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## Can Network Effects Impede Optimal Contracting in Debt Securities?

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# Can Network Effects Impede Optimal Contracting in Debt Securities?

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## Abstract

We examine network effects as an impediment to optimal financial contracting. In devising the terms of their transaction, the parties may prefer to conform to a market standard rather than matching their own contracting needs. To study this possibility, we investigate choice of contract law provisions in European debt securities. In order to disentangle network effects from the effects of substantive differences of contract laws, we take advantage of a natural experiment: In 1999, eleven countries adopted the Euro as an official currency. As a consequence, the investor base of European issuers expanded beyond their respective home states. We hypothesize that the demand for an international standard contract law increased as the national securities markets converged into a single Euro area market. Using a difference-in-difference approach, we show that there is a strong and significant shift to English law for debt securities in Euro area member states as compared to other European countries. Our results are robust to alternative hypotheses and various statistical tests. Choice of law in debt securities may follow a market standard rather than quality differences among the competing contract laws.

JEL-Code: G14, K12, L14

Keywords: financial contracting, network effect, debt securities, economic and monetary union

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## 1. Introduction

People enter into contracts to make themselves better off. It thus seems that contracts must reflect parties' preferences: If they did not, the parties would write a different contract. Of course, drafting an alternative provision may not be worthwhile. Economizing on transaction costs can lead the parties to use standardized terms instead of fine-tuning their agreement, as everyone familiar with contracting practice will affirm. Yet when the gains are significant, one would expect the parties to deviate from 'boilerplate' terms and devise better provisions. Put differently, only contract drafting costs seem to prevent the parties from implementing the optimal solution for their transaction.<sup>1</sup> In this paper, we explore an additional impediment to efficient contracting. Even if individual parties are prepared to incur the extra effort, they may still refrain from customizing their contract. The reason is that there can be a benefit from adhering to a contracting standard shared by most other market participants: By definition, the market standard is well known to many potential contract partners, which reduces the transaction costs not just of writing but also of understanding and evaluating contract terms. Because it is frequently used, there is considerably more experience with the standard contract design than with any potential alternative. As a consequence, the parties could opt for the market standard although it poorly matches their own needs. Even when standardization is preferable overall, the adopted standard could be inferior to an alternative term that could as well serve as standard.

In economic theory, the advantages of market standardization are referred to as 'network effects' (see the excellent survey by Farrell and Klemperer 2007). Network effects occur when users of a good derive a benefit from others using the same or a 'compatible' good. The literature has developed mostly around the network effects of communication and information technologies such as telephone 'networks,' video cassette recorders, computer operating systems, or online platforms (see the seminal contributions by Rohlfs 1974; Katz and Shapiro 1985; Farrell and Saloner 1985). But network effects are an almost ubiquitous phenomenon and can arise in many areas, including the standardization of more traditional products such as typewriter keyboards (David 1985; Liebowitz and Margolis 1990) or non-

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<sup>1</sup> 'Optimal' here refers to the second best in view of the information available for contracting.

tradable, societal goods like languages, social norms or culture (see, e.g., Grewal 2008; Church and King 1993; Adams 1996).

If network effects are sufficiently large, users will tend to opt for goods based on their network effects as opposed to their inherent non-network benefits. Markets in network goods therefore sometimes precipitously converge on a common standard or very few standards, an event known as ‘tipping.’ In adopting the standard, users trade off their own preferences over the different goods against the standard’s greater network effects. As a result, they sometimes settle for an inherently inferior good in exchange for enjoying the benefits of a larger network. At first blush, individual utility maximization involving tradeoffs over more than a single quality dimension is perfectly consistent with social welfare. Network effects pose a special problem, however, when all users together fail to coordinate on the socially optimal network good or the optimal combination of network goods. For one thing, network effects can inefficiently prevail over inherent, non-network related quality: The market may adopt, and possibly remain locked in, a standard of inferior quality (mis-standardization). Also, it could converge to a single standard when more diversity would be preferable to accommodate heterogeneity in demand (over-standardization). A second type of failure occurs when the market splinters in too many different network goods, thus foregoing the full potential of network effects (under-standardization).

Contract terms and legal rules can also exhibit network effects (Klausner 1995; Druzin 2009). Contracting parties may stick to a market standard in order to reduce the cost of negotiating contracts and to benefit from a well-tested contracting practice. Network effects in this regard have important normative implications: Combined with the difficulties of coordination, they raise the concern that the market could come to adopt a standard that is suboptimal for all contract parties (mis-standardization); in a similar vein, all contracts may use uniform terms or the same legal rules even though a subset would be better served with a different legal design (over-standardization). If either of these happened, network effects would impede the development of socially optimal contracts. Considerably less confidence would be justified in the efficiency of an observable market practice. From a policy perspective, a possible response is explicit standard setting to enable market coordination on a superior standard, or several standards. Beside the substantive quality of contractual choice, there is an additional normative aspect: There can be too little standardization because market participants remain stuck in different practices

and fail to coordinate up to a level that constitutes a tipping point (under-standardization). To reap the potential efficiency gains from network effects, it may again be advisable to foster formal standard setting in the market.

We study a particular type of contract, namely debentures and other debt securities. Under standard financial contracting theory, one would expect the terms of a debt security to reflect agency costs. An example of this view is the design of covenants in loan contracts and bond indentures (e.g., Smith and Warner 1979; Gârleanu and Zwiebel 2009; Nikolaev 2010; Miller and Raiser 2012). Network effects can impede agency cost minimization when issuers include terms that are commonly used rather than those that are optimal for the particular issuer and security. To detect network effects in debt securities contracting, we focus on an important feature of contract design, the choice of governing law. The applicable law guides the interpretation of the contract and limits the scope of permissible arrangements. For instance, the US Trust Indenture Act 1939 prevents majority decision-making with regard to payment terms, thereby restricting bondholders' ability to renegotiate a debt security.<sup>2</sup> German law until 2009 equally proscribed bondholder resolutions on financial entitlements whereas in the UK collective action clauses have been in use since 1879 (Buchheit and Gulati 2002). The governing law can be quite relevant. At the same time, standardizing the contract design of debt securities should also rank highly because issuers are interested in enhancing liquidity in the secondary market. Network effects should loom particularly large for the choice of applicable law because using a contract law requires an upfront investment in understanding and evaluating not just a single term but a full set of legal rules.

A first look at contract law choices for debt securities supports this conjecture: Choice of law is highly concentrated for debt securities. For a sample of US corporate debentures in 2002, Eisenberg and Miller (2009, p. 1491) report a market share of 89 percent for New York law. Similarly, in our own sample of debt securities from European issuers English law commanded a market share of 80 percent in the late 2000s. Such a high concentration suggests a strong demand for standardization (as opposed to near-uniform preferences for the inherent quality of New York or English law). Our empirical analysis seeks to establish that this is indeed the case: The rise of English law to market dominance coincided with

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<sup>2</sup> The Trust Indenture Act applies to public offerings of corporate bonds in the US, even when a foreign law governs the indenture.

the advent of the Euro in 1999. We argue that the European Monetary Union (EMU) broadened the investor base for European issuers, thereby increasing the benefits of a pan-European standard. Consistent with the network effects hypothesis, our analysis shows that the demand for English law grew stronger where the targeted investor audience changed most, namely for issuers located in EMU member states and for debt securities denominated in the currency of an EMU state. One can hardly miss the irony of the story: The United Kingdom steadfastly opposed the EMU, and yet the common currency led English contract law to dominate the EMU's market in debt securities.

There is some empirical evidence on network effects of contract terms and legal rules. A strand of research analyzes the development of 'boilerplate' contract terms to establish that market demand for standardization in spite of divergent preferences. Like our study, this literature focuses on debt securities: Kahan and Klausner (1997, pp. 740-760) track the evolution of 'event risk covenants' in 101 corporate bond indentures issued in the years 1988 to 1993. They argue that the drafting quality of these contractual provisions both converged and improved over time, which they read as evidence of collective learning and hence network effects. Choi and Gulati (2004) carefully examine the move towards collective action clauses in sovereign bond contracts governed by New York law based on a sample of 155 offerings. They document an abrupt shift in 2003 and conclude that the dominance of unanimous action clauses did not reflect uniform issuer preferences. More recently, Choi, Gulati and Posner (2012a, 2012b) generalize and extend these earlier findings for a larger sample of 1,385 sovereign bonds from 1960 to 2011 and for various contractual provisions. On this broader basis, they are able to show that the terms in sovereign bonds often remain stable over extended periods of time before suddenly shifting towards new market standards in reaction to external shocks. Again, this finding of 'clustered change' is consistent with network effects in contracting. Interestingly, the boilerplate literature also contemplates the role of lawyers and underwriters as change agents for contracting standards (particularly Kahan and Klausner 1997; Choi, Gulati and Posner 2012b). We complement this research based on a comprehensive dataset of European debt securities. More importantly, the natural experiment of the EMU allows us to establish more direct evidence of a causal link from network effects to contracting practice.

Broughman, Fried and Ibrahim (2012) provide a rigorous and careful analysis of network effects in corporation law,<sup>3</sup> albeit without using the term.<sup>4</sup> Using a sample of start-up firms from 2000 to 2002, they show that the likelihood of incorporation in Delaware (rather than in the firm's home state) increases as more venture capital financiers are located outside their home state. It appears that venture capitalists urge firms to use a familiar corporation law, either the law of the venture capitalist's home state or Delaware law as the nationwide standard. Accordingly, Delaware law may owe its dominant position at least in part to network effects – it is the only law that market participants throughout the US are familiar with. This account receives additional support from survey evidence: Lawyers representing issuers and underwriters in IPOs admit to recommend only the corporate law of either Delaware or their respective home state because they feel unfamiliar with other corporate laws (Carney, Shepherd, and Bailey 2012).<sup>5</sup>

Accounting rules are closely related to financial contracting. Reppenhagen (2010) provides evidence of 'contagion' in individual firms' decision to adopt fair value expensing of stock-based compensation. At the theoretical level, he attributes contagion, among other things, to firms' concern for 'comparability' in financial reporting. If using the same accounting methods improves comparability, this is again an instance of network effects. Another recent contribution explicitly refers to the economics of network effects. Ramanna and Sletten (2012) seek to explain the decision of countries to replace their national accounting standards with the International Financial Reporting Standards (IFRS). They find that countries tend to move towards IFRS as the trade volume with other IFRS adopters increases. Ramanna and Sletten interpret trade volume with IFRS adopters as a proxy of network benefits from using the emerging global accounting standard. However, one could also argue that trade volume captures economic similarities or closer political ties. Identifying network effects seems particularly difficult at the country level.

The remainder of the paper proceeds as follows: In section 2., we lay out our hypothesis that network effects drive contract design and specifically the choice of law in indentures.

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<sup>3</sup> Ribstein and Kobayashi (2001, pp. 121-127) also investigate network effects in business organization law.

<sup>4</sup> In fact, the 'lingua-franca effect' identified by Broughman, Fried and Ibrahim (2012) is precisely what we refer to as 'direct network effects.' They seem to be following Klausner (1995) who reserves the term 'network effects' for indirect network effects. See *infra* section 2.1.

<sup>5</sup> Carney, Shepherd, and Bailey (2012) also show that issuers are more likely to incorporate in their home state when the issuer's and/or underwriters' legal advisers are located in the same state.



We also elaborate our approach to the identification problem that any empirical analysis of network effects needs to solve. Our data and empirical strategy are described in section 3. Section 4. contains the empirical results and section 5. concludes.

## **2. Contract Laws as Networks**

### **2.1. Theory**

Network effects occur when using a good confers a benefit on other users of the same or a compatible good. The literature often distinguishes direct and indirect network effects. A good generates direct network effects by facilitating interactions with other users. Examples are communication technologies such as the telephone or languages. The utility derived from these goods tends to increase as more people join the network and the opportunities for interaction expand. By contrast, indirect network effects arise when a larger user base attracts more suppliers of complementary goods. For instance, operating systems of personal computers or mobile devices appeal to users mostly through the breadth of applications offered by third parties. Because software developers can reach more potential customers on a widely used operating system, the supply of applications tends to increase with the number of platform users.

Network effects are not confined to communication and information technologies. Legal rules can also give rise to network effects. Klausner (1995) has been the first to observe that contract parties may wish to rely on contract terms that are widely used in order to benefit from network effects. A popular contract term, according to Klausner (1995), confers a number of advantages (see also Kahan and Klausner 1997; Goetz and Scott 1985): Widespread contract terms are often interpreted by the courts. A large body of precedents implies that the term's legal content is more clearly defined. In a similar vein, one can learn from the experience of others so that the pitfalls of commonly used terms are better known and can be avoided. The repeated use of a term exposes unforeseen consequences and fosters an evolutionary process of refinement. As lawyers tend to be more familiar with frequent contract terms, legal advice is less costly and more reliable.

Judicial precedents or the amount of experience with a given term constitute *indirect* network effects. They result from services by third parties (courts, lawyers) and from the creation of public knowledge. As Druzin (2009) points out, contract terms and legal rules

also cause *direct* network effects.<sup>6</sup> Negotiating a contract is less costly when each of the parties to a particular contract is familiar with the same terms. Using a term for the first time requires an upfront learning investment. A party needs to understand the term's meaning and legal implications to gauge its impact on expected payoffs under the contract. If she refuses to make this investment, she exposes herself to legal risk, including the risk that the other party exploits an informational advantage. Beside the cost of learning (or increased legal risk), business processes have to be adapted to contract terms. Variation of terms over contracts tends to sacrifice economies of scale. Therefore, parties will want to limit the range of different terms under which they conclude their contracts. Using unfamiliar terms imposes higher transaction costs both through the initial learning investment and higher current costs. Since the parties must agree on one and the same contract, there is a benefit from being familiar with the same contract terms as one's potential contract partners. Shared use of the same contract terms, in this regard, resembles a common language that equally reduces the cost of transacting (see Druzin 2009, pp. 18–19).

To summarize, an individual party's preferences over contract terms can be a function of which terms are being used by others: Firstly, if a term is widespread there is a chance that the party can employ the same term in many, possibly all, of her transactions without having to incur the extra cost of contracting under different terms. Secondly, an often used term offers greater certainty of outcomes and ease of application at lower cost. These benefits arise not only for contract terms agreed upon by the parties but also for the rules of interpretation, implied terms, default rules and mandatory rules that attach to the contract law of a given jurisdiction. Choosing the applicable law means selecting not just a single term but a whole set of rules, both mandatory and default, to govern the contract. Therefore, learning costs and the value of collective experience should be at least as important for the choice of law as they are for single contract terms. If network effects affect the parties' contract drafting they should also be present in the selection of the applicable law.

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<sup>6</sup> Interestingly, all of the benefits identified by the earlier literature consist of indirect network effects. Klausner (1995, pp. 785-786) only briefly considers 'marketing network externalities' that arise when investors are familiar with a common term. This can be seen as direct network effects.

In this paper, we study the choice of contract law in European debt securities. Debentures and other debt securities raise many legal and regulatory issues ranging from disclosure requirements to taxes and bankruptcy law, among other matters. We focus on the debt contract underlying a debt security. Under European conflict-of-laws rules, parties are free to choose the law applicable to their contract.<sup>7</sup> The governing contract law can have some import. To illustrate, English law allows the indenture to provide for majority decisions on reducing the principal amount or the interest to be paid under a bond whereas such collective action clauses were not permissible under German law prior to 2009.<sup>8</sup> In addition, German law until 2009 used to restrict ‘no-action clauses,’ which delegate the enforcement of bondholder rights to a trustee (Häseler 2010; Allen 2012, pp. 72-73). German courts also can review the indenture *ex post* and invalidate terms they consider unfair. Another difference is that English law offers a comprehensive body of fiduciary duties for trustees that apply to bondholder trustees. Continental European jurisdictions typically lack the general concept of a trust (Allen 2012, pp. 75-80; Hill and Beech 2010; Rawlings 2007). Finally, investors could also consider the political risk that a given jurisdiction might amend its laws to alleviate its sovereign or corporate liabilities (Choi, Gulati and Posner 2012a, pp. 139-140).

At first blush, one would expect these substantive differences to guide choice of law. The parties should prefer the contract law that best suits their transaction. However, substantive quality no longer needs to dominate choice of law once network effects come into play. In the presence of network effects, the parties can face a tradeoff between their preferences in terms of legal content and the urge to save on learning and operating costs as well as to benefit from greater certainty and collective experience. The issuer of a debt security may choose a particular contract law because she expects investors and legal advisers to be more familiar with it, in spite of the fact that the contract law of another jurisdiction would allow more efficient indenture terms. The competition literature on network effects demonstrates that in such a setting, the market can happen to coordinate on an inferior standard or fail to switch to a superior standard. Network effects can trump substantive

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<sup>7</sup> See art. 3 Rome Convention on the law applicable to contractual obligations of 1980 and now art. 3 Regulation (EC) No 593/2008 on the law applicable to contractual obligations (Rome I).

<sup>8</sup> To be more precise, German law prohibited majority decision-making on payment terms for issuers located in Germany. Whether the ban extended to foreign issuers remained an unsettled issue.

quality (Farrell and Saloner 1985; Farrell and Klemperer 2007, pp. 2024–2026; for contract terms Klausner 1995).

To structure our analysis, assume that an issuer  $i$  derives the following net benefit  $B$  from choosing contract law  $j$  for a debt security:

$$B_i(j) = Q_j(\tau_i) + N(u_{ij}, s_{ij1}, s_{ij2}, \dots, s_{ijK}) - C_{ij} \quad (1)$$

$Q_j$  is the benefit from the substantive quality of law  $j$ . It depends on issuer type  $\tau_i$  because a given contract law may be more or less suitable for different issuers and debt securities, such as sovereign or corporate debentures or asset-backed securities (ABS).  $N$  denotes the benefits from network effects. As explained above, direct network effects result from the number of other ‘users’ of the same contract law, that is the number of market participants that are familiar with the law and therefore willing to enter into a contract governed by it (without the higher transaction costs of using an unfamiliar law). From the point of view of an issuer, the potential contract partners are the investors targeted by the debt security issue. Therefore,  $N$  is a function of  $u_{ij}$ , the number of users of law  $j$  in the investor target group of issuer  $i$ .<sup>9</sup>

While direct network effects relate to the number of available investors, indirect network effects arise from services – in the broadest sense – offered for a particular contract law or a debt security issue under a particular contract law.<sup>10</sup> Service providers include those retained by the issuer, such as legal advisers and underwriters. No less important are complementary services performed on behalf of investors or the market at large (whether paid for by investors, the issuer or others), notably rating agencies, financial industry associations, regulators, stock exchanges, auditors and law firms as information intermediaries. The supply of these services are denoted  $s_{ijk}$  for contract law  $j$  and the kind of service  $k$  (legal advice, underwriting, etc.). As with the investor audience, the supply of services can vary across issuers, hence the index  $i$ . The total amount of network benefits  $N$  depends on both direct network effects ( $u_{ij}$ ) and indirect network effects ( $s_{ij1}, s_{ij2}, \dots, s_{ijK}$ ).

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<sup>9</sup> Note that the investor base could vary across issuers: A debenture issued by an Italian municipality can aim at another investor audience than the covered bond of a German mortgage bank.

<sup>10</sup> The emphasis of our definition differs somewhat from that of the earlier legal literature. While we focus on the familiarity of complementary service providers with a contract law, legal scholars particularly highlight the collective experience and judicial precedents created by the widespread use of contract terms (see particularly Klausner 1995; Kahan and Klausner 1997).

Finally, the net benefits of a given law are reduced by the costs of using it. These costs  $C_{ij}$  depend on whether issuer  $i$  has already made the set-up investment of learning contract law  $j$  (or retaining advisors familiar with the law  $j$ , etc.). Issuing debt securities under a law that the issuer has not used before causes ‘switching costs.’ Also, if issuer  $i$  concurrently uses another contract law she bears an opportunity cost from not using the same law for all of her debt securities. Switching costs and the higher operating costs of using more than one law explain why issuers – like investors and service providers – prefer to employ only one or a few contract laws, which gives rise to network effects. At the same time, the costs of choosing law  $j$  vary across issuers – as well as across investors and service providers – so long as the market has not converged to a single standard. Issuers, investors and service providers using the same contract law will tend to cluster: Quite naturally, one expects Italian contract law to be used predominantly (if at all) by Italian issuers, investors, and service providers.<sup>11</sup>

## 2.2. Identification

We seek to establish empirically whether network effects influence issuers’ choice of contract law for debt securities. If network effects exist, issuer  $i$  is more likely, *ceteris paribus*, to choose law  $j$  when the user base and/or the service supply for law  $j$  increases (and if the additional users and/or service providers belong to the market segment targeted by  $i$ ). Accordingly, an expansion of the user base  $u_j$  and/or the service supply  $s_{j1}, s_{j2}, \dots, s_{jK}$  should boost the demand for law  $j$ . Unfortunately, it is generally difficult to determine empirically whether network effects are present and drive demand (Birke 2009; Farrell and Klemperer 2007, pp. 2015–2016). Typically, a serious identification issue arises when one attempts to spot a causal link from the aggregate behavior of a group to the behavior of individual group members. The problem consists of disentangling the effect of aggregate behavior and other environmental variables or common group characteristics that affect both aggregate and individual behavior (Manski 1993; Hartmann et al. 2008, pp. 293–295). In the context of network effects specifically, the challenge is to distinguish the effect of widespread adoption of a network good from the effect of quality differences. If a contract law  $j$  offers superior substantive quality  $Q_j$  (such as extensively granting freedom of contract), issuers will tend to prefer it for this reason. As more issuers choose law  $j$ ,

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<sup>11</sup> See Sundararajan (2007), Banerji and Dutta (2009) and Fjeldstad, Moen and Riis (2010) for theoretical models of ‘local’ network effects.

investors will become familiar with it, which implies an increasing investor base  $u_j$  (of course, investors may themselves prefer the better law). Equally, service providers will adapt to law  $j$  so that the supply of complementary services  $s_{j1}, s_{j2}, \dots, s_{jK}$  rises. There is a simultaneity problem because the choice of law also has an impact on the drivers of network effects.

There are essentially two ways to overcome the identification problem. One can attempt to control directly for quality differences. This approach poses a major challenge because one would have to obtain data on all relevant quality features of the various contract laws for debt securities. If one overlooked an important quality characteristic, the impact of network effects would likely be overestimated. As one can come up with a huge variety of potentially important characteristics of a contract law for debt securities, this approach appears not very promising. We thus resort to the second strategy. It consists of exploiting an exogenous variation in the drivers of network effects that cannot be related to quality differences. In our view, the EMU presents such an opportunity.

The advent of the Euro has profoundly changed the European debt securities markets (Pagano and von Thadden 2004; Galati and Tsatsaronis 2003; Hartmann, Maddaloni and Manganelli 2003). The Euro eliminated the exchange rate risk for cross-border investment in debt securities as between issuers and investors from the EMU. On the supply side, corporate issuers soon took advantage of the broader market by selling more debt securities than before (Hartmann, Maddaloni and Manganelli 2003, pp. 186-189; Galati and Tsatsaronis 2003, pp. 178-182). Hale and Spiegel (2012) show that non-financial firms from countries outside the EU and the US became by around 17 percentage points more likely to issue bonds denominated in Euro than in any of its predecessor currencies before the EMU.<sup>12</sup> More important for our main hypothesis is the demand side: The introduction of a common currency led investors from the EU and – to a lesser degree – from outside Europe to invest a greater share of their debt securities portfolios in the Euro area (Balli, Basher and Ozer-Balli 2010; Haselmann and Herwartz 2010; De Santis and Gérard 2009; Couerdacier and Martin 2009; Lane 2006; see also Baele et al. 2004, pp. 521-522; Pagano and von Thadden 2004, pp. 538-540).<sup>13</sup> Apparently, investors responded to the elimination

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<sup>12</sup> See generally on the surge in.

<sup>13</sup> Subsection 4.3. and Figure 6 below give an impression of the rise of cross-border investment in debt securities as well as its composition.

of currency risk and started viewing the Euro area as a single debt market.<sup>14</sup> One reason is that regulation restricts foreign currency holdings by certain institutional investors such as insurance companies and pension funds. The EMU allowed them to diversify their holdings internationally (Lannoo 1998, p. 327; Santos and Tsatsaronis 2003, p. 3).

As a consequence, the investor audience of European issuers, particularly those from EMU states, changed in composition and became more international. In terms of our analytical framework, the single currency likely caused a variation of  $u_{ij}$  for various contract laws  $j$ . Prior to the EMU, many debt security issues targeted the domestic market. Domestic investors can be expected to know and trust the contract law of their own jurisdiction.<sup>15</sup> When the investor base becomes more diverse, an increasing share of investors will be unaccustomed to the contract law of the issuer's jurisdiction. If an unfamiliar law causes higher transaction costs, there could be a benefit from using a contract law that is more commonly known. This cannot be the law of each investor's home jurisdiction. Rather, a diverse investor base from several countries needs to converge on a common bridge standard. Any national contract law could in principle serve as the 'lingua franca' of Euro area debt security issues. But judging in hindsight, the only viable contender was English law. Therefore, for a given Euro area issuer  $i$  the EMU should have increased the share of investors familiar with English law ( $u_{i, \text{English law}}$ ) and decreased the share of investors familiar with the issuer's home law ( $u_{i, \text{home law}}$ ). If network effects matter, we expect the benefits derived from using English law to rise relative to the law of the issuer's home state (or any other law that the issuer may have used before).

The variation in investor base mirrors similar changes in the markets for complementary services. For underwriting services in particular, the EMU has opened up the European market to competition from large US banks. The entry of these new players appears to reflect the broadened investor base: Issuers used to retain an underwriter from one of the smaller national currency areas whereas after EMU, firms more often relied on foreign banks (Galati and Tsatsaronis 2003, pp. 183-186; Santos and Tsatsaronis 2003, pp. 13-15; Kollo 2005). Economies of scale and enhanced competition significantly cut issuer costs

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<sup>14</sup> Using panel data from 1978 to 2007, Kalemli-Ozcan, Papioannou and Peydró (2010) provide evidence that the elimination of exchange rate risk contributed the most to the increase in bank-to-bank debt holdings in the Euro area.

<sup>15</sup> Provided that it is used at all, which was the case in many EMU jurisdictions before the Euro, see Figure 1.

leading to a convergence with the US market in debt securities (Santos and Tsatsaronis 2003; Melnik and Nissim 2006; Peristiani and Santos 2010). In terms of our analytical framework, the EMU increased the likelihood that issuers selected underwriters from countries other than their home jurisdictions. As we learned from expert interviews, the larger players in the underwriting market were often located in London. Among other things, they standardized documentation to take advantage of economies of scale and, plausibly, developed a penchant for employing a uniform contract law throughout all their issuances, namely English law. In terms of our analytical framework, for many issuers  $i$  the EMU reduced the prevalence of underwriters willing to issue debt securities under the law of the issuer's home jurisdiction  $s_{i, \text{home law, underwriter}}$  relative to underwriters preferring English law  $s_{i, \text{English law, underwriter}}$ . It stands to reason that a similar shift may have taken place in other complementary service markets, such as legal advice or ratings. Accordingly, the network effects of English law vis-à-vis the other national contract laws should have strengthened as a result of the EMU.

Our identification strategy builds on the EMU as an outside shock on the determinants of network effects. At the same time, the introduction of the Euro did not change the substantive quality  $Q_j$  of the various contract laws or the issuer-specific costs  $C_{ij}$  of using them. The EMU thus provides an opportunity to isolate the impact of network effects from that of variation in the quality of the different laws. It is conceivable, however, that concurrently with the EMU the quality of English contract law improved (or that of other laws deteriorated). To account for this possibility, we adopt a difference-in-difference approach: The variation in network effects should have its main impact on issuers situated in EMU member states (before vs. after the Euro) and on debt securities denominated in the respective currency of an EMU member state (the national pre-Euro currency vs. the Euro). By contrast, the characteristics of a chosen contract law remain unchanged for an issuer from within and without the Euro area and for debt securities denominated in the currency of an EMU and non-EMU state. If, after the start of the EMU, the likelihood of choosing English law rose significantly more for issuers from inside the Euro area than for those from other countries, this would constitute rather solid evidence of network effects. In fact, our approach tends to underrate network effects: If investors and complementary service providers become more familiar with English law after the introduction of the Euro, the stronger network effects of English law could also impact non-EMU issuers.



### 3. Data and Empirical Models

#### 3.1. Data

Our main data source is the Thomson Reuters SDC Platinum Global New Issues database (SDC Platinum), which contains detailed information on public and private debt offerings. Our initial sample consists of 66,116 debt issues in 30 different countries over the period from 1985 to 2008. The sample covers all member states of the European Union (EU) and the European Free Trade Association (EFTA). Appendix A provides a list of the countries in the dataset.<sup>16</sup> We equate the location of an issue to the location of the corporate entity issuing the debt securities. To qualify for inclusion, this corporate entity and its ultimate corporate parent had to be located in one of the sample countries.<sup>17</sup> In the following, we refer to our initial sample as the ‘full’ sample.

On January 1, 1999 eleven EU member states entered ‘stage III’ of the EMU. This implied that the conversion rates of the respective national currencies were irrevocably fixed and the Euro was eventually introduced as the single currency.<sup>18</sup> Only two years later, Greece became a member of the Euro area. Slovenia and Cyprus entered in 2007 and 2008, respectively.<sup>19</sup> By the end of the observation period, nearly half of the sample countries had introduced the Euro as their common currency, which provides the exogenous variation we exploit for our analysis.<sup>20</sup>

We conduct our analysis at the level of individual debt security issues. The dependent variable is *English law*, which equals 1 if English law governs the debt contract and 0 otherwise. We consider a range of security specific explanatory variables. Appendix B provides detail on data sources and variables definitions. When we require these security specific indicators, we are left with 18,196 observations (the ‘micro’ sample).<sup>21</sup> In Table 1, we report descriptive statistics for the five main control variables. In particular, we provide

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<sup>16</sup> We did not observe a single debt issue from Malta and thus did not consider it in our sample.

<sup>17</sup> The location of the corporate entity issuing the debt security and its ultimate corporate parent may differ. In our dataset they were identical in 85 percent of the cases.

<sup>18</sup> The introduction of Euro banknotes and coins finally took place on January 1, 2002.

<sup>19</sup> Malta also acceded the EMU as of January 1, 2008.

<sup>20</sup> Slovakia and Estonia joined the EMU after our observation period, in 2009 and 2011, respectively.

<sup>21</sup> As a result we lose all observations from Cyprus and Slovenia.

the means and medians for the *maturity*, the *offering amount*, the *S&P rating* and the *offering yield* as well as the percentage of *government debt* issues. In terms of rating, yield and the amounts raised, issues in EMU countries were not very different from those in other European countries. However, the average maturity of debt securities in EMU countries was shorter than in non-EMU countries. Furthermore, the amounts in EMU member states post-Euro were significantly larger and the average yield more than a percentage point lower as compared to non-EMU countries and EMU countries.

– Insert Table 1 here –

### 3.2. Empirical Models

The move to a single currency made debt security issues from EMU member states more attractive to foreign investors. If network effects in contract law matter, this should increase the demand for English law as an international standard.

#### *Debt Security Probit Regressions Based on Issuer Location*

We are interested whether the introduction of the Euro led issuers from EMU member states to choose English law more often. Hence, our initial treatment group consists of debt securities issued in an EMU member state, i.e., a country that had joined the Euro area by the end of the sample period. The treatment is the introduction of the Euro in these countries. It affects only those debt securities that were issued after the respective country had introduced the Euro as an official currency. Debt securities from countries which did not join the Euro area by the end of the sample period constitute the control group.

Given that we are modeling a binary choice, that is whether a debt contract adopts English law or not, we estimate the following Probit model:

$$\Pr(\text{English law} = 1) = \Phi(\beta_1 \text{EMUcountry} + \beta_2 \text{After1998} + \beta_3 \text{EMUstageIII} + \gamma \text{CONTROLS}) \quad (2)$$

*EMUcountry* equals 1 if the issue was placed in an EMU member state before or after the introduction of the Euro (treatment group). It thus captures general differences between issuers located in EMU member states and issuers in all other countries (which had not joined the Euro area by 2008). We include *After1998* (which equals 1 for debt securities issued after 1998) to capture changes in choice of law preferences around the time the Euro

took effect in most EMU member states. *EMUstageIII* is our treatment variable of interest. It takes the value 1 if the debt security was issued after the Euro was introduced in an EMU member state and 0 otherwise (for non-EMU countries or for EMU countries before the move to the Euro). It reflects the additional effect of the Euro on those issuers that should experience the largest shift in investor base and service providers. If the demand for English law as an international standard rises more among these issuers than among issuers from non-EMU countries or EMU countries that acceded only later, network effects would be the only plausible explanation. In addition, we include a vector of issue-specific control variables: the *maturity*, *offering amount*, *S&P rating* and *offering yield* of the debt security as well as a dummy variable for *government debt*.

In further specifications, we include country dummies to control for country-specific drivers of demand for contract law. For instance, the national corporate or bankruptcy law might influence the optimal design of debt securities contracts. Country dummies allow us to account for any such time invariant effects. They also cover the difference between treatment and control group so that *EMUcountry* becomes obsolete.

Based on the network effects hypothesis, one would expect the Euro effect to vary for different market segments and types of debt securities. The impact should be more pronounced for ‘domestic’ debt securities as opposed to more ‘international’ debt securities that used to address an international investor clientele even before the Euro. To test this conjecture, we construct a subsample of only domestic debt securities. We define a domestic debt security as one which is denominated in the local currency and where the issuer’s ultimate parent (if the issuer is a subsidiary) is located in the same country.

Our hypothesis is that, as a result of the common currency, contract law choices now aim at network effects in the single European market instead of the issuer’s domestic market. This leads to another prediction: We expect European issuers to attribute more weight to network effects in the all-EMU market as compared to those in their home markets. To examine this additional implication, we create the new variables *Prevalence<sub>t-1</sub>* and *Prevalence<sub>EMU,t-1</sub>*. They contain the percentage market share of English law in the previous year in, respectively, the issuer’s home country and the overall EMU market. We interpret this as the user base of English law and hence the network effects commanded by English law in the different markets. Both variables, standing for themselves, might only pick up path dependence or an adjustment process from gradual learning in any given market. For

our network hypothesis, we are mainly interested in the impact of English law prevalence in the domestic market vis-à-vis the European market and how issuer responsiveness to these two markets changes with the introduction of the Euro. As a complement to our difference-in-difference approach, we estimate Probit models separately for issuers from EMU and non-EMU countries:

$$\Pr(\text{English law} = 1) = \Phi(\beta_1 \text{Prevalence}_{t-1} + \beta_2 \text{Prevalence}_{\text{EMU}, t-1} + \gamma \text{CONTROLS}) \quad (3)$$

#### *Debt Security Probit Regressions Based on Currency Denomination*

In the difference-in-difference models presented so far, we define the treatment and the control group based on the issuer's location. As an alternative specification, we consider the currency denomination as the relevant group characteristic: Our treatment group now consists of debt securities denominated in the currency of an EMU member state, which is the respective national currency before the common currency took effect and the Euro thereafter. The treatment is the introduction of the Euro. Debt securities denominated in the currency of a non-EMU state (which was not replaced by the Euro) constitute the control group. The formal statement of this Probit regression is as follows:

$$\Pr(\text{English law} = 1) = \Phi(\beta_1 \text{EMUcurrency} + \beta_2 \text{After1998} + \beta_3 \text{Euro} + \gamma \text{CONTROLS}) \quad (4)$$

*EMUcurrency* equals 1 if the debt security is denominated in Euro or a predecessor currency of the Euro. Again, we include either year dummies or the variable *After1998*. *Euro* is the variable of interest that captures the additional demand for English law from the replacement of national currencies in the EMU by the Euro.

## **4. Empirical Results**

### **4.1. Descriptive Statistics**

Figures 1 – 4 provide descriptive statistics on the size of the local debt markets and the market shares of domestic, English and other foreign laws in our sample jurisdictions. Among the largest debt markets were the United Kingdom, Germany, the Netherlands, France and Luxembourg. For EMU member states, Figures 1 – 2 distinguish for the period

before and after the country adopted the Euro. In the pre-Euro era, the domestic law of the issuer's country was used quite frequently. In the ten largest markets, 57 percent of the debt contracts were governed by domestic law; English law covered only 10 percent. At the same time, almost no indenture in the six smallest markets chose domestic law. A similar pattern emerges for the non-EMU countries in Figure 3. Domestic law played a major role only in Switzerland, the three non-EMU Scandinavian countries (Sweden, Denmark, and Norway) and, of course, the United Kingdom, where almost all debt contracts adopted English law. Figure 4 further elaborates the correspondence of market size and the use of English law. It relates the average number of debt issues per year in the various countries to the market share of English law. Apparently, only the larger debt markets were able to sustain their own contract law for indentures while smaller markets tended to use English law as the international standard even before the Euro. Whether the prevalence of domestic law in the large markets resulted from different preferences or from accidental path dependence is difficult to tell. In any event, contract laws for debt securities seem to face a critical minimum threshold size, which is suggestive of network effects.

The popularity of domestic law declined even in the larger markets as soon as the respective country joined the Euro area. Figure 2 reveals that the domestic law lost its relevance in every single market. Throughout the ten EMU countries with the largest debt securities markets, it was chosen for only 17 percent of debt security issues.

– Insert Figures 1-4 here –

Figure 5 further documents the rise of English law after the Euro became the common currency of the EMU member states. Based again on our full sample, Figure 5 reports the percentage of English law governing domestic and 'Eurobond' debt security issues over time for all countries in our sample except the United Kingdom. Again, we define 'domestic' issues as those where the currency and the location of both the issuer and its ultimate corporate parent coincide. Consistent with the network effects hypothesis, domestic debt securities did not adopt English law as long as the investor base was largely national. After the Euro opened up national debt securities markets, English law rapidly gained ground even for domestic issues: In 2004, 79 percent of domestic debt issues chose English law, up from barely above nil before 1995. We observe a similar – though less pronounced – trend for debt securities issued in the Eurobond market. 'Eurobonds' are denominated in a currency different from the country where the debt security is issued. The

share of English law in the Eurobond market rose from 30 percent in 1998 to 81 percent in 2004. Even before the EMU, Eurobond investors and issuers were more diverse than those in the national markets. This could explain why English law already had a strong foothold in the Eurobond market. But even there, the benefits of international standardization appear to have grown further post-EMU. The success of English law in both market segments suggests that it has become the uncontended, unique standard for both domestic and international debt securities.

– Insert Figure 5 here –

## 4.2. Model Estimates

### *Debt Security Probit Regressions Based on Issuer Location*

The Probit estimation results of Eq. 2 are reported in Table 2. With the basic control variables *EMUcountry* and *After1998* in place, the coefficient of *EMUstageIII* is large and statistically significant throughout the domestic issues subsample. The interpretation of this coefficient is that once a country entered the Euro area, the probability increased that a debt contract would adopt English law (taking into account country specific differences and general changes in contract law preferences over time). That the treatment effect is much stronger for domestic issues is in line with the network effects hypothesis: The shift in network effects post-Euro should be more pronounced for those debt securities that, pre-Euro, involved mostly local players. Even for all debt securities, as we use the more fine-grained country dummies instead of the *EMUcountry* control, the treatment effect comes out significant.

Interestingly, issuers from EMU member states were generally less likely to choose English law. The Euro brought down contract laws that had a strong position at least in their home market. In addition, there was a general shift towards English law as *After1998* and most of the year dummies after 1998 are positive and highly significant. One plausible explanation is that the increased network effects of English law made themselves felt to non-EMU issuers as well. Investors and service providers in general may have become more familiar with English law. Thus, our difference-in-difference approach overall tends to underestimate the role of network effects. Security characteristics seem to have no systematic impact.

– Insert Table 2 here –

Table 3 contains the results from Eq. 3. They conform to our prediction that, after the introduction of the Euro, network effects in the all-European market became more important both in absolute terms and relative to the network effects in the issuer’s domestic market. Before the Euro, the market share of English law in the domestic market was a similarly strong or better predictor of issuers’ choices than the respective market share across all EMU countries (specification (1), (3), (5) and (7)). This pattern fully reverses after 1998, as the size of the  $Prevalence_{EMU, t-1}$  coefficient now surpasses that of  $Prevalence_{t-1}$  and is reliably positive and significant both in EMU and non-EMU countries. For non-EMU countries, the Euro has generally had less impact on the relative importance of the EMU market vis-à-vis the issuer’s national home market. This finding reaffirms our assumption that the effect of the Euro was stronger for EMU countries (the treatment group in our difference-in-difference analysis) than for non-EMU countries (the control group). For domestic issues in the non-EMU countries, the market share of English law in the EMU became as influential as in the EMU countries themselves. The latter result suggests that the Euro changed network effects for non-EMU countries as well, albeit to a lesser degree than for the EMU countries.

– Insert Table 3 here –

#### *Debt Security Probit Regressions Based on Currency Denomination*

Table 4 contains the results from Eq. 4, which frames the natural experiment in terms of currency rather than issuer location. We analyze whether the introduction of the Euro increased the demand for English law for debt securities offered in EMU markets as indicated by the currency used (as opposed to the location of the issuer). We again include our basic control variables as well as country and year dummies. As it turns out, the coefficient of interest *Euro* is positive and statistically significant throughout all specifications. Similar to our earlier results, debt securities aimed at EMU markets generally choose English law less often, and there was a trend towards English law after 1998.

– Insert Table 4 here –

### 4.3. Alternative Explanations of the Treatment Effect

Our identification strategy assumes that the advent of the common currency varied the investor base but not the substantive quality of European contract laws. Indeed, it appears that English law did not undergo any relevant changes with regard to debt securities in the years around 1999.<sup>22</sup> Even if the quality of English law had improved, the effect should be the same for the control group, that is for issuers outside the EMU or for debt securities denominated in a non-EMU currency. Our difference-in-difference approach thus accounts for variance in English law. Conversely, there is no reason to believe that only the contract law of EMU jurisdictions – but not that of other European states – deteriorated concurrently with the introduction of the Euro.

Yet quality considerations could impact our results also from the demand side. As the common currency opened up national markets, foreign investors may not only have been less familiar with the various national contract laws, giving English law a comparative advantage in network effects. In addition, they might have brought their own divergent preferences for contract design and hence a shift in the demand for contract law quality. We pursue this argument even though it is not quite clear why investors' predilections for the substance of legal rules should differ in the first place. Be this as it may, the objection is most plausible for investors from outside Europe: If a preference for English law had prevailed among European investors, it would be hard to explain why debt securities were issued under various contract laws before the monetary union – other than because of network effects that outweighed intrinsic preferences. Therefore, if a change in quality demand is to explain the rise of English law, it must be due to non-European investors entering the EMU debt securities markets after the switch to the Euro.

To examine this possibility, we consider the composition of foreign investors in debt securities issued in the initial EMU member states over time. We use the portfolio holdings of foreign debt securities from the IMF Coordinated Portfolio Investment Survey (CPIS). We divide these amounts by the total amount of debt securities outstanding from the BIS debt securities statistics. In our view, this is the best available proxy for the percentage of debt securities issues that have been bought by foreign investors. Figure 6 shows a solid

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<sup>22</sup> The passage of the Trustee Act 2000 might seem to have strengthened the liability of trustees. In fact the trust deed can limit the trustee's duties and exempt her from liability and invariably does so (Rawling 2007).



increase in relative foreign holdings from 2 percent in 1997 to nearly 12 percent in 2002, which confirms that debt securities markets in EMU states opened up as a result of the common currency. More important for our argument here is the fact that investors from European countries (EMU and EU-27) dominated the boom in cross-border holdings. As the new foreign investors were mostly from Europe, they likely did not introduce different quality preferences to European debt securities markets.

– Insert Figure 6 here –

There is yet another way in which the Euro may have shifted the demand for contract design and hence for the substantive quality of contract laws. Insofar as the common currency has broadened the securities markets in EMU countries, it could have also attracted new kinds of issuers and securities. It has been suggested, for instance, that the Euro allowed corporations of lesser credit standing to issue debt securities (e.g., Pagano and von Thadden 2004, p. 537). For lower rated issuers, the optimal debt contract could look different. It might include collective action clauses which English law in contrast to other jurisdictions permits. Similarly, the Euro could have fostered the growth in ABS in EMU countries in the years before the financial crisis (European Central Bank 2007). ABS may require specific arrangements that English law more easily provided. If this were the case, the introduction of the Euro would have changed not only the network effects of European contract laws but also the requirements of optimal financial contracting. As a consequence, one could attribute the move to English law to a variation in the demand for the content of legal rules, rather than to network effects.

We cannot entirely rule out any such explanation. However, in Tables 2 and 3 we control for various security characteristics. They include the rating of the debt security and the offering yield. If a rise in lower rated issuers were behind the move to English law, these control variables should capture the effect. The same is true for *maturity* and *offering amount* to the extent they reflect systematic differences across security types, e.g., for ABS. As we control for government entities, our results are also not driven by a systematic rise or decline of sovereign debt issues.

Apart from quality differences, some institution may have helped to promote English law as de facto standard for debt securities contracting. Such a story would be consistent with our network effects hypothesis: Standard setters can only succeed if there is demand for a standard, which is just another way of saying that there are network effects. Nonetheless,

we are not aware of a recommendation or activity by a formal standard setting institution to the effect that debt securities should be governed by English law. The influential Primary Market Handbook of the International Capital Market Association refrains from recommending the choice of English law or that of any other jurisdiction.

## **5. Conclusion**

The Euro has transformed European debt securities markets. Simultaneously, English law has become the contract law of choice for issuers throughout Europe. We are able to show that English law has made the largest inroads for issuers located in the EMU and for debt securities denominated in an EMU currency (the Euro or its legacy currencies). Neither a quality improvement of English law nor a change in preferences over legal rules explains the ‘difference in difference’ between EMU and non-EMU countries before and after the Euro. Likewise, there is no reason to assume that the cost of using English law declined more for EMU issuers than for those in non-EMU countries. Instead, our results point to the benefits of using a law that most contract partners and complementary service providers are familiar with. Contract laws exhibit network effects.

Our analysis remains silent as to which players triggered the move to English law. By eliminating the exchange rate risk, the immediate effect of the common currency was on investors. It may be, however, that investors pay relatively little attention to the legal detail of indentures. The largest costs from differences in contract laws arise in the process of structuring a debt issue. It has been noted earlier that the introduction of the Euro shook up the market for underwriting services; a similar change may have occurred among legal advisers. One can imagine that the new pan-European market gave rise to a cluster of service providers for debt securities issues, presumably located in London. Because these underwriters and law firms had the greatest direct cost savings potential from standardizing legal technology, they may have been its main drivers. In terms of our analytical framework, the network effects from underwriters and lawyers could have been decisive for the triumph of English law.

From a normative angle, our findings cast doubt on the efficiency of contracting. They are consistent with three different interpretations: One could suppose that English law unequivocally is the optimal contract law for debt securities. In this case, our analysis implies that network effects prevented a more efficient contract design. As issuers,

investors, lawyers, underwriters and other parties in the domestic markets – at least the larger ones – were more familiar with their own national laws, they were unable to orchestrate a switch to the superior alternative. In this view, it took the external shock of the Euro to overcome the inefficient inertia created by network effects (and switching costs). A second story is that English law is, in fact, less suitable for debt securities than all or some of the national laws it replaced. If this were the case, then the shift in network effects from the Euro would indeed be responsible for suboptimal contracting choices. A variant of this view is that different contract laws cater to diverse contracting needs. The rules provided by English contract law might suit some issuers and debt securities but not others. Because neither changes in substantive quality nor issuer demand explain the move to English law, it follows that at least some issuers had to forego their most preferred contract law due to network effects. A third and final possibility is that the substantive differences between contract laws are in fact trivial. While lawyers have to consider the technicalities of the applicable law when drafting a contract, it may be that the laws of all jurisdictions effectively permit any kind of contract that the parties desire. Contract laws could be ‘different but equivalent.’ Under this reading, network effects in the choice of applicable contract law are fully consistent with optimal contracting. Standardization would involve only a tradeoff between current cost savings and the one-time costs of switching to the new law.

Generally speaking, network effects are more than just a potential impediment to efficient contracting. They reflect genuine savings of transaction costs for the contract parties and for complementary service providers. Given the world’s multitude of jurisdictions, it seems not unlikely that the number of contract laws in use is inefficiently high and hence the degree of standardization is too low. In a financial contracting setting like the one we study, accomplishing standardization in itself deserves credit. The theory of network effects only cautions that the market can err by picking the wrong standard and by standardizing too much or too little. There could be a role for institutional arrangements that help the market to avoid costly mistakes.

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## **Appendix A, List of countries in the dataset**

### **European Union: Year Euro was introduced**

Austria	1999	Bulgaria
Belgium	1999	Czech Republic
Cyprus	2008	Denmark
Estonia	2011*	Hungary
Finland	1999	Latvia
France	1999	Lithuania
Germany	1999	Poland
Greece	2001	Romania
Ireland	1999	Sweden
Italy	1999	United Kingdom
Luxembourg	1999	
Netherlands	1999	
Portugal	1999	
Spain	1999	
Slovakia	2009*	
Slovenia	2007	

### **European Free Trade Association**

Iceland
Liechtenstein
Norway
Switzerland

\*Country joined stage III of EMU after the observation period.

## Appendix B, Variable definitions

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### CHARACTERISTICS OF SECURITY

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#### DOMESTIC LAW:

Equals 1 if the domestic law governs the contract; 0 otherwise. Source: SDC Platinum.

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#### ENGLISH LAW:

Equals 1 if English law governs the contract; 0 otherwise. Source: SDC Platinum.

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#### FOREIGN LAW:

Equals 1 if any foreign law (except English law) governs the contract; 0 otherwise. Source: SDC Platinum.

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#### GOVERNMENT DEBT:

Equals 1 if the debt security is issued by a supranational, sovereign or federal credit agency; 0 otherwise. Source: SDC Platinum.

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#### MATURITY:

The years to final maturity of the debt security. Source: SDC Platinum.

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#### OFFERING AMOUNT:

Total offering amount as stated in the prospectus in 100 millions of US-dollars. For a simultaneous offering identified in one prospectus this item represents the sum of all tranches in the offering. Source: SDC Platinum.

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#### S&P RATING:

Standard & Poor's rating of the debt security at time of offer. The ratings assign values from 1 to 21, with the best notional rating AAA being assigned a value 1 and the worst CC being assigned the value 21. Source: SDC Platinum.

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#### YIELD:

The offer yield to maturity or to the put in percent. It corresponds to the internal rate of return, i.e. the cash flows from the debt security considering the coupons, the purchase price and the principal at maturity. For convertible and non-convertible debt, this is the rate of return an investor will receive if the security is held to the earliest maturity date. Source: SDC Platinum.

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### NETWORK EFFECTS

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#### EMUSTAGEIII:

Equals 1 if the country has adopted the Euro as an official currency in a given year; 0 otherwise.

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#### EURO:

Equals 1 if the debt security is denominated in Euro, 0 otherwise.

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#### PREVALENCE<sub>T-1</sub>:

The percentage of debt securities in the full sample issued in a given country during the previous year that were governed by English law. Source: SDC Platinum.

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#### PREVALENCE<sub>EMU, T-1</sub>:

The percentage of debt securities in the full sample issued in the EMU during the previous year that were governed by English law. Source: SDC Platinum.

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**Table 1, Descriptive statistics for independent variables 1985 to 2008**

*All* is the overall sample, *EU* are the member states of the European Union as of 2008. *EMU* are member states of the EMU. *EMU (EMUStageIII)* contains observations from EMU member states after the Euro had been introduced in the respective country. The location of the issue is defined by the location of the corporate entity issuing the debt security. This location may differ from the ultimate corporate parent's location.

	<b>All</b>	<b>EU</b>	<b>EMU</b>	<b>EMU (EMUStageIII)</b>	<b>non-EMU</b>
# Issues	18,196	91%	73%	24%	27%
<b>Maturity (in years)</b>					
Mean	7.5	7.5	6.6	7.8	9.9
Median	5.1	5.1	5.1	5.1	7.1
<b>Offering Amount (in millions of US-\$)</b>					
Mean	149	153	150	205	146
Median	84	85	85	124	82
<b>S&amp;P Rating</b>					
Mean	AA-	AA-	AA-	AA	AA-
Median	AA	AA	AA	AA+	AA
<b>Offering Yield</b>					
Mean	6.4%	6.5%	6.5%	5.3%	6.4%
Median	5.9%	6.0%	5.8%	4.9%	6.0%
Government Debt	21%	21%	21%	26%	20%
Domestic Debt	43%	41%	42%	37%	45%
UK Law	38%	39%	32%	53%	55%

**Table 2, Probit Estimates Choice of English Law and EMU Membership**

The dependent variable in equations (1) to (8) is *English law*. It indicates whether the debt security is governed by English contract law. *EMUcountry* equals 1 if the country where the issuer is located had joined stage III of the EMU by 2008, 0 otherwise. *After1998* equals 1 if the debt security was issued after 1998, 0 otherwise. *EMUstageIII* equals 1 if the country had adopted the Euro as an official currency by the time the debt security was issued, 0 otherwise. We calculate marginal effects at the means of the independent variables in all equations and apply robust standard errors. Numbers in brackets are p-values.

	All Issues				Domestic Issues			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>Treatment Variables</b>								
EMUcountry	-0.236*** (0.000)		-0.239*** (0.000)		-0.396*** (0.000)		-0.400*** (0.000)	
After1998	0.353*** (0.000)	0.289*** (0.000)			0.222*** (0.000)	0.258*** (0.000)		
EMUstageIII	-0.014 (0.412)	0.056*** (0.009)	-0.013 (0.465)	0.062*** (0.005)	0.256*** (0.000)	0.231*** (0.000)	0.242*** (0.000)	0.228*** (0.000)
<b>Debt Security Controls</b>								
Maturity	-0.000 (0.377)	-0.002*** (0.003)	-0.001 (0.243)	-0.002*** (0.000)	0.002*** (0.000)	-0.000 (0.779)	0.002*** (0.000)	-0.001*** (0.005)
Offering Amount	0.007*** (0.002)	0.000 (0.943)	0.004* (0.058)	-0.003 (0.245)	0.009*** (0.000)	-0.005* (0.057)	0.007*** (0.000)	-0.005** (0.015)
S&P Rating	-0.003** (0.044)	-0.002 (0.186)	-0.001 (0.598)	0.000 (0.783)	-0.001 (0.279)	-0.001 (0.375)	-0.000 (0.863)	0.001 (0.601)
Offering Yield	0.006*** (0.000)	-0.001 (0.451)	0.012*** (0.000)	0.006*** (0.000)	0.008*** (0.000)	-0.004* (0.067)	0.009*** (0.000)	0.001 (0.342)
Government Debt	0.022** (0.021)	0.015 (0.134)	0.003 (0.768)	-0.007 (0.508)	0.016 (0.114)	0.019 (0.113)	-0.005 (0.616)	-0.012 (0.224)
<b>Fixed Effects</b>								
Country Dummies		Yes		Yes		Yes		Yes
Year Dummies			Yes	Yes			Yes	Yes
Log Pseudolikelihood	-10,698	-9,482	-10,002	-8,858	-2,747	-1,683	-2,486	-1,438
Wald Chi <sup>2</sup>	2,568	3,865	3,417	4,368	1,462	1,820	1,549	1,889
Pseudo R <sup>2</sup>	11.5	21.5	17.2	26.6	31.5	58.0	38.0	64.1
Observations	18,196	18,185	18,196	18,185	7,752	7,749	7,749	7,746

**Table 3, Probit Estimates Choice of English Law and Prevalence of English Law**

The dependent variable in equations (1) to (8) is *English law*. It indicates whether the debt security is governed by English contract law.  $Prevalence_{ALL,t-1}$  is the percentage of debt securities under English law in the overall sample.  $Prevalence_{EMU,t-1}$  is the percentage of debt securities under English law in EMU member states. Both variables are lagged by one year. We calculate marginal effects at the means of the independent variables in all equations and apply robust standard errors. Numbers in brackets are p-values.

	All Issues				Domestic Issues			
	non EMU		EMU		non EMU		EMU	
	before 1998	after 1998	before 1998	after 1998	before 1998	after 1998	before 1998	after 1998
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>Treatment Variables</b>								
Prevalence <sub>t-1</sub>	0.005*** (0.000)	0.002*** (0.005)	0.003*** (0.000)	0.003*** (0.000)	0.002* (0.076)	0.002 (0.413)	0.000** (0.018)	0.002 (0.160)
Prevalence <sub>EMU, t-1</sub>	0.005*** (0.000)	0.004*** (0.000)	0.002*** (0.001)	0.007*** (0.000)	0.001 (0.498)	0.011*** (0.000)	-0.000 (0.717)	0.012*** (0.000)
<b>Debt Security Controls</b>								
Maturity	-0.003*** (0.003)	0.002 (0.166)	-0.005*** (0.003)	-0.002*** (0.006)	-0.006*** (0.004)	-0.004** (0.024)	0.000 (0.800)	-0.002 (0.116)
Offering Amount	3.134*** (0.000)	0.006 (0.335)	0.900*** (0.002)	-0.024*** (0.000)	-1.331* (0.069)	-0.002 (0.877)	0.162* (0.088)	-0.024*** (0.000)
S&P Rating	0.003 (0.444)	-0.001 (0.754)	-0.001 (0.509)	0.002 (0.517)	0.009 (0.126)	-0.013* (0.068)	-0.000 (0.492)	0.006 (0.207)
Offering Yield	0.009** (0.031)	-0.005** (0.040)	-0.001 (0.751)	0.006** (0.016)	-0.001 (0.702)	-0.008 (0.201)	-0.001 (0.673)	0.006 (0.209)
Government Debt	-0.011 (0.684)	-0.003 (0.924)	0.005 (0.694)	-0.015 (0.442)	-0.004 (0.923)	0.052 (0.347)	0.001 (0.804)	-0.059* (0.077)
<b>Fixed Effects</b>								
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Log Pseudolikelihood	-1,404	-612	-4,246	-2,578	-154	-120	-287	-822
Wald Chi <sup>2</sup>	1,216	553	516	669	380	264	78	403
Pseudo R <sup>2</sup>	34.7	35.5	7.4	12.4	83.7	73.6	10.8	23.5
Observations	3,157	1,751	8,867	4,262	1,556	690	3,631	1,578

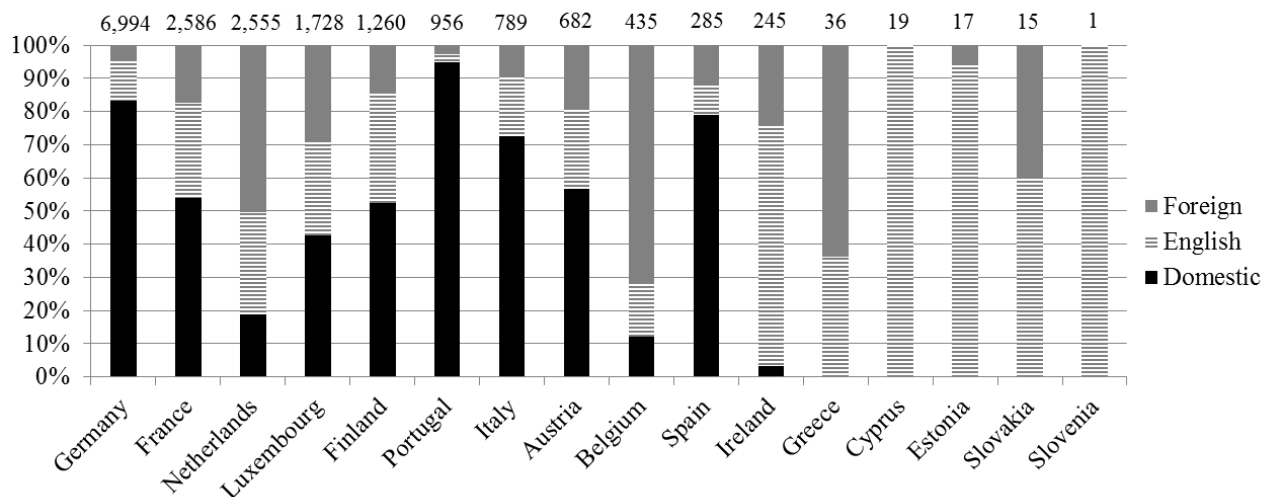
**Table 4, Probit Estimates Choice of English Law and Currency**

The dependent variable in equations (1) to (4) is *English law*. It indicates whether the debt security is governed by English contract law. *EMUcurrency* equals 1 if the currency in which the debt security was denominated in Euro or a predecessor currency of the Euro, 0 otherwise. *After1998* equals 1 if the debt security was issued after 1998, 0 otherwise. *Euro* equals 1 if the debt security was issued in Euro, 0 otherwise. We calculate marginal effects at the means of the independent variables in all equations and apply robust standard errors. Numbers in brackets are p-values.

	All Issues			
	(1)	(2)	(3)	(4)
<b>Treatment Variables</b>				
EMUcurrency	-0.477*** (0.008)	-0.478*** (0.000)	-0.456*** (0.000)	-0.463*** (0.000)
After1998	0.288*** (0.011)	0.240*** (0.000)		
Euro	0.075*** (0.015)	0.195*** (0.000)	0.065*** (0.000)	0.189*** (0.000)
<b>Debt Security Controls</b>				
Maturity	0.005*** (0.001)	0.002*** (0.006)	0.005*** (0.000)	0.001 (0.289)
Offering Amount	0.015*** (0.002)	0.005* (0.053)	0.012*** (0.000)	0.001 (0.629)
S&P Rating	-0.002 (0.001)	-0.001 (0.446)	0.000 (0.978)	0.001 (0.380)
Offering Yield	0.006*** (0.001)	0.001 (0.733)	0.012*** (0.000)	0.007*** (0.000)
Government Debt	0.014 (0.010)	0.021** (0.047)	-0.006 (0.559)	-0.001 (0.896)
<b>Fixed Effects</b>				
Country Dummies		Yes		Yes
Year Dummies			Yes	Yes
Log Pseudolikelihood	-9,639	-8,297	-9,139	-7,814
Wald Chi <sup>2</sup>	3,769	4,286	4,18	4,482
Pseudo R <sup>2</sup>	20.2	31.3	24.4	35.3
Observations	18,196	18,185	18,196	18,185

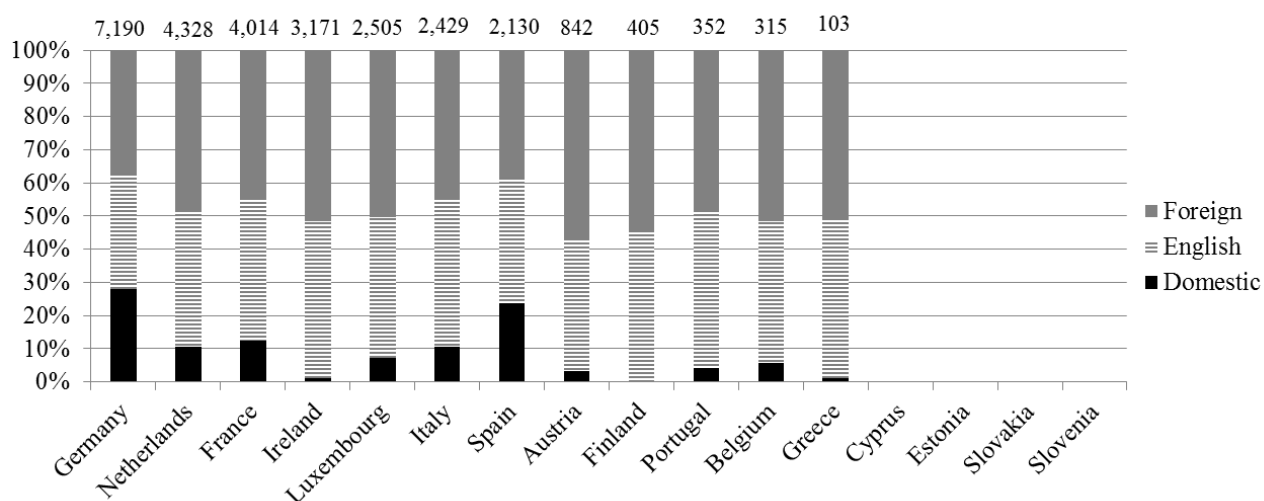
**Figure 1, Adoption of Domestic, English and Foreign Law in EMU member states before the introduction of the Euro as an official currency**

The value above each bar is the number of debt securities issued in that country between 1985 and the year the country introduced the Euro as an official currency. The location of the issue is defined by the location of the corporate entity issuing the debt security. This location may differ from the ultimate corporate parent's location. Bars indicate the percentages of domestic, English and (other) foreign contract law.



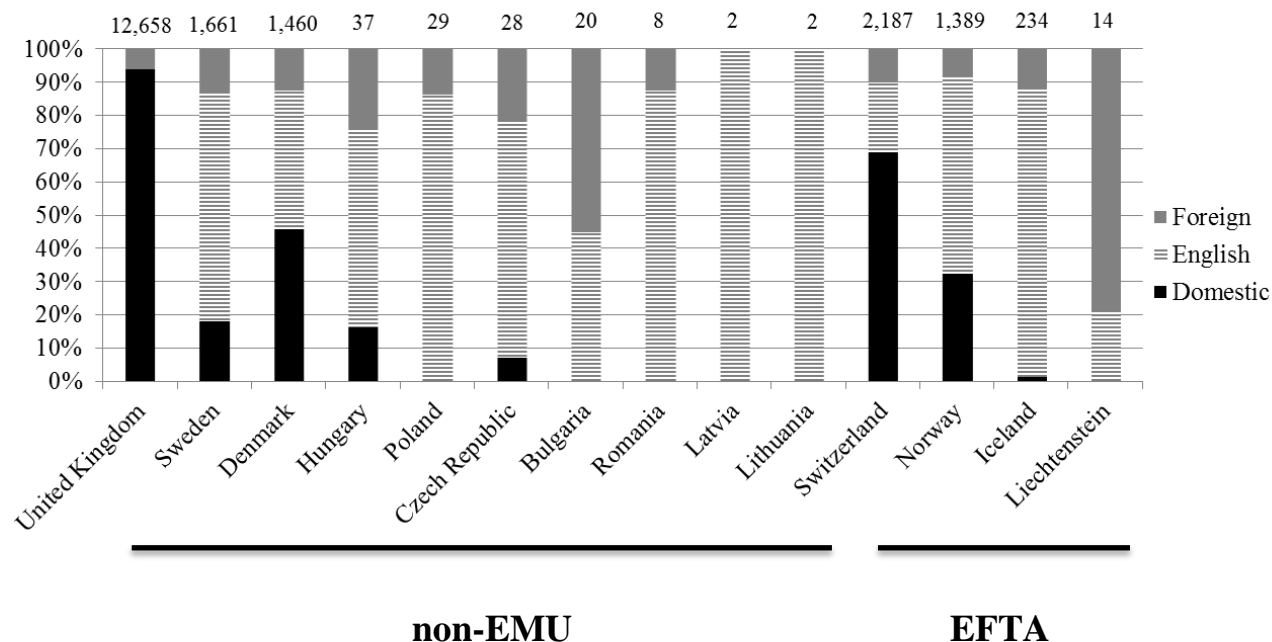
**Figure 2, Adoption of Domestic, English and Foreign Law in EMU member states after the introduction of the Euro as an official currency**

The value above each bar is the number of debt securities issued in that country between the year the country introduced the Euro as official currency and the year 2008. The location of the issue is defined by the location of the corporate entity issuing the debt security. This location may differ from the ultimate corporate parent's location. Bars indicate the percentages of domestic, English and (other) foreign contract law.



**Figure 3, Adoption of Domestic, English and Foreign Law in non-EMU member states 1985 and 2008**

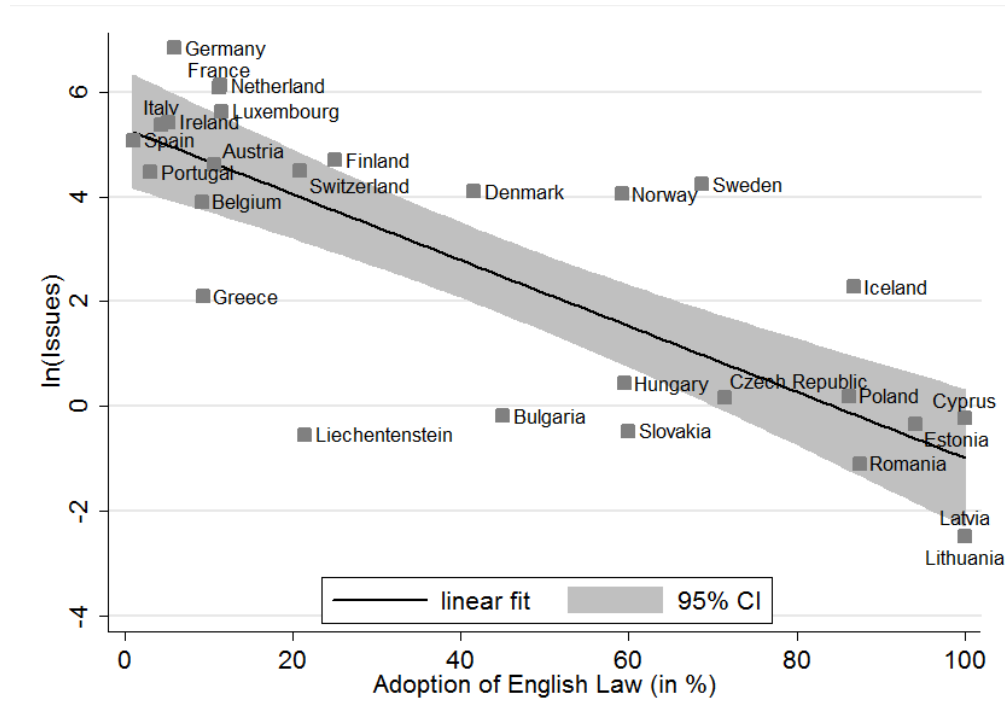
The value above each bar is the number of debt securities issued in that country between 1985 and 2008. The location of the issue is defined by the location of the corporate entity issuing the debt security. This location may differ from the ultimate corporate parent's location. Bars indicate the percentages of domestic, English and (other) foreign contract law.





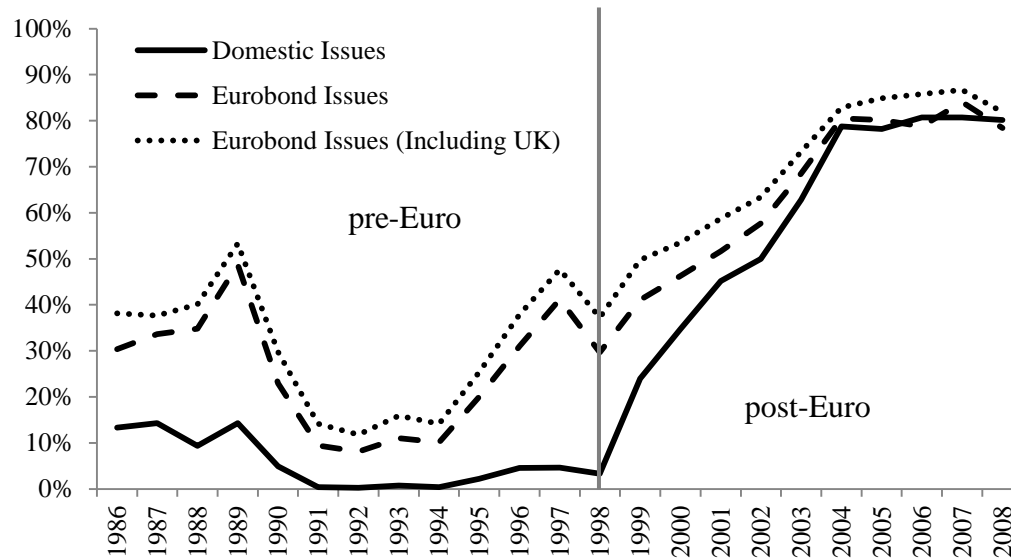
**Figure 4, Debt Securities Market Size and Adoption of English law**

Market size is defined as the average number of debt issues per year in a country between 1985 and the year that country introduced the Euro as official currency. For non-EMU member states the observation period runs from 1985 to 2008. The location of the issue is defined by the location of the corporate entity issuing the debt security. This location may differ from the ultimate corporate parent's location.



**Figure 5, Adoption of English law in Domestic Issues and Eurobond Issues**

The figure displays the percentage of English law that was adopted in domestic issues and Eurobond issues of debt securities between 1986 and 2008 for all countries in the full sample except the UK. 'Domestic issues' are defined as debt issues where the ultimate corporate parent and the corporate entity issuing the debt security are located in the same country and the debt security is denominated in the local currency of that country. 'Eurobond issues' were classified by the SDC Platinum database. 'Eurobonds' are denominated in a currency different from the country where the debt security is issued. The vertical line marks the initial introduction of the Euro as an official currency in eleven countries.



### Figure 6, Foreign Portfolio Holdings in EMU Debt Securities

The figure displays foreign portfolio investment holdings in debt securities as a percentage of the total amounts of outstanding debt securities in the initial EMU countries (Austria, Belgium, Finland, France, Germany Ireland, Italy, Luxembourg, Netherlands, Portugal and Spain). The data source is the IMF Coordinated Portfolio Investment Survey (CPIS) and the BIS debt securities statistics. As no CPIS data was available for Germany and Switzerland in 1997, we imputed the values by calculating the share of Germany and Switzerland in EMU holdings in 2001.

