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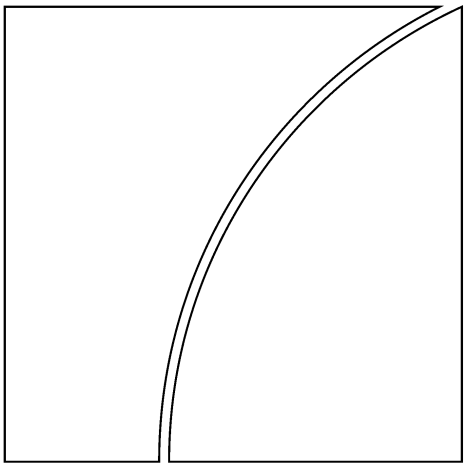

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The cost of barriers to entry: evidence from the market for corporate euro bond underwriting

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Abstract

The advent of the euro has eroded many of the barriers that segmented the European corporate bond market along currency lines and given rise to a unified market comparable in size to the one denominated in US dollars. In doing so, the new currency has made it easier for investment banks to explore scale economies in the provision of underwriting services, lowered the entry barriers to this industry, and made it easier for European borrowers to benefit from scope economies by combining their purchasing of commercial and investment banking services. This paper shows that the arrival of the euro led to a reduction in the underwriting fees of corporate bonds issued in the new currency and that this reduction was largely due to greater contestability of the investment banking business in the post-EMU European market. Our paper also shows that the elimination of market segmentation led to a migration of underwriting business towards the larger international investment banking houses, particularly those from the United States, rather than an intensification of the business links between euro area borrowers and bankers from the same country. Moreover, borrowers that chose American investment banks appear to have made extra savings in the underwriting fees. Finally, our analysis shows that these fee savings were not overcome by an increase in the credit spreads of these borrowers' bonds at issue date. Altogether, these results suggest that borrowers attach more weight to placing capacity than to business relationships in the choice of an underwriter.

JEL Classification: G15, G24, G32.

Keywords: market segmentation, corporate bond underwriting, euro.

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1. Introduction[1]

With a single stroke on 1 January 1999, the economic and monetary union (EMU) replaced 11 national currencies by the euro, eliminating the potential impact of exchange rate fluctuations for a large number of transactions.[2] The advent of the single currency also set in motion processes that reshaped the European financial landscape. This paper focuses on the impact of the euro on the underwriting market for corporate bonds denominated in the new currency. The paper also attempts to draw some general lessons regarding the relative importance of the investment banker's relationship with the borrower as well as its placement capacity as drivers in the borrower's choice of underwriter.

Almost overnight the introduction of the euro eliminated many of the economic, regulatory and psychological factors that had led to the segmentation of the European market for corporate bonds along currency lines. Exchange rate risk and national idiosyncrasies in yield curve dynamics, factors that dominated the pricing of fixed income securities in the pre-EMU period, became irrelevant. Regulatory requirements restricting currency exposure of institutional investors coupled with the generally observed "home currency bias", which had contributed to the segmentation of demand for securities, became obsolete. Thus, the market segmentation which had made it difficult for firms to benefit from the scope economies of using as an underwriter the bank with which they had a relationship disappeared.[3] Lastly, the erosion of rents that derived from local expertise in research and marketing reduced the economic barriers to entry for investment houses from outside the area. As a result, a more homogeneous market and an expanded investor base emerged in the post-EMU period, allowing underwriters to compete on a pan-European basis.

The effects of the euro's arrival were significant and materialised in a short period of time. The event presents a good opportunity to study the structure of competition in the underwriting market for international bonds and more generally the forces that determine successful underwriters. Hence, our paper has two objectives. The first is to investigate the impact of the arrival of the single currency on the cost of bond issuance, and in particular on two determinants of this cost: underwriting fees and bond credit spreads at issue date. The second objective of the paper is to analyse the channels through which EMU affected the issuance cost of corporate bonds and how these relate to the functions of the underwriter as an intermediary.

Our analysis of the bond underwriting fees shows a rapid convergence between the euro- and dollar-denominated segments following the introduction of the single currency. This reduction in the underwriting fees for euro-denominated bonds, as compared to issues in the legacy currencies, was not accompanied by an increase in bond underwriting spreads at issue. We further find that this decrease in the cost of bond issuance was also accompanied by a sharp decline in conventional measures of market concentration for underwriting services. These findings suggest that economic barriers to entry in the pre-EMU underwriting market entailed important costs to issuers of bonds denominated in the predecessor currencies of the euro. The single currency brought about a more competitive market and one that presented borrowers with both greater choice of underwriters and lower costs of bond issuance.

This part of our analysis relates to the recent literature on the impact of regulatory changes on the competitiveness of the bond underwriting business. One strand of this literature focuses on the US experience in the later part of the 1980s, with the erosion of the restrictions on commercial bank

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[1] We thank Philipp Hartmann, Philip Lowe, Mark Carey and seminar participants at the Faculdade de Economia do Porto, CEMAF/ISCTE, BIS, the 2001 FMA meetings, the ECB-CFS Research Network Launching Workshop and the NYU conference on The Euro: Valuation, Hedging & Capital Market Issues for useful comments and suggestions. Clifford Dammers has provided unique insight into the workings of the international bond market. We are also grateful to Craig Furfine for very helpful programming tips, and Denis Pêtre for helping us with the data. The views stated herein are those of the authors and not necessarily those of the Bank for International Settlements, the Federal Reserve Bank of New York or the Federal Reserve System. Contact information: Kostas Tsatsaronis e-mail: *ktsatsaronis@bis.org,* tel: +41 61 280 8082; João Santos e-mail: *joao.santos@ny.fed.gov,* tel:+1 212 720 5583.

[2] The 11 founding members were Austria, Belgium, Germany, Finland, France, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain. Greece became the 12th member of the currency union in January 2001.

[3] Prior to the euro, issuers wishing to tap a foreign market would find it advantageous to select an underwriter with marketing and sales expertise in the currency of issue. This usually meant selecting an underwriter from the country of the currency of issue, as opposed to a bank from the borrower's home country.

involvement in investment banking that had been imposed since the 1930s.[4] Gande et al (1999), for example, link the overall reduction in underwriting fees for domestic US bonds to the competitive impact from the entry of commercial banks into the business. Roten and Mullineaux (2002) conclude that the effect of commercial bank entry was transitory after examining a data set spanning a longer period. Yasuda (1999) analyses separately issuers' choice of underwriter and the price of the issue in the US domestic bond market. She finds that pre-existing relationships are a significant source of market power for the entrant commercial banks but only for low-reputation firms.

Hamao and Hoshi (2000) focus on the impact of the Financial System Reform Act, which was introduced in Japan in 1993 and allowed banks to enter the underwriting business by setting up securities subsidiaries. They find that, despite some evidence of conflicts of interest, bank subsidiaries were able to gain an important market share in a short period of time through an aggressive entry strategy focusing on issues aimed mainly at institutional investors and by cultivating issuers with weak ties to their parent banks.

In the second part of our analysis, we examine the specific forms under which intensified competition in the euro-denominated segment manifested itself in the post-EMU environment. In doing so, we draw a parallel between the impact of the advent of the euro and the effect of tariff reductions on cross-border trade. Two competing views on the effects of liberalisation on international trade flows are of particular interest to us. The first posits that in the presence of scale economies in production, free trade benefits countries with larger domestic demand bases (Krugman (1980), Helpman and Krugman (1985)). An alternative view, formulated by Head and Ries (2001), emphasises the importance of national content of traded goods in the presence of constant returns to scale. In this case, trade liberalisation gives small-market producers access to much larger markets, thus increasing the overall demand for their output.

Our paper complements the literature that has studied these effects in connection with international trade of manufactured goods by looking at the financial services sector.[5] In the context of the bond underwriting market, the presence of increasing returns to scale suggests that the market environment after the introduction of the single currency would favour the larger international investment banks. If, alternatively, scale effects are not as important as "domestic content" (in the form of relationship capital between the intermediary and the issuer) then greater market openness would tend to increase the share of home underwriters in the corporate bond market.[6]

The analysis of the patterns of intermediation in the European segment of the market before and after EMU provides evidence in favour of the increasing returns to scale hypothesis. European corporate borrowers did not exercise the freedom in the choice of underwriter offered by the euro by exploiting existing relationships with their "home" institutions. Businesses instead gravitated towards the larger bond underwriting houses, especially those from the United States, and in doing so they enjoyed a reduction in underwriting fees. Importantly, though, they benefited from savings in underwriting fees without having to pay higher credit spreads for their bonds at issue.

Our results, therefore, suggest that marketing and placement capability dominated the information synergies in the relationship between the underwriter and the borrower. The evidence of economies of scale in the production of investment banking services also suggests a solid economic rationale for consolidation in the industry at both national and international levels.

The remainder of the paper is organised as follows. The next section compares the market for bond underwriting in Europe before and after the arrival of the euro. Section 3 presents our methodology, and describes the data and the variables used in our analysis. Section 4 discusses the empirical results and Section 5 concludes.

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[4] Since 1988, the Federal Reserve has used the so-called "Section 20 subsidiary" rule to allow subsidiaries of commercial bank holding companies to underwrite securities, bypassing the strict separation of commercial and investment banking activities imposed by the Glass-Steagall Act of 1930.

[5] Beginning with the deadweight loss calculations of Johnson (1960), there has been a great deal of interest in the measurement of the costs of trading barriers. See, for example, Feenstra (1992, 1995) and the references therein.

[6] A bank that provides commercial banking services to a borrower would find it easier to underwrite the firm's securities as it could use the information it has accumulated over the course of its relationship with the firm. See Kanatas and Qi (1998) for a formalisation of this argument, and Rajan (1996) and Santos (1998) for other potential benefits for a firm from relying on its bank for underwriting services.

2. Eliminating entry barriers: one currency, one market

The impact of EMU in the European bond markets was multifaceted, and providing a full analysis of it is beyond the scope of this paper.[7] The discussion in this section focuses more narrowly on the impact of the euro on the market for corporate bond underwriting.

Besides eliminating all uncertainty relating to exchange rate risk affecting the choice between securities denominated in the legacy currencies, a key impact of the euro was to relax a number of regulatory restrictions on the currency exposures of institutional investors in the euro area. These restrictions include currency matching requirements that put a ceiling (typically 20%) on the permissible mismatch in the currency denomination of assets and liabilities, and portfolio allocation rules that further restrict these investors' ability to allocate funds in foreign-issued securities (Table 1).[8] Similarly, the euro relaxed the influence of less formal restrictions, such as the so-called "prudent man" rules, which reinforce the well documented tendency of investor portfolios to be overweight on domestic assets at the expense of better diversification opportunities offered by a wider geographic spread of their holdings.[9]

Table 1
Restrictions on institutional investors' investments (%)

Countries	Position limits		Portfolio allocations to foreign securities		
	Pension funds	Life insurance companies	Pension funds		Life insurance companies
			Equities	Bonds	
France	–	<20	2	3	0
Germany	<20	<20	5	2	0
Italy	PMR[1]	<20	0	0	0
Netherlands	–	<20	17	12	10

[1] PMR = Prudent man rule.

Sources: Davis and Steil (2000); Lannoo (1998).

The combined effect of these factors had led to a segmentation of the European fixed income market along currency lines. By lowering these economic barriers to cross-border investing, the single currency allowed issuers of euro-denominated bonds to address simultaneously a larger and more diverse group of investors.[10] Data covering the extent of cross-border securities holdings within the euro area are limited, but suggest that asset managers responded positively to these changes. For example, the share of euro area bonds in the portfolios of Italian mutual funds increased from 8% in 1995 to 23% in 2000. Furthermore, available information on portfolio flows to and from the euro area suggests that European investors absorbed the bulk of euro-denominated bond supply.[11]

[7] For a more complete overview of the effects of the euro on European financial markets see Danthine et al (2001), ECB (2001a,b), von Thadden (2001), Detken and Hartmann (2000) and Galati and Tsatsaronis (2003).

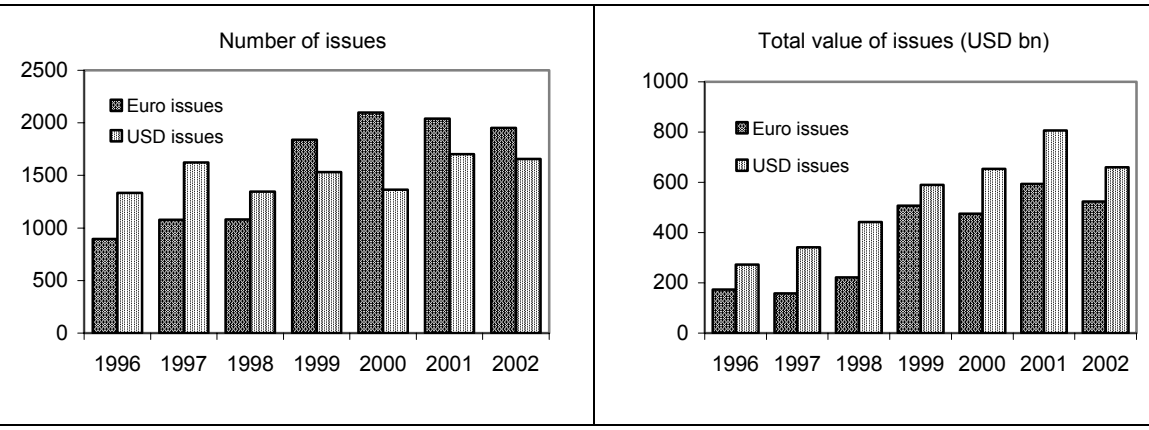
[8] These restrictions apply to the technical provisions against liabilities as defined in each regulatory jurisdiction. Life insurance liabilities are typically denominated in the local currency as the commercial practice of these companies has been to use locally chartered subsidiaries rather than cross-border sales for their international operations (Lannoo (1998)).

[9] The so-called "home bias puzzle" has been documented by several authors (see, for example, Tesar and Werner (1994), Baxter and Jermann (1997) and Glassman and Riddick (2001)).

[10] Michael Somers, head of the Irish National Treasury Management Agency, noted colourfully that "we're all essentially selling the same detergent now" referring to the greater substitutability of government bonds in the post-EMU period (Financial Times, 2 January 2002).

[11] These facts are consistent with the conclusions of Detken and Hartmann (2000) that, during its first year, the euro's role as an international financing vehicle was more important than its role as an international investment currency. For a more

Figure 1
Private sector international bond issues



Note: Euro data prior to 1999 relates to the legacy currencies that later became part of the euro.

Source: Galati and Tsatsaronis (2003).

Higher demand from a larger and broader investor base brought about an improvement in secondary market liquidity, which further enhanced the attractiveness of euro-denominated bonds. Galati and Tsatsaronis (2003) show evidence of a substantial increase in market turnover for private debt issues denominated in euros after the introduction of the single currency.[12]

Issuers reacted very favourably to these structural changes brought about by the euro. During 1999, for the first time, the number of euro-denominated issues in the international bond market surpassed those denominated in the US dollar. The historical gap in issuance volume between the two currency segments almost disappeared (Figure 1).[13] The euro-denominated segment also became more diverse as compared to the pre-EMU period. In particular, non-financial borrowers based in the euro area were among the key contributors to the issuance boom (Table 2), reducing the market dominance of financial sector signatures. Similarly, the euro encouraged lower-rated corporate borrowers, particularly in the single-A to BBB range, to issue in a market that used to be dominated by sovereigns and high-grade corporates. Finally, euro area borrowers that were new to the capital markets also made a key contribution to this surge in bond issuance; 30% of the bonds issued after the euro were by firms that had been absent from the capital markets at least since 1994.

These changes in the underlying economics of the demand for and supply of euro-denominated bonds implied important changes for the business of underwriting bonds in the post-EMU period. Importantly, the introduction of the single currency has affected both sides of the dual role of the underwriter as an intermediary: its relationship with the borrower and its ability to successfully market the issue.[14]

detailed discussion of the trends and nature of international portfolio flows within the single currency area and vis-à-vis the rest of the world see also Galati and Tsatsaronis (2001).

[12] See also BIS (2001).

[13] As we describe later, our data relate to "international" issues and as such are more representative of bonds issued in the European market but do not cover a large domestic US bond market.

[14] See Marshall and Ellis (1994) for a detailed description of the activities performed by an underwriter and Smith and Walter (2000) for a review of the investment banking business in the euro area.

Table 2
Location and sector of activity of bond issues denominated in euros

Year	Issuer's location (USD bn)		Issuer's sector of activity (%)		
	Euro area issuers	Non-euro area issuers	Non-financial corporations	Banks	Other financial corporations
1996	95.6	58.0	19.4	95.8	23.4
1997	92.8	57.7	19.6	86.5	22.4
1998	144.7	95.1	37.1	111.1	48.3
1999	372.7	169.8	154.4	252.9	82.3
2000	346.8	155.2	131.1	249.9	85.1
2001[1]	326.2	155.4	153.3	202.9	76.1

[1] Up to the third quarter.

Sources: Thomson securities: IFR Platinum database; authors' calculations.

One factor guiding the choice of an underwriter is its ability to understand and respond to the needs of the issuer. For example, the ability to draw on the experience and knowledge derived from an ongoing business relationship between the issuer and the banker would tend to reduce the overall transaction and information costs to the two parties.[15] Furthermore, intimate knowledge of the borrower can also be interpreted by potential buyers as a form of certification of the bond's quality. In the segmented bond market prior to EMU, borrowers would find that a lending relationship was of little value if their home bank did not have marketing operations in the country of the desired currency of issue. Hence, the single currency made it easier for issuers of euro-denominated bonds to benefit from any scope economies in the simultaneous provision of commercial and investment banking services by a financial institution.

The other aspect of the role of the underwriter is successful placement of the issue in the primary market, a task that requires expert judgment of market conditions and accurate gauging of investor demand. An underwriter who is continuously engaged in marketing a specific type of bond is better placed to gauge market demand in that segment and more closely attuned to current investors' preferences compared to an occasional player. Moreover, an effective marketing network is key to the success of an underwriter. The establishment of such a marketing capacity is one of the major cost lines for underwriters and its maintenance requires repeated (and successful) presence in the market. Finally, successful placement is important because it helps minimise the cost from unsold or under priced inventory, thereby lowering the cost of this funding source.

After EMU the creation of a single monetary policy, and the consequent convergence of yield curves across the euro area, obviated the need for multiple research teams covering different countries for underwriters with pan-European ambitions. Moreover, underwriting costs were further reduced as a result of the broadening of the investor base that allowed securities houses to rely on a single marketing network to place all euro-denominated issues.[16] In fact, an underwriter could compete even if it cultivated links with only a subset of the much larger market for euro-denominated bonds. Finally, the new currency reduced the competitive advantage of home currency underwriters and facilitated the establishment of pan-European operations by aggressive competitors from outside the area.

[15] See Santos (1998) for a review of the potential economies of scope associated with the combination of commercial banking with investment banking activities, and Forestieri (1993) for a survey of the empirical research on economies of scope.

[16] The euro-denominated bond market, as a consequence of its larger size, also permits a clearer separation of the institutional and retail segments of the market. The particular requirements of retail placement, such as smaller denomination of the bonds, the printing and handling of physical certificates, a more extensive distribution network and higher transaction costs, can add substantially to the cost of issuance. In smaller markets, borrowers were at times obliged to also cater to retail clientele but the larger and deeper bond market since the introduction of the euro has reduced the importance of these considerations.

3. Hypotheses, method and data

3.1 Hypotheses and method

Our investigation of the effect of EMU on the underwriting market for bonds denominated in the single currency proceeds in three parts. In the first part, we compare the underwriting fees for euro-denominated bonds with those of bonds denominated in the legacy currencies or in US dollars, and relate the changes in fees to changes in the market concentration in each segment. We also use regression analysis to evaluate the impact of the euro on the underwriting fees of euro-denominated bonds.

In the second part of our investigation, we attempt to distinguish between different channels through which the arrival of the euro might have affected underwriting fees for euro-denominated bonds. We focus on two hypotheses, each emphasising a different facet of the underwriter's role: the relationship with the borrower and the capability to place an issue. If the informational advantage derived from an existing relationship is a dominant factor in the choice of an underwriter, then in the post-EMU market one would expect that firms' greater freedom in the choice of underwriter would lead to a preference for banks from their own country. In this case, informational economies associated with the joint provision of underwriting services and other banking services would explain the reduction in underwriting fees. We label this the "national differentiation" hypothesis, borrowing a term used by Head and Ries (2001), who argue that trade liberalisation benefits producers of goods with a distinct national character.

Alternatively, if global selling capability is more important, then in the post-EMU period one would expect business to gravitate towards large international underwriters, regardless of their nationality. In this case, the presence of scale economies in the underwriting business would explain the reduction in underwriting fees, for example in the form of declining cost of market research and maintenance of placement capacity for underwriting houses with pan-European operations. We refer to this as the "increasing returns to scale" hypothesis as it bears similarities to the international trade theory put forward by Krugman (1980), which asserts that in the presence of scale economies trade liberalisation would favour countries with larger domestic demand.

We distinguish between these two hypotheses by examining the dynamics of the share of "home currency" and "home country" underwriters around the introduction of the euro. We pay particular attention to the choice of underwriter by issuers that came to the bond market for the first time in the post-EMU period, as well as the market share of large underwriters. We also augment our fee regressions by including variables that capture the effect of overall scale of operations for the underwriter, the size of the market and any relationship between the nationality of the underwriter, the currency of issue and the nationality of the borrower.

In the third part of our analysis we examine the impact of the changes brought about by the euro on bond spreads. Aggressive pricing of underwriting services might attract more business but lower fees can also lead to lower investment bank revenue and profits. It is possible, therefore, that lower fees might be accompanied by diminished underwriter ability to correctly price bonds, less diligent research and sales efforts, or increased aversion to the risk of having to absorb a large stock of unsold bonds. These considerations could lead to reduced proceeds for the borrower in the form of lower prices (ie higher yield spreads) that may offset the gains from the reduction in fees. We use regression analysis to investigate whether the effect of EMU on the characteristics of the underwriter market has meant a more conservative pricing of bonds.

3.2 Data

The data used in this study have been extracted from the IFR Platinum database compiled by Thomson Financial Securities. This database covers mainly bond issues characterised as *international* by meeting one of the following criteria: (a) they are self-described as such in the prospectus stating that the issuer targets investors outside its home country, (b) the bond is denominated in a currency different from the home currency of the issuer, or (c) the issue is underwritten (or co-managed) by an international investment bank.

While the international characterisation leaves out a large number of bonds issued by US borrowers, which are primarily domestically focused, it is fairly inclusive in the case of bonds issued by European

borrowers. Apart from government debt issues, very few bonds issued by European corporate borrowers are purely domestic. The small size of national markets obliges issuers to issue bonds that appeal to international investors. An advantage of focusing on the international bond market for the purpose of this study is that we can capture the market segment that is most exposed to international competition and where issuers are more likely to be influenced by cost factors, including the underwriting fees that are the main focus of this paper.

In the formal analysis we have selected only fixed coupon bonds issued by the private sector between January 1994 and June 2001. We have excluded bonds issued by financial institutions (first digit SIC code 6) because of the possibility that they might not be competitively underwritten if issued by subsidiaries or affiliates of securities houses. Because of similar considerations we have also excluded bonds issued by central or local governments and public enterprises (first digit SIC code 9). Many European sovereigns have issued bonds that were underwritten by the national central bank and it is likely that large issuers such as emerging market countries might have a special relationship with the institutions that promote their bonds. The same holds true for the large supranational institutions such as the World Bank, which is one of the most active players in the international bond market. The inclusion of these borrowers in the sample could distort the results.

The data set used for the analysis comprises 3,110 bonds that satisfy the above criteria and for which we could obtain all the necessary information. Table 5 provides a general idea of the composition of the data set, which appears to be balanced with roughly comparable numbers of bonds in the two main currency categories and bonds in the pre-EMU and post-EMU subperiods.

3.2.1 Variables

We next present the most important variables used in our analysis, namely the fees, the primary market spreads and a number of categorical variables that relate to the identity of the underwriter. The data appendix contains a fuller description of all variables used in the regressions.

The measure of fees we use is the Gross Spread, which refers to underwriting fees expressed as a percentage of the total funds raised. This is the same variable used by other related studies such as Gande et al (1999) and Mullineaux and Roten (2002). The definition is inclusive of several types of fees such as management, selling commissions, preacipium, etc.[17] We elected to analyse the gross fee because it is the most comprehensive of the overall issuing expenses borne by the borrower.

There are two sources of potential misrepresentation of the real level of fees by the measure included in our data. The first is the practice of “re-allowance”, whereby the selling bank would offer the bond to the final investor at a discount to the official offer price, hence passing on a portion of the underwriting fee as stated on the issue’s prospectus. While widespread during the 1980s, however, this practice was phased out after 1989 and the alternative arrangement of a “fixed price offer/re-offer” has gradually become the accepted standard in the international bond market. The fixed price re-offer system binds the members of the selling syndicate to the established offer price for a period of several weeks following the launch of the issue, obviating the need for the statement of an inflated fee figure in the prospectus.[18] A discrepancy might still exist in the case of issues that are simultaneously offered to retail and institutional clients. Higher fees might be stated for those issues in order to cover the expenses of retail distribution. Large portions of these fees could be “re-allowed” to institutional buyers.

The IFR Platinum database does not unambiguously identify issues targeted to the retail investor and thus makes it difficult to measure this effect directly. Moreover, to the extent that re-allowance of fees might affect our results it is likely to be in the form of an upward bias in the level of reported fees that should not be affected in any direct way by the introduction of the euro.

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[17] In some cases the database provides a breakdown of the gross fees to individual components but for most bonds all fees are combined into one.

[18] The first issue offered under this arrangement was a US dollar World Bank bond in 1989. The fixed price offer formula was quickly spread to other currency segments. For a description of the offer system and a number of institutional details regarding arrangements in the international bond market see Fisher (1997).

A second source of potential misrepresentation of the cost of issuance by the fee stated on the bond's prospectus stems from the fact that an issue is often bundled with interest rate and/or currency swap products, which are structured so as to better suit the borrower's financing needs. The lack of information on any swap-related revenue to the investment banker will tend to bias our estimates of the level of fees. However, it is unclear to what extent its absence should interfere with our analysis of the effect of the euro on these fees.

An investment house's involvement in the preparation and sale of a bond issue in the primary market can take many forms. This paper focuses exclusively on the role of the bookrunner (occasionally also referred to as the lead underwriter) as identified in the database. The bookrunner receives the original mandate to organise the bond issue and subsequently forms the underwriting syndicate and acts as its leader. As a reward for shouldering the main responsibility for the coordination of the placement as well as bearing the risks of a botched sale, the bookrunner receives the largest portion of the fees.[19] For a number of bonds in our data set there is more than one bookrunner. We have dealt with this issue in a manner most appropriate to the specific context. For instance, in creating flags related to the nationality of the banker (eg is the banker of the same nationality as the borrower?) we have been inclusive in assigning a "yes" flag if any of the bookrunners met the specific criterion. By contrast, when calculating the banker market shares and concentration measures for different currency segments, we divide the amount of the issue equally across all members of the underwriting syndicate.

The third key variable we use in the analysis is the primary market yield spread on the issue. It is measured as the difference in the yields to maturity between the specific bond and a risk-free bond with the same denomination and maturity characteristics, typically issued by the "home" government for that country. We use the spreads supplied as part of the IFR database. Since the database does not contain spreads for all the bonds in our sample but includes the yield to maturity for the issue, we have also calculated spreads using this information to calculate spreads over the swaps curve for that currency. There is a strong co-movement between the two sets of spreads but the spread over the swaps curve displays higher volatility across issues. We have, therefore, elected not to use them in the analysis reported in the next section.[20]

4. Evidence on the reduction in underwriting costs

This section contains the results of our empirical analysis of the effect of EMU on underwriting fees and bond credit spreads at issue date for euro-denominated bonds. The analysis proceeds in three parts. We first document the increase in the contestability of the euro-denominated market segment and the accompanying decline in fees. In the second part we examine the evidence on the shifting patterns in the selection of underwriters as well as the importance of factors such as the size of the market or the underwriter's overall activity in the determination of fees. In the third part we examine whether the patterns that emerged in the post-EMU environment had any impact on the other component of borrowing costs: the bond yield spreads at issue.

4.1 Competition and fees

The right-hand panel of Table 3 shows the average gross fees for the bonds in our sample. Figures refer to percentage points of the amount raised and are calculated as averages weighted by the size of the issue (expressed in US dollars). There is a clear global downward trend in fees over the 1994-2001 period with value-weighted average fees for 2001 standing at 86 basis points below their 1994

[19] The lead manager is also the leader of the price stabilisation effort during the first few weeks of the new issue flotation. This operation, which aims at keeping the market price close to the offer price, can result in trading losses if the bond is received unfavourably by the investor community.

[20] We have used the spreads over swaps in our regressions and obtained results that are qualitatively the same as those reported in Section 4.3. Because of the higher variance of the calculated swap spreads, the precision of our coefficient estimates and overall fit of the regression were lower than those reported in Table 10.

levels, the equivalent of a 37% reduction.[21] The difference between underwriting fees before and after the introduction of the euro (the bottom rows of Table 3) is statistically significant at all conventional confidence levels both for the market as a whole and for either of the two major currency segments.

Table 3
Patterns of international bond issuance

Year	Number of issues			Total proceeds (USD bn)			Average gross fees (in % of amount raised)[1]		
	USD	Euro[2]	Total	USD	Euro[2]	Total	USD	Euro[2]	Total
1994	82	77	244	19.3	10.7	40.8	1.299	1.553	1.377
1995	116	77	304	25.3	11.6	51.9	1.516	1.797	1.533
1996	116	78	352	30.8	16.9	66.3	1.082	1.543	1.306
1997	148	52	330	47.8	13.6	82.3	1.134	1.732	1.222
1998	175	86	389	67.5	23.5	110.8	0.860	1.664	1.086
1999	239	176	591	93.5	83.0	213.8	0.748	0.803	0.768
2000	192	173	546	105.1	70.9	217.5	0.583	0.685	0.579
2001[3]	131	123	354	96.9	80.0	197.9	0.586	0.426	0.512
Total	**1,199**	**842**	**3,110**	**292.7**	**180.3**	**981.2**	**0.816**	**0.888**	**0.851**
1994-98	422	289	1,213	114.3	54.0	237.0	1.096	1.654	1.259
1999-2001[3]	634	520	1,703	322.1	246.2	682.4	0.636	0.638	0.622

[1] Average fees in these columns are calculated on a value-weighted basis.

[2] This column includes all issues in euros, ECUs and legacy currencies.

[3] Up to the second quarter.

Sources: Thomson securities: IFR Platinum; authors' calculations.

On closer inspection, however, the size of the overall decline in average fees is largely attributed to a sharp drop in the euro-denominated segment, which for the purposes of this table encompasses all bonds issued in euros (or the ECU) as well as those issued in one of the 11 legacy currencies. Average fees per dollar raised were halved between 1998 and 1999, and continued to decline in the following years. More importantly, the fees between the euro and US dollar segments of the market converged rapidly after 1999. The average wedge in fees stood at 55.8 basis points before EMU and all but disappeared after the introduction of the new currency.[22] Since the issue size of the average bond denominated in one of the legacy currencies or the ECU was about $206 million, the borrower incurred an extra cost of the equivalent of $1.14 million in underwriting fees by not issuing in US dollars.[23]

This economically significant decline in underwriting fees for euro-denominated bonds coincided with a sharp increase in the competitiveness of the European market for underwriting services in the post-EMU period. Table 4 shows the evolution of two measures of market concentration for various

[21] Value-weighted averages provide a per-dollar-raised measure of bond underwriting cost for borrowers. Hence they are a more relevant measure of the economic costs of accessing capital market funding. The corresponding per-issue average fee figures are 1.338% and 0.799% respectively for the pre- and post-EMU periods in our sample.

[22] The difference of a quarter basis point is not statistically significant.

[23] The pre-EMU euro-denominated issues include 29 bonds denominated either in the euro or the ECU. The average value-weighted fee for those bonds was 1.37%, falling in between the average fees for legacy currency (1.685%) and US dollar-denominated issues (1.095%). There are no legacy currency denominated bonds in our sample issued after January 1999.

currency segments for the period 1994-2001: the Herfindahl index and percentage share of the top five underwriters.[24]

Table 4

Concentration in the underwriting market for international bonds

Currency		1994	1995	1996	1997	1998	1999	2000	2001
US dollar	HHI[1]	339.7	494.2	411.5	426.7	589.2	814.4	723.6	905.7
	Top 5[2]	28.7	41.1	35.6	36.8	45.6	55.5	49.7	58.5
Euro	HHI	.	.	.	.	971.2	400.6	449.9	533.8
	Top 5	.	.	.	.	57.1	33.4	38.3	40.6
Deutsche mark	HHI	1,372.2	785.5	948.3	889.4	967.9	.	.	.
	Top 5	67.5	49.6	59.2	54.2	53.0	.	.	.
French franc	HHI	1,511.1	2,503.9	1,555.1	1,323.9	1,792.7	.	.	.
	Top 5	77.5	93.2	79.1	70.8	82.6	.	.	.
Italian lira	HHI	1,758.0	1,679.1	1,936.0	1,344.8	2,658.7	.	.	.
	Top 5	77.5	85.5	87.3	71.8	74.9	.	.	.
Dutch guilder	HHI	5,344.7	2,405.6	3,510.9	3,012.4	1,783.6	.	.	.
	Top 5	100.0	90.6	100.0	96.2	83.1	.	.	.
Yen	HHI	662.0	660.2	1,238.4	714.4	957.2	675.6	633.7	790.5
	Top 5	45.6	48.0	60.7	50.9	61.3	47.0	46.5	53.9
Pound sterling	HHI	1,122.1	1,054.1	1,734.3	863.7	670.8	922.5	730.5	703.7
	Top 5	65.0	61.8	79.0	58.0	46.4	59.0	50.9	49.4
Swiss franc	HHI	1,488.8	1,862.7	1,262.3	1,350.2	1,213.8	1,841.1	1,498.8	2,694.9
	Top 5	70.3	75.4	68.4	70.6	69.5	81.2	77.7	85.9

[1] HHI: The Herfindahl index of concentration calculated as the sum over all bookrunners of their squared percentage share in terms of volume (total value) of bonds issued in the specific currency/year pair. [2] Top 5: The percentage share of overall volume in the particular currency/year pair underwritten by the top five investment houses.

There are two features of Table 4 that are worth highlighting. First, bond underwriting in the smaller currency segments is generally less competitive. This is especially true if one considers the predecessor currencies of the euro or the Swiss franc, where the top five bookrunners controlled more than 70% of the overall activity. In fact, by commonly applied criteria, all legacy currency markets, with the exception of the Deutsche mark segment, could be classified as concentrated and many as highly concentrated.[25] The effect of the single currency on the market structure is appreciated by noting that, post-EMU, the underwriting business in the euro-denominated segment is the least concentrated of the international bond market.

[24] The Herfindahl index is calculated as the sum over all bookrunners of their squared percentage share in terms of volume of bonds issued in the specific currency/year pair.

[25] The US competition authorities use a Herfindahl index value in the 1,000-1,800 range as an indication of a concentrated market, and index values in excess of 1,800 as evidence of highly concentrated markets that require regulatory review and potentially action.

A second feature of Table 4 is the upward trend in concentration measures for the US dollar market segment throughout our sample period. This is a likely reflection of the consolidation wave in the US financial industry during the second part of the 1990s, and it is consistent with greater concentration in the global market for investment banking services and the success of larger investment banks in attracting global business.[26] In the context of our study, this implies that while there may be fewer global competitors in the second part of our sample period, the contestability of the euro-denominated segment improved dramatically after 1999 because more investment houses were able to compete for the underwriting business opportunities in the single currency.

In the analysis so far we have examined the evolution of average fees without paying attention to the particular characteristics of the different market segments. Previous research has established that certain issuer and bond characteristics are important determinants of underwriting fees.[27] Hence, we then examine whether these characteristics alone explain the decline in the fees for euro-denominated bonds.

To this end we run a regression of the gross underwriting fees on a number of variables that have been found to have some explanatory power, such as: size, rating, maturity of the issue, the industrial sector of the issuer, and whether the bond is part of an MTN programme.[28] We also include an annual trend variable to capture any global effects and two variables to control for the familiarity of the market with the particular corporate name. More specifically, we include a dummy variable to identify borrowers that have issued more than once in our sample period, and a dummy variable to flag bonds that have a primarily domestic focus. Moreover, to gauge the shift with the introduction of the euro we include a set of interaction dummy variables for the pre- and post-EMU periods with the different currency segments. Finally, we include the Herfindahl index of market concentration for the particular currency/year combination.[29]

The results of this regression analysis (Table 5) suggest an important shift in the pricing of underwriter services quite specific to the euro-denominated segment of the international bond market. The left-hand columns relate to the entire sample of 3,110 bonds. After controlling for bond and issuer characteristics, there appears to be a significant downward trend in fees of the order of 4.5 basis points per year. In addition to this overall decline, fees for euro-denominated bonds declined dramatically after the introduction of the new currency. The difference of roughly 65 basis points between the fees for bonds denominated in one of the legacy currencies prior to EMU and those denominated in the common currency after 1999 is highly significant (t-statistic of 9.73). This decline is much larger than the 21 basis point decline in fees for US dollar-denominated bonds. In fact, the advent of the euro all but erased the 50 basis points that separated the fees in the two currency segments.[30]

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[26] In fact, league tables for bond underwriting supplied by Thomson Financial indicate that the global share of the top five (top 10) underwriters in the international bond market increased from 32.7% (50.7%) to 52.5% (77.9%) over the course of the 1990s.

[27] See Gande et al (1997), Gande et al (1999) and Roten and Mullineaux (2002).

[28] Because of space considerations we do not report the regression coefficients for the rating and industrial sector dummies in Tables 5, 8, 9 and 10. The full results are available from the authors on request.

[29] The index is calculated as in Table 6 but for expositional purposes it is divided by 1,000 (hence its range is 0-10). For a full description of the variables the reader is referred to the data appendix.

[30] The difference of 4 basis points is not statistically significant (t-statistic 1.03).

Table 5

Determinants of bond underwriting gross fees[1]

Variables	All issues	Pre-euro	Post-euro	US dollar	Euro/legacy
Constant	1.488*** [13.70]	1.772*** [10.90]	1.126*** [7.19]	1.332*** [8.49]	2.428*** [13.03]
Trend	–0.045*** [–4.45]	–0.030** [–2.52]	–0.113*** [–5.78]	–0.074*** [–3.06]	–0.037* [–1.94]
Pre-USD	–0.040 [–0.93]	–0.086* [–1.82]	.	.	.
Pre-euro	0.264*** [2.67]	0.205** [2.05]	.	.	.
Pre-legacy	0.452*** [9.65]	0.427*** [8.98]	.	.	.
EMU-USD	–0.255*** [–4.54]	.	0.037 [0.89]	.	.
EMU-euro	–0.214*** [–3.48]	.	0.126*** [2.73]	.	.
EMU-other	–0.282*** [–4.90]	.	.	.	.
EMU	.	.	.	–0.139** [–2.20]	–0.819*** [–7.58]
Concentration	0.030*** [3.07]	0.002 [0.19]	0.074*** [4.08]	0.044 [0.20]	–0.086*** [–3.52]
Issue size	–0.160*** [–2.66]	0.220 [1.37]	–0.251*** [–4.08]	–0.055 [–0.72]	–0.435*** [–3.57]
Issue size (sq)	0.014 [0.72]	–0.158** [–2.27]	0.052*** [2.73]	–0.005 [–0.19]	0.076** [2.17]
Junk rating	0.641*** [6.72]	0.412*** [7.99]	0.251*** [2.66]	0.612*** [10.78]	0.390*** [3.12]
Maturity (1-5 yrs)	–0.183*** [–6.85]	–0.213*** [–5.86]	–0.137*** [–3.60]	0.027 [0.67]	–0.240*** [–4.53]
Maturity (>15 yrs)	–0.164*** [–4.80]	–0.205*** [–3.52]	–0.090** [–2.18]	–0.089** [–2.35]	–0.203 [–1.05]
MTN	0.454*** [3.71]	.	0.455*** [3.55]	0.491*** [7.11]	0.451* [1.74]
Domestic	–0.196*** [–3.64]	–0.290*** [–3.99]	–0.176** [–2.00]	–0.144* [–1.76]	–0.047 [–0.55]
Repeat issuer	–0.124*** [–2.68]	–0.259*** [–3.65]	–0.024 [–0.40]	–0.258*** [–3.39]	0.155* [1.86]
Tests[2]					
Pre-legacy = EMU-euro	9.736	.	.	.	.
Pre-legacy = pre-USD	10.524	9.846	.	.	.
EMU-euro = EMU-USD	1.034	.	2.191	.	.
Observations	3,110	1,619	1,491	1,199	842
R^2	31.2%	24.3%	19.2%	28.7%	44.7%

[1] In addition to the variables reported in the table, the regression includes a full set of rating and sector dummy variables.
[2] Inference uses standard errors robust to general forms of heteroskedasticity.

The other coefficients paint a picture which is generally consistent with the existing literature. Fees increase with market concentration, but while the effect is statistically significant, it is not very strong. For every 1,000 point increase in the Herfindahl index, fees increase by 4 basis points. Fees are generally lower for better-rated names and for bonds with a primarily domestic focus or those issued by borrowers known to the market. The same is true for bonds at the two ends of the maturity spectrum. The level of fees is typically inversely related to the size of the bond issue, with a 15 basis point decline per extra billion US dollar increase in size.

The two middle columns present the results of the same regression by splitting the sample into the pre-EMU and post-EMU periods. The main thrust of the results is robust to the sample split but there are a number of interesting nuances. There is acceleration in the pace of decline in fees in the more recent period, as evidenced by the higher value of the linear trend coefficient.[31] In the later period the effect of issue size on fees is somewhat less pronounced but that of market concentration is much more important. In fact, it appears that the overall significance of the Herfindahl index in the regression is driven primarily by the post-EMU observations. Finally, there is a decline in the fee discount associated with name familiarity, as can be seen from the lower value and statistical significance of the dummies for domestic issues and repeat borrowers. In our view, this reflects an increase in the maturity of the market and improvements in the ability of end investors to evaluate previously unfamiliar signatures, thus reducing the effort of the underwriter to place these bonds.

The two right-hand columns report regressions run separately for the dollar and euro-plus-legacy currency denominated issues. The coefficients confirm that the impact of EMU on underwriting fees was stronger in the euro-denominated segment. The estimated coefficient on the EMU period dummy variable is almost six times higher in the euro/legacy subsample than in the dollar sample (8.2 versus 1.4 basis points respectively). It is also estimated more precisely as indicated by the relative magnitude of the corresponding t-statistics.

4.2 Increasing returns to scale versus national differentiation

In the first part of our empirical investigation we provided evidence that the advent of the single currency led to an increase in the contestability of the euro-denominated segment and a decline in underwriting fees for bonds denominated in that currency. However, our regression results indicate that a decline in the measured concentration of the underwriter market alone fails to provide a convincing explanation for the marked decline in fees. In the second part we will examine more precisely how the single currency affected competitiveness in the underwriter market by focusing in more detail on how borrowers used the greater flexibility in the choice of underwriter in the post-EMU period, and how that choice affected fees. Did issuers favour bankers from their own country, with whom they were more likely to have had an ongoing relationship, or was their choice primarily driven by the global placing capacity of the larger investment banking houses?

We first examine the evolution of the relationship between the nationality of the underwriter on one hand, and that of the issuer and the currency of denomination of the bond on the other. We then examine how these relationships relate to the level of underwriting fees for the different segments of the international bond market. Finally, we enrich our fee regressions with variables that account for these relationships as well as with proxies of the overall size of the market. In our analysis we pay particular attention to the role of US underwriters.

Table 6 provides an overall picture of the trends in the relationship between the underwriter and the issuer on the one hand and the underwriter and the currency of denomination of the bond on the other hand. The upper panel shows a slight increase in the percentage of issues with a “home currency” underwriter. Local bankers accounted for 58.2% of the total issues after 1998 as compared to 54.5% of the issues in the earlier period. This overall picture, however, masks the opposing trends taking shape in Europe and North America during this period. Borrowers from both sides of the Atlantic have shown a stronger preference for US underwriters of their dollar bonds in the post-EMU period (62.1% compared to 39.1%) but have relied much less on local underwriters for their euro-denominated bonds compared to those in the legacy currencies (59.5% versus 80.5%). In fact, the very high incidence of

[31] Despite the fact that the coefficient reflects only three years of data (1999-2001) it is more precisely estimated judging from the high degree of statistical significance (t-ratio of 5.80).

"home currency" underwriters for bonds denominated in the legacy currencies is the clearest indication of market segmentation in the pre-EMU period.

Table 6
Association patterns of underwriters, borrowers and currency of issue

Borrower	EMU	Currency of issue		
		US dollar	Euro/legacy	Total
Banker nationality matches currency of issue (in %)				
North America	pre-EMU	37.0	71.1	50.6
	post-EMU	64.9	38.7	58.6
Euro area	pre-EMU	25.7	89.3	63.9
	post-EMU	41.7	68.6	55.6
Total	pre-EMU	39.1	80.5	54.5
	post-EMU	62.1	59.5	58.2
Banker nationality matches borrower nationality (in %)				
North America	pre-EMU	18.1	5.9	12.9
	post-EMU	61.0	25.8	46.9
Euro area	pre-EMU	12.9	51.5	28.6
	post-EMU	8.3	40.8	6.5
Total	pre-EMU	14.8	26.8	20.3
	post-EMU	45.9	33.7	38.7

The lower panel of Table 6 looks at the coincidence of banker and borrower nationalities, our proxy for the existence of a business relationship. There is a pronounced increase in the share of bonds underwritten by a "home banker" in the most recent period (38.7% compared to 20.3%). Once more, however, there are opposing trends between North American and European issuers. While US investment bankers more than tripled their share of business originated by US borrowers (46.9% versus 12.9%), European bankers' share of euro area bonds declined after EMU. The fact that these opposing trends are present in both the dollar and euro/legacy segments suggests that the boom in issuance of euro-denominated bonds did not translate into a profit windfall for the area's investment banks. It also suggests that the existence of a business relationship with the borrower plays a limited role in the choice of underwriter.

It is instructive to examine more closely the nationalities of underwriters of euro-denominated bonds issued by euro area borrowers. Table 7 provides the distribution of underwriter nationality in terms of the value and volume of this category of bonds. The contrast between the pre- and post-EMU periods is quite stark. Between 1994 and 1998, US bankers underwrote only three issues out of a total of 169, or 3.6% of the overall volume. In the post-EMU period they accounted for 41 issues out of 223 and nearly one quarter of the overall volume.

The increase in the share of the US investment houses is even more impressive if one considers only first-time issuers from the euro area. This group should be the most resistant to competition from outsiders as it comprises issuers that are typically less well known to the international market and more likely to want to capitalise on existing relationships with local banks by using them as underwriters. Nevertheless, the bottom panel of Table 7 shows that the allocation of this business across the three groups of underwriter nationalities is, if anything, slightly more skewed in favour of the US houses. This evidence points clearly to the fact that international competition from the larger US investment houses has been a central new feature of the post-EMU environment.

Table 7
European issuers' choice of underwriter

		Underwriter's nationality			
		US	**Euro area**	**Other Europe**	**Total**
Euro area issuers in euro/legacy currencies					
Pre-EMU	Amount (USD million)	1,488	36,319	3,142	40,950
	Number of issues	3	152	14	169
Post-EMU	Amount (USD million)	30,501	71,912	33,380	135,793
	Number of issues	41	127	55	223
First time issuers from the euro area issuing in euro					
Post-EMU	Amount (USD million)	40,950	31,572	19,879	73,752
	Number of issues	169	52	26	102

Returning to our regression analysis, we enrich our previous model by including a number of variables to help us differentiate between the effect of the closeness of the relationship between the borrower and the underwriter on the underwriting fees and the importance of scale economies. To capture the effects of the first type we have included two "affinity" dummies. The first dummy (bank=currency) flags bonds for which the underwriter's nationality matches that of the currency of issue, while the second dummy (bank=issuer) flags the coincidence of nationality between the borrower and the underwriter.[32] To account for the impact of scale economies and liquidity effects we include the (logarithm of the) overall volume of bonds issued in a specific currency/year pair and the share of that volume won by the issue's underwriter. Finally, we include three indicator variables that flag issues underwritten by a US house or one of the larger investment banks from the euro area (EU) or Switzerland (CH). By selecting only the larger underwriters from each area we attempt to capture the potential effect of global placing capacity on fees.

The overall results (shown in Table 8) are generally consistent with the message from the earlier regressions. The pattern of differences in the fees between bonds issued in the legacy currencies and those issued either in US dollars or in euros is similar to that depicted in Table 5. It is interesting to note, however, that the differences across currencies are smaller in this set of regressions, an indication that the expanded set of explanatory variables is partially successful in explaining the estimated impact of the euro on underwriting fees.

An important difference between the two sets of regressions is the negative sign of the coefficient of the concentration index for the overall regression and the pre-EMU sample.[33] This implies that fees are lower in more concentrated market segments, and is particularly true in the pre-EMU and the euro/legacy currency subsamples. It certainly suggests that our measure of concentration cannot explain the decline in fees in the euro segment of the market and it also suggests that we should look for other indicators of increased market contestability. We will do this below. Another possible explanation of the result is that it should be seen in conjunction with the coefficients we obtain for the variable that measures the overall volume of issuance in the currency of denomination of the bond. This latter variable is a very important factor in the determination of underwriting fees. Fees decline by

[32] As explained earlier, in the case of multiple underwriters, the flag is equal to one if any of the firms is from the same country as the issuer.

[33] The concentration variable is insignificant in the post-EMU sample.

Table 8
Determinants of bond underwriting gross fees

Variables	All issues	Pre-euro	Post-euro	US dollar	Euro/legacy
Constant	1.777***	1.729***	2.097***	2.260***	1.897***
	[13.93]	[8.39]	[9.21]	[3.57]	[7.26]
Trend	-0.030***	-0.005	-0.147***	-0.018	-0.045**
	[-2.99]	[-0.37]	[-6.99]	[-0.40]	[-2.31]
Pre-USD	0.209***	0.311***	.	.	.
	[4.29]	[5.07]			
Pre-euro	0.329***	0.393***	.	.	.
	[3.12]	[3.50]			
Pre-legacy	0.499***	0.429***	.	.	.
	[10.63]	[8.29]			
EMU-USD	0.041	.	0.521***	.	.
	[0.65]		[6.70]		
EMU-euro	-0.004	.	0.584***	.	.
	[-0.05]		[6.71]		
EMU-other	-0.355***	.	.	.	.
	[-6.35]				
EMU	.	.	.	-0.090	-0.883***
				[-1.36]	[-8.07]
Concentration	-0.048***	-0.068***	-0.002	-0.024	-0.129***
	[-3.16]	[-3.56]	[-0.06]	[-0.79]	[-3.88]
Volume	-0.220***	-0.208***	-0.391***	-0.344	0.195***
	[-6.16]	[-3.93]	[-5.79]	[-1.60]	[3.31]
Bank=currency	0.098***	0.299***	0.001	0.191*	0.028
	[3.57]	[6.33]	[0.02]	[1.73]	[0.49]
Bank=issuer	-0.008	0.017	-0.017	0.052	-0.002
	[-0.30]	[0.35]	[-0.49]	[1.22]	[-0.04]
US banker	-0.244***	-0.456***	-0.177***	-0.462***	-0.104
	[-7.54]	[-6.74]	[-4.33]	[-4.16]	[-1.54]
EU banker	0.109***	0.267***	-0.011	0.056	-0.045
	[3.01]	[5.44]	[-0.22]	[0.45]	[-0.85]
Swiss banker	0.171***	0.264***	0.088**	0.027	0.075
	[5.42]	[5.31]	[2.22]	[0.53]	[1.21]
Global share	-0.006	0.007	-0.004	0.010	-0.008
	[-1.39]	[0.93]	[-0.86]	[1.09]	[-0.94]
Currency share	0.006***	0.007***	-3.267E-04	-0.011	0.010***
	[4.14]	[4.00]	[-0.12]	[-1.38]	[3.30]
Issue size	-0.016**	-0.076	-0.124*	-0.024	-0.442***
	[-2.53]	[-0.49]	[-1.91]	[-0.31]	[-3.40]
Issue size (sq)	0.014	-0.063	0.021	-0.007	0.080**
	[0.71]	[-1.11]	[1.01]	[-0.28]	[2.06]
Junk rating	0.590***	0.592***	0.296***	0.732***	0.419***
	[11.85]	[7.88]	[3.17]	[10.69]	[3.18]
Maturity (1-5)	-0.186***	-0.191***	-0.172***	-0.035	-0.245***
	[-7.01]	[-5.33]	[-4.48]	[-0.89]	[-4.35]
Maturity (>15)	-0.122***	-0.147***	-0.033	-0.032	-0.169
	[-3.59]	[-2.67]	[-0.78]	[-0.83]	[-0.87]
MTN	0.414***	.	0.410***	0.385***	0.390
	[3.83]		[3.46]	[5.37]	[1.52]
Domestic	-0.212***	-0.377***	-0.188**	-0.143*	-0.069
	[-3.78]	[-4.64]	[-2.19]	[-1.75]	[-0.69]
Repeat issuer	-0.112**	-0.244***	-0.007	-0.259***	0.166**
	[-2.44]	[-3.52]	[-0.12]	[-3.36]	[2.01]
Tests					
Pre-legacy = EMU-euro	6.932	.	.	.	.
Pre-legacy = Pre-USD	5.592	1.670	.	.	.
EMU-euro = EMU-USD	1.049	.	1.367	.	.
Observations	3,109	1,619	1,490	1,199	842
R^2	35.1%	33.0%	23.1%	32.6%	46.2%

25 basis points for every tenfold increase in the size of the currency segment. Moreover, the importance of the overall activity in a currency segment increases in the later part of our sample. We showed earlier (Table 4) that larger currency segments tend to be more competitive. We argue that the change in the sign of the concentration measure is related to the high degree of collinearity between the two variables.[34]

There is no apparent connection between the level of fees and our proxy for the existence of a relationship between the banker and the issuer. Bankers that underwrite bonds in their home currency, however, seem to be able to earn a premium. This result seems to be driven by the post-EMU part of our sample. A smaller premium seems to be available to underwriters with large operations in the currency of issue. For every 10 percentage point increase in the underwriter's share there is a 6 basis point increase in fees. The result is particularly pronounced in the pre-EMU period and the euro/legacy currency segment. We interpret this as evidence of the pricing power that is associated with local sales expertise.

Arguably, however, the most striking feature of these results relates to the lower fees for bonds underwritten by a US investment bank. The discount is particularly pronounced for the pre-EMU period when it exceeds 70 basis points, but it is present throughout the sample. It is not clear how one could explain this persistent fee reduction by US securities houses other than being the result of their effort to further improve their prominence in the global market. This is consistent with our evidence of the rapid increase in US houses' market share among bonds issued by euro area borrowers after the introduction of the single currency.

Overall these results provide evidence that the market for bond underwriting in the euro area became more contestable in the post-EMU period. As a consequence, underwriting fees declined, and the home currency advantage for underwriting houses became less important. The banks that benefited from greater market openness were those with global presence and those that were able to capitalise on economies of scale by increasing their share in expanding market segments. This was especially true for US houses that managed to make important inroads into the European market. In the pre-EMU environment the fact that they generally charged lower fees was not sufficient to overcome the barriers to entry implied by a bond market segmented along currency lines, which privileged underwriters with local expertise. After the advent of the single currency, US investment banks were able to compete successfully with "home currency" bankers for the euro-denominated segment and this helped bring down the difference in fees across the US and euro currency segments.

4.2.1 Correction for endogeneity

The significance of the negative coefficient associated with issues underwritten by a US investment bank raises the question of endogeneity. Namely, whether these underwriters were better disposed to offer lower fees for the same level of service, or whether they were more able to pre-select issues with lower underwriting risks. If the latter were the case, one could argue that lower barriers to outside penetration into the euro-denominated market brought only limited benefits to those issuers that presented lower risk to the underwriter. If, however, self-selection cannot explain fully the wedge between fees charged by US and non-US underwriters, higher competition in the post-EMU period had more widespread (and possibly longer-lasting) benefits for issuers in the new currency.

To address these questions and guard against the possibility that our statistical inference is incorrect because of the endogeneity of one of the regressors, we apply standard procedures based on Heckman (1976, 1978) and discussed in Maddala (1983). The procedure is based on a specification of the following form:

$$FEES_j = X'\beta + \gamma\, USbanker_j + \varepsilon_j$$

$$USbanker_j^* = Z'\delta + \eta_j \;, \quad \text{and} \quad USbanker = 1 \;\Leftrightarrow\; USbanker_j^* \geq 0$$

[34] Both variables are defined over currency/year pairs. This means that all bonds issued in euros during 2000 will have the same value for market concentration and the same value for market volume. In our sample the correlation between the two variables is equal to 66.4%.

The first equation is the one of interest. It includes a variable flagging those issues underwritten by a US banker and which we are interested in estimating consistently the coefficient vector [β , γ]. The second equation associates the choice of a US banker with positive values of a latent variable (*USbanker**), which is modelled as a function of a set of observable variables *Z*. The system is estimated by maximum likelihood and the results reported in Table 9.[35]

The results confirm those of the previous set of regressions. Many of the coefficient estimates remain very close to the OLS estimates, with the most important exceptions being those that pertain to the US dollar-denominated issues and the estimated effect of a US underwriter. The large decline in underwriting fees for euro-denominated bonds in the post-EMU period is significant and much more important than the decline in the dollar-denominated segment. In fact, the model that takes into account the potential selection bias in the choice of a US underwriter estimates that fees for the euro-denominated segment are lower than those for the US dollar bonds in the post-1999 period.[36] These regressions also show that US underwriters typically charge lower fees. The difference is highly significant for the regressions over the whole sample as well as three of the subsamples. As was the case for the OLS results, the difference in fees between issues underwritten by US and European banks is the smallest in the euro/legacy denominated sample.

Therefore, it is safe to conclude that the reduction in the underwriting fees charged by US investment banks was not due to their selection of firms, but instead to their ability to compete more efficiently in the bigger market that emerged with the arrival of the euro.

4.3 The effect on interest rate spreads

In the previous sections we provided evidence linking the marked decline in fees for euro-denominated bonds to increased scope for underwriter competition after the introduction of the single currency, and to the inroads made by large US investment houses in this segment of the international bond market. In this section we examine the effect of these changes on bond prices, testing in particular whether lower fees have been associated with a reduction in the quality of underwriting services in the form of higher primary market spreads and, hence, a reduced benefit to the borrowers. We regress the primary market spreads of the bonds in our sample on the dummy variables we used to identify the currency of issue and those issues that were underwritten by US or large European houses.[37] As control variables we include the usual variables used in models of bond pricing such as the bond rating, a maturity bracket and the size of the issue, as well as indicator variables of whether the bond was issued with a domestic investor focus or as part of an MTN programme. To account for cyclical shifts in the pricing of risk at the time of issuance the regression includes quarterly dummies for all but the first quarter in the sample. We also include variables that identify bonds denominated in the home currency of the borrower or the underwriter and bonds underwritten by a bank from the home country of the borrower.

The results are presented in Table 10. As with the fee regressions, we run the regressions over the entire sample and separately for the pre- and post-EMU periods and the dollar and euro/legacy denominated issues. There is nothing in the results that suggests a reduction in the quality of underwriting, at least as this is measured by underwriters' ability to price the issue to the market. If anything, yield spreads for euro-denominated bonds appear to be narrower in the post-EMU period.

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[35] Maddala (1983) describes the maximum likelihood estimation as well as a two-step procedure which estimates the selection equation by probit and then augments the set of explanatory variables by the inverse of the Mill's ratio. It is worth noting that the particular model we estimate is identified. This would be the case even if we did not have variables in the selection equation that are not included in the fees equation. The reason is the non-linearity of the transformation of the latent variable into a binary dummy variable. In addition, tests of independence of the residuals (not reported here) cannot reject the hypothesis of zero correlation between the two error terms (ε and η).

[36] The regression over the entire sample estimates a difference of 27.8 basis points, which is highly significant (t-statistic 5.15). The post-EMU sample regression shows a much smaller difference of 7.8 basis points that is not statistically significant.

[37] Spreads are calculated as the difference between the yield to maturity of the bond and the corresponding point on the government yield curve of the currency of issue.

Table 9

Determinants of bond underwriting gross fees with endogenous selection[1]

Variables	All issues	Pre-euro	Post-euro	US dollar	Euro/legacy
Constant	1.704***	1.679***	1.971***	2.569***	1.893***
	[7.89]	[6.26]	[4.97]	[4.34]	[2.99]
Trend	-0.014	0.004[	-0.119***	0.018	-0.044**
	[-1.30]	0.32]	[-5.03]	[0.43]	[-2.13]
Pre-USD	0.349***	0.454***	.	.	.
	[6.68]	[6.47]			
Pre-euro	0.307***	0.394***	.	.	.
	[2.58]	[3.32]			
Pre-legacy	0.496***	0.422***	.	.	.
	[10.21]	[7.89]			
EMU-USD	0.292***	.	0.678***	.	.
	[3.93]		[7.12]		
EMU-euro	0.013	.	0.602***	.	.
	[0.20]		[6.58]		
EMU-other	-0.360***	.	.	.	.
	[-6.51]				
EMU	.	.	.	0.089	-0.880***
				[1.02]	[-9.13]
Concentration	-0.039***	-0.063***	-0.002	-0.317	-0.129***
	[-2.58]	[-3.40]	[-0.09]	[-1.23]	[-3.72]
Volume	-0.194***	-0.193***	-0.366***	-0.325*	0.194***
	[-4.67]	[-3.52]	[-5.09]	[-1.70]	[2.70]
Bank=currency	0.100***	0.325***	0.006	0.027	0.028
	[3.68]	[7.56]	[0.16]	[0.09]	[0.50]
Bank=issuer	-0.012	0.002	-0.015	0.093**	-0.002
	[-0.45]	[0.06]	[-0.42]	[2.47]	[-0.04]
US banker	-0.849***	-0.895***	-0.625***	-1.637***	-0.140
	[-9.20]	[-6.94]	[-4.77]	[-5.10]	[-0.79]
EU banker	0.098***	0.264***	-0.005	0.056	-0.045
	[2.69]	[5.03]	[-0.11]	[0.56]	[-0.84]
Swiss banker	0.166***	0.260***	0.095**	0.071	0.075
	[5.32]	[5.32]	[2.35]	[1.62]	[1.20]
Global share	-0.005	0.008	.	0.005	-0.008
	[-1.11]	[1.05]		[0.57]	[-0.87]
Currency share	0.006***	0.007***	.	-0.005	0.010***
	[4.01]	[3.99]		[-0.69]	[3.21]
Issue size	-0.010	-0.132	-0.034	0.185*	-0.440***
	[-1.49]	[-0.94]	[-0.42]	[1.80]	[-3.61]
Issue size (sq)	0.013	-0.064	0.013	-0.036	0.080**
	[0.58]	[-0.97]	[0.53]	[-1.08]	[2.00]
Junk rating	0.713	0.655	1.204***	0.889***	0.426***
	[1.25]	[1.13]	[13.01]	[10.07]	[3.15]
Maturity (1-5)	-0.259***	-0.239***	-0.237***	-0.356***	-0.248***
	[-8.68]	[-6.07]	[-5.70]	[-6.20]	[-4.59]
Maturity (>15)	-0.076*	-0.065	-0.038	0.198***	-0.168
	[-1.86]	[-1.08]	[-0.73]	[2.74]	[-0.83]
MTN	0.367***	.	0.386***	0.116	0.389*
	[2.89]		[3.14]	[0.60]	[1.71]
Domestic	-0.225***	-0.375***	-0.190***	-0.187**	-0.069
	[-3.92]	[-4.19]	[-2.57]	[-2.45]	[-0.74]
Repeat issuer	-0.115***	-0.254***	0.012	-0.326***	0.166**
	[-2.69]	[-4.23]	[0.21]	[-3.91]	[2.22]
Tests					
Pre-legacy = EMU-euro	7.414	.	.	.	.
Pre-legacy = Pre-USD	2.751	0.447	.	.	.
EMU-euro = EMU-USD	5.158	.	1.277	.	.
Observations	3,110	1,619	1,490	1,199	842

[1] In addition to the variables reported in the table, the regression includes a full set of rating and sector dummy variables.

Table 10
Determinants of primary market yield spreads

Variables	All issues	Pre-euro	Post-euro	US dollar	Euro/legacy
Constant	36.852*	105.879***	-42.367	64.419	-59.723
	[1.76]	[6.17]	[-1.06]	[1.08]	[-1.18]
Pre-USD	-11.338	15.588**	.	.	.
	[-1.45]	[2.08]			
Pre-euro	-26.064***	-10.443	.	.	.
	[-3.26]	[-1.51]			
Pre-legacy	-13.712**	-11.667**	.	.	.
	[-1.96]	[-2.06]			
EMU-USD	82.735***	.	-4.427	.	.
	[5.63]		[-0.26]		
EMU-euro	16.469	.	-72.922***	.	.
	[1.19]		[-4.16]		
EMU-other	60.312***	.	.	.	.
	[5.21]				
EMU	.	.	.	115.625***	36.434***
				[2.68]	[2.57]
Concentration	-0.001	-0.001	-0.001	0.015	-0.003
	[-0.78]	[-0.65]	[-0.12]	[0.16]	[-0.92]
Volume	18.831***	8.294*	49.028***	.	0.265
	[2.90]	[1.66]	[2.91]		[0.04]
Bank=currency	-3.987	15.613***	-8.598	-2.458	-0.667
	[-0.94]	[3.20]	[-1.34]	[-0.06]	[-0.11]
Bank=issuer	2.471	0.114	5.573	-2.430	0.580
	[0.66]	[0.03]	[0.95]	[-0.33]	[0.13]
US banker	5.028	-14.079**	5.537	-11.665	20.842***
	[1.09]	[-2.24]	[0.90]	[-0.30]	[3.66]
EU banker	-0.072	-9.882**	5.295	-25.721**	4.325
	[-0.02]	[-2.13]	[1.02]	[-2.16]	[1.13]
Swiss banker	-1.988	2.191	0.171	-11.855	9.686
	[-0.42]	[0.28]	[0.03]	[-1.40]	[1.36]
Currency share	0.537**	0.194	1.272*	1.948**	0.225
	[2.47]	[1.12]	[1.73]	[2.11]	[1.22]
Issue size	-0.047***	-0.104***	-0.046***	-0.068***	-0.003
	[-4.93]	[-7.00]	[-4.30]	[-4.31]	[-0.30]
Issue size (sq)	0.016***	0.067***	0.012***	0.021***	0.0038*
	[4.63]	[6.98]	[4.46]	[3.82]	[1.75]
Junk rating	287.331***	341.484***	362.302***	406.272***	496.691***
	[18.37]	[14.61]	[13.06]	[18.66]	[11.33]
Maturity (1-5)	-20.577***	-9.944*	-31.294***	-26.066***	-12.839*
	[-4.90]	[-1.70]	[-5.07]	[-3.83]	[-1.74]
Maturity (>15)	45.236***	28.446***	68.168***	44.829***	18.480*
	[7.20]	[4.58]	[7.03]	[4.99]	[1.85]
MTN	-33.467**	.	-22.888	-60.463*	-8.081
	[-2.47]		[-1.37]	[-1.91]	[-1.39]
Domestic	-10.614	10.138	-44.418**	-23.558	15.967**
	[-1.15]	[1.53]	[-2.20]	[-1.14]	[2.20]
Repeat issuer	-14.987**	-37.382***	-0.955	-33.446***	-20.600**
	[-2.12]	[-3.67]	[-0.10]	[-2.71]	[-2.20]
Tests:					
Pre-legacy = EMU-euro	2.569	.	.	.	.
Pre-legacy = Pre-USD	0.400	4.403	.	.	.
EMU-euro = EMU-USD	9.804	.	9.773	.	.
Observations	1,818	937	881	863	580
R^2	76.1%	81.4%	76.2%	75.8%	87.3%

There is a general increase in spreads in the post-EMU period, regardless of the currency of denomination.[38] The global trend, however, masks differences between individual currency segments that are particularly significant for our investigation. Namely, that spreads for euro-denominated issues have narrowed relative to those observed in the dollar segment of the market. More specifically, while in the pre-EMU period spreads were broadly comparable across currency segments, after the introduction of the single currency spreads of dollar-denominated bonds are higher by 65 basis points. The difference is highly significant in both statistical and economic terms. This divergence in the trends of spreads in the two currency segments is also evident in the subsample regressions.

In addition to these results, and very importantly for our study, we do not observe any statistical evidence that issues underwritten by US investment houses are priced more conservatively as compared to those underwritten by their European competitors. The difference between the coefficients of the respective dummy variables is never significant except in the regression run for the euro/legacy denominated sample. However, when this last regression is restricted to the post-EMU period the difference disappears.[39]

We therefore conclude that while there is some evidence that the global decline in underwriter fees was generally accompanied by higher interest rate costs to the borrower, there is no evidence that the *specific* and *pronounced* decline in underwriting fees for euro-denominated bonds was neutralised by an increase in their yield spreads. In fact, we find that spreads in the euro-denominated segment of the market are lower in the post-EMU period, and this is independent of the nationality of the underwriter. This implies that the lower level of fees for bonds underwritten by US houses should be viewed as genuinely lower costs for the issuers of those bonds.

5. Final remarks

The introduction of the euro eliminated many of the economic and institutional barriers that segregated European corporate bond markets along currency lines, thus stimulating competition among the underwriters of those bonds. The single currency made it easier for investment banks to explore scale economies in the provision of underwriting services, lowered the entry barriers to this industry, thus increasing contestability, and made it easier for European borrowers to benefit from the scope economies obtained from combining commercial and investment banking.

In this paper we have provided evidence that links the onset of EMU with a marked decline in underwriting fees for corporate bonds issued in euros. This decline reduced the cost of underwriting services for issuers in the single currency to levels similar to those prevailing in the US dollar-denominated segment of the market. The importance of this change becomes apparent when we take into account that the average fee for bonds denominated in euros in 1994 was about twice the corresponding figure for dollar-denominated bonds. The paper also shows that the reduction in underwriting fees was largely due to greater contestability of the investment banking business in the post-EMU European market, and connected to the rapid penetration of that market by US investment banks. Finally, we provide evidence that these gains for issuers were not neutralised by a parallel increase in primary market yield spreads. To the contrary, we find that euro-denominated bonds carried lower spreads over bonds issued in US dollars in the post-EMU period.

The post-EMU period in our sample is of limited length and it does not allow us to make definitive statements about the permanency of the reduction in fees. In fact, an initial downward overshooting of fees was observed in other cases of structural change in the competitive environment than that experienced in the euro-denominated segment of the international bond market. Roten and Mullineaux (2002) demonstrate that the initial decline in fees after commercial banks were allowed to underwrite bonds in the US domestic market was (partially) reversed after the market reached a new

[38] This evidence of widening spreads paired with the trend decline in fees documented in the earlier regressions could be interpreted as weak evidence that underwriters may shift part of the risk towards their clients in response to lower fee levels. The examination of this point goes beyond the scope of this paper and we consider the issue as a topic of future research.

[39] The results of this regression are not reported here but are available from the authors on request. The difference is estimated at .61 basis points (t-statistic 0.001).

equilibrium. Also, James (1992) argues that the initial decline in fees as a result of intensified competitiveness is in part explained by new entrants' efforts to establish a firm foothold. At a second stage, these same underwriters would increase fees to recapture the required margins that ensure long-term profitability.

There are a number of reasons why we think that this is not the case for euro-denominated bonds. First, the introduction of the single currency has altered some of the fundamentals that underpin pricing of underwriting services. We argue that demand for euro-denominated bonds is more broadly based and more diversified than was the case for any single legacy currency segment. Also, the simplified economics of the macro factors that determine pricing and research have contributed to lowering of the cost base of major players in the area. Increased liquidity of the market further reduced the risks borne by the underwriter. Second, given that by the end of our sample period there was a convergence of fees between the two main currency segments of the international bond market, we argue that there has been no undershooting. Rather, fees for euro-denominated bonds have reached the lower levels applicable to larger, liquid and mature segments of the market. Finally, we have documented that US investment banks charged lower fees throughout our sample of seven years. Hence, to the extent that our findings link the decline in fees for euro-denominated bonds with the activity of US investment houses, we expect that there is a large permanent component to these declines.

The savings from the reduction in the bond underwriting fees are important, but the structural changes introduced by the euro in this context may have helped put in train a number of longer-term processes. First, the blend between bank and capital market funding for European firms is likely to be influenced by the lower cost of access to the latter source.[40] This redistribution is likely to have implications for the transmission of monetary policy and other financial shocks to the real sector. Second, these shifts will have an impact on the role of European banks in the process of financial intermediation and the relative emphasis they place on their investment and commercial banking operations. Finally, it will have broader implications for the financial architecture in the euro area with implications for risk-sharing opportunities and corporate governance that differentially characterise systems with an emphasis on bank-based and market-based finance.[41] Some of these issues appear to be fruitful areas for future research.

Lastly, our analysis provides some general insights about the factors that influence the selection of an underwriter. Our results highlight the role of placing capacity as the key determinant in the choice of underwriter. In terms of underwriting volume, the link between the level of sales expertise of the investment banker with the final investors is stronger than its familiarity with the issuer. Moreover, underwriters with an active track record in individual currency segments are able to attract enough business to allow them to charge a premium for their services. European houses suffered from the effective levelling of the playing field as a result of the introduction of the single currency and surrendered market share to their US competitors.

In terms of the international trade analogy we discussed earlier, we conclude that while we find some elements of fee premia associated with "national differentiation" effects in the form of sales expertise in particular markets, the scale economies available to global players are important magnets for further business in an increasingly open market environment. Underwriting in the two largest currency segments of the international bond market is sufficiently exposed to global competition to lead to a convergence of fees. At the same time, larger investment banking houses can maintain an edge over those with operations on the basis of their scale, providing a rationalisation of the recent wave of consolidation in the sector.

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[40] See Mayer (1988) for evidence on the differences in the way that firms finance investment in bank-based systems and market-based systems.

[41] Researchers, including Dewatripont and Maskin (1995), Sabani (1993) and Allen and Gale (1997), have identified important differences between these financial system prototypes. See Thakor (1996) and Allen and Gale (2000) for an extensive discussion of the implications of financial system design.

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Data appendix

Below we detail the variables we use in the formal analysis:

GROSS FEE:	The underwriting fee for an issue expressed as a percentage of the total funds raised. The definition is inclusive of several types of fees such as management, selling commissions, preacipium, etc. In some cases the database provides a breakdown of the gross fees to individual components but in many instances all the fees are combined into one. We have elected to analyse the gross fee because it is the most representative of the overall issuing costs.
SPREAD:	The difference between the yield to maturity of the bond at issue and the corresponding tenor of the government yield curve in that currency. For dollar issues this would be the Treasuries curve, for Deutsche mark issues the German government curve, etc. For euro-denominated issues this benchmark would be the one suggested by the market for the specific maturity. Frequently this would be the corresponding German bond, but often in the case of intermediate maturities (eg four-seven years) it could be the French or Dutch government bond. The spreads were supplied directly by the IFR database.
AMOUNT:	The natural logarithm of the size of the issue expressed in US dollars (ISSUE SIZE) at the time of issuance. In order to capture potential non-linearities in the relationship between fees and the size of the issue we have also included a squared term (ISSUE SIZE (SQ)) among the regressors.
TIME:	To capture secular trends in the behaviour in underwriting fees, we have included a linear TREND variable defined as the difference between the year of issue of the bond and 1994 (the first year in our data). We also include dummy variables to indicate the part of our sample period after the introduction of the euro. The variable EMU marks the single currency subperiod and is equal to one for all bonds issued after 1 March 1998. The date indicates the time of the official recommendation for the first group of countries that would join EMU. At that time, the convergence of yield curves was practically complete and markets started treating the euro as a certainty. Interaction dummies of this variable with the various currency flags are also indicated using the pre-currency and EMU-currency format (ie pre-USD, EMU-USD).
CURRENCY:	There are three dummy variables that capture effects specific to a certain currency segment of the market. USD is a flag for US dollar-denominated issues, EURO flags issues in ECU or the euro, LEGACY flags issues in one of the predecessor currencies of the euro, and OTHER accounts for all the remaining currencies. Interaction terms of these variables with the pre- and post-EMU periods are noted as pre-<CURRENCY> and EMU-<CURRENCY>.
SECTOR:	This is a set of seven dummy variables designed to capture specific effects due to the nature of the issuer's line of business and it corresponds to the first digit of the borrower's SIC classification.
RATING:	A set of seven dummy variables that denote the rating category of the bond at issue. We have used the following classification (AAA, Aa1-3, A1-3, Baa1-3, Ba1-3, B1-3, Caa1-3) for Moody's ratings and (AAA, AA, A, BBB, BB, B, CCC) for Standard & Poor's ratings. We have used the rating by Moody's, and in its absence the rating by S&P, if

	available. The JUNK dummy variable denotes ratings that are in the sub-investment grade category.
MATURITY:	To capture effects related to the maturity of the bond, we have classified the issues in three maturity buckets: MATURITY (1-5) for maturities of less than five years and MATURITY (>15) for issues that have longer than 15 years of maturity at issue.
VOLUME:	This is a variable that measures the overall volume of issuance in the particular currency of denomination of the bond during the specific year of issue. The variable is expressed as the base 10 logarithm of the overall volume measured in billions of US dollars.
AFFINITY DUMMIES:	This is a group of dummy variables that flag the coincidence of the nationality of the borrower, the currency of issue and the nationality of the underwriter. The variable BANK = CURRENCY is equal to one when the issue is denominated in the "home currency" of the underwriter, while the variable BANK = ISSUER denotes the cases where the nationalities of the banker and the issuer coincide independent of the currency of denomination. For issues denominated in euros, the dummy is equal to one if the banker is from any of the single currency area countries. For issues underwritten by more than one bank the dummies are equal to one if the nationality of any of the main underwriters satisfies the relevant criterion.
US/EU/CH BANKER:	Indicator variables which are equal to one if the underwriter is a US institution, one of the top euro area institutions (based on it being ranked among the top 10 underwriters in the league tables for the period of our sample), or one of the two Swiss investment banks, respectively. The treatment of issues with multiple underwriters is similar as to that for the affinity variables.
BANKER'S SHARE:	These are two variables measuring the share (in percentage points) of the underwriter during the year of issuance of (i) the overall volume of issuance in the specific currency segment (CURRENCY SHARE), and (ii) the global underwriting activity (GLOBAL SHARE). In the case of more than one underwriter we have selected the syndicate member with the largest share in the respective universe.
DOMESTIC:	This is a dummy variable that corresponds to a flag in the database that signals issues of primarily domestic focus.
FREQUENT ISSUER:	This set of variables controls for issuers that are frequent users of the international bond market, and thus might be more familiar to investors. The dummy variable REPEAT ISSUER flags bonds issued by borrowers that have more than one record in the IFR database over the time period of our analysis. The flag MTN indicates issues that are part of a medium-term-note multi-issue programme.
CONCENTRATION:	The Herfindahl index of concentration for the currency segment and year of issue of the bond. It is calculated as the sum of squared percent shares of all underwriters of bonds in the specified universe. For the calculation, we took into account all the bonds included in the database, not only those on which we based the regressions. The variable used in the regressions has been rescaled to fit in the range: 0 - 10.

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