industry, and allows us to keep track of bonds issued by the same firm. However, as we do not have firm balance sheet information, our ability to condition on firm characteristics is limited to these indicators, and our primary conditioning is on the characteristics of the issue.

We also supplement our bond data with country-level macroeconomic data and with LIBOR interest rates for main currencies.

3.1 Bond data

We use all bonds issued in international bond markets by private firms with nationality of operations in one of 22 countries. The data span 1980 through February 2007. However, because there are only a few international bonds issued during the 1980-1985 period, and because we want to balance the number of years before and after the EMU, we limit the sample period in our analysis to 1990-2006. This information comes from DCM Analytics, which is available from Dealogic. Thus, we have 9 years of data before the EMU took effect and 8 years of data afterwards.⁴

We identify the nationality of the issuer by its nationality of operations. The nationality of operations is likely to best match the currency in which the bond issuer’s expenses are invoiced. Table A.2 presents the count and the volume (in US dollars) of bonds issued during our sample period by all countries in our sample, which we separate into four groups: EMU members (“insiders”), non-EMU financial centers (“financial centers”), less influential countries outside EU (“small

⁴We keep 1990 in the sample because in some regressions we use lagged variables.

outsiders”), and EU members who did not join the EMU (“non-EMU EU”). We make two important observations with respect to this Table. First, both the number and the U.S. dollar volume of bond issues increased dramatically from the period before EMU to the period after. Second, in both periods the total amount borrowed by euro area issuers is about half of that issued by firms located in financial centers, while the number of bonds is more comparable, which implies that an average issue by a euro area firm is smaller than that of the financial center firm.

We identify the market on which the bond is issued by the currency denomination of the bond. While there are other ways to segment the international bond market (for example, by governing law), we believe that defining the market as all bonds issued in a given currency is most relevant for our particular experiment. Table A.3 presents bond characteristics (issue size and maturity) by currency denomination of a bond issue before and after EMU for the full sample and for small outsiders. The following observations are worth pointing out: (a) while the average issue size denominated in U.S. dollars or other (non-euro) currency about doubled in the period after EMU compared to the period before, the average issue size denominated in a euro area currency tripled; (b) the average maturity of U.S. dollar denominated bonds remained the same, while the maturity of other currency bonds lengthened; (c) the average size of a bond issue is larger if it is denominated in dollars than if it is denominated in a currency of the euro area, which in turn is larger than the average size of a bond issue denominated in another currency, although these differences are not statistically significant; (d) differences in maturity across currency denomination of bonds are not large and are not statistically significant.

Our sample includes financial firms as well as non-financial firms. Because we believe that financial and non-financial firms face different currency risk structures and have different choices when issuing an international bond, we conduct all our analysis separately for financial and non-financial firms. Figure 1 shows the shares of the volume of bond issues in each market before and after EMU by the borrowers from all 22 countries in our sample, for non-financial and financial

firms separately. We can see that the share of non-financial firms denominated in euro area currencies increased dramatically from the period before EMU to the period after. This observation is consistent with findings of previous studies (e.g. Lane (2006a,b)).⁵ Notably, we can see almost no increase in the share of issues denominated in euro area currencies by financial firms.

Figures 2-5 show the shares of the volume of bond issues in each market before and after the launch of the EMU by the borrowers from our four different regions: financial centers, EMU insiders, small outsiders, and non-EMU EU.⁶ We can see that for non-financial borrowers from all of these regions, the share of bond issues denominated in euro area currencies increased dramatically after the launch of the EMU, and that this increase was at the expense of the dollar-denominated issues. For financial firms, we only see a substantial increase in the share of euro area denominated issues for issuers from the EU (whether EMU members or not). Possibly, this difference can be due to the enhancements to European payments, in particular the new TARGET payment system, that affected all EU member countries and was launched at roughly the same time that the euro was introduced.

3.2 Other data

The rest of our data sources are conventional. In order to conduct our first stage estimation, we first created an annual panel data set containing the following variables: GDP in U.S. dollars, current account scaled by GDP, capital account openness, country credit ratings, annual coefficient of variation of exports, nominal interest rate, 1-year US treasury rate, and exchange rate regime.

National accounts data come from the IMF's World Economic Outlook Online Database, April 2008 edition. The capital controls variable, an index in which a higher value indicates a country is

⁵Given the overall increase in bond issuance discussed above, it is important to keep in mind that while the share of U.S. dollar denominated issues declined, the total amount issued in U.S. dollar has still increased substantially.

⁶Appendix Table A.2. lists countries in each region. In particular, because the United Kingdom is a financial center, our non-EMU region is comprised by Denmark and Sweden.

more open to cross–border capital transactions, comes from Chinn and Ito (2006). Country credit ratings are compiled from the Institutional Investor magazine’s annual September ratings. Data for nominal interest rates come from the IMF’s International Financial Statistics, with lending rates replaced with deposit rates for countries for which deposit rates are missing. The 1-year US treasury rate data was obtained from FAME, a Federal Reserve Board database, LIBOR rates are from Bloomberg. Finally, exchange rate regime data come from Ilzetzki, Reinhart, and Rogoff (2008); we use their “coarse” classification codes. We use some of these variables as controls in our second stage regressions as well.

4 Empirical results

We first confirm that our finding of an overall increase in euro–denominated bond issuance after the EMU, discussed above, is true in a parametric setting. Table 1 presents the marginal effects of the “After EMU” indicator from our multinomial logit regression for the full sample of bond issues, as well as split by region and separately for financial and non–financial issuers.⁷ In this specification each firm chooses one of the five currencies for each of its bond issues: dollar, euro, yen, pound, or any other currency. We choose “other currency” as our base category. We find that, for the full sample of non–financial firms, there is a strongly significant 35.3 percentage point increase in the probability of denominating its bonds in euro and a similar decrease (34.1 percentage points) in the probability of denominating in dollars after the EMU.

The effects are similar if we limit our sample to firms from financial centers, and are about half the size for EMU insiders and small outsiders. For non–EMU EU firms (firms from Denmark and Sweden in our sample), although we observe an increase in the probability of issuing in euro after the EMU, it is not statistically significant, possibly due to a small number of observations. In all cases, except this last group, the increase in the probability to choose euro as the currency

⁷All multinomial regressions are fully reported in the Appendix.

of the bond issue comes at the expense of the dollar, while probability of choosing yen, pound, or other currencies does not appear to be affected by the launch of the euro.

For financial firms, on the other hand, we do not find a statistically significant euro effect, except in case of the non-EMU EU region. In fact, for firms from financial centers and small outsider countries, there is a small decline in the probability of denominating in euro after the launch of the EMU. In addition, we see a small increase in the probability of denominating bond issues in pounds for financial firms from the euro area. This particular effect maybe pointing at the potential for an increased importance of London as a financial center after the launch of the euro and the launch of the TARGET payment system, issues that are beyond the scope of the current paper.

4.1 Extensive margins

We now turn to the three channels of response to the launch of the euro discussed above. Since we do not observe much increase in the euro issuance after the EMU by financial firms, we limit our analysis of the euro effect channels to non-financial firms. The channels we consider include two extensive margins — an increase in the choice of the euro for currency denomination of first international bond issues by firms that are issuing in international markets for the first time, and changes in international bond issue currency denomination in favor of the euro by seasoned issuers. The intensive margin channel is an increase in the share of euro area currency issues in total international bond issuance by borrowers that issue in multiple currencies.

The results of adjustments along the extensive margins are reported in Table 2. The first channel focuses on the effect the launch of the EMU had on firms that issue in the international bond market for the first time.⁸ Our hypothesis is that these firms will be more sensitive to the

⁸Our data set does not have complete coverage of the domestic bond market, so we do not know whether firms previously issued in that market. Nevertheless, there are additional costs of entering the international bond market, even for firms that are seasoned in their local bond markets. As such, being seasoned or unseasoned in the international

savings that the emergence of a new deep market potentially presents, because, unlike seasoned borrowers, they are not tied to any specific market.

The top panel of Table 2 presents the marginal effects of the same multinomial regressions as the ones reported in Table 1, except this time we limit our sample to the first international bond issue for each firm. We can see the effects that are very similar to the full sample — after the EMU the probability of issuing in euro area currencies increased by 33.6 percent while the probability of denominating the bond in U.S. dollar fell by 33.2 percent.

The second extensive-margin response to the launch of the EMU, namely the switching of seasoned borrowers from issuing in other currencies to issuing in euro is analyzed in the bottom panel of Table 2. For this analysis, we limit our sample to firms that issued international bonds both before and after the launch of the EMU (Firms BA) in order for the results not to be affected by the changing sample of firms over time. We construct a new indicator, that measures the transition from and to euro area currencies, this time combining all the non-euro currencies into one category “non-euro.” We again use a multinomial specification, but this time the outcomes are defined as: (0 — base category) issuing in currency other than euro given that previous bond was also in currency other than euro; (1) issuing in euro (or currency of future EMU member) given that the previous issue was also in euro (or currency of future EMU member); (2) issuing in euro given that the previous issue was in currency other than euro; and (3) issuing in currency other than euro given that the previous issue was in euro.

Our results indicate that while there was an increase in inflows from non-euro to euro area currencies after the EMU, it was small and not statistically significant. In fact, the outflow from euro into non-euro currencies increased slightly more, and this effect is significant. More importantly, however, we observe a large, 14 percentage point increase in the probability of continuing to denominate in euro from one issue to the next after the launch of the EMU, while the probability

bond market would likely influence the choice of currency denomination in the following issue.

of staying in a non-euro category fell by 21 percentage points. This implies there is an increase in transition into euro over the long run after the launch of the EMU.

4.2 Intensive margin and comparisons

We now turn to the intensive margin, namely the change in the share of funds raised on the euro-denominated bond market in total bond issuance by firms that were already issuing in currencies of future EMU members before the launch of the EMU and remained active in the euro-denominated market afterwards (Firms EuroBA). By definition of this sub-sample, these are the firms that were already borrowing in currencies of future EMU members before the EMU took effect.

Table 4 summarizes the data for non-financial firms and shows that while the share of euro in total issuance increased after the launch of the EMU for the full sample, the share for firms that were active on the euro-denominated market both before and after the launch of the EMU remained unchanged. This is in particular contrast with the change in the currency composition of new issues, for which share of euro increased from 9.4% to 46.3%.

Because this analysis is not possible at the firm level, we aggregate the total amount borrowed by each specific group of firms in euro and in other currencies for each country-year and compute the share of euro-denominated issuance in each country in each year for each group of firms. In addition to the full sample of bonds issued by non-financial firms, we consider first bond issues, bond issues by firms that borrowed both before and after the EMU, and bond issues by firms that borrowed in euro area currencies both before and after the EMU. Clearly the fourth group is the subset of the third.

Table 5 presents full results of linear regression with country fixed effects for the country-year panel. Once again, we confirm that in the full sample of non-financial firms there is an increase in the share of euro-denominated bonds (first column) after the launch of the EMU. This share increased by 18.3 percentage points after the launch of the EMU. We also see, once again, a similar

and in fact a slightly larger impact of the launch of EMU for the sub-sample of first issues (second column). We do not, however, find a significant effect of the EMU along the intensive margin (last column) — the coefficient on the “After EMU” indicator, while positive, is not statistically significant in the sub-sample of firms that were active on the euro-denominated bond market both before and after the launch of the EMU (Firms EuroBA). Keeping in mind that these firms also enter in the subset of firms that were active on overall international bond market both before and after the EMU launch (Firms BA, third column), we can see that the second extensive margin discussed above, namely the switching of the firms from other currencies into euro, is what is driving the significant, and larger, coefficient in the third column.

We conclude from this analysis that changes along the two extensive margins discussed above played a much larger role than those along the intensive margin in driving the observed move towards the euro in international bond currency denominations subsequent to the launch of the EMU. Within that category, we find that the effect was the strongest for the first extensive margin, i.e. among the new entrants to the international bond market.

5 Conclusion

In this paper we used micro-level data to analyze the impact that the launch of the EMU had on the currency denomination of international bond issues. While the increase in bond issuance in the currencies of the euro area after the EMU has been documented at the aggregate level, to our knowledge, ours is the first systematic analysis of this issue at the micro level.

Micro-level analysis allowed us to study separately financial and non-financial firms and to determine the relative importance of the channels through which this increase took place. We find that the bulk of the increase occurred among non-financial firms, and do not even find a significant “euro effect” among financial firms. This result suggests that financial firms, which are quite adept

at hedging currency risk and conducting international transactions, were closer to their optimal exposure to euro area currencies prior to the launch of the EMU, so they did not increase that exposure markedly after the launch of the monetary union.

In contrast, we find a substantial statistically significant euro effect for our sample of non-financial firms. We then examine the channels through which this increase in euro denomination by non-financial firms took place. We find that the increase in the issuance of euro-denominated bonds by non-financial firms was mainly driven by a large increase in the propensity of new entrants to international bond market to denominate their first bond issue in euro and by the increase in the number of firms that continued issuing in euro once they entered that market. We do not find significant evidence of an increase along the “intensive margin,” i.e. in the increase in share of euro issuance by firms that were already active issuers in the currencies of future EMU members before the launch of the EMU.

Using multinomial logit specification, we also find that most of the increase in euro issuance was at the expense of dollar issuance. Taken together, these findings suggest that we might expect the launch of the euro to accelerate the decline in the share of dollar-denominated issues in international bond markets: First, the bulk of the increase in euro-denominated bond issues occurred at the extensive margin, and we would expect the decisions made by firms at the extensive margin to become more representative going forward, as characteristics tying firms to individual currencies are likely to weaken over time. Second, we found that the increase in euro-denominated issues came largely at the expense of the dollar.

It therefore appears that on average firms that are issuing in dollars are less tied to that currency than are firms issuing in other currencies, such as yen or pounds. This would be intuitive, since the dominant position of the dollar would likely leave it the currency denomination of choice for firms that had little preference over currency denominations. However, as the market for bonds denominated in euro continues to grow, these more footloose firms will be the most likely

to respond to the increased liquidity in euro-denominated bond markets by switching to issuing in that currency. Since these firms are most likely to be initially issuing in dollars, these increases are likely to come at the expense of the share of dollar-denominated issues, and may portend further declines in the share of dollar-denominated issues in this market.

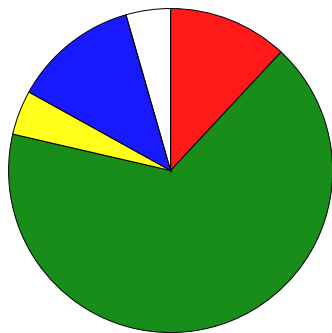
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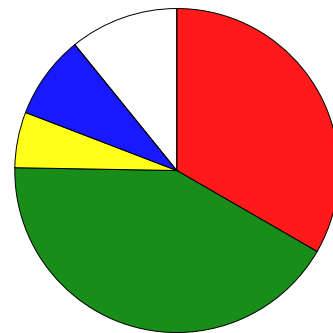
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Figure 1: Currency denomination of international bond issues. All issuers.

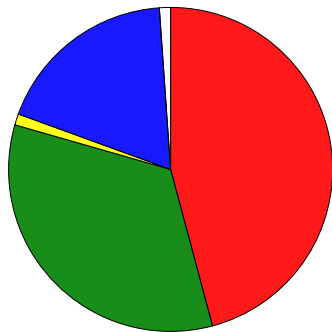
Before EMU, non-financial



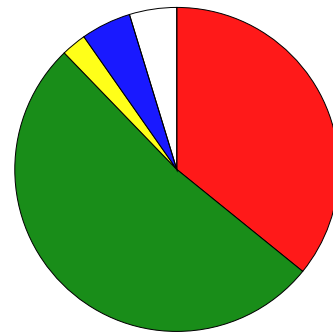
Before EMU, financial



After EMU, non-financial



After EMU, financial

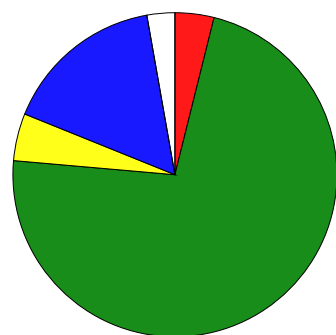


■ USD ■ Euro ■ Yen ■ Pound ■ Other

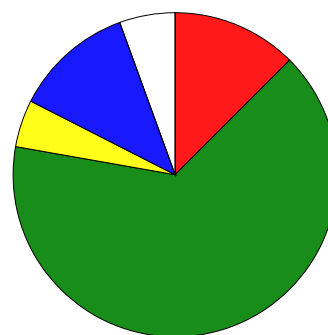
Note: pie charts constructed by amount issued.

Figure 2: Currency denomination of international bond issues. Financial centers.

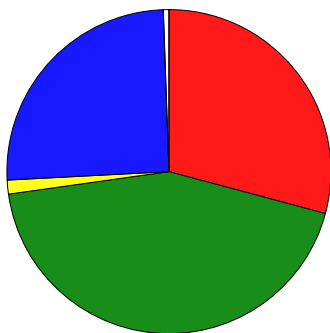
Before EMU, non-financial



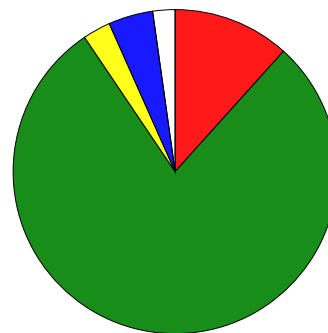
Before EMU, financial



After EMU, non-financial



After EMU, financial

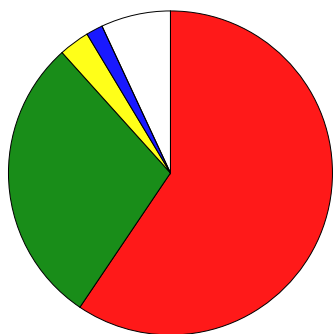


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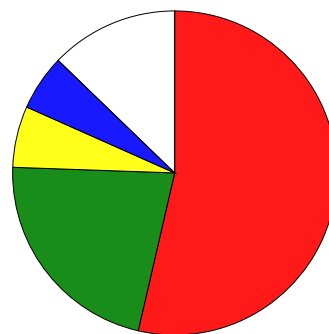
Note: pie charts constructed by amount issued.

Figure 3: Currency denomination of international bond issues. Euro zone issuers.

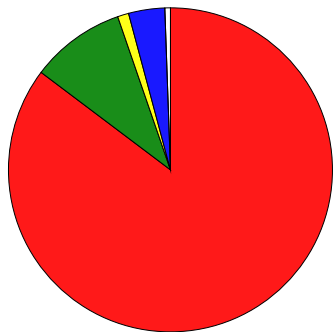
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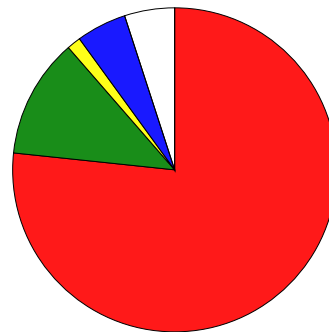
Before EMU, financial



After EMU, non-financial



After EMU, financial

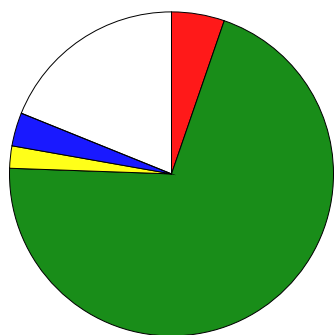


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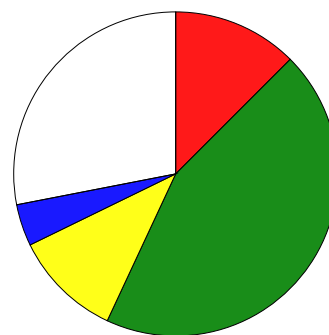
Note: pie charts constructed by amount issued.

Figure 4: Currency denomination of international bond issues. Small outsiders.

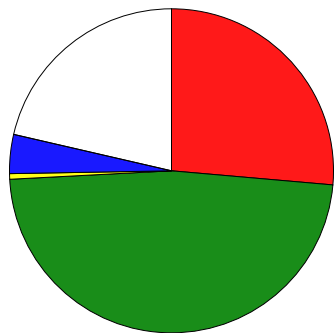
Before EMU, non-financial



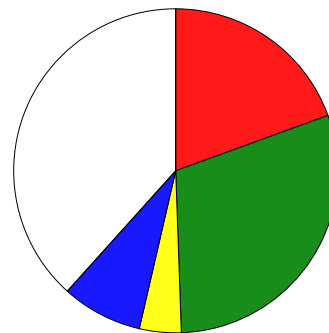
Before EMU, financial



After EMU, non-financial



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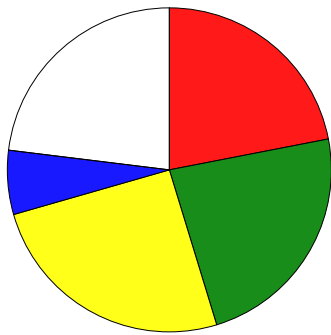


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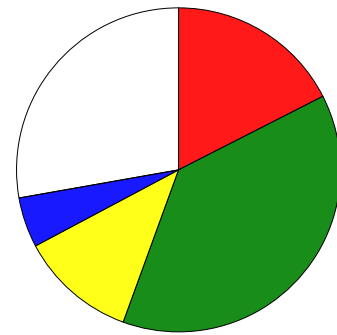
Note: pie charts constructed by amount issued.

Figure 5: Currency denomination of international bond issues. Denmark and Sweden.

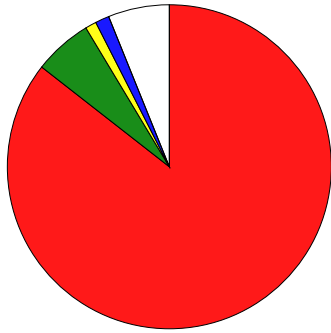
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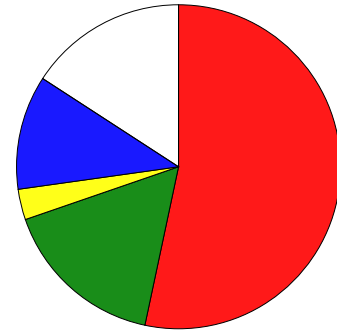
Before EMU, financial



After EMU, non-financial



After EMU, financial



■ USD ■ Euro ■ Yen ■ Pound □ Other

Note: pie charts constructed by amount issued.

Table 1: Overall effect of the EMU by region of issuer

Currency:	USD	Euro	Yen	Pound	Other cur.
Non-financial firms					
All regions	-34.1*** (3.71)	35.3*** (2.06)	0.031 (0.30)	-1.13 (3.03)	-0.085 (0.29)
Fin. centers	-30.3*** (9.63)	31.5*** (2.61)	0.065 (0.23)	-1.33 (11.2)	0.028 (0.064)
EMU insiders	-15.5** (6.55)	15.9** (6.20)	-0.079 (0.13)	-0.034 (0.61)	-0.28 (0.27)
Small outsiders	-18.6 (11.5)	13.3*** (4.27)	0.00017 (0.0021)	-0.84 (1.06)	6.10 (10.3)
Denmark & Sweden	0.071 (0.049)	3.51 (3.96)	-0.0034 (0.0024)	. .	-3.58 (3.91)
Financial firms					
All regions	1.74 (2.67)	-3.39 (2.46)	-0.99 (1.11)	1.92 (1.60)	0.70 (1.35)
Fin. centers	0.51 (6.08)	-3.91*** (1.40)	0.39 (1.00)	2.89 (3.08)	0.12 (0.70)
EMU insiders	0.90 (4.49)	1.36 (6.54)	-1.94** (0.84)	2.85* (1.58)	-3.17 (2.14)
Small outsiders	-1.68 (12.4)	-7.66*** (1.59)	4.20 (4.33)	-1.09 (1.22)	6.23 (9.58)
Denmark & Sweden	0.93 (3.63)	30.3** (13.6)	-23.1 (29.4)	-0.25 (0.16)	-7.88 (46.7)

Note: Reported are marginal effects of “After EMU” indicator in multinomial logit regressions (percentage points). Dependent variable is currency of bond issue, base category is “other currency.” Full regressions are reported in Appendix tables. Standard errors are in parenthesis. Marginal effects and their standard errors are multiplied by 100 to be represented in percentage points. They might not add up to 0 across outcomes due to rounding. Significance levels are based on z -statistic’s P-value: * is significant at 10%, ** — at 5%, *** — at 1%.

Table 2: Extensive margins

Margin 1: currency denomination of the first international bond
 Dependent variable is currency of bond issue, base category is “other currency”

	USD	Euro	Yen	Pound	Other cur.
Non-fin. firms	-33.2*** (7.84)	33.6*** (7.99)	0.0026 (0.0028)	-0.034 (0.044)	-0.36 (0.29)

Margin 2: change in currency denomination of international bonds of seasoned issuers
 Dependent variable is transition to or from euro, base category is transition from non-euro to non-euro

	Non-euro to Non-euro	Euro to Euro	Non-euro to euro	Euro to noneuro
Non-fin. firms	-21.1*** (6.15)	14.2*** (2.76)	2.63 (2.94)	4.20*** (1.56)

Note: Reported are marginal effects of “After EMU” indicator in multinomial logit regressions (percentage points). Full regressions are reported in Appendix tables. Standard errors are in parenthesis. Marginal effects and their standard errors are multiplied by 100 to be represented in percentage points. They might not add up to 0 across outcomes due to rounding. Significance levels are based on z -statistic’s P-value: * is significant at 10%, ** — at 5%, *** — at 1%.

Table 3: Amount issued (bil. USD) by non-financial firms

	Before EMU			After EMU		
	in Euro	Total	Share Euro/Total	in Euro	Total	Share Euro/Total
All issues	114.7	964.6	11.9%	4186.8	9134.2	45.8%
First issues	59.1	627.0	9.4%	3383.4	7309.5	46.3%
Firms BA ^a	39.4	234.7	16.8%	513.5	1128.0	45.5%
Firms EuroBA ^b	33.9	66.8	50.7%	415.7	818.0	50.8%
Other BA ^c	5.5	167.9	3.3%	97.8	310.0	31.5%

^a Firms BA: firms that issued bonds both before and after EMU.

^b Firms EuroBA: firms that issued bonds in a currency of the euro area both before and after EMU.

^c Other BA: firms that issued bonds both before and after EMU but are not in Firms EuroBA set.

Table 4: The effect of EMU on the share of euro-denominated issues (by amount)

	All firms	First issues	Firms BA ^a	Firms EuroBA ^b
After EMU	0.183*** (0.050)	0.189*** (0.059)	0.157** (0.068)	0.114 (0.117)
USD int. rate	0.005 (0.018)	0.043* (0.024)	-0.018 (0.024)	-0.021 (0.047)
DM-USD int. rate	-0.051** (0.021)	-0.094*** (0.029)	-0.031 (0.029)	-0.024 (0.055)
JY-USD int. rate	0.042 (0.027)	0.095** (0.036)	0.020 (0.039)	0.000 (0.070)
BP-USD int. rate	0.030 (0.023)	0.035 (0.028)	0.026 (0.032)	0.073 (0.051)
Inflation	-0.043** (0.017)	-0.035 (0.027)	-0.004 (0.026)	-0.139*** (0.048)
II rating	1.420** (0.546)	3.525*** (0.822)	1.908* (1.078)	1.085 (1.991)
ER volatility	-0.000 (0.004)	-0.001 (0.021)	-0.025 (0.035)	0.051 (0.057)
I(Fixed ER)	0.089 (0.097)	0.596*** (0.105)	-0.197* (0.111)	-0.254* (0.144)
Selection	0.724 (2.269)	-57.162*** (12.461)	25.226*** (6.465)	12.514 (8.945)
Observations	146	65	87	53
Countries	18	13	14	12
R^2	0.460	0.783	0.434	0.421

^a Firms BA: firms that issued bonds both before and after EMU.

^b Firms EuroBA: firms that issued bonds in a currency of the euro area both before and after EMU.

Note: Dependant variable is the share of issues (by amount) denominated in a currency of the euro area, aggregated across a sample of firms, as indicated, at country-year level.

Fixed effects regression. Non-financial firms only. Standard errors are in parenthesis.

A Appendix

Table A.1: 1st stage results

	Coefficient	Std. error
GDP (in U.S. dollars)	0.006***	0.001
CA/GDP	-0.009**	0.004
Financial account openness	0.075***	0.028
II credit rating	0.043***	0.003
Coef. of variation of exports	-14.877***	5.539
Interest rate	-0.0003**	0.0001
1-year U.S. Treasury rate	-0.028	0.034
ER regime: hard or crawling peg	0.109	0.471
ER regime: crawling peg	-0.204**	0.092
ER regime: crawling peg or band	-0.345	0.480
ER regime: crawling band	-0.004	0.110
ER regime: free float	0.169	0.197
ER regime: free fall	-0.061	0.162
ER regime: dual market	0.052	0.340

Pseudo- R^2 : 0.57; Num. obs.: 2361; Num. countries: 139; Log Likelihood: -695.6

Probit regression. Panel of country-year observations.

Dependent variable: I(Number of foreign bond issues > 0).

Exchange rate regime: hard peg is an omitted category.

Year fixed effects for 1981-2006 omitted.

Table A.2: Bond issues by country of issuer

	Number of issues			Volume of issues (bil. USD)		
	Before EMU	After EMU	Total	Before EMU	After EMU	Total
EMU	5655	16339	21994	837.6	5557.0	6394.5
Austria	139	653	792	14.8	89.7	104.6
Belgium	380	684	1064	21.9	150.1	172.1
Finland	157	34	191	17.8	10.0	27.8
France	1282	3952	5234	200.2	1089.0	1289.2
Germany	1770	4860	6630	337.7	1764.8	2102.4
Greece	12	221	233	1.3	74.3	75.6
Ireland	112	1259	1371	16.8	283.8	300.6
Italy	191	1156	1347	31.3	587.5	618.8
Luxembourg	634	1126	1760	31.9	62.4	94.3
Netherlands	814	1417	2231	132.6	735.1	867.7
Spain	164	977	1141	31.3	710.3	741.5
Financial Centers	4880	11931	16811	1380.2	11000.7	12380.8
Japan	1068	676	1744	93.9	121.1	214.9
Switzerland	216	294	510	63.0	96.5	159.4
UK	1393	5163	6556	316.3	4989.0	5305.4
US	2203	5798	8001	907.0	5794.1	6701.1
Small Outsiders	861	4491	5352	124	566.9	691
Australia	331	1920	2251	36.9	262.8	299.8
Canada	359	753	1112	67.2	207.9	275.1
New Zealand	22	92	114	2.0	18.5	20.5
Norway	149	1726	1875	17.9	77.7	95.6
non-EMU EU	303	734	1037	20.7	95.4	116.1
Denmark	197	397	594	13.5	75.7	89.2
Sweden	106	337	443	7.2	19.7	26.9
Total	11699	33495	45194	2362.5	17220.0	19582.5

Table A.3: Average bond characteristics (size, maturity)

	Before EMU		After EMU	
	Mean	S.D.	Mean	S.D.
All currencies				
issue size (bil. USD)				
All issuers	0.20	0.42	0.51	1.27
Small outsiders	0.14	0.17	0.13	0.39
maturity (yrs.)				
All issuers	7.29	6.58	10.13	11.34
Small outsiders	6.90	6.16	12.88	11.57
Euro denominated				
issue size (bil. USD)				
All issuers	0.16	0.22	0.58	1.18
Small outsiders	0.14	0.10	0.38	0.49
maturity (yrs.)				
All issuers	6.87	4.66	10.24	13.12
Small outsiders	5.85	3.35	9.58	17.75
USD denominated				
issue size (bil. USD)				
All issuers	0.39	0.70	0.82	1.72
Small outsiders	0.22	0.21	0.16	0.34
maturity (yrs.)				
All issuers	8.57	8.14	8.32	8.74
Small outsiders	9.39	8.28	8.94	6.89
Denominated in other currency				
issue size (bil. USD)				
All issuers	0.11	0.21	0.23	0.86
Small outsiders	0.09	0.11	0.08	0.38
maturity (yrs.)				
All issuers	6.76	6.59	11.35	10.97
Small outsiders	5.46	4.06	15.08	11.81

Table A.4: Multinomial logit regression for non-financial firms. Full sample.

	USD	Euro	Yen	Pound
I(after EMU)	-0.825** (0.324)	0.787*** (0.294)	0.131 (0.578)	-0.110 (0.616)
Issue amount	2.395*** (0.868)	2.228** (0.885)	-0.182 (1.395)	2.129** (0.892)
I(bond rating is below IG)	2.491** (1.108)	3.178*** (1.126)	-27.037*** (1.167)	3.141*** (1.118)
Issue maturity	0.079*** (0.019)	0.084*** (0.018)	0.009 (0.028)	0.093*** (0.026)
Euro Area issue	2.207*** (0.618)	5.041*** (0.605)	1.647* (0.958)	3.253*** (1.022)
U.S.gov. law	3.599*** (0.392)	1.814*** (0.303)	0.947 (0.787)	2.477*** (0.654)
U.K.gov. law	2.936*** (0.458)	2.929*** (0.381)	2.561*** (0.646)	4.628*** (0.590)
Germany gov. law	0.153 (0.491)	-1.209 (0.800)	-0.128 (1.135)	0.028 (0.980)
USD int. rate	-0.401*** (0.099)	-0.324*** (0.115)	-0.488** (0.203)	-0.486*** (0.125)
DM-USD int. rate	-0.120 (0.075)	-0.290*** (0.074)	0.068 (0.138)	-0.207* (0.123)
JY-USD int. rate	-0.187 (0.132)	0.003 (0.146)	-0.600* (0.333)	-0.086 (0.209)
BP-USD int. rate	-0.163 (0.106)	-0.034 (0.122)	-0.029 (0.124)	-0.240* (0.141)
Selection	9.635*** (2.449)	3.389 (2.641)	2.029 (2.830)	-35.710*** (5.796)
CPI Inflation	0.056 (0.091)	0.267*** (0.076)	0.275** (0.132)	0.234** (0.111)
II rating	-9.258*** (3.498)	-1.476 (4.561)	-18.395*** (3.452)	-13.658*** (3.558)
ER volatility	0.024** (0.012)	-0.007 (0.013)	-0.007 (0.019)	0.004 (0.010)
I(Fixed ER)	0.707*** (0.258)	0.045 (0.209)	0.458 (0.394)	2.080*** (0.588)
Pseudo- R^2 : 0.419; Num. obs.: 11635; Log Likelihood: -9569.4				

Base category is other currency.

Table A.5: Multinomial logit regression for financial firms. Full sample.

	USD	Euro	Yen	Pound
I(after EMU)	-0.008 (0.139)	-0.141 (0.162)	-0.252 (0.226)	0.238 (0.260)
Issue amount	2.940** (1.204)	2.954** (1.195)	-2.053 (2.604)	2.449** (1.147)
I(bond rating is below IG)	0.407 (0.559)	1.904* (1.140)	-2.697 (2.367)	-0.398 (0.772)
Issue maturity	0.110*** (0.024)	0.101*** (0.017)	0.232*** (0.034)	0.131*** (0.017)
Euro Area issue	1.701*** (0.611)	2.750*** (0.475)	-0.294 (0.638)	2.853*** (0.768)
U.S.gov. law	2.383*** (0.632)	0.904 (0.774)	0.648 (0.425)	2.453*** (0.816)
U.K.gov. law	1.842*** (0.471)	1.706*** (0.494)	1.352*** (0.418)	2.925*** (0.820)
Germany gov. law	-0.395 (0.432)	-0.355 (0.335)	0.857 (0.570)	-1.205*** (0.371)
USD int. rate	-0.129 (0.105)	0.132** (0.053)	-0.561*** (0.077)	0.110 (0.106)
DM-USD int. rate	-0.171 (0.110)	-0.103* (0.062)	0.301*** (0.095)	0.034 (0.116)
JY-USD int. rate	-0.096 (0.102)	0.007 (0.090)	-0.906*** (0.154)	-0.151* (0.091)
BP-USD int. rate	0.205* (0.104)	0.164*** (0.045)	-0.046 (0.094)	0.183*** (0.054)
Selection	3.641 (3.757)	2.124 (3.397)	-2.669 (6.090)	7.767** (3.767)
CPI Inflation	0.146 (0.094)	-0.086 (0.071)	-0.002 (0.059)	-0.105 (0.098)
II rating	0.935 (3.971)	2.331 (3.611)	-13.868*** (3.545)	2.208 (3.997)
ER volatility	0.008 (0.005)	0.005 (0.006)	-0.048*** (0.005)	-0.011*** (0.003)
I(Fixed ER)	0.596*** (0.160)	1.166*** (0.161)	-0.107 (0.221)	0.535** (0.243)

Pseudo- R^2 : 0.262; Num. obs.: 31486; Log Likelihood: -34783.7

Base category is other currency.

Table A.6: Multinomial logit regression for non-financial firms. Financial centers.

	USD	Euro	Yen	Pound
I(after EMU)	-1.041*** (0.380)	0.652 (0.473)	-0.192 (0.754)	-0.401 (0.639)
Issue amount	3.083 (1.899)	2.879 (1.915)	-0.068 (2.657)	2.794 (1.949)
I(bond rating is below IG)	20.778*** (0.117)	21.629*** (0.127)	-24.898 (0.000)	21.656 .
Issue maturity	0.169*** (0.036)	0.167*** (0.046)	0.089 (0.069)	0.182*** (0.057)
Euro Area issue	2.135** (1.012)	26.398*** (2.007)	21.770*** (0.091)	24.748*** (3.241)
U.S.gov. law	4.037*** (0.455)	2.242*** (0.474)	1.723 (1.185)	3.397*** (0.723)
U.K.gov. law	3.696*** (0.834)	3.624*** (0.715)	3.479*** (0.918)	5.841*** (1.003)
Germany gov. law	0.409 .	-22.285*** (1.444)	-21.069 (0.000)	-20.845*** (2.807)
USD int. rate	-0.439*** (0.042)	-0.357*** (0.088)	-0.539** (0.244)	-0.581*** (0.073)
DM-USD int. rate	-0.057 (0.123)	-0.167*** (0.021)	0.040 (0.175)	-0.114 (0.191)
JY-USD int. rate	-0.112 (0.144)	-0.047 (0.051)	-0.366 (0.384)	-0.039 (0.293)
BP-USD int. rate	-0.418*** (0.082)	-0.213** (0.103)	-0.283** (0.113)	-0.535*** (0.105)
CPI Inflation	0.001 (0.210)	0.266* (0.151)	0.234 (0.224)	0.240*** (0.059)
II rating	-13.781** (6.326)	6.085 (12.116)	-23.490*** (4.051)	-17.416** (7.490)
ER volatility	0.083*** (0.022)	0.106*** (0.033)	0.074 (0.064)	-0.255*** (0.055)
I(Fixed ER)	-0.197 (0.334)	-0.627*** (0.184)	-2.975*** (0.353)	1.264*** (0.303)

Pseudo- R^2 : 0.393; Num. obs.: 6870; Log Likelihood: -6076.8

Base category is other currency.

Table A.7: Multinomial logit regression for financial firms. Financial centers.

	USD	Euro	Yen	Pound
I(after EMU)	-0.026 (0.323)	-0.186 (0.160)	0.031 (0.108)	0.236 (0.146)
Issue amount	4.099*** (0.593)	3.757*** (0.363)	1.246 (1.379)	3.537*** (0.166)
I(bond rating is below IG)	1.001 (0.866)	2.430 (1.558)	0.461 (0.747)	-0.081 (1.812)
Issue maturity	0.057 (0.055)	0.054 (0.047)	0.131 (0.089)	0.083 (0.059)
Euro Area issue	-17.651 (0.000)	6.028*** (0.731)	-19.814*** (1.138)	5.248*** (0.606)
U.S.gov. law	3.415*** (1.013)	2.293* (1.239)	0.706*** (0.216)	4.631*** (1.640)
U.K.gov. law	2.895** (1.276)	2.645* (1.492)	1.291*** (0.187)	6.138*** (1.894)
Germany gov. law	20.231*** (1.095)	-1.005 (1.198)	18.465 .	-0.871 (2.808)
USD int. rate	-0.069*** (0.020)	-0.044 (0.081)	-0.641*** (0.103)	-0.050** (0.022)
DM-USD int. rate	0.050 (0.054)	-0.080 (0.086)	0.290* (0.169)	0.034 (0.122)
JY-USD int. rate	-0.229*** (0.077)	-0.224*** (0.060)	-0.917*** (0.312)	-0.198 (0.138)
BP-USD int. rate	0.042 (0.243)	0.204* (0.112)	-0.062** (0.024)	0.077 (0.130)
CPI Inflation	0.022 (0.056)	-0.140*** (0.030)	-0.093 (0.111)	-0.179 (0.126)
II rating	-3.359*** (1.277)	-4.536 (5.920)	-32.894*** (3.522)	-17.887*** (2.061)
ER volatility	0.271*** (0.017)	0.474*** (0.024)	0.233*** (0.047)	0.310*** (0.016)
I(Fixed ER)	0.378*** (0.074)	0.683*** (0.245)	-0.568** (0.286)	0.315 (0.228)

Pseudo- R^2 : 0.20; Num. obs.: 8812; Log Likelihood: -10302.7

Base category is other currency.

Table A.8: Multinomial logit regression for non-financial firms. EMU insiders.

	USD	Euro	Yen	Pound
I(after EMU)	-0.549 (0.794)	1.365 (0.963)	0.836 (0.880)	1.145 (1.370)
Issue amount	4.925*** (0.741)	4.945*** (0.775)	3.824*** (1.311)	4.850*** (0.659)
I(bond rating is below IG)	1.030 (1.227)	1.696 (1.242)	-39.181*** (1.098)	0.830 (1.418)
Issue maturity	-0.015 (0.015)	0.040** (0.017)	-0.118** (0.047)	0.042* (0.024)
Euro Area issue	2.578** (1.035)	4.376*** (0.590)	0.912 (1.088)	3.294** (1.296)
U.S.gov. law	5.331*** (0.719)	2.928*** (0.638)	1.006*** (0.387)	4.158*** (1.497)
U.K.gov. law	2.736*** (0.522)	2.488*** (0.252)	1.550*** (0.468)	4.343*** (1.201)
Germany gov. law	0.122 (0.537)	-0.864* (0.470)	1.036 (0.976)	0.274 (0.659)
USD int. rate	-0.267 (0.350)	-0.173 (0.314)	-0.381* (0.198)	-0.373 (0.425)
DM-USD int. rate	-0.419** (0.200)	-0.578*** (0.125)	0.055 (0.300)	-1.116*** (0.256)
JY-USD int. rate	-0.009 (0.325)	0.177 (0.303)	-0.974** (0.457)	0.229 (0.522)
BP-USD int. rate	0.000 (0.118)	0.252* (0.137)	0.443 (0.439)	0.344 (0.381)
Selection	1.848 (6.010)	0.237 (4.430)	-41.523*** (12.848)	-6.743 (9.296)
CPI Inflation	0.404 (0.310)	0.382** (0.181)	0.372 (0.337)	0.572*** (0.167)
II rating	-8.117 (13.330)	-9.439 (12.450)	-29.504*** (9.010)	4.831 (14.082)
ER volatility	0.007 (0.006)	-0.018*** (0.006)	-0.026*** (0.009)	-0.005 (0.010)
I(Fixed ER)	0.913 (0.631)	-0.066 (0.817)	0.279 (0.472)	1.495 (1.026)

Pseudo- R^2 : 0.294; Num. obs.: 3765; Log Likelihood: -2308.1

Base category is other currency.

Table A.9: Multinomial logit regression for financial firms. EMU insiders.

	USD	Euro	Yen	Pound
I(after EMU)	0.314 (0.219)	0.294 (0.269)	-0.416 (0.349)	0.975** (0.432)
Issue amount	4.223*** (0.721)	5.347*** (0.623)	-5.435*** (1.572)	4.413*** (0.646)
I(bond rating is below IG)	-2.078*** (0.503)	29.585*** (0.842)	1.400*** (0.521)	-1.564** (0.674)
Issue maturity	0.078*** (0.019)	0.082*** (0.017)	0.207*** (0.030)	0.098*** (0.021)
Euro Area issue	2.102*** (0.583)	2.609*** (0.396)	0.657 (0.666)	2.560*** (0.672)
U.S.gov. law	3.164*** (0.318)	-0.570 (0.531)	1.500*** (0.527)	3.634*** (0.805)
U.K.gov. law	2.149*** (0.353)	1.597*** (0.431)	2.318*** (0.487)	2.362*** (0.711)
Germany gov. law	-0.334 (0.352)	-0.486 (0.382)	0.922 (0.641)	-0.826** (0.357)
USD int. rate	-0.192 (0.128)	0.153** (0.068)	-0.537*** (0.099)	0.118 (0.176)
DM-USD int. rate	-0.346*** (0.131)	-0.108* (0.061)	0.428*** (0.048)	-0.097 (0.131)
JY-USD int. rate	0.061 (0.101)	0.079 (0.079)	-0.913*** (0.190)	-0.088 (0.160)
BP-USD int. rate	0.252* (0.142)	0.128** (0.055)	-0.213 (0.140)	0.256*** (0.065)
Selection	-3.745 (4.330)	-5.774** (2.692)	-14.788** (5.837)	4.063 (5.112)
CPI Inflation	0.320*** (0.101)	-0.030 (0.088)	0.040 (0.066)	0.103 (0.120)
II rating	-2.080 (6.578)	-4.208 (3.263)	-19.295*** (5.033)	2.899 (5.135)
ER volatility	0.004 (0.003)	0.003 (0.004)	-0.045*** (0.006)	-0.015*** (0.002)
I(Fixed ER)	0.378** (0.168)	1.003*** (0.228)	-0.112 (0.300)	-0.147 (0.415)

Pseudo- R^2 : 0.217; Num. obs.: 16771; Log Likelihood: -17857.8

Base category is other currency.

Table A.10: Multinomial logit regression for non-financial firms. Small outsiders.

	USD	Euro	Yen	Pound
I(after EMU)	-0.844 (1.167)	0.174 (0.975)	-0.502 (0.497)	-2.964** (1.303)
Issue amount	1.232*** (0.056)	0.653 (0.422)	-18.879*** (7.322)	0.885 (0.551)
I(bond rating is below IG)	23.502*** (0.346)	23.383*** (0.404)	-7.059*** (1.605)	23.092 .
Issue maturity	0.073*** (0.010)	0.075*** (0.020)	0.054* (0.031)	0.052*** (0.017)
Euro Area issue	2.138*** (0.597)	24.396*** (1.147)	3.333*** (0.681)	-16.966*** (1.359)
U.S.gov. law	2.311*** (0.685)	0.796** (0.362)	-1.283 (0.893)	-1.040*** (0.325)
U.K.gov. law	1.969*** (0.594)	1.926** (0.898)	0.888 (0.932)	2.743* (1.666)
Germany gov. law	-0.181 (0.000)	-19.683 (0.000)	-1.797 (0.000)	-16.451*** (0.087)
USD int. rate	-0.642*** (0.126)	-1.030*** (0.340)	-1.110*** (0.313)	-1.221*** (0.258)
DM-USD int. rate	0.089 (0.252)	0.644 (0.452)	0.604 (0.466)	0.542 (0.380)
JY-USD int. rate	-0.600*** (0.222)	-1.757*** (0.588)	-2.000*** (0.729)	-1.277*** (0.400)
BP-USD int. rate	0.031 (0.079)	0.389 (0.246)	0.392** (0.161)	-0.063 (0.792)
Selection	17.121 (14.654)	-15.379* (7.964)	-7.709** (3.629)	-41.384*** (16.051)
CPI Inflation	-0.005 (0.072)	-0.076 (0.235)	0.241 (0.150)	-0.085 (0.411)
II rating	-8.401 (7.649)	2.730 (2.001)	-16.580*** (3.613)	17.903* (9.799)
ER volatility	12.875** (6.197)	3.259 (6.939)	8.493 (6.700)	-2.181 (7.790)
I(Fixed ER)	-1.681 (1.542)	0.991 (1.372)	1.297 (1.593)	1.905 (1.268)
Pseudo- R^2 : 0.323; Num. obs.: 586; Log Likelihood: -521.4				

Base category is other currency.

Table A.11: Multinomial logit regression for financial firms. Small outsiders.

	USD	Euro	Yen	Pound
I(after EMU)	-0.470 (0.915)	-1.360** (0.602)	-0.124 (0.829)	-1.287*** (0.423)
Issue amount	-0.083 (0.960)	0.465 (1.135)	-9.964*** (3.203)	0.381 (1.086)
I(bond rating is below IG)	0.369 (0.960)	2.715 (2.026)	-47.633*** (1.321)	3.526*** (0.235)
Issue maturity	0.221*** (0.049)	0.063** (0.026)	0.418*** (0.063)	0.022 (0.043)
Euro Area issue	-1.089** (0.431)	2.789*** (0.993)	-4.106*** (1.183)	-63.923 (0.000)
U.S.gov. law	-0.907 (0.808)	-0.726*** (0.233)	-1.357 (1.694)	-1.309*** (0.281)
U.K.gov. law	-0.142 (0.615)	0.152 (0.358)	-1.445 (0.973)	0.399 (0.854)
Germany gov. law	-1.827*** (0.557)	-1.318 (0.978)	-40.728*** (0.653)	18.542 .
USD int. rate	-0.115 (0.152)	0.084 (0.066)	-0.689** (0.292)	0.039 (0.245)
DM-USD int. rate	-0.214*** (0.032)	-0.374*** (0.058)	-0.128 (0.112)	-0.463** (0.208)
JY-USD int. rate	-0.335*** (0.087)	0.075 (0.118)	-1.194*** (0.282)	0.227 (0.241)
BP-USD int. rate	0.396*** (0.031)	0.291* (0.153)	0.419*** (0.144)	0.150 (0.095)
Selection	16.753*** (1.873)	14.228*** (3.523)	22.726*** (4.610)	15.598*** (5.002)
CPI Inflation	-0.007 (0.226)	-0.186 (0.142)	0.055 (0.143)	-0.064 (0.205)
II rating	5.095 (4.383)	15.682*** (1.899)	-13.744*** (4.263)	13.338*** (5.069)
ER volatility	-0.658 (0.793)	1.281*** (0.133)	1.698*** (0.629)	1.590 (1.914)
I(Fixed ER)	-0.453*** (0.166)	-0.336 (0.388)	1.647*** (0.470)	-0.077 (0.754)
Pseudo- R^2 : 0.374; Num. obs.: 4636; Log Likelihood: -3917.1				

Base category is other currency.

Table A.12: Multinomial logit regression for non-financial firms. Denmark and Sweden.

	USD	Euro	Yen	Pound
I(after EMU)	2.580*** (0.059)	1.070 (0.997)	-2.974*** (0.501)	-14.756*** (3.367)
Issue amount	0.589 (5.122)	7.503*** (1.057)	-41.773*** (6.397)	10.426*** (0.602)
I(bond rating is below IG)	-3.740 (0.000)	41.627 .	1.016 .	2.044 .
Issue maturity	-0.384*** (0.085)	0.024 (0.040)	0.037*** (0.005)	0.281*** (0.017)
Euro Area issue	-49.250 (0.000)	4.704*** (1.103)	-47.426 (0.000)	-21.341 (0.000)
U.S.gov. law	28.906 .	22.228*** (1.882)	-17.036 (0.000)	-5.182 (0.000)
U.K.gov. law	1.315*** (0.412)	3.134* (1.787)	-0.309 (0.560)	18.054* (9.834)
Germany gov. law	35.771 .	36.331 .	42.019 .	48.250 .
USD int. rate	-0.583 (0.594)	1.408 (1.398)	0.121 (0.843)	0.525 (0.791)
DM-USD int. rate	0.001 (0.383)	-0.223 (0.417)	1.092*** (0.420)	-0.821*** (0.190)
JY-USD int. rate	-0.267 (0.337)	0.829 (1.198)	-0.305 (0.704)	1.577** (0.761)
BP-USD int. rate	0.833 (1.169)	-0.181 (0.629)	-1.529*** (0.246)	-1.856* (1.051)
Selection	71.469*** (1.154)	-36.626 (83.401)	31.022 (50.826)	-362.053*** (92.620)
CPI Inflation	-0.240 (0.244)	0.080 (0.429)	0.510*** (0.016)	-5.247*** (0.682)
II rating	-33.159*** (11.251)	1.570 (11.272)	33.893*** (2.428)	61.613** (29.072)
ER volatility	-1.786*** (0.584)	5.649*** (1.768)	-1.106 (0.925)	9.425*** (3.407)

Pseudo- R^2 : 0.521; Num. obs.: 162; Log Likelihood: -106.7

Base category is other currency.

Table A.13: Multinomial logit regression for financial firms. Denmark and Sweden.

	USD	Euro	Yen	Pound
I(after EMU)	0.385 (1.790)	1.662 (1.160)	-1.112 (1.669)	-0.820 (1.230)
Issue amount	6.877** (2.927)	9.070** (3.795)	-19.772 (14.009)	8.529** (3.777)
Issue maturity	0.023 (0.045)	0.061 (0.056)	0.338*** (0.108)	-0.006 (0.016)
Euro Area issue	-37.875*** (1.029)	1.008 (0.699)	-27.298*** (0.222)	-38.862*** (1.785)
U.S.gov. law	40.618 .	-6.322 (0.000)	-3.729 (2.782)	-4.969 (0.000)
U.K.gov. law	2.684*** (1.003)	1.000** (0.452)	-0.024 (0.648)	1.131*** (0.227)
Germany gov. law	22.586*** (1.354)	25.592 .	48.642 .	24.903*** (1.722)
USD int. rate	-0.371* (0.211)	-0.423** (0.212)	-0.663 (0.512)	-3.156*** (0.819)
DM-USD int. rate	-0.132 (0.471)	0.197*** (0.041)	-0.079 (0.305)	1.154*** (0.409)
JY-USD int. rate	-0.415 (0.612)	-0.457** (0.217)	-0.843 (0.579)	-3.733*** (0.722)
BP-USD int. rate	0.172 (0.334)	-0.200*** (0.039)	-0.204** (0.081)	-0.490 (0.558)
Selection	-1.607 (4.838)	19.302 (20.850)	-8.971*** (1.430)	100.978*** (5.314)
CPI Inflation	0.171 (0.133)	0.283 (0.274)	0.363*** (0.015)	-0.408 (0.540)
II rating	-19.046 (16.027)	-18.198** (8.822)	-22.949** (9.873)	-26.706*** (3.190)
ER volatility	-0.769 (1.616)	-2.350*** (0.656)	-0.567 (0.354)	-3.985 (2.845)

Pseudo- R^2 : 0.513; Num. obs.: 822; Log Likelihood: -544.6

Base category is other currency.

Table A.14: Multinomial logit regression for non-financial firms. First issues.

	USD	Euro	Yen	Pound
I(after EMU)	0.055 (0.485)	1.608** (0.729)	1.311** (0.621)	0.433 (0.641)
Issue amount	0.901 (0.687)	0.644 (0.686)	-0.015 (1.040)	0.605 (0.700)
I(bond rating is below IG)	0.767 (1.292)	1.680 (1.323)	-43.210*** (1.518)	2.068 (1.339)
Issue maturity	0.050* (0.028)	0.054** (0.026)	0.003 (0.042)	0.061** (0.027)
Euro Area issue	0.769 (1.439)	3.417*** (1.207)	-0.431 (1.656)	1.311 (1.614)
U.S.gov. law	4.154*** (0.590)	1.634** (0.703)	0.475 (0.891)	1.532* (0.868)
U.K.gov. law	2.092** (0.878)	2.253*** (0.858)	1.677** (0.810)	3.909*** (0.888)
Germany gov. law	2.570* (1.467)	1.917 (1.719)	1.558 (1.645)	3.429 (2.197)
USD int. rate	-0.310 (0.211)	-0.304 (0.191)	-0.220 (0.245)	-0.444* (0.262)
DM-USD int. rate	-0.211 (0.214)	-0.380* (0.214)	-0.155 (0.242)	-0.330 (0.357)
JY-USD int. rate	0.077 (0.305)	0.179 (0.352)	0.119 (0.405)	-0.070 (0.534)
BP-USD int. rate	-0.207 (0.210)	-0.118 (0.212)	-0.052 (0.247)	-0.110 (0.252)
Selection	6.313 (8.990)	4.031 (9.804)	-3.268 (9.063)	-34.571 (21.481)
CPI Inflation	-0.054 (0.096)	0.081 (0.101)	0.098 (0.216)	-0.031 (0.206)
II rating	-16.052*** (5.403)	-1.521 (9.576)	-28.926*** (5.461)	-19.982* (11.205)
ER volatility	-0.000 (0.010)	-0.026*** (0.009)	0.015 (0.042)	-0.034** (0.015)
I(Fixed ER)	-1.095*** (0.416)	-0.408 (0.441)	-0.425 (0.643)	23.972*** (1.211)
Pseudo- R^2 : 0.514; Num. obs.: 6710; Log Likelihood: -3995.8				

Base category is other currency.

Table A.15: Multinomial logit regression for non-financial firms. Firms BA only.

	Euro to Euro	Any to Euro	Euro to any
I(after EMU)	1.754*** (0.493)	0.535 (0.338)	0.764*** (0.252)
Issue amount	-0.031 (0.063)	0.103** (0.043)	0.005 (0.075)
I(bond rating is below IG)	0.568 (1.049)	0.646* (0.338)	-0.441 (0.712)
Issue maturity	-0.023 (0.028)	-0.037 (0.024)	-0.024* (0.014)
Euro Area issue	4.365*** (0.587)	4.386*** (0.949)	0.671 (0.755)
U.S.gov. law	1.155 (0.895)	1.153 (1.043)	-0.604* (0.325)
U.K.gov. law	0.973*** (0.323)	1.740** (0.846)	-0.520* (0.289)
Germany gov. law	-1.755*** (0.570)	-1.292* (0.731)	-0.587 (0.672)
USD int. rate	-0.015 (0.107)	0.159 (0.104)	0.172 (0.112)
DM-USD int. rate	-0.406*** (0.150)	-0.165 (0.124)	-0.021 (0.121)
JY-USD int. rate	0.301 (0.196)	0.302** (0.133)	0.169 (0.109)
BP-USD int. rate	0.271** (0.134)	0.030 (0.161)	0.060 (0.123)
Selection	-21.000** (10.414)	-17.950* (9.850)	-10.197 (9.945)
CPI Inflation	0.143 (0.088)	0.103 (0.095)	0.031 (0.076)
II rating	0.418 (6.655)	3.884 (5.824)	1.356 (5.834)
ER volatility	-0.037* (0.019)	-0.018 (0.016)	-0.022 (0.016)
I(Fixed ER)	-1.284*** (0.442)	-0.078 (0.294)	0.448** (0.203)

Pseudo- R^2 : 0.249; Num. obs.: 2528; Log Likelihood: -2213.7

Base category is non-euro to non-euro.